Executive Summary

The *Trends in Information Resource Management at DOE Headquarters* is published annually to inform the DOE Headquarters community about changes in the information management environment. The document, in its second year of publication, is becoming more robust as more historical data is available and as the information management environment at Headquarters evolves.

Individual organization and consolidation trends are categorized within the following topics: Federal Information Resource Management (IRM) Staff, Contractor Support Staff, Desktop Technology, Connectivity, Information Systems, Document and Records Management, Presentation Graphics and Publications Management, and Interactive Management. The organization environment within these areas is used as an indicator of the degree of implementation of information management in the individual organizations, using the Headquarters Organization IRM Plans as the main source of data. Issues identified in an analysis of the data are presented throughout the document and summarized in the **Issues** section at the end.

Since information is a critical resource for achieving the missions of the Department, 1/4 of Headquarters organizations established Information Management Branches or Divisions. For 1/3, Branch Chiefs or Division Directors serve as Points-of-Contact for coordination of Information Management activities with the Office of Information Technology Services and Operations. Many offices have information management steering committees. Specific examples are presented in the **Federal IRM Staff** section.

Trained support staff, dedicated to developing and maintaining information systems and assisting the Federal staff in using technology, strongly enable the creation of productive work environments. Nearly two-thirds of the Headquarters Federal staff work for organizations where the ratio of information management support staff to Federal staff is at least 1:20. Ratios by organization are presented in the **Contractor Support Staff** section.

The Headquarters workstation inventory will be all 32-bit (386 or above) architecture (the minimum required to support a fully integrated information environment) by the end of FY 1995. Organizations improved their ability to predict requirements for workstations, printers, and other peripherals as presented in the **Desktop Technology** section.

Seventy percent of the Headquarters staff will be connected to the Headquarters local area network (LAN) by the end of FY 1993. The large body of LAN users will create a virtual community to connect to the national information highway. This dynamic environment will result in a new focus for information management requirements. A "birds-eye" view of the overall Headquarters LAN is presented for the first time in the **Connectivity** section.

Current efforts in strategic information planning are summarized in the **Information Systems** section. Analysis of data on the Headquarters information system base reveals over 300 disparate systems, many nearing the end of their system life cycle (average age of 6 years). This situation affords the opportunity to employ a structured, cooperative approach towards establishing an information architecture, which is particularly necessary in this complex, resource-intensive area, because of budget constraints.

Seventeen sets of document imaging and retrieval requirements that have been identified by Headquarters organizations are presented in the **Document and Records Management** section. At least four imaging initiatives are underway, each employing a different hardware and software solution. An analysis is needed of the ramifications of the proliferation of incompatible technologies and the functionality provided by each. The steps for implementing one of the initiatives is presented as an example to show the complexity of document imaging projects.

Most of the Headquarters organizations have the capability to produce presentation graphics and publication quality documents. Specific examples are provided in the **Presentation Graphics and Publications Management** section to demonstrate the accomplishments in several Headquarters organizations. The use of the significant advances in this technology area has been limited, but the potential to create superior material now goes far beyond the meaning of the term "desktop publishing".

Tools for **Interactive Management** at Headquarters include: electronic mail (OfficeVision and cc:Mail), televideo services, and voice mail. Usage statistics indicate a high level of acceptance of these exciting new ways to conduct DOE business. Initiatives are in the areas of electronic mail interfaces, a DOEwide electronic mail and telephone directory, and a televideo services strategic business plan.

Table of Contents

Background

The *Trends in Information Resource Management at DOE Headquarters* (Trends) is published annually to inform the DOE Headquarters community about changes in the information management environment. The document, in its second year of publication, is becoming more robust as more historical data is available and as the information management environment at Headquarters evolves. The charts that are new this year document the current environment. These charts represent baseline data for future Trends.

One of the purposes of the Trends document is to acquire evidence that Headquarters organizations are assimilating guidance offered in the Emerging Technologies Planning Guide (Guide) into their IRM strategies. Another purpose is to identify areas of interest and requirements of the Headquarters organizations to direct technology research for future issues of the Guide. Therefore, the Headquarters IRM planning process feeds the Guide concurrently with the Guide feeding the planning process.

ISSUE
What steps can be taken to further establish the Emerging Technologies Planning Guide as a useful tool to assist organizations in strategic IRM planning?

The Trends document is organized around the following topics, which were included in the Organization IRM Profile featured in the FY 1992 Trends document.

- ▶ Federal IRM Staff

- ▶ Contractor Support Staff

- ▶ Desktop Technology

- ▶ Connectivity

- ▶ Information Systems

- ▶ Document and Records Management

- ▶ Presentation Graphics and Publications Management

- ▶ Interactive Management

These categories have been tentatively established as indicators of the degree of implementation of information management.

The main source of data is the Headquarters Organization Plans, which were updated during the long-range update cycle conducted from August to January. Since these plans were published, the Secretary has announced a reorganization of DOE. For the purpose of this document, the information in the various plans is considered to be valid to accomplish the Departmental missions.

Several of the charts have figures for staffing. This document is assuming a total Headquarters staff numbering approximately 6,000. However, organizations on individual charts may show numbers totalling more or less than 6,000. The discrepancies are due to sources of data having differing breakdowns of staff figures.

Whenever an issue is defined in the body of the document, it is stated in a box such as appears on the previous page. These issues are listed together in an appendix. For the purposes of this document, an issue is defined as a point which needs further attention and exploration. The Trends issues are questions, predictions, opportunities, assumptions, or principles of operation. Rarely do the issues represent differences of opinion.

Organization codes are used throughout the document. A listing of the organizations codes and the corresponding organizations is included as an appendix.

Federal IRM Staff

> *"Turning data and information into usable knowledge by putting it into the hands of those who need it requires evaluation, planning, time, and funding."* [1]

Headquarters organizations are recognizing the importance of information management:

▶ **Organizational Impact** - 26 percent (5 of 19) of Headquarters elements have established divisions or branches that include the words "Information Management" in the titles

▶ **Management Interest and Oversight** - 42 percent (8 of 19) of Headquarters elements have Branch Chiefs or Division Directors who have assumed the Point-of-Contact (POC) role for coordination of IRM activities with the Office of Information Technology Services and Operations

The Office of Energy Research (ER) has been serving as a pilot organization for program-wide information management planning. A working group has been established comprised of individuals from Headquarters, Labs, and Field offices working on ER projects. The group meets periodically with the following goals in mind.

▶ To share experiences and develop a team approach to information management

▶ To determine near-term ER corporate information management initiatives

▶ To establish an approach for developing ER information management strategic planning guidance

▶ To initiate development of a new ER information management planning process

The Office of Environmental Restoration and Waste Management Information Management Steering Committee was chartered by the Assistant Secretary to provide and ensure appropriate direction, guidance, and coordination in the planning, development, enhancement, implementation, and operation of information systems and information management activities. The Committee consists of members representing each of the Deputy Assistant Secretaries.

The Assistant Secretary for Human Resources and Administration (AD) IRM Council consists of the heads of the AD elements or their designees. The group meets to

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[1] *Emerging Technologies Planning Guide*, 1993 Edition, Section 8.

identify, discuss, and prioritize information management projects and allocate funds to those judged to be highest priority. Within AD, the Office of Personnel participates in a DOEwide committee which identifies and works to implement information system initiatives of mutual benefit. There are also Federal Governmentwide information management initiatives in the Personnel arena. The Office of Procurement has a Configuration Management Planning Group, which meets on a weekly basis to direct information system development efforts.

Within the Office of the Chief Financial Officer, there is a DOEwide steering committee for the Departmental Integrated Standardized Core Accounting System (DISCAS), which defines enhancements for that system.

Fossil Energy has had a nationwide information management team in place for 3 years. The group meets at least quarterly to discuss program-wide efforts. The current initiative is to establish communication links among the various electronic mail (E-mail) systems.

ISSUES

In organizations where there is a strong information management staff, the challenge for the Office of Information Technology Services and Operations is to establish good communications and provide sufficient leadership to ensure an efficient, cohesive information infrastructure at Headquarters.

It is important that all organizations understand the necessity for including representatives from their programs in defining information needs.

The following chart summarizes the Federal IRM Staff for the Headquarters organizations. The **POCs** column refers to personnel who act as regular points-of-contact in the working relationship with the Office of Information Technology Services and Operations.

Federal IRM Staff		
Org.	**POCs**	**IRM Supporting Group**
AD	Office Directors, Branch Chief, Division Directors, other staff	AD IRM Council, Human Resource Information Systems Branch (AD-123), Management Information System Division (AD-34)
BC	1 staff	Board of Contract Appeals (BC-1)

Federal IRM Staff

Org.	POCs	IRM Supporting Group
BU	1 staff	Office of Small and Disadvantaged Business and Utilization (BU-1)
CE	Division Director, 2 staff	Facilities and Systems Coordination Division (CE-64)
CP	1 staff	Office of Planning and Resource Management (CP-11)
CR	Division Director, Branch Chief, 1 staff	Financial Systems Development Division (CR-44), Information Technology Branch (CR-133)
DP	Branch Chief, 3 staff	Facilities, Equipment, and Communications Management Branch (DP-542.2)
EH	2 staff	
EH-4	1 staff	Office of Security Evaluations (EH-4)
EM	Division Director, 3 staff	Information Resources Management Division (EM-123)
EP	1 staff	Office of Resource Management (EP-3)
ER	Branch Chief, 1 staff	Policy Review & Information Resources Management Branch (ER-621)
FE	1 staff	Management and Administration Division (FE-122)
GC	1 staff	Administrative Operations (GC-50)
HG	1 staff	Management Information Division (HG-12)
IG	1 staff	Executive Director (IG-10)
IN	1 staff	
MI	1 staff	Office of Minority Economic Impact (MI-1)
NE	1 staff	Resource Management Division (NE-13)
NS	1 staff	Office of Nuclear Safety (NS-1)
OC	1 staff	
OE	Division Director	Office of Resource Management (OE-4)
PA	1 staff	Office of Public Affairs (PA-1)
PR	1 staff	Information Systems & Analysis Division (PR-142)
RW	Division Director, 3 staff	Information Management Division (RW-12)

Contractor Support Staff

The level of contractor information management support available to the individual DOE Headquarters staff member varies depending on the organization. A few organizations have very little or no, contractor support specifically assigned to them; instead, they rely solely on the End User Computer Center and HOTLINE support. On the other hand, the Office of the Chief Financial Officer is supported by a large team of programmers and automated office support systems (AOSS) personnel that results in a ratio of support to Federal staff of 1:5.

As can be seen from the charts that follow, support groups tend to be organized according to function as the support to Federal staff ratio becomes lower. This organization allows for creation of a team of specialists and also allows programming staff to be devoted to developing applications without being interrupted to respond to support calls.

While an established ideal ratio of contractor support to Federal staff has not been defined, the Office of the Chief Financial Officer has a much higher ratio than any other organization. The mission of processing large volumes of financial information has made them one of the oldest Headquarters DOE users of computer technology. The unique nature of the mission within this Office may require the current level of support. The heavy use of older, more traditional systems and technology might also influence the level of support required. It may be that the organization has arrived at a point of maturity in the establishment of an information architecture (due to the structured nature of the data that is being manipulated), and, consequently, the high level of support is necessary. As other organizations go about challenging aspects of definition and establishing more robust information architectures, the high level of support might be duplicated in those organizations.

ISSUE
Organizations must be prepared to fund a fully supportive information architecture to realize the full benefits of their hardware infrastructure.

Some organizations also receive information management support from contractors other than those monitored by the Office of Information Technology Services and Operations as part of general programmatic services contracts. Figures for that type of support are not included in the baseline analysis that follows. The pie chart displayed on the next page presents the DOE Headquarters staff divided into 5 groups depending on the ratio of support staff to Federal staff: 1:5, 1:10-20, 1:21-35, 1:36-85, and no support staff. According to the chart, 61 percent of Headquarters staff belong to organizations that are supported at a ratio of at least 1:20.

The following chart shows the distribution of support staff by function over the various Headquarters organizations.

Contractor Support Staff/Federal Staff Ratios
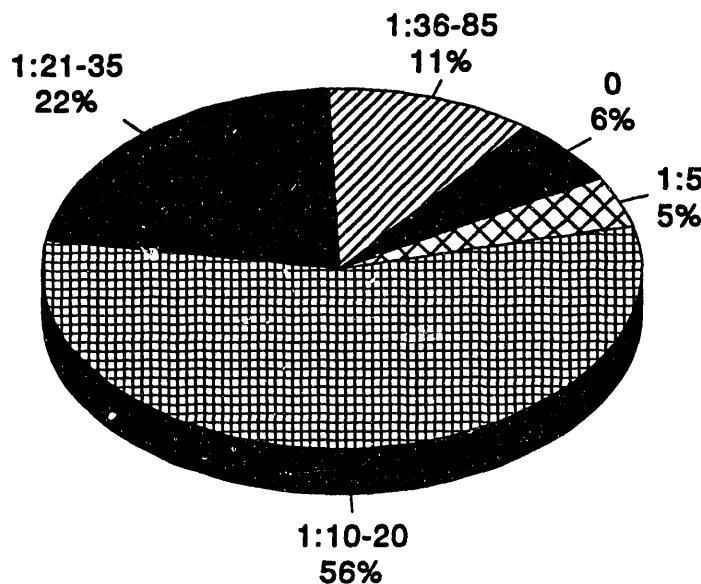
The categorization of staff as either AOSS support (**Gen'l AOSS**), IS development/maintenance, or local area network (LAN) administration is approximate, since staff often perform more than one function. The **Total** column is the sum of the previous three columns; an approximation of the Federal staff in each organization is given in the column **Fed Staff**; and, the ratio of the total support staff to the Federal staff is shown in **Ratio Supp/Fed**.

Org.	Gen'l AOSS	IS Dev/ Maint	LAN	Total	Fed Staff	Ratio Supp/Fed
CR	3	51		54	264	1:5
#STAFF-GROUP1					264	
AD	26	56		82	804	1:10
AN	5			5	60	1:12
EM	19	18	6	43	550	1:13
DP	16	23		39	528	1:14
RW			10	10	150	1:15
NS	5			5	75	1:15

Org.	Gen'l AOSS	IS Dev/ Maint	LAN	Total	Fed Staff	Ratio Supp/Fed
SA	4	6		10	160	1:16
PR		16		16	265	1:17
EP	6	6		12	213	1:18
CP	2	2		4	74	1:18
CE	7	9		16	325	1:20
IN	4			4	80	1:20
#STAFF-GROUP2					3,284	
ER	12	11		23	482	1:22
PA	2			2	53	1:27
NE	11			11	332	1:31
EH	12			12	400	1:33
#STAFF-GROUP3					1267	
FE	4			4	240	1:60
IG	2			2	150	1:75
GC	3			3	242	1:81
#STAFF-GROUP4					652	
HG				0	97	0
EH-4				0	35	0
OC				0	12	0
OE				0	105	0
RG				0	70	0
BC				0	8	0
BU				0	10	0
MI				0	13	0
#STAFF-GROUP5					350	
Total	143	198	16	357	5,797	1:16

Desktop Technology

Desktop technology refers to the hardware and software tools available at the fingertips of Federal staff members including workstations, printers, fax capability, operating systems, word processing, spreadsheets, and database management packages.

There is limited information on how desktop technology is, or is not, meeting the needs of the individual users at Headquarters. Last year the Trends document introduced an AOSS Workstation Questionnaire that can be used to do a sample or comprehensive survey of staff in organizations. Results of the survey can be used to determine client organization requirements for workstations, peripherals, and software, and to match the technologies needed to solve problems or provide capabilities. Until this level of data is obtained, much of the detailed planning done with various organizations will remain questionable. Further analysis is needed to compare the interface of users with the technologies to determine the trends and to give validity to the approaches taken.

ISSUE
The opportunity for development of a good baseline of data pertaining to desktop technology exists. This development process would be enhanced through the use of the AOSS Workstation Questionnaire referenced above.

Standard Workstations

In the desktop technology area, workstation requirements are more completely defined than other requirements, with many organizations willing to forecast needs 5 years into the future. Strategies center around replacing a set number of workstations per year, rather than striving to achieve a technology architecture by a certain time.

Data-gathering during this year's planning process has improved as can be seen on the Workstation Requirements graphs displayed on the next page. A definite leveling trend can be seen when comparing the predicted requirements in FY 1993 with that of the previous 2 years. These graphs also show the decline in demand for high-end workstations, in part because the 486-technology workstation is now standard. Requirements for standard workstations are 20 - 50 percent higher for FY 1993 and FY 1994 than earlier predicted requirements. This increase could be due to organizations having a better picture of their FY 1993 - FY 1994 budget.

Workstation Requirements

FY 1991

Quality of data on these charts for FY 95-98 reflects better data-gathering techniques

1,600
1,400
1,200
1,000
800
600
400
200
0

FY 91   FY 92   FY 93   FY 94   FY 95   FY 96   FY 97   FY 98

Leveling trend

FY 1992

1,600
1,400
1,200
1,000
800
600
400
200
0

FY 91   FY 92   FY 93   FY 94   FY 95   FY 96   FY 97   FY 98

20 - 50% higher than earlier prediction

FY 1993

1,600
1,400
1,200
1,000
800
600
400
200
0

FY 91   FY 92   FY 93   FY 94   FY 95   FY 96   FY 97   FY 98

■ Standard
▨ Total Other

Current workstation figures show a total of about 6,000 workstations in inventory. One-third (2,000) of the identified workstations are 386-technology, while almost one-half (3,000) are 286-technology. The rest of workstations (1,000) are made up of 486-technology, Macintosh, laptops, and High-end. Although 486-technology workstations comprise only a small part of the inventory an increase is inevitable because the 486-technology workstation has replaced the 386-technology workstation as the standard workstation. By the end of FY 1993, the Headquarters 486-technology workstation inventory should increase from about 400 to 1,800.

The chart displayed below shows how the inventory of new workstations will grow every year through FY 1997. The workstations will replace older technology workstations, and reallocation should result in the retirement of the oldest workstations. Therefore, current projections indicate that all Headquarters workstations should be 32-bit (386 and above) architecture (the minimum required to support a fully integrated information environment) by the end of FY 1995. The chart also predicts the introduction of new information technologies during the same time-frame.

ISSUE
Is the end of FY 1995 soon enough to achieve a Headquarterswide 32-bit architecture?

	FY-end 1992	FY-end 1993	FY-end 1994	FY-end 1995	FY-end 1996	FY-end 1997
New Workstation Totals	377	1,831	2,848	3,589	4,389	4,890
New Technological Advances		- Windows NT, OS/2, and 586 (Pentium) are available now - Alpha Chip becomes available	Motorola Power PC becomes available	686 becomes available		

When comparing these new technologies with Headquarters accumulative inventory of new workstations during the same time frame, one can speculate about the significance and impact these technologies will have in improving the effectiveness of Headquarters programs.

While adapting to the new challenges of technology, future requirements should not be estimated solely on the basis of today's activities. Meeting the challenge successfully and improving capabilities can only enhance the achievement of DOE's mission.

ISSUE
How will the availability of 586-technology impact requirements for the standard workstation (486-technology)?

Workstation inventory as of year-end FY 1992 is itemized by organization on the chart displayed on the next page.

Current Workstation Inventory

Org (Staff)	286 WS	386 WS	486 WS	Macintosh	Portable/ Laptop	High-end	Total
AD (804)	507	302	46	11	38	2	906
AN (60)	42				7		49
BC (8)	4	4			1		9
BU (10)	6	4					10
CE (325)	285	95	30		16		426
CP (74)	9	83	2		2		96
CR (264)	146	116	10		7		279
DP (721)	202	201	219	3	121		746
EH (400)	112	218	11	11	46		398
EH-4 (35)	40	4	5				49
EM (550)	96	502	1	27	20		646
EP (213)	150	44	9	3	15		221
ER (482)	123	205	62	74	17	2	483
FE (240)	162	55	23		13		253
GC (242)	74	54			1		129
HG (97)	42	18	17		1		78
IG (150)	125	4	9		41		179
IN (80)	24	97			4	1	126
MI (13)	11	5	1		1		18
NE (332)	90	162	34	3	33		322
NS (75)	26	10			16		52
OC (12)			7		4		11
OE (105)	76	2	5				83
PA (53)	37	22	3	1	5		68
PR (265)	267	56	54	1	9		387
RG (70)	45	37	3				85
RW (150)	66	30	60		8		164
SA (160)	174	33	3		26		236
Total	**2,941**	**2,363**	**614**	**134**	**452**	**5**	**6,509**

ISSUE
A large number of customers (CE, DP, EP, FE, GC, IG, and PR) have vintage technology.

Workstation requirements through FY 1997 are itemized by organization on the chart displayed on the next page.

Note: The 586 workstation requirement totals are low, but these figures are based on the requirements submitted. These low figures support the conclusion that clients have not yet realized a need to specify workstation requirements at this level.

The increase in requirements for Macintosh and portable/laptops by all of the organizations is more prevalent than figures in previous years.

ISSUE
With the influx of new employees, how much will their experience with other technology increase the projected requirements for Macintosh workstations?

The chart displayed on the next page shows the workstation requirements for each organization.

Workstation Requirements

Org.	486 WS FY93	486 WS FY94	486 WS FY95	486 WS FY96	486 WS FY97	586 WS FY93	586 WS FY94	586 WS FY95	586 WS FY96	586 WS FY97	High-End FY93	High-End FY94	High-End FY95	High-End FY96	High-End FY97	Macintosh FY93	Macintosh FY94	Macintosh FY95	Macintosh FY96	Macintosh FY97	Portable/Laptop FY93	Portable/Laptop FY94	Portable/Laptop FY95	Portable/Laptop FY96	Portable/Laptop FY97
AD	223	186	91	86	52						1					11	23	22	20	3	26	26	10	11	6
AN	10	10	10	10	10																				
BC	2	2																							
BU	4	2	2	2																					
CE	60	100																			10	10	10	10	10
CP	17	17	15	15	15		50	50			10	10									10	10	10	10	10
CR	60	50	50	50	50	100										10					5	5	25	5	5
DP	200	150	150	100	45											10	10				30	25	5	5	5
EH	105	45	45	45	45																25	30			
EH-4	5	5																							
EM	100	100	100	100	100		70	70	70	70	5					20	15	10	10	10	25	25	25	25	25
EP	20	20	20	20	20	5	3	3	3	3	10	10	10	15	15	3	3				10	10	10		
ER	157	32	32	32	34						10					41	35	35	28	26	15	15	15	7	12
FE	64	50	50	50	50											6					25	25			
GC	30	30	30	30																		1	1		
HG	14	14							14												5	1		1	
IG	20	20	20	20	20						2	3	3				5				5	5	5	5	5
IN	28	43	1	1	20																				
MI	1	1																				20			
NE	120	20	60	60	60																12	3			
NS	30	40	20	20																	3				
OC	7	2	2	2																	8	1			
OE		5	5	5	5																				
PA	25	20	20	20	20											2	4	8	1	1	12	12	12	12	12
PR	40	40	40	20												1	1	1			15	15	2		
RG	29	10	10	10																		8			
RW	60	15	15	15	15																2	1			
SA	30	30	30	30	30																		10	10	13
Total	1,461	1,024	838	743	546	105	123	123	87	73	37	23	13	15	15	143	63	46	57	36	269	250	141	97	96

Other Equipment

There have been some interesting trends in the area of other equipment as seen in the following graphs. These bar graphs allow comparison of the requirements for FY 1993 predicted in FY 1992, and the requirements as restated for FY 1993. The large increase in PostScript printers is partly due to upgrading laser printers with PostScript capabilities and designating PostScript printers as the standard laser printer. Printers, therefore, are another area where organizations seem willing to forecast a need for routine replacement of older technology. There has also been a 30 percent increase in both Macintosh and laptop personal computer requirements. All other requirements have remained nearly the same.

Other Hardware Requirements

FY 1992 Forecast

Bar chart with y-axis from 0 to 1,000 (increments of 100). Categories: Mac, Laptop, Color, PScrpt, OCR*, Fax, CD-ROM
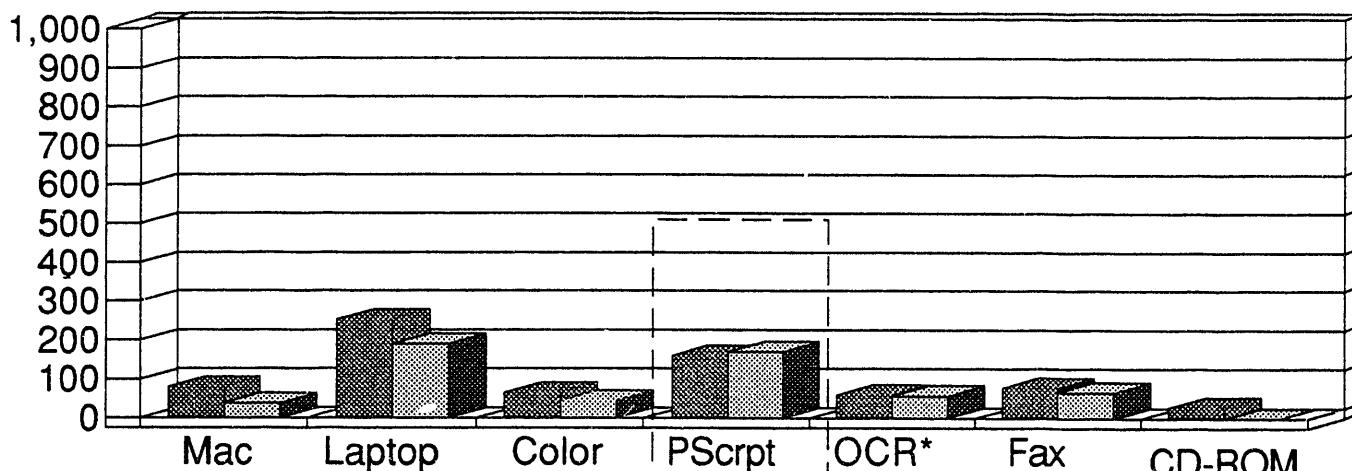
FY 1993 Forecast

30% increase from FY 92

Increase in PostScript printers due to DOE designation as standard

Bar chart with y-axis from 0 to 1,000 (increments of 100). Categories: Mac, Laptop, Color, PScrpt, OCR*, Fax, CD-ROM
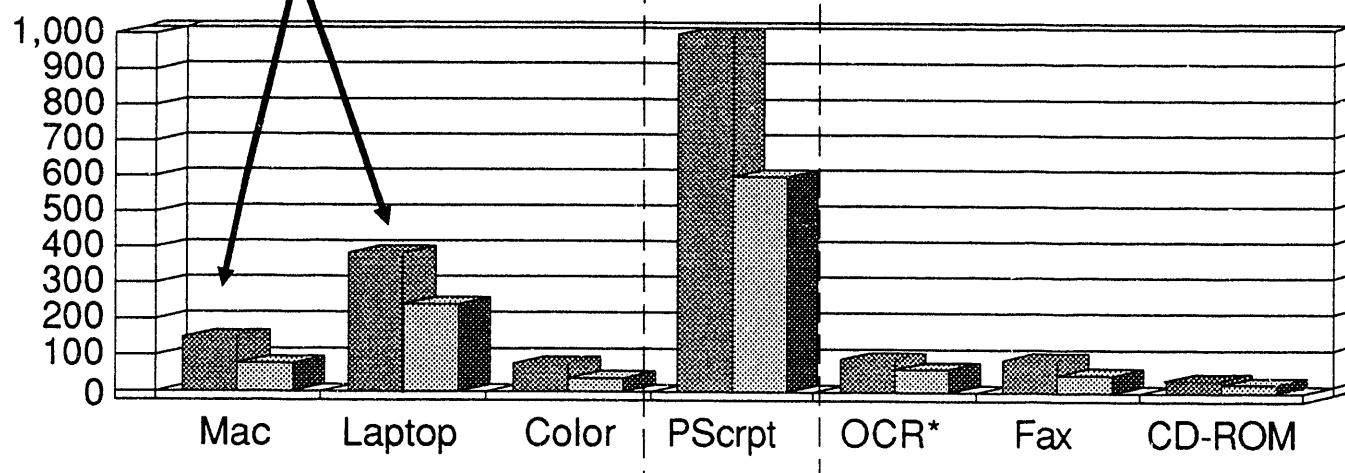
* Includes Scanners
Optical Character
Readers

FY 1993 Requirements

FY 1994 Requirements
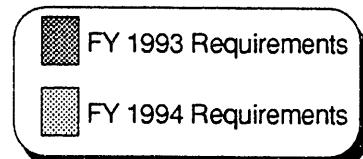
The following chart displays the current inventory of PostScript, color, and other printers, image-scanners, fax machines, CD-ROMs, Modems/data path units (DPUs), and monitors.

Org.	Current Hardware Inventory							
	Laser Printer*	Color Printer	Other Printers	Text/Image Scanner	Fax	CD-ROM	Modems/ DPUs	Monitors
AD	404	2	93	3	40	15	363	7
AN	18		13		2			
BC	7				1		8	
BU	6		5		2		9	
CE	96	1						
CP	47						?	
CR	100	1			12		?	
DP	404	9		1	61	1		
EH	222	1			15		?	
EH-4	14	2	15	1				
EM	252		72		7		137	
EP	80	2			18		112	
ER	315	6		1		1	?	
FE	225	10		1	25	2	?	
GC	60		107		15		?	
HG	4	1						
IG	6	4		1	12		?	
IN	95						?	
MI	14	1			1	1	?	
NE	199	1					?	
NS	35				2		?	
OC	6				1		?	
OE	50	3		3	5			
PA	51				10			
PR	12		102		11		?	
RG	83				3		?	
RW	83				7			
SA	106	5		2			?	
Total	**3,204**	**49**	**750**	**13**	**250**	**20**	**629**	**7**

* It is unknown how many of these printers have PostScript capability.
? Figures unavailable

The Hardware Requirements chart shows the FY 1993 forecasted requirements, along with the requirements for FYs 1994 - 1997. Figures illustrate that over 1,000 PostScript printers will be added to inventories during FY 1993. PostScript printers and modems/DPUs are the two most requested items of peripheral equipment by the organizations.

It is possible to have lower figures for the remaining peripheral equipment totals if these items could be provided on the LAN. For example, implementing at least one color printer or scanner on the LAN would greatly extend the reach of color printing to users, and would enable users to scan materials and store large output files on network drives. LAN services could increase usage and decrease specific peripheral hardware equipment.

ISSUE
Organizations should be prompted by the PMOs to begin planning for implementing printers, scanners, other peripherals, and services provided on the LAN.

Although monitors seem to play an insignificant part in the current hardware totals, the requirements in this area are expected to increase over the next few years. As screen resolution levels increase due to enhanced graphic and text applications, monitor sizes should increase to compensate for character reduction caused by the higher resolutions.

ISSUE
What impact will the increased graphics capabilities of large screen monitors have on future requirements?

The portable printer is another piece of equipment gaining ground in future requirements. Although few organizations are requesting these printers at this time figures are expected to increase as they become more popular and accessible to the organizations.

ISSUE
What preparation should be made to handle increased demand for special-purpose equipment (e.g., imaging equipment, portable printers, and other associated peripherals)?

Other Hardware Requirements

Org.	PostScript Printer FY 93	FY 94	FY 95	FY 96	FY 97	Color Printer FY 93	FY 94	FY 95	FY 96	FY 97	Portable Printers FY 93	FY 94	FY 95	FY 96	FY 97	Text/Image Scanner FY 93	FY 94	FY 95	FY 96	FY 97
AD	162	121	50	32	34	24	16	7	5	6						33	34	13	14	7
AN	5	5	5	5	5											3	2			
BC																				
BU	4	2	2																	
CE	50	30				3										1	1			
CP	32	17	15	15	15															
CR	60	76					1	2												
DP	160	85	50			15	5	5								3	25	25		
EH	86	20	20	20	20	2	2	2	2	2	5	5	5	5	5	1	1			
EH-4	14					2														
EM	100	100	100	100	100	3	3	3	3	3	6	6	6	6		2	2	2	2	3
EP	25	25	25	25		6	5	5			10	10	10			7	2	2		
ER	80	80	60	10	10	4	2				5	5	5			6				
FE	66					10										1				
GC	42	38	20	20																
HG	2	5	2	2	2	1										1	1			
IG	10	10	10	10	10	5	5									1				
IN	17	46	5	5	5											2	2			
MI	6															1				
NE	23	6	10	10	10															
NS	14	18	17	17													1			
OC	8	1	1	1			1													
OE	25	8	8	8	8															
PA	20	20				2	4	8	16	32						2				
PR	35	35	32	30	30		1				10	10				3	2			
RG	5	5	5	5	5															
RW		8	8	8	8												6			
SA	33	23	22	20	20	1	1									1				
Total	**1,084**	**784**	**467**	**343**	**282**	**78**	**46**	**32**	**26**	**43**	**36**	**36**	**26**	**11**	**5**	**68**	**79**	**42**	**16**	**10**

Other Hardware Requirements (cont'd)

Org.	Plain Paper Fax					CD-ROM/Jukebox					Modems/DPUs					Large Screen Monitors				
	FY 93	FY 94	FY 95	FY 96	FY 97	FY 93	FY 94	FY 95	FY 96	FY 97	FY 93	FY 94	FY 95	FY 96	FY 97	FY 93	FY 94	FY 95	FY 96	FY 97
AD	24	14	4	3	4	11	16	14	9	9	62	15	15	10	10	12	4	5	1	
AN																				
BC																				
BU																				
CE	2	2																		
CP	2	2																		
CR	8	4																		
DP	10	25	25			3	1										10			
EH	10										20					10	7	7		
EH-4	1										1									
EM	20	10	10	10	2															
EP	4	4	4			2	2	2			35	10	10			2	2	2		
ER	6	9	9	4	4	2	5	5												
FE	12					10						1								
GC																				
HG		1				1										14	14	14	14	
IG	10	10									25	25	25	25	25					
IN						2	3	3	3	2						8				
MI	1	1																		
NE						1														
NS											20					10	7	7		
OC											14									
OE																				
PA	2	2	2	2	2	1														
PR						1	1				25	25	25			20	10			
RG																				
RW																	10			
SA						2	3	3	3	2										
Total	112	84	54	19	12	36	31	27	15	13	202	76	76	35	35	76	64	35	15	0

Software

Although data gathering during this year's planning process improved over last year's effort, a decline in software specifications for the majority of the organizations exists. Until the quality of data gathered improves, much of the detailed planning done for software requirements will remain questionable.

There was, however, a marked increase this year in LAN software specifications as a whole. This increase may be due to the fact that users are more comfortable forecasting special software version applications due to the increase of LAN implementations.

ISSUE

Because organizations continue to have problems expressing software needs, guidance should be provided by Office of Information Technology Services and Operations.

The Software Requirements charts shown on the next two pages display current and forecasted requirements. Only the most requested packages and organizations that submitted requirements are listed.

Software Requirements

Org.	WordPerfect					Harvard Graphics					Windows					DOS				
	FY 93	FY 94	FY 95	FY 96	F Y 97	FY 93	FY 94	FY 95	FY 96	F Y 97	FY 93	FY 94	FY 95	FY 96	FY 97	FY 93	FY 94	FY 95	FY 96	FY 97
AD	109	85	111	25	76	55	15	41	21	26	140	52	102	21	88	52	27	93	27	81
BU													10				10			
CR	30					20										30	20	20	20	20
DP		400	100				100	25			100	400	100	100						
EH						10	10	10	10		50	50	50	50	50					
EM						12					100									
EP											10	10								
ER						100	100	100												
FE											100									
HG											14	14	100							
IG																	25	25	25	25
IN											10	25	20							
MI																7	5			
NE	100	100	50			10	10	10												
OC																14				
PR	30	5	2			5	5	2			2	10	10			28	6			
RW											100	50								
Total	269	590	263	25	76	212	240	188	31	26	626	611	392	171	138	131	93	138	72	126

Software Requirements (cont'd)

Org.	Lotus 1-2-3					OS/2					cc:Mall					dBase				
	FY 93	FY 94	FY 95	FY 96	FY 97	FY 93	FY 94	FY 95	FY 96	FY 97	FY 93	FY 94	FY 95	FY 96	FY 97	FY 93	FY 94	FY 95	FY 96	FY 97
AD	69	35	35	30	10	7	10	10	55	10	90					70	25	46	6	26
CR	30	20	20	5	5											20	10	10	5	5
EE						350														
EH	6	6	6	6												13	14	14	14	
EM	67															35				
EP						5	5	5												
ER						327	137	117	125	125	200	200	200	200	200					
HG							50	50												
IN																10	10	10	10	10
PR	30	2	2														2	2		
Total	202	63	63	41	15	689	202	182	180	135	290	200	200	200	200	148	61	82	35	41

As a result of the discussion on new operating systems in the Emerging Technologies Planning Guide, organizations are becoming increasingly aware of, and are showing a great deal of interest in, implementing advanced systems. The numbers for AD and ER span to FY 1997, indicating the eagerness of these two organizations to plan ahead as Windows NT and OS/2 become more proven operating systems.

ISSUE
Will a determination be made as to the preferred long-range advanced operating system software and platform to enable organizations to begin budgeting and planning requirements to upgrade DOS-based systems?

Connectivity

"The current environment at DOE-HQ is limited mainly to terminal emulation and some file transfers between the PC and mainframe and between PCs connected to a local or wide area network. The PC to host connections permit electronic scheduling and electronic mail through OfficeVision. The PC-based networked environment includes electronic mail. Small applications, device sharing, gateways to host, outside dialing, and CD-ROM connections are also available." [2]

About 80 percent of the Headquarters organizations communicate with the mainframe through data path units (DPUs) or modems. In the previous section, the Hardware Requirements chart illustrates that only four organizations require DPUs or modems beyond FY 1993. Other methods of connectivity are on the increase at Headquarters, such as televideo services, which is discussed in a separate section. Because LAN connectivity is so prevalent, this section of the Trends paper will focus on the LAN, highlighting its progress as one connectivity solution at Headquarters.

LAN Implementation

The following pie charts illustrate the evolution of LAN implementation at Headquarters. About 2,200 new LAN connections are scheduled during FY 1993 - the largest number in any fiscal year since inception of the LAN at Headquarters. This number accounts for almost 40 percent of the Headquarters employee population.

LAN Implementation

Staff on LAN
1,794

Staff on LAN
4,039

Staff on LAN
4,774

Staff Not on LAN
4,318

Staff Not on LAN
1,961

Staff Not on LAN
1,226

FY 1992

FY 1993

FY 1994

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[2] *Emerging Technologies Planning Guide*, 1993 Edition, Section 3.

In FY 1992 only 30 percent of the Headquarters population were connected to the LAN. By fiscal year-end 1993, over 65 percent of the DOE Headquarters staff will have LAN connectivity. In the ensuing fiscal year about 700 LAN connections are planned. However, due to the reorganization of Headquarters Offices, this number is subject to change. There is an assumption of no change in staff figures from FY 1993 to FY 1994.

```
**ISSUE**
The large number of new LAN users will cause organizations to alter their
focus in all areas of information resources requirements, due to the
increasing capability offered by the LAN.
```

Current and Planned Connectivity

The chart displayed on the next page shows connectivity for DOE Headquarters organizations at present and in the near future. The following are desc￫   ￫s of some of the heading categories.

  ► Organizations on the LAN **(Current)**

  ► Organizations scheduled to go on the LAN in FY 1993 **(FY 1993)**

  ► Number of file server information systems accessed on the LAN and number of mainframe (MF) information systems accessed through the LAN **(#Info Sys)**

  ► Number of LAN connections in the field **(Field Users)**

  ► Name of software (S/W) applications, other than the DOE standard, on the LAN **(Organizational Specific S/W Applications)**

Eight organizations (BC, BU, CP, GC, IN, MI, PA, SA) are not listed in the chart. These organizations are neither currently on the LAN, nor planning connectivity during FY 1993. All organizations have access to OfficeVision, and all but three of the eight organizations (BC, IN, and PA) utilize DPUs or modems to gain access to other systems on the mainframe. BC uses internal modems to access external data sources, and IN is connected to the mainframe via coaxial cable. PA has no access to systems on the mainframe other than OfficeVision.

Current/Planned Connectivity

Org.	#LAN Users Current	#LAN Users FY 1993	LAN Technology	Number of Servers	Additional Network Service Technology	#Info Sys LAN	#Info Sys MF	Field Users	Organizational Specific S/W Applications
AD	136	136	DAVID/10Base-T	6	DPU/Modem/Balun, High-speed laser/color printer, Fax, Chatterbox, CD-ROM	5	40	29	ProComm Plus, dB IV, Windows, Doc Mgmt Sys, Lotus Notes (eval.), Electronic Signature
AN		50	FDDI		STU III				
CE	144	260	10Base-T	7	CD-ROM, Digital Camera	2	2	11	FoxPro, Alpha-4, Lotus Notes (eval.), Electronic Signature
CR	44	60	10Base-T	3		4	11	15	
DP	183	220	10Base-T	5	CD-ROM, Jukebox, OCR, X.400	1	10	6	Electronic Signature
EH		300	10Base-T	2	DPU/Modem, Fax	2			Electronic Signature, Windows
EH-4	50		FDDI	1		3			FoxPro
EM	450		10Base-T	8	DPU/Modem, Chatterbox	4	5	10	Windows, FoxPro, ProComm Plus, Alpha-4, Wingz, Timeline, Reflections 7, Automax
EP	60		DAVID/10Base-T		DPU/Modem		10		
ER	402	232	10Base-T/FDDI	9	Chatterbox, Fax, Laser/color printer, Text scanner, CD-ROM/optical drive, X.400, ESnet	1	10	6	Windows, Windows NT, OS/2, FoxPro, Onlan NAS, dB III/IV, Omnet, Data Physician, PerFill, Network Scheduler, 800 Number
FE	185		10Base-T	2	DPU/Modem		3	7	Electronic signature
HG	80		DAVID/10Base-T	2	Modem, PostScript, text, label printer, CD-ROM	1	1		Word for Windows
IG		140	10Base-T	1	DPU/Modem	1	1	2	
NE		240	10Base-T	5	DPU/Balun, Fax, PostScript/color printer	4		1	PC DOCs, PerFill, QuattroPro
NS		164	10Base-T	1	DPU/Modem, Fax	1	1	6	
OC	15			1	DPU	1			
OE	5			1					
PR		203	10Base-T	2	DPU/Modem, Printer	1	12	30	Paradox, dB IV, Windows
RG	60		10Base-T	1	DPU/Modem		1	1	Windows
RW	165	5	DAVID/10Base-T	7	CD-ROM, Fax	2	1	2	Lotus Notes (eval.)
Total	1,794	2,245		62		32	108		

Of the eight DOE Headquarters organizations not listed in the previous chart, six are forecasting LAN connectivity in the FYs 1994-1995 timeframe. The four organizations presently serviced by DAVID manager LANs are upgrading to 10Base-T technology. Further upgrades to fiber optic cable and Fiber Distribution Data Interface (FDDI) are planned for HG and RW during FY 1994.

The Office of the Chief Financial Officer (CR) makes use of all the following primary computing environments available at Headquarters: mainframe, minicomputer, LAN, and microcomputer. These computing resources employ a variety of communications technologies to support the following processing requirements: internal (within CR), local (within Headquarters), and remote. Further LAN implementations will await evaluation of the initial LAN performance of the installed systems and the identification of new systems that would function well in the LAN environment. Microcomputer workstations provide the primary working environment for CR staff. Connectivity to the mainframe and minicomputer systems is achieved through DPUs for those not on the LAN.

The classified LAN, supporting 50 staff members in Security Evaluations (EH-4) is the first Headquarters LAN with total fiber optic connections complete to the workstation. The fiber optic cable addresses the emanation issue with classified data. EH-4 eventually wants the LAN to be connected to the classified mainframe in order to access OfficeVision and the Safeguards and Security Information Management System. In the interim, personnel must logoff the LAN to access the mainframe.

Environmental Restoration and Waste Management (EM) LANs connect the Forrestal, Trevion, and Bellemead Buildings. Connectivity between LANs is handled by high speed lines such as T-1s. Connectivity to outside systems is handled by DPUs and LAN-based modem pools. The FoxPro database management system was chosen as the system application for LAN-based applications because it is both IBM and Macintosh compatible.

The current EM LAN transmits 10 million bits per second (mps). As the program grows in both staff and traffic, the backbone will need to be upgraded to 100 mps. When the multimedia technology matures and video images and graphic images are being transmitted, it will be necessary to have the entire LAN upgraded to 100 Mps (if the technology and cost performance is acceptable).

The Energy Research/Science and Technology Advisor (ER/STA) Headquarterswide LAN/WAN became operational during FY 1991, and the ER/STA Corporate database design was updated to take advantage of the technology. At this time, the LAN is servicing approximately 500 ER/STA Headquarters microcomputer users. In addition, the Energy Sciences Network (ESnet) is accessible from the ! AN.

The Headquarters Office of Civilian Radioactive Waste Management (RW) has 165 staff members on a LAN that is connected to a VAX machine at Weston, RW's Headquarters' contractor. The LAN is also accessed by the RW project office in Las Vegas.

Workgroup Computing

The LAN is the connectivity solution associated with the concept of group computing complexes, where office-unique information processing takes place. LANs provide advanced capabilities such as multiuser database processing, high-speed file transfer, and electronic mail between workstations. The ability for an entire organizational workgroup to build *workgroup-specific* applications and share office data, hardware, and software are the most valuable aspects of a LAN.

In keeping with this emerging technology of workgroup computing, an RW objective is to support their program by providing an integrated office automation and information management environment, called InfoSTREAMS. The first step includes interfaces to wordprocessing, spreadsheets, and other standardized applications; an analysis of concept-based retrieval software; and the installation and testing of Lotus Notes and cc:Mail gateways.

The Office of Information Resources Management (AD-20) is implementing a pilot workgroup program in Lotus Notes, designed to track and coordinate documents and information used by a group of people. All hardware and software upgrades have been accomplished, and training has been conducted in Windows and Lotus Notes. The primary application has been developed and is being implemented to coincide with the budget cycle. The pilot is focusing on supporting the AD-20 budget formulation process by bringing all senior personnel involved in budget formulation into a workgroup environment where budget development, formulation, and approval will be available.

Although there is value in separate studies and accomplishments, organizations can benefit from sharing each other's achievements. The Lotus Notes evaluation, conducted simultaneously within two organizations (RW and AD-20), is the latest example of decentralized activity in the LAN environment. Other examples of organizations conducting individual analyses of methods or systems or software can be seen throughout Headquarters. EM's choice of FoxPro as the database management system in their IBM and Macintosh workstation environment and EH-4's fiber optic LAN are two other examples of individual organizational approaches to meeting the common goal of Headquarterswide connectivity.

Due to the decentralized nature of the LAN environment, communication concerning LAN administration is minimal. A LAN User Group, composed of representatives from each organization, may help to add a more structured and unified approach to pursuing mutual initiatives. Some specific points that a LAN User Group might address are a standard Windows menu; LAN performance management tools to evaluate utilization of file servers and monitor network traffic and activity; and evaluation of the latest technology.

ISSUE
A LAN User Group may be the answer to a cooperative pursuit of solutions concerning LAN connectivity.

Information Systems

A General Accounting Office (GAO) report entitled *Better Information Resources Management Needed to Accomplish Missions* was published in September 1992. Among the findings was that the Department of Energy information management architecture suffered from duplicate data and systems and a lack of strategic planning.

The following are several efforts currently addressing these shortcomings.

- ► One of the early efforts was a Headquarters process improvement team (PIT) on the integration of planning, budget, and acquisition. One of the recommendations coming out of that group was for establishment of a DOEwide corporate information architecture.

- ► An information resources management (IRM) planning PIT has endorsed the concept of a general information framework and is planning on integrating an information architecture concept into the IRM planning process.

- ► The Headquarters IRM Council, in response to the above-mentioned GAO report, chartered a Corporate Information System Working Group. Recommendations from that group included creating an Assistant Secretary for Human Resources and Administration (AD) project management office and appropriating resources to establish a DOE corporate information architecture.

- ► A recent survey of DOE IRM managers mentioned the need for an information architecture as one of the five major information management/technology issues facing the Federal government.

- ► An Information Management Task Force is one of 15 priority teams established by the Secretary.

Some of the Headquarters organizations are recognizing the need for an organization information architecture and are sponsoring tasks in that area. An example is the Office of Budget within the Office of the Chief Financial Officer. A study recently completed of budget-related information systems at DOE described the current environment, summarized plans already underway for FY 1993, and recommended activities for the FY 1994 - FY 1999 interval. The ultimate goal is an integrated DOEwide budget information system.

The chart displayed on the next page portrays the distribution of the DOE information system base by function. The source of the information is the Systems Review Inventory System (SRIS), a database that contains information about DOE information systems.

The following 11 functional categories have been established by the Office of IRM Policy, Plans, and Oversight (AD-24) and are contained in a field on the database named Primary Function.

- ► EXC - Executive System

- ► PRM - Program and Management (system for middle managers)

- ► OPS - Management of Operations

- ► PLN - Planning

- ► BUD - Budget

- ► ACC - Finance and Accounting

- ► PRC - Procurement

- ► PRJ - Project Management

- ► ADM - Administration

- ► SEC - Safeguards and Security

- ► SPP - Special Purpose (system providing information needed for the management of specialized DOE operating or staff functions)

SRIS is a central repository of information on each DOE automated information system that is planned, under development, or operational. It contains narrative descriptive information about the systems, as well as data on the developmental costs, operating costs, persons to contact, etc. SRIS resides on the AD local area network (LAN) where it can be accessed by Headquarters users and the field. Alternatively, data can be entered through a personal computer version of SRIS and is received in this way from field organizations. Although the data in SRIS is updated at least once a year, it still reflects inaccuracies and gaps. Not all systems have been entered in SRIS.

Organizations should be encouraged to place a higher priority on assuring the accuracy of data. This data can be utilized by the organizations to document their information architecture and can also be a helpful analysis tool to the Headquarterswide information system base.

Organization Information Systems by Functions

Org.	EXC	PRM	OPS	PLN	BUD	ACC	PRC	PRJ	ADM	SEC	SPP	Total
AD		7	2	3		6	1	3	91		3	116
AN	1		1						3	1		5
CE		1				1	1		2			5
CP									3			3
CR					9	16			3			28
DP		6	3	2	1	2		1	4	1	3	23
EH		1							8			9
EM		7		1	7			10	5			30
EP		13						1				14
ER		1			6	1	1	1	6			16
FE		1			2		1					4
GC									2			2
HG											2	2
IG		1										1
NE		1		3		2		1	4	1	1	14
PA									1			1
PR				2			27	2	23		1	54
RG		1				1						2
RW		3							1			4
SA										5		5
Total	1	43	6	11	25	29	31	19	155	8	10	338

Source: System Review Inventory System (SRIS)

The pie chart categorizes information systems by platform within DOE. This data was compiled from SRIS.

Information Systems by Platform
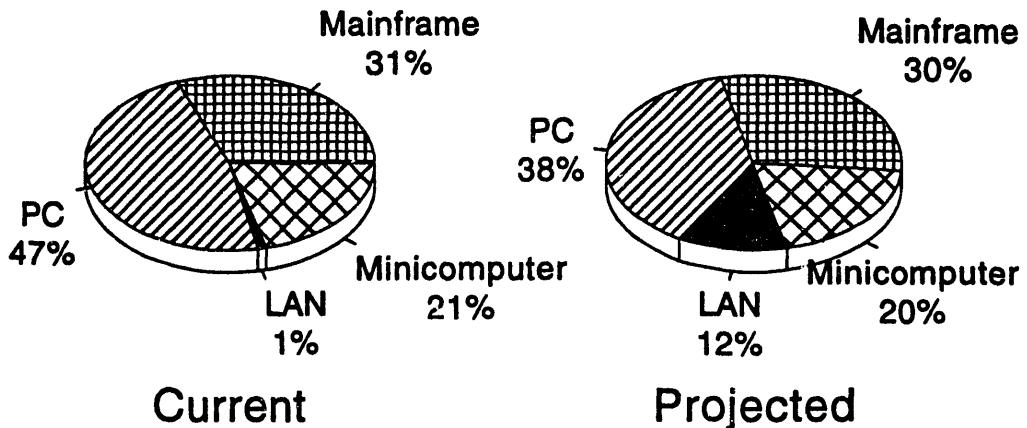
Last year's version of this report indicated CR's Budget Table System as the only LAN system within the Department. This year there are five major systems listed. Other sources indicate as many as 33 systems currently on various organizational LANs. With LAN projections tentatively indicating 6,000 nodes at Headquarters by FY 1995, the natural progression would likely move toward more LAN systems in order to gain the most efficient utilization of the LAN as a resource.

Indicative of this progressive trend is the pie chart of projected information systems displayed on the next page that is based on data gathered from individual organization IRM plans. The data reflects a tentative increase of 11 percent over the next 2 years (through FY 1995).

Prime candidates for transition to a networked-based corporate information architecture are currently the Assistant Secretary for Environmental Restoration and Waste Management (400-plus nodes), the Assistant Secretary for Conservation and Renewable Energy (300-plus nodes), the Office of Energy Research (300-plus nodes), the Assistant Secretary for Defense Programs (500 nodes), and the Assistant Secretary for Human Resources and Administration (200-plus nodes). Most of these organizations are evaluating numerous standalone applications for possible transition to LAN platforms.

Major projects currently under development that will have departmentwide impact are listed below. -

> ► **Procurement and Assistance Data System (PADS)** - A software application used to support all statutory and regulatory contract reporting requirements. The system currently resides on the mainframe in Germantown and is being downsized to a microcomputer-based distributed platform utilizing LAN client/server processing architecture. The redeveloped system will reside on a LAN that will be located within the Forrestal Building and is tentatively scheduled to be operational in FY 1994.

> ► **Systems Approach to Grants Administration (SAGA)** - A database of grant information residing in the LANs of the 10 CE Regional Support Offices, with overview information delivered to the CE-50 LAN. SAGA assists in the management of funds and status of energy conservation projects for state governments and public institutions. Sources of funding for the projects include petroleum violation escrow funds.

> ► The Chief Financial Officer (CR) is moving towards an integration of DOE corporate financial systems by placing the **DOEwide Financial Information System (FIS) (renamed Management Analysis and Reporting System [MARS])**under the **Departmental Integrated Standardized Core Accounting System (DISCAS)** umbrella. When development is completed the Departmental Financial System will totally reside on the resident Hewlett-Packard processor.

All of these organizations have indicated requirements leaning toward "corporate" information systems within the next ten years. Most plan for initial refinement of these systems within their individual organization and, ultimately, a move toward providing the information contained therein as a part of "expert" systems. This information would be available to top-level management within the Department in a user-friendly format for efficient use.

The chart displayed on the next page is a listing of information systems within the Headquarters. They are listed by organization, a total of systems, the average age of all systems within the organization, and a breakout of the systems by platform. The chart indicates a total of 338 systems currently in use (or in development) within the Headquarters with a cumulative average age of approximately 6 years.

ISSUE

With the technology for implementation of several organizational LANs now becoming increasingly available, it would seem feasible that there would be a gradual progression toward LAN-based information systems. This would allow for a more thorough distribution of the data contained therein (initially) throughout the individual organization and, ultimately, throughout the entire Headquarters environment. The opportunity exists for a cost/benefit analysis of many systems that could be utilized most efficiently by many users via LAN-based systems.

DOE Information Systems

Organization	Total # Systems	Average Age	Platform Data			
			Mainframe	PC	LAN	Mini
AD	116	6	37	75	1	3
AN	5	7	0	3	0	2
CE	5	6	2	3	0	0
CP	3	3	1	2	0	0
CR	28	6	11	12	1	4
DP	23	6	10	7	0	6
EH	9	5	0	0	0	9
EM	30	2	2	21	1	6
EP	14	9	8	6	0	0
ER	16	13	10	6	0	0
FE	4	13	3	1	0	0
GC	2	9	1	1	0	0
HG	2	7	1	1	0	0
IG	1	15	0	0	0	1
NE	14	6	11	0	0	3
PA	1	7	0	1	0	0
PR	54	6	16	31	0	7
RG	2	15	2	0	0	0
RW	4	1	0	0	2	2
SA	5	10	5	0	0	0
Totals	338	6	120	170	5	43

Source: System Review Inventory System (SRIS)

Document and Records Management

Unlike other business assets, it is difficult to express the value of information to an organization. This is normally true until someone is unable to find a crucial piece of information. For example, a company that suddenly moves into a litigation needs access to large portions of information. During research efforts, critical documents are found missing. In this instance hundreds of millions of dollars could be at stake because a nominal investment was not made in a document and records management system. It is becoming increasingly difficult for organizations to operate successfully without access to all forms of information — whether it's a competitive marketing report, a Department of Energy Directive, copies of nuclear safety reports, or legislative reviews, etc. Imaging, in conjunction with other information management tools, is becoming an integral part of this process. Information is critical and more people are being convinced of that fact.

A survey of the imaging industry indicated revenues from electronic image management products and services were $1.3 billion in 1990[3]. Revenues were estimated to be more than $3 billion in 1992, and are estimated to grow to more than $6 billion by year-end 1996. The technology is becoming cheaper, faster, and smaller. Sections 5 and 6 of the *Emerging Technologies Planning Guide*, 1993 Edition, review some of the essentials of documentation management and document imaging. Section 6 provides some insightful information including, but not limited to the following.

- ▶ the importance of imaging systems

- ▶ the benefits of imaging

- ▶ the applications that could be supported

- ▶ possible integration with other applications

- ▶ brief description of the process

- ▶ a typical imaging system component configuration

Planning for implementation of imaging systems and projects within DOE has been on a gradual increase since FY 1987. Organizations on the forefront of these efforts include the Energy Regulatory Administration (recently incorporated into the Office of the General Counsel), the Office of The Executive Secretariat, and the Office of Hearings and Appeals. Created during September 1989, The Office of Nuclear Safety (recently combined with the Assistant Secretary for Environment, Safety and Health) planned for a major imaging effort.

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[3] *Survey of the Imaging Industry*, 1992, performed by Deloitte & Touche and the Association for Information and Image Management (AIIM).

The design and implementation of an integrated information management system, involving text and image processing, was introduced in a program plan[4]. The plan illustrated the potential to significantly improve the effectiveness of each division while providing total file integrity of vital records within the Office of Nuclear Safety. The Office of the General Council has indicated a requirement for a full-text search and retrieval system for approximately 5 years.

Major imaging projects currently ongoing within DOE Headquarters include the following.

> ▶ The Energy Regulatory Administration established its first OCR station during 1987 in response to a large litigation case (approximately 50,000 pages scanned). This was followed in FY 1992 with the installation of an electronic imaging system which contained the following.
>
> > - CD-ROM Jukebox (5 inch) - 3
> > - Optical Server - 1
> > - ScanStation - 2
> > - OCR Station - 1
> > - ViewStation - 11
>
> ▶ The Q&A/Testimony Library System consolidates DOE testimony to the Congress, Congressional questions and Departmental responses related to scheduled hearings, Secretarial speeches, and other policy statements. Documents are processed through an imaging and OCR system in AD-30 and sent to the Office of Scientific and Technical Information (OSTI), in Oak Ridge, TN.
>
> ▶ Another major goal within AD-30 includes adopting an imaging processing strategy to convert some kinds of paper documents into digital images that can be stored, searched, and retrieved efficiently over LANs.
>
> ▶ The Nuclear Safety Information and Imaging Management System (NSIIMS) addressed the following major areas.
>
> > - Formulation and implementation of nuclear safety administrative policy
> >
> > - Development of a nuclear safety records management function
> >
> > - Development of a nuclear safety information systems management function
> >
> > - Establishment of policy with regard to utilization of existing automated systems

The Office of Hearings and Appeals has undertaken the conversion of a large inventory of historical documentation from paper to electronic format. This conversion is reducing space requirements and storage costs, and eliminating the need to transfer these documents to archives. This project provides a more immediate and easier method of retrieval of specific documents.

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[4] *Final Nuclear Safety Information and Imaging Management System (NSIIMS) Program Plan*, July 3, 1991, Trident Systems, Landover, Maryland 20785.

The Office of Hearings and Appeals recognizes this is a large project that could, over the life of the project, convert over a million pages from paper to electronic image. The Office of Hearings and Appeals has therefore developed a three-stage approach to the conversion.

Stage I (FY 1992-1995)

Initial Conversion of Paper Documents to Image Format - Beginning in FY 1992, and continuing until completion, HG has dedicated one workstation for the purpose of imaging documents. HG staff "scan", document, and mark currently stored documents for destruction. The conversion plan implements oldest documents first (first-in, first-out [FIFO]). During this stage, there will be image-only conversion with no requirement for search and retrieval of documents other than by retrieving the document by HG reference number. The system is not connected to the LAN and is not yet intended to be a multi-user system.

Stage II (FY 1994)

Image/ASCII Format - HG will acquire software to convert the image files to ASCII format and will develop a multi-user search and retrieval system to access all converted documents. HG analysts and attorneys will be able to retrieve ASCII documents for importation into wordprocessing documents or will be able to print image files from the network. If software advances provide a single image/ASCII format, HG will utilize the advanced application.

HG will investigate the production of CD-ROM for storage and dissemination of public information that is currently available in paper form. In additio: , HG will investigate electronic transfer of public information through the enlargement of the HG electronic bulletin board.

Stage III (FY 1995)

Current Document Conversion to Image/ASCII Format - Beginning in FY 1995, HG will convert current documents to image/ASCII format to operate as a paperless office. Analyst and attorney work files will be maintained as image/ASCII files on the network.

Other organizations indicating requirements for imaging systems and/or peripheral imaging equipment (i.e., scanners, CD-ROM players, etc.), along with a brief description of the proposed system are displayed on the next page.

Organization	Description	Year
AD-24	Image Access (CD-ROM/Jukebox) for Federal Information Resources Management Regulations, FAR, GSA Regulations	FY 93-94
AD-40	Imaging Study	FY 94-95
AD-50	Imaging project study (SF 171/Office Personnel Folders)	FY 95-96
AD-60	Text retrieval system (Occupational Safety & Health Regulations, historical documentation of safety incidents, inspection of facilities	Unspecified
AD-70	CD-ROM/servers - Text retrieval system (Training data updating)	Unspecified
CR	OCR/CD-ROM/WORM technology (Storage devices for centralized electronic library)	FY 94
DP-20	Classified central repository (storage of digitized images - approximately 500,000 pages)	FY 93
DP-40	Document storage/retrieval system (approximately one million pages — possible CD WORM technology application)	FY 93
DP-50	Full-text Search & Retrieval System	FY 93
DP-60	Document imaging system (CD-ROM devices and jukeboxes, OCR scanners for LAN upgrades)	FY 93
EE	Color scanners w/OCR software, WORM/CD-ROM drives for LAN file servers (Conversion of hard-copy records to imaged (digital) format for management purposes)	FY 93-97
EM	Records management system (storage/retrieval of records information)	FY 93-94
EP	OCR, CD-ROM devices (Text Information Mgmt System)	FY 93-95
ER	CD-ROM & optical storage devices (approx 150 users)	FY 93
GC	Full-text search & retrieval system	Unspecified
IG	Full-text database retrieval capability	FY 93
RW	OCR, image scanner, CD-ROM player (InfoSTREAMS)	FY 93

The number of imaging and document storage/retrieval project requirements being undertaken at the Department of Energy indicates the opportunity for positive movement in this area.

ISSUE
Imaging/storage/retrieval technology is beginning to filter into individual organizations. With the technology now becoming increasingly cheaper, faster, and more user-friendly, it would seem the most opportune time to pursue the implementation of standards. This would result in the most efficient use of current information within the Department using this technology.

Presentation Graphics and Publications Management

The ability to combine graphics and narrative into a document or presentation and produce it on a laser printer has been called "desktop publishing" in the past. The capability to create superior material now goes far beyond the meaning of that term. Today, systems such as Windows and OS/2 provide the following advancements.

► Graphical user interfaces (GUIs) and the ability to exchange data and share program functions

► Font embedding

► Multi-media

Currently, within the Department of Energy, a 386-technology workstation is needed for a minimal support of presentation graphics and eye-catching documentation. Harvard Graphics 3.0, WordPerfect 5.1 (tables/columns/graphics), Lotus 1-2-3, and DrawPerfect 1.1 are four examples of the standard DOE software used for presentation graphics and publication management. A PostScript laser printer can provide the capability to size fonts, and a color printer can further contribute to the appeal of a formal presentation or document. When software is more complicated in executing graphics and text-publishing, a more powerful personal computer is required.

Most of the Headquarters organizations have the capability to produce some level of presentation graphics and publication management. However, use of the significant advances in this technology arena have only been scattered. Many of the organizations have come to rely either on the Office of Administrative Services (AD-60) because of its responsibilities for Headquarters printing and graphics (Printing and Graphics Division) or other outside resources, such as the Visuals Library in Germantown.

The Visuals Library provides a physical catalogue of graphics images such as aerial photographs of Federal Government facilities and word charts that can be incorporated into documents and view graphs. Storing this information on the local area network would make the information more readily available to the DOE community and assist AD-60 in providing superior graphics support.

In addition to AD-60, the Office of Energy Research and the Office of Environmental Restoration and Waste Management are good examples of what can be accomplished by an individual organization in creating effective presentation graphics and publication management.

In ER, the use of color graphics and the need to perform high resolution color scanning and printing has become a regular requirement for the preparation of briefings, publications, and multi-agency efforts. ER has aggressively made color printing available via the network and plans to obtain photographic quality scanning and color printing technology during FY 1993.

ER plans to provide an electronic graphics presentation environment that allows presentation text, graphic, and image material to be categorized, stored, and retrieved on a network workstation or video system. This would allow for the information to be presented at any time or at any location, providing multi-media output as required.

EM is providing an electronic graphics presentation environment that is currently being developed on a Macintosh workstation, but will be compatible within the IBM PC environment in the future. The following are examples of several graphics packages currently in use on the Macintosh.

Graphics Package	Interesting Features
MacroMind Director	Integrates sound and animation. Facilitates interactivity.
Paracomp Swivel	Provides three-dimensional modeling. Recently developed a DOE seal.
Aldus Persuasion	Produces viewgraphs and slides in both color, and black and white.
Adobe Premier	Provides video editing of special effects and assists in the transition to animation.
MacroMedia Gaffer	Converts Macintosh presentation materials to be run on Windows.

Audio Visual tools are invaluable in developing highly effective presentation graphics. The following are examples of how EM has harnessed this technology.

▶ Embedding scripts into an individual presentation, precluding the need for live narration

▶ Stopping and restarting during a presentation without destroying the continuity by simply using a mouse to click on and off

▶ Using a digital still camera to capture photographic images that can be used as computer graphic images

▶   Placing a finished presentation on videotape through the use of a video recorder, so that it can viewed at any time; this eliminates the need for a user to attend numerous meetings

▶   Developing computer-based training (CBT) courses to assist users in understanding systems developed specifically for EM

Large screen, high-resolution monitors and high-speed computers and communications channels are needed to support this technology. Memory limitations associated with the use of video graphics are anticipated. Imaging of records for records management and document control is a technology that will continue to emerge. Because images are stored bit-by-bit, a single page requires space in memory totalling many thousands of bytes. Transferring these images requires the use of wide band data communication channels.

ER and EM demonstrate what can be accomplished by an individual organization in creating effective presentation graphics and publication management. This is an example of what can be accomplished on an individual organizational level.

ISSUE
What are the ramifications (e.g., cost, long-term commitment, training, etc.) of an organization pursuing individual goals in the presentation graphics and publications management area?

Interactive Management

Electronic Mail

A major initiative of the Office of Information Technology Services and Operations is to implement interoperable electronic mail and file transfer capabilities DOEwide. The basic goal is to connect DOE organizations and provide comprehensive directory services. An X.400 interface has been chosen because of its ability to navigate between the existing proprietary mail systems.

Implementation will be achieved by a combination of the following options.

- ▸ Electronic mail over a private DOE network including an X.400 backbone with access to FTS2000 X.25 circuits where possible

- ▸ Electronic mail using X.400 and the X.25 FTS2000 with Administrative Management Domain (ADMD) Relay Services as they are required

- ▸ Electronic mail using X.400 and the connection-less network protocol (CLNP) via ESnet and Internet

- ▸ Electronic mail gateways to transmission control protocol/internet protocol (TCP/IP) with simple mail transfer protocol (SMTP) for additional connectivity

The Electronic Mail/File Transfer (E/FT) Business Plan has been reviewed by the members of the E/FT Task Force, the E/FT Steering Committee, and the Information Resources Management (IRM) Council. The E/FT Business Plan provides electronic mail direction, objectives, work breakdown structures, and projected cost information for implementing the X.400 interface.

A project that originally began as an update of the DOE telephone book/locator is now available to OfficeVision users to send electronic mail. It is being improved by placing DOE contractors in the DOE telephone book/locator and expanding its circulation to include the X.400 electronic mail directory. Serving as a basis for the X.500 directory services, this would initially involve periodically exchanging files to Operations Offices and other interested locations. Ultimately, changes to the directory made at any specific location would be available instantaneously everywhere. This would enhance the download capability for LAN administrators for use in their individual cc:Mail directories. Eventually, the DOE staff location/address information will be updated by the administrative officers of each organization.

There are currently about 2,300 users of OfficeVision, the mainframe electronic mail package. The LAN electronic mail package, cc:Mail, is available to the 1,794 personnel on the LAN with a 33 percent increase of users in FY 1993. Trends in OfficeVision usage versus cc:Mail usage will be watched to ascertain whether both products are required or whether OfficeVision will be phased out during Headquarterswide implementation of the LAN. A pilot program began in March 1993 to allow a cc:Mail-to-OfficeVision user interface, tracking messages sent between them across the SNA gateway. In May 1993, this pilot program was expanded to include five Operations Offices.

OfficeVision Participation

Staff Active on OV
2,256

Staff Inactive on OV
3,744

Total Headquarters
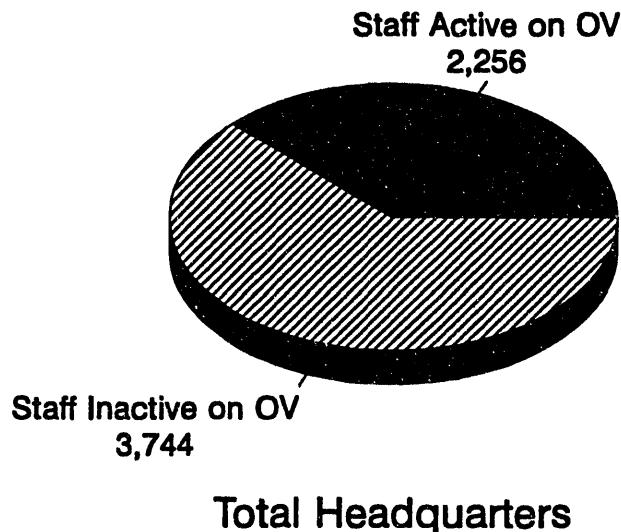
Usage of OfficeVision is currently measured through central processing unit (CPU) utilization in terms of CPU time in the thousands of seconds. During 1993, usage has decreased 18 percent from about 30 million seconds in January to about 25 million seconds in March due to the increasing number of users moving to the LAN environment (i.e., cc:Mail). The following table provides a 3-month average OfficeVision usage by selected DOE organizations. Currently, cc:Mail usage is not being tracked.

ISSUE
With the potential for substantial numbers of users being added to cc:Mail, will it become necessary to track cc:Mail usage?

Current Utilization of OfficeVision	
Organization	CPU Time in Seconds (Thousands)
AD	1,281
CE	116
CP	183
CR	0
DP	1,872
EH	346
EH-4	0
EM	0
EP	0
ER	170
FE	336
GC	70
HG	0
IG	0
IS	25
NE	6,392
PA	236
PR	0
RW	28
Total	11,030

Note: These figures represent average usage for the first 3 months of 1993.

TeleVideo Services

The use of televideo services to improve communications is discussed at length in a draft of the Department of Energy Business Plan For Televideo Services. Benefits cited are in the following areas.

AREA	BENEFIT
Travel	Cost Avoidance
Policy and Event Broadcast	Enhanced Decision Making and Productivity
Remote Learning	Improved Productivity
Project/Program Management	Cost Avoidance and Enhanced Decision Making
Distributed Staff Meetings	Improved and Enhanced Decision Making

DOE organizations have made considerable use of the existing televideo services facilities. There are four networks currently operating: compressed video transmission service (CVTS); the secured network; Energy Research (ER); and Emergency Operations Center. DOE hopes to be able to consolidate these four networks into three in the future. There is a proposal under consideration from American Telephone & Telegraph to consolidate the secured network into the CVTS network. The average usage of the CVTS and secure facilities has been 400 hours over the past 3 months.

Twelve new sites are planned for the CVTS network in the next few months. This would place more emphasis on dial-up/central switch, move away from dedicated lines, and increase the service provided to users. A 6-month phase-in period would be required. Currently, there is one multi-point control unit operating at Albuquerque; others are planned for Las Vegas and Germantown.

A cost decrease makes televideo services more readily available. Emerging technologies such as desktop televideo services offer technical possibilities. Also, there are portable televideo servicing units available that will allow any organization, large or small, to enjoy the advantages of televideo services.

There is a concern about the ability to provide adequate services in this rapidly growing area. This concern is being addressed by moving towards more use of digital transmission modes, such as fractional T-1s and possible future implementation of new coding protocols, such as asynchronous transfer mode (ATM).

Broadcast training was initiated in FY 1992 and has involved partnerships with the University of New Mexico and George Washington University. The broadcasts offered so far have been predominantly DOE-oriented and have involved such subjects as Radioactive Waste Management, Environmental Risk Management, and Business and Management. The use of video as a training medium is expected to grow because it is inexpensive, easy to set up, and amenable to large groups of people. A major application being considered includes the creation of a DOE Technical Training Center. Specific capabilities foreseen to be required include: uplink/downlink broadcast capabilities, televideo services, multi-media training systems, and computer-controlled overhead projection.

The Secretary of Energy is making extensive use of the broadcast medium and reaching 95 percent of the DOE community with these broadcasts. The ability to distribute this video signal is currently limited to inside site locations (e.g., auditoriums and large conference rooms). However, in the near future it can be enhanced to small meeting rooms and within a year, it will be available to the desktop. Significant benefits are realized from the Secretary's use of this medium.

- ► All personnel get same information at the same time

- ► Ability to see and hear the Secretary lends credibility and fosters team spirit

- ► There is an option to give instantaneous feedback

ISSUE
Improvements in technology and cost decreases will make televideo services a viable communication tool DOEwide. There should be concern for how preparations are being made to handle an increased volume of televideo servicing activity.

Voice Mail

The current number of users of voice mail stands at about 1,800 for Germantown (this covers both onsite and offsite locations) and 2,250 for Forrestal. Based on total number of users (2,000 for Germantown and 4,000 for Forrestal), Germantown has 91 percent and Forrestal 57 percent of the total number of phone customers eligible using the voice mail system. The Germantown voice mail system is run under the Aspen system and has a capacity of up to 2,000 users. The Forrestal voice mail system is run under the Maxim system and has a capacity of up to 10,000. The features for each system are identical.

The Germantown system is becoming overextended. It is being considered for an upgrade to the Maxim system to accommodate the growth of voice mail users. The chart displayed below shows the percentage of DOE personnel at both Germantown and Forrestal that are currently using voice mail and identifies the potential for increased DOEwide usage of this product.

ISSUE

There is a need to recognize that Voice Mail is being used to transmit and record important information. The ability to store this information with other electronic information on similar topics is required. As a first step, it would seem an opportune time to explore ways to retain information over a longer period of time.


Voice Mail Participation

Staff on V-Mail
1,829
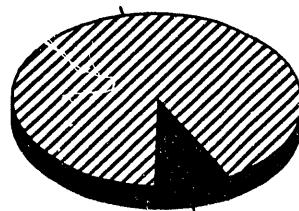
Staff on V-Mail
2,270
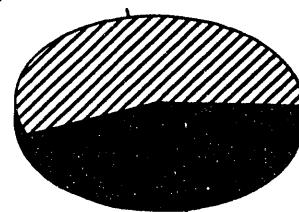
Staff Not on V-Mail
171

Staff Not on V-Mail
1,730

Germantown

Forrestal

Appendixes

Department of Energy User Organizations

AD   Assistant Secretary for Human Resources and Administration
AN   Office of Arms Control and Nonproliferation
BC   Board of Contract Appeals
BU   Office of Small and Disadvantaged Business Utilization
CE   Assistant Secretary of Energy Efficiency and Renewable Energy
CP   Assistant Secretary for Congressional, Intergovernmental & International Affairs
CR   Office of Chief Financial Officer
DP   Assistant Secretary for Defense Programs
EH   Assistant Secretary for Environment, Safety, and Health
EH-4 Office of Security Evaluations
EM   Assistant Secretary for Environmental Restoration and Waste Management
EP   Assistant Secretary for Policy Planning and Program Evaluation
ER   Office of Energy Research
FE   Assistant Secretary for Fossil Energy
GC   Office of General Counsel
HG   Office of Hearings and Appeals
IG   Office of Inspector General
IN   Office of Intelligence
IS   Office of Intelligence & National Security
MI   Office of Minority Economic Impact
NE   Office of Nuclear Energy
NS   Office of Nuclear Safety
OC   Office of Contractor Employee Protection
OE   Office of Emergency Planning and Operations
PA   Office of Public and Consumer Affairs
PR   Office of Procurement, Assistance and Program Management
RG   Office of Procurement, Assistance, and Program Management
RW   Office of Civilian Radioactive Waste Management
SA   Office of Security Affairs

ISSUES

The following are issues that have been identified in the body of the document. Page numbers provided at the end of each issue refer back to the location in the document.

1. What steps can be taken to further establish the Emerging Technologies Planning Guide as a useful tool to assist organizations in strategic IRM planning? (p. 1)

2. In organizations where there is a strong information management staff, the challenge for the Office of Information Technology Services and Operations is to establish good communications and provide sufficient leadership to ensure an efficient, cohesive information infrastructure at Headquarters. (p. 4)

   It is important that all organizations understand the necessity for including representatives from their programs in defining information needs. (p. 4)

3. Organizations must be prepared to fund a fully supportive information architecture to realize the full benefits of their hardware architecture. (p. 6)

4. The opportunity for development of a good baseline of data pertaining to desktop technology exists. This development process would be enhanced through the use of the AOSS Workstation Questionnaire referenced above. (p. 9)

5. Is the end of FY 1995 soon enough to achieve a Headquarterswide 32-bit architecture? (p. 11)

6. How will the availability of 586-technology impact requirements for the standard workstation (486-technology)? (p. 11)

7. A large number of customers (CE, DP, EP, FE, GC, IG, and PR) have vintage technology. (p. 13)

8. With the influx of new employees, how much will their experience with other technology increase the projected requirements for Macintosh workstations? (p. 13)

9. Organizations should be prompted by the PMOs to begin planning for implementing printers, scanners, other peripherals, and services provided on the LAN. (p. 18)

10. What impact will the increased graphics capabilities of large screen monitors have on future requirements? (p.18)

11. What preparation should be to handle increased demand for special-purpose equipment (e.g., imaging equipment, portable printers, and other associated peripherals)? (p. 18)

12. Because organizations continue to have problems expressing software needs, guidance should be provided by Office of Information Technology Services and Operations. (p. 21)

13.   Will a determination be made as to the preferred long-range advanced operating system software and platform to enable organizations to begin budgeting and planning requirements to upgrade DOS-based systems? (p. 23)

14.   The large number of new LAN users will cause organizations to alter their focus in all areas of information resources requirements, due to the increasing capability offered by the LAN. (p. 25)

15.   A LAN User Group may be the answer to a cooperative pursuit of solutions concerning LAN connectivity. (p. 29)

16.   With the technology for implementation of several organizational LANs now becoming increasingly available, it would seem feasible that there would be a gradual progression toward LAN-based information systems. This would allow for a more thorough distribution of the data contained therein (initially) throughout the individual organization and, ultimately, throughout the entire Headquarters environment. The opportunity exists for a cost/benefit analysis of many systems that could be utilized most efficiently by many users via LAN-based systems. (p. 34)

17.   Imaging/storage/retrieval technology is beginning to filter into individual organizations. With the technology now becoming increasingly cheaper, faster, and more user-friendly, it would seem the most opportune time to pursue the implementation of standards which would allow for the most efficient use of current information within the Department using this technology. (p. 39)

18.   What are the ramifications (e.g., cost, long-term commitment, training, etc.) of an organization pursuing individual goals in the presentation graphics and publications management area? (p. 42)

19.   With the potential for substantial numbers of users being added to cc:Mail, will it become necessary to track cc:Mail usage? (p. 44)

20.   Improvements in technology and cost decreases will make televideo services a viable communication tool DOEwide. There should be concern for how preparations are being made to handle an increased volume of televideo servicing activity. (p. 47)

21.   There is a need to recognize that Voice Mail is being used to transmit and record important information. The ability to store this information with other electronic information on similar topics is required. As a first step, it would seem an opportune time to explore ways to retain information over a longer period of time. (p. 48)

END

DATE FILMED
9/23/93