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MARTIN MARIETTA

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ENVIRONMENTAL RESTORATION PROGRAM

Information Management Architecture for an Integrated Computing Environment for the Environmental Restoration Program

Volume 2. Interim Business Systems Guidance

MANAGED BY
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FOR THE UNITED STATES
DEPARTMENT OF ENERGY

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ENERGY SYSTEMS

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ES/ER/TM-120/V2

Information Management Architecture for an Integrated Computing Environment for the Environmental Restoration Program

Volume 2. Interim Business Systems Guidance

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ACRONYMS AND ABBREVIATIONS

AES	Automated Estimating System
ATMS	Action Tracking Management System
BAA	Business Area Analysis
BSA	Business Systems Architecture
BSD	Business System Design
BSG	Business Systems Guidance
C&TS	Computing and Telecommunications Services
CAS	Cost Accounting System
COTS	commercial off-the-shelf
CRRI	Clinch River Remedial Investigation
CWTS	Central Waste Tracking System
D&D	decontamination and decommissioning
DBMS	data base management system
DMC	Document Management Center
DOE	Department of Energy
DOE-ORO	DOE Oak Ridge Operations
EIMS	Environmental Information Management System
EMIS	Engineering Management Information System
Energy Systems	Martin Marietta Energy Systems, Inc.
ER	Environmental Restoration
ERS	Employee Records System
ER TA	*Environmental Restoration Program Interim Technical Architecture*
ERWM	Environmental Restoration and Waste Management
ESLIMS	Energy Systems Laboratory Information Management System
GIS	Geographical Information System
IEF	Information Engineering Facility
IEM	Information Engineering Methodology
IRM	Information Resources Management
ISP	Information Strategy Planning
LAN	local area network
LIMS	Laboratory Information Management System
MCIS	Management Control Information System
OREIS	Oak Ridge Environmental Information System
ORNL	Oak Ridge National Laboratory
PC	personal computer
PGDP	Paducah Gaseous Diffusion Plant
PORTS	Portsmouth Gaseous Diffusion Plant
SDM	Software Development Methodology
TCP/IP	Transmission Control Protocol/Internet Protocol
TSD	treatment, storage, and disposal
WAG	Waste Area Grouping
WIMS	Waste Information Management System

EXECUTIVE SUMMARY

The Environmental Restoration Program Interim Business System Guidance supports better information resource management as stated in Martin Marietta Energy Systems, Inc., general policies. Details about the corporate information structure are in the accompanying *Information Management Architecture for an Integrated Computing Environment for the Environmental Restoration Program, Volume 1. Introduction* (ES/ER/TM-120).

The main focus of the ER Program Interim Business System Guidance is (1) to serve as a reference point to current application systems, (2) to show results of the current systems evaluation, (3) to discuss application system development strategy, and (4) to discuss how commercial off-the-shelf software applies to the ER Program.

1. INTRODUCTION AND OVERVIEW

1.1 PURPOSE

The purpose of this interim document is to provide guidance in implementing an information management plan for the Environmental Restoration (ER) Program until a fully developed Information Strategy Planning (ISP) effort can be accomplished.

1.2 BUSINESS SYSTEMS ARCHITECTURE VERSUS BUSINESS SYSTEMS GUIDANCE

The Business Systems Architecture (BSA) is the second of three architectures defined during ISP. As stated in the *Information Engineering Methodology* by James Martin & Associates (also known as the red books), the objectives of a BSA are:

1. to show the possible future environment of applications systems and data bases that will meet the overall needs of the company;
2. to provide a baseline for planning of future analysis and systems development, which helps to ensure compatibility between systems and with data bases; and
3. to provide a baseline for reviewing the technical architecture.

The BSA defines the applications systems and data bases that need to be built or improved to meet the information needs of the company. Without a BSA, applications systems and data bases are built in isolation, which causes redundancy and makes data flow impossible to control. The BSA defines the expected systems, the expected data stores, and the interdependencies between them.

However, the ER Program Interim Business Systems Guidance (BSG) is not intended to represent a BSA. A fully developed ISP effort must be accomplished before the benefits of a BSA can be fully achieved.

The BSG is intended to inform ER Program management of the opportunities to improve their information management activities by providing the results of the current systems evaluation. This evaluation will show ER Program management some hardware/software/interface detail about several ER-owned applications, as well as non-ER applications currently being used by the ER Program in various functional areas of the company. The BSG also supports the Information Engineering Methodology• (IEM) (Sect. 1.4), provides a strategy for application development strategy (Chap. 3), and provides information on how commercial off-the-shelf (COTS) software applies to the ER Program. (See Chap. 4.)

1.3 OBJECTIVES

The ER Program needs better information management. Currently, individual programs build and maintain many separate, redundant information resources to meet their own specific requirements. These redundant information system solutions and the cost and inefficiencies of incompatible information technologies across sites and organizations are no longer an option; nor are they affordable. It is essential to effectively and efficiently team together to network and to move information horizontally across the company without boundaries and still maintain security.

The objectives of this interim document are to reinforce the ER Program's commitment to better information management and to document the results of a current system evaluation conducted for the ER Program.

1.4 METHODOLOGY OVERVIEW

1.4.1 Information Engineering Methodology

IEM, as described in the accompanying *Information Management Architecture for an Integrated Computing Environment for the Environmental Restoration Program, Vol. 1: Introduction* (ES/ER/TM-120), is a complete and integrated approach to the development of information systems. It provides effective approaches for meeting the computing needs of the business community. It includes seven stages that comprehensively address the information requirements of a business, but that also define manageable and deliverable tasks toward this goal. These stages are listed here.

1. *Information Strategy Planning.* ISP is composed of high-level models or architectures that are used to define the information and computing requirements of an organization. This BSG, along with the accompanying *Environmental Restoration Program Interim Technical Architecture* (ER TA) and the Information Architecture to be developed, addresses the ISP stage and covers the ER Program as a whole.

   Although the remaining six stages are commonly addressed on a project level, there may be multiple projects within a particular segment of the business. The business area scope is outlined from the ISP stage, and each of the related projects builds on others within the business area to produce a comprehensive and integrated information systems solution for the whole business area, rather than producing ad hoc solutions to short-term problems. Each project then performs steps 2 through 7.

2. *Business Area Analysis (BAA).* The BAA is a detailed analysis that is performed on a particular segment of the business. The BAA stage models all aspects of the data and activities within the business area being addressed. It assesses the support currently given by existing systems and identifies the ideal system or set of systems that should be in place for the business area.

3. *Business System Design (BSD).* The BSD specifies an application system or set of systems that is designed to support a business area.

4. *Technical Design (TD).* The Technical Design is a BSD tailored to a specific computing environment that specifies the hardware, data base management system (DBMS), user interface, and the like.

5. *Construction.* The construction stage involves constructing and delivering the components of a system.
6. *Transition.* The transition stage involves replacing the currently used systems with the newly constructed and installed application system.
7. *Production.* The production stage involves use of the new application system to satisfy the needs of the business users.

1.4.2 Make-Buy-Use Strategy

Upon completion of the BAA phase of IEM, system requirements are stated in the form of data, activity, and interaction models. These requirements are the baseline for initiating a *make-buy-use* decision. The term *make-buy-use* has three components:

Make This refers to custom software that is developed internally and/or by subcontracted organizations.

Buy This refers to purchasing one or more COTS packages.

Use This refers to reusing components (e.g., modules, screens/forms, data structures) from existing systems.

These options are not mutually exclusive; this means, a decision could consist of one, two, or all three of the options.

Reuse reduces cost and development time and, therefore, should always be a considered solution. Reuse is not limited to using components "as is," but also includes use with modifications. See Sect. 3.2.1 for more information on reuse within the ER Program.

When possible, the use of COTS packages is a recommended solution for meeting information processing needs in the Martin Marietta Energy Systems, Inc. (Energy Systems), Technical Architecture Specification. Care must be taken to ensure that these packages comply with relevant standards and support an open architecture environment. (See Chap. 4 for more information.)

Making or developing custom software may be the only option in situations in which COTS or existing software components are not available to satisfy the system requirements or those in which their use would compromise the architecture, resulting in increased overall costs to the ER Program. Attention should be given to documenting these custom components for future reuse. (See Sect. 3.2.5 for more information.)

1.4.3 Alternate Approaches

Situations may arise that dictate the need for an alternate approach from the "classic" IEM approach described in Sects. 1.4.1 and 1.4.2. Alternate approaches include Rapid Application Development and prototyping, for example. When considering a deviation from the standard IEM approach, the Information Engineering Technology Group within Computing and Telecommunications Services (C&TS) should be contacted for guidance.

2. DESCRIPTION OF CURRENT SYSTEMS

The scope of this evaluation project includes the application development activities of the ER Program. Using application systems identified by previous studies, a subset of application systems was determined to be ER systems. The list of identified ER Program application systems was divided into ER Program-owned application systems and other Energy Systems application systems that support the ER Program.

To perform a current systems evaluation, questionnaires were sent and/or personal interviews were conducted with the contact person for each application system. A total of 39 questionnaires were sent to contact persons for ER Program application systems and application systems interfacing to the ER Program. Five personal interviews were conducted. Not all questionnaires were returned. The results of the current systems evaluation (system name, contact person, functionality, hardware, software, etc.) are summarized in this chapter. This evaluation is not complete, but it represents the information currently available.

The following is a list of application systems identified as ER Program-owned applications, applications that support the ER Program, and applications for which no contact was identified. Details concerning these applications are presented in Sects. 2.1 through 2.2.

Environmental Restoration Program-owned application systems

Administrative Records
Clinch River Remedial Investigation (CRRI)
Document Management Center (DMC)
Document Management System (DMS)
Environmental Information Management System (EIMS)
ER Waste Actuals
ER Waste Generation Forecast

Geographical Information System (GIS)
Management Control Information System (MCIS)
Oak Ridge Environmental Information System (OREIS)
Waste Area Grouping (WAG) 6 Information Management System
Waste Management Planning Model

Energy Systems application systems supporting the Environmental Restoration Program

Action Tracking Management System (ATMS)
Active Division Procedure Status System
ALPHA-4 Decommissioning Management Information System
Automated Estimating System (AES)
Bibliographic Data Base for Remedial Action Program
Central Waste Tracking System (CWTS)
Cost Accounting System (CAS)
Employee Records System (ERS)
Energy Systems Action Management System
Energy Systems Laboratory Information Management System (ESLIMS)
Engineering Management Information System (EMIS)

Environmental Data System
Environmental Monitoring Management Information System
ER and Waste Management (ERWM) Procedures Data Base
EnviroView
ER Procedure Schedules
Federal Agency Pollution Abatement Plan
Integrated Data Base
Intelligent Document Tracking System
The Oak Ridge K-25 Site Waste Tracking and Reporting System
Laboratory Information Management System (LIMS)
Library Generation and Waste Inventory Projections
Nuclear Facility Decommissioning and Site Remedial Action Data Base
Oak Ridge Generation and Treatment
Portsmouth Gaseous Diffusion Plant (PORTS) Waste Tracking System
Real-Time Monitors
Remedial Action Contacts Data Base
Standard Practice Procedure Processing Data Base
Subsurface Data Base
Training Management Information System
Waste Information Management System (WIMS)
The Oak Ridge Y-12 Plant Waste Tracking Project

Potential support application systems (contacts not identified)

Commitment Tracking System
ER and Waste Services Management ADS
Funding Authorization Document System
HARM II
Performance Measurement Analysis System
PORTS Accounting System
Progress Tracking System
Project Management Integrated System
PTS Status Report System
Road Map Information System
Waste and ER Management System
Workload Breakdown Data Base System

2.1 APPLICATION SYSTEMS OWNED BY THE ENVIRONMENTAL RESTORATION PROGRAM

The results of the current systems evaluation (system name, contact person, functionality, hardware, software, etc.) of application systems owned by the ER Program are summarized in this section. This evaluation is not complete but represents the information currently available.

Clinch River Remedial Investigation

The CRRI system is designed to provide planning for, tracking of, storage of, and information about sample collection data for all phases of the CRRI Environmental

Monitoring project using relational data base structures. The system provides as nearly as possible "real time," on-line information about the status of the collection processes.

Contact: Denise Schmoyer (System Administrator).

Status: Long range.

Processing facilities: The system resides on a SUN SPARC10 Work Station running the SUNOS operating system. The networking protocol is Transmission Control Protocol/Internet Protocol (TCP/IP).

Application Software: DBMS is ORACLE. The system development facilities include ORACLE Development Tools (MENUS/FORMS/REPORT WRITER), SAS, and C. The software is a collection of COTS software tied in with software custom built by C&TS. Technical support is provided locally by C&TS and Computing Applications.

Interfaces/interactions: In the future, CRRI will interface with OREIS.

Application functionality: The application is used in the business area of ER.

Document Management Center

DMC manages ER records and tracks paper documents electronically. There is one center per site. Records are retained for 100 years.

Contacts: Jane Haynes and Kenton O'Kaine.

Status: Temporary. Plans are in the works to convert to the Y-12 Plant Electronic Document Management System.

Processing facilities: PC, Stand-alone Banyan VINES network.

Application software: For DMC, DBMS is CDMS. R&R is the report generator. AskSam is also used. The system has 12 users.

Interfaces/interactions: None.

Application functionality: The application is used in the business area of records management.

Document Management System

The Document Management System (DMS) is a data base of descriptive information about ERWM documents and serves as a pointer to their physical location within the document management center. It also serves as the electronic index for the Administrative Record Files.

Contact: Stephen Cordes (Data Base Administrator).

Status: Long range.

Processing facilities: The system resides on the ERWM1 file server and runs on IBM PC-compatible systems over the PGDP Novell LAN.

Application software: The system currently uses the ORACLE DBMS, but is migrating to Microsoft Access. The development facilities used include ORACLE SQL*Forms, C, ORACLE SQL*Report and ORACLE SQL*Plus. The system was developed by Science

Applications International Corporation (Oak Ridge) and is currently supported locally by PGDP Energy Systems ERWM Information Management, by Science Application International Corporation (by task, usually only for upgrades), and by ORACLE.

Interfaces/interactions: Barcoding is in progress, but no "reader" software/hardware is currently used. Eventually the system will interface with the EIMS to provide data package tracking.

Application functionality: The application is used in the business area of project management.

Environmental Information Management System

This system is used for the collection, management, reporting, and analysis of environmental measurements data from environmental compliance, monitoring, and restoration programs supporting Energy Systems and Martin Marietta Utility Systems, Inc., at PGDP.

Contacts: Tracey Feldhaus (Data Administrator). Stephen Cordes (Data Base Administrator).

Status: Long range.

Processing facilities: The system resides on a Novell server and runs on IBM PC-compatible systems over the PGDP Novell LAN.

Application software: The system currently uses the Team Up DBMS, report writer and programming language along with a small amount of C. Plans are to upgrade the system to Microsoft Access using Access BASIC, potentially some Windows Software Development, C and/or C++, and Microsoft Visual BASIC. The system was developed by PGDP Energy Systems ERWM Information Management. Technical support is available locally from Stephen Cordes and Steve Vick and to a degree from the vendor (Team Up).

Interfaces/interactions: The system interfaces with the Analytical Laboratory Information System at PGDP to download lab data and (currently) field sample and sampling event information. In the near future (6–12 months), Kentucky state and Environmental Protection Agency officials will be able to access the system. Eventually, the system will interact with GIS, DMS, and barcoding software.

Application functionality: The application is used in the business areas of ER, as well as environmental monitoring and compliance.

Environmental Restoration Waste Actuals

This application consolidates the total volume of waste generated by remedial action and decontamination and decommissioning (D&D) projects from all sites.

Contact: Alfreda Cook.

Status: Long range. Plans are to add network access capability in FY 1994.

Processing facilities: The system resides on a PC running DOS. The system has approximately two users.

Application software: The system development facility is FoxPro. All software is COTS. Technical support is provided from within the work group.

Interfaces/interactions: None.

Application functionality: The application is used in the business area of waste management.

Environmental Restoration Waste Generation Forecast

This application consolidates forecasted waste volume and characterization data for remedial action and D&D projects from all sites. The information is used to support Department of Energy (DOE) data calls and treatment, storage, and disposal (TSD) facility planning.

Contact: Alfreda Cook.

Status: Long range. Plans are to add network access capability in FY 1994.

Processing facilities: The system resides on a personal computer (PC) running DOS. There are ~12 users of the system.

Application software: The system development facility is FoxPro. Report generators are FoxPro and Microsoft Excel. All software is COTS. Technical support is provided from within the work group.

Interfaces/interactions: None.

Application functionality: The application is used in the business area of waste management.

Geographical Information System

GIS provides spatial data for maps and querying. It is also used for decision-making analysis.

Contact: Stephen Cordes (Data Base Administrator). Bruce Meadows (GIS Specialist).

Status: Long range.

Processing facilities: The system resides on a single-user PC under MS Windows 3.1. It will soon be available on the PGDP Novell LAN.

Application software: Only spatial data is available via ArcView and AutoCAD. Analytical data will be available through ODBC to Microsoft Access. The system uses off-the-shelf components and is supported both locally and by the respective vendors.

Interfaces/interactions: No interfaces to other application systems exist. The system will soon be able to read analytical data from EIMS through Microsoft Access.

Application functionality: The application is used in the business area of decision-making analysis.

Management Control Information System

The system provides program-level scheduling, estimating, management of project scope, methods of accomplishing project tasks, and performance measures.

Contact: Hannah Powell (ER MCIS Program Manager). Wendell Cooper (Project Manager). Paul Smith (Data Systems Research and Development Project Manager).

Status: Long range.

Processing facilities: The system is implemented on six SUN Sparc 10 workstations, one per site, and one central. The workstations are 386 machines with Windows running TCP/IP across Ethernet.

Application software: DBMS is SYBASE. The system development facilities are FoxPro (PC) for Cermis, C++, and Zinc.

Interfaces/interactions: The system moves data from Alpha to MCIS servers. MCIS interfaces with CAS and the Financial Information System. There are ~20 users per site at the Oak Ridge sites. The system interfaces with the Open Plan Project Management System.

Oak Ridge Environmental Information System

OREIS is mandated by DOE Oak Ridge Operations, ER Program, to fulfill the data requirements prescribed in both the Federal Facility Agreement and the Tennessee Oversight Agreement and to support data management activities for all five facilities managed by Energy Systems. These facilities are the three Oak Ridge Reservation facilities [Oak Ridge National Laboratory (ORNL), the Y-12 Plant, and the K-25 Site] and the gaseous diffusion plants located at Paducah, Kentucky, and Portsmouth, Ohio.

Contact: Raymond McCord (Program Manager). David Herr (Deputy Program Manager).

Status: Long range.

Processing facilities: The system resides on a collection of unclassified nonsensitive SUN workstations running the SUNOS operating system. The networking protocol is TCP/IP.

Application Software: DBMS is the ORACLE relational DBMS (Pro*C, SQL, PL/SQL). The system development facilities are ARC/INFO (GIS) (ARC Macro Language), C, FORTRAN, UNIX Scripts, and SAS (SAS/Assist, SAS/Insight). The software is a collection of COTS tied in with custom-built software.

Interfaces/interactions: No interfaces to other application systems exist. There are ~30 users per site.

Waste Area Grouping 6 Information Management System

The WAG 6 system is designed to provide planning for, tracking of, storage of, and information about sample collection data for all phases of the WAG 6 Environmental Monitoring project using relational data base structures. The system provides as nearly as possible "real time," on-line information on the status of the collection processes.

Contact: Jim Calfee (Systems Administrator).

Status: Long range.

Processing facilities: The system resides on a SUN SPARC10 Work Station running the SUNOS operating system. The networking protocol is TCP/IP.

Application software: DBMS is ORACLE. The system development facilities include ORACLE development tools (MENUS/FORMS/ REPORT WRITER), SAS, and C. The software is a collection of COTS tied in with custom-built software built by C&TS. Technical support is provided locally by C&TS.

Interfaces/interactions: In the future, WAG 6 will interface with OREIS.

Application functionality: This application system is used in the ER business area.

Waste Management Planning Model

This system is designed to forecast waste volumes and predict TSD capacity needs for waste generated through the life of each remediation and D&D project and define these volumes by type, class, and contaminant characteristics.

Contact: Alfreda Cook.

Status: This system will be migrated/converted to another use or application.

Processing facilities: The system resides on a PC running DOS. There are no plans for changes or upgrades to the current host. There are approximately three users of the system.

Application software: DBMS is general purpose simulation software. The report generator is Microsoft Excel. All software is COTS. Technical support is provided externally.

Interfaces/interactions: This system interfaces with the Waste Generation Forecast Data Base.

Application functionality: The application is used in the business area of waste management.

2.2 ENERGY SYSTEMS APPLICATION SYSTEMS SUPPORTING ENVIRONMENTAL RESTORATION

The following is a summary of the current Energy Systems application systems that support the ER Program.

Action Tracking Management System

ATMS is used to track various types of deliverables and commitments, but primarily regulatory commitments. It is used by individuals or groups for general action tracking. The system has versatility among users.

Contact: Tracey Brindley (Regulatory Specialist).

Status: Long range.

Processing facilities: The system resides on the ERWM1 file server and runs on IBM PC-compatible systems over the PGDP Novell LAN.

Application software: The system uses the FoxPro DBMS and development tools as well as the R&R report writer. It is composed of a mixture of off-the-shelf and custom components developed by CYCLA Corporation. Technical support is provided locally and externally by the vendor.

Interfaces/interactions: No interfaces to other application systems exist.

Application functionality: The application is used in all aspects of the business, but primarily for regulatory commitments.

Active Division Procedure Status System

Contact: Jeff Hoyer.

Status: No response.

Alpha-4 Decommissioning Management Information System

This system tracks information about activities related to the decommissioning of Alpha-4. Functions supported by the system include tracking access to a contaminated area of 9201-4, air monitoring the working environment, and tracking removed material.

Contact: Janice Atwater.

Status: Temporary.

Processing facilities: The system currently resides on the OCB unclassified VAX cluster. The user interface is a terminal. The communications facility is the System Select Network.

Application Software: DBMS is Rdb. System development facilities are COBOL and FMS. Technical support is provided from within the work group.

Interfaces/interactions: None.

Application functionality: The system is used in the Environmental Management business area.

Automated Estimating System

AES is a PC software package developed to aid in the preparation and reporting of construction cost estimates.

Contact: Deborah A. Holder.

Status: Long Range.

Processing facilities: The application resides on individual PCs using DOS.

Application Software: AES.

Interfaces/interactions: This system interfaces with OpenPlan Scheduling.

Application functionality: The application is used in the estimating and scheduling business area.

Bibliographic Data Base for Remedial Action Program

Contact: Park Owen.

Status: No response.

Central Waste Tracking System

CWTS provides consolidated waste tracking information across the Oak Ridge Reservation and tracks waste from cradle to grave.

Contact: Lisa F. Miller (CWTS Lead Analyst).

Status: Long range.

Processing facilities: The application resides on a DECStation 5000-240. The user interface is PCs using Telnet. The communications facility is TCP/IP.

Application software: DBMS is SYBASE, and system development facility is UNIFACE. The report generator is SQR Reportwriter. The application uses custom software developed by C&TS. Technical support is available locally from the UNIFACE Users Group, Workstation Support, and the K-25 Site Data Base Group. Support is available externally from SYBASE/UNIFACE/DEC.

Interfaces/interactions: The application interfaces with the Y-12 Plant, K-25 Site, and ORNL Waste Tracking systems.

Application functionality: The application is used in the Waste Management business area.

Cost Accounting System

CAS maintains the Energy Systems account and work order and related structures and data. It receives cost transaction input from across Energy Systems, performs data validation, identifies initial cost elements, assigns rates, assigns costs, redistributes cost, calculates indirect charges and overhead, and reports.

Contact: Russell L. Crisp.

Status: Long range.

Processing facilities: The application currently resides on the IBM 3090. User access to the system is through PCs, terminals, and the Macintosh. The communications facility consists of Banyan and direct.

Application software: DBMS is DB2. The system development facilities include COBOL II, CICS, SAS, and VSAM. Control-D is used on a limited basis as a report generator. The application uses a mixture of COTS and custom software. The custom software was developed by C&TS. Technical support is available locally (within the work group) and externally from the vendor.

Interfaces/interactions: All CAS data are represented in the Corporate Information Center. In addition, the account and work order and associated data are accessed directly or indirectly by more than 50 different computing systems within Energy Systems.

Application functionality: The application is used in the Financial (Office of the Controller and Business Systems) area of the business.

Employee Records System

This system provides personnel, security clearance, computer system, document access, and other information on people who work for the Energy Systems plants. The system is a central part of the Y-12 Plant integrated environment and is used by software systems and the Y-12 Plant population for ad-hoc query.

Contact: Chris Elmer.

Status: Long range.

Processing facilities: The host for this application is the Y-12 Plant unclassified IBM NY12E and the unclassified OCU VAX cluster.

Application software: DBMS is IDMS and Rdb. The system development facility is COBOL. All software is custom built by C&TS. Technical support is available within the work group.

Interfaces: This system is the central system in the Y-12 Plant integrated environment. Many systems access ERS in order to identify personnel information. ERS receives updates twice each week from the K-25 Site Employee Master.

Application functionality: The application is used in the Human Resource Management business area.

Energy Systems Laboratory Information Management System and Laboratory Information Management System

These systems manage and report data to support Energy Systems site laboratories. ESLIMS is a common laboratory information system planned to replace existing LIMS at all five Energy Systems sites (e.g., LIMS at the Y-12 Plant and Analytical Laboratory Information System at the K-25 Site) in the near future.

ESLIMS will have a common core set of functions for all sites, in addition to site-specific functionality where needed. The system supports management of lab tests and resources, lab analysis, and project and quality control management.

Contact: C. A. Serbin.

Status: ESLIMS is scheduled for release December 1994 at the K-25 Site; subsequent sites will come on line at ~6-month intervals.

Processing facilities: ESLIMS will be developed on six VAX machines: unclassified machines at the K-25 Site, ORNL, PGDP, and PORTS and two deployments at the Y-12 Plant, one classified and one unclassified. Initially, terminals and terminal emulators will provide a character-based user interface with the system. Eventually, some sites will use client-server with a Windows-type interface. Networks will vary by site.

Application software: DBMS is ORACLE 7. System development facilities include Information Engineering Facility (IEF), UNIFACE, and FORTRAN. ORACLE's report generator is used for some site-specific reports. The software will be developed in house by C&TS and developers within the Analytical Services Organization at all sites. Technical support is available locally within the work group.

Interfaces/interactions: Interfaces are site specific and will initially be file transfer interfaces.

Application functionality: The application will be used in the lab support area of the business.

Engineering Management Information System

This system coordinates data from Energy Systems Accounting, Payroll/Personnel, and Labor Standardization and integrates engineering work load, forecasting, cost, and performance based on hours and selected administrative information.

Contact: Randy Blair.

Status: Long range.

Processing facilities: The system resides on the 3090 at the K-25 Site using 7171 protocol and the IBM Token Ring. No upgrades to the current host are planned.

Application software: DBMS is IDMS. The system development facilities are COBOL and REXX. All software is custom built.

Interfaces/interactions: EMIS interfaces with Personnel, Labor Standardization, CAS, the Official Building File, the Engineering Design Information System, the Project Records Information System, the MK-Ferguson of Oak Ridge Company Cost System, and the DOE Prime Cost System.

Energy Systems Action Management System

Contact: Cynthia Eubanks.

Status: No response.

Environmental Data System

Contact: Wayne McMahon.

Status: No response.

Environmental Monitoring Management Information System—Surface Water

This system provides the Y-12 Plant Environmental Management Department with the tools necessary to run the day-to-day operations of the Surface Water Monitoring Program and to fulfill the regulatory obligations of the Y-12 Plant Surface Water Monitoring Program.

Contact: Buddy Cate (Project Leader). Kim Hanzelka (User Representative).

Status: Long range.

Processing facilities: The application currently resides on the unclassified OCU VAX cluster host. The user interface is through VT-100 terminal emulation.

Application software: DBMS is VMS and Rdb. The system development facilities are FORTRAN IV with embedded SQL, DECforms, and IEF. All the software is custom built by C&TS. Technical support is available from within the work group and from the Energy Systems central organization.

Interfaces/interactions: This system interfaces with LIMS.

Application functionality: This application is used in the Health, Safety, Environmental, and Waste business area.

EnviroVIEW

This system provides configuration management for hazardous materials and conditions at the K-25 Site. Visual representations of the location, extent and intensity of chemical or physical hazards are maintained. Access control, with change requests and decision logging, is also provided.

Contact: Roy Sheely.

Status: It is currently being prototyped for the K-25 Site Asbestos Management and Radioactive Contamination Control programs. Future applications under consideration include Building Access Requirements; Waste/Disposal Container Tracking; Stacks and Vents; Storm and Sanitary Drains; Building Material Safety Data Sheets; Building Fire and Emergency Plans; and Safety Work Permit Requirements.

Processing facilities: Deployment of the system is targeted to DOS/Windows-based PCs with LAN connectivity.

Application software: Development is on a custom basis with an external subcontractor. The software is developed using the NextStep development environment.

Interfaces/interactions: CADAM engineering drawings of the K-25 Site and individual buildings/facilities are imported; FoxPro is the primary local data base.

Environmental Restoration Procedure Schedules

Contact: Jeff Hoyer.

Status: No response.

Environmental Restoration and Waste Management Procedures Data Base

Contact: Jeff Hoyer.

Status: No response.

Federal Agency Pollution Abatement Plan

Contact: Johnny Skinner.

Status: No response.

Integrated Data Base

Contact: J.A. Klein.

Status: No response.

Intelligent Document Tracking System

Contact: Pat Halsey.

Status: No response.

K-25 Site Waste Tracking and Reporting System

Contact: Pat Mountain.

Status: No response.

Library Generation and Waste Inventory Projections

Contact: J.A. Klein.

Status: No response.

Nuclear Facility Decommissioning and Site Remedial Action Data Base

Contact: Park Owen.

Status: No response.

Oak Ridge Generation and Treatment

Contact: J.A. Klein.

Status: No response.

Portsmouth Gaseous Diffusion Plant Waste Tracking System

Contact: Ken Constant.

Status: No response.

Real-Time Monitors

Contact: Jim Smith.

Status: No response.

Remedial Action Contacts Data Base

Contact: Park Owen.

Status: No response.

Standard Practice Procedure Processing Data Base

Contact: Jeff Hoyer.

Status: No response.

Subsurface Data Base

Contact: Wayne McMahon.

Status: No response.

Training Management System

The Training Management System is an integrated system that provides accountability and control of employee training and qualification within the Y-12 Plant. It is being expanded to include the training needs of Energy Systems.

Contact: Paul Pendergrass (Head, Business and Resource Management Systems Section).

Status: Long range.

Processing facilities: The application resides on the unclassified OCU VAX cluster.

Application software: DBMS is Rdb. The system development facility is COBOL. The software was custom built by C&TS. Technical support is available from the work group and from the Energy Systems Central Organization.

Interfaces/interactions: Current interfaces are the Y-12 Plant ERS CAS, Y-12 Plant Information Center, and Security Management and Control System. Future interfaces are Medical, Equipment Testing and Inspection, VTX, Lesson Plan Tracking System, and Educational Assistance.

Application functionality: The application is used to support Human Resource Management.

Waste Information Management System

The purpose of the system is to provide for Request for Disposal and waste material tracking, including waste characterization data, and to fulfill all daily and regulatory Waste Management Department requirements.

Contact: Stephen Cordes (Data Base Administrator).

Status: Long range.

Processing facilities: The system resides on the C743 file server and runs on IBM PC-compatible systems over the PGDP Novell LAN.

Application software: The system uses the Team Up DBMS and report writer, as well as some BASIC components. Major system changes are envisioned, including DBMS changes, but no timetable has been set. The system uses off-the-shelf components (i.e., the Team Up DBMS) and custom components developed by Energy Systems Waste Management. The system is currently maintained by PGDP Energy Systems ERWM Information Management. Technical support is available from Information Management, Waste Management, and to a degree from the vendor (Team Up).

Interfaces/interactions: The DOE WIMS will be accessed by United States Enrichment Corporation personnel. Intermec barcode readers are used.

Application functionality: This application is used in the business area of waste management.

Y-12 Plant Waste Tracking Project

This is a comprehensive system for the management and tracking of hazardous and industrial wastes at the Y-12 Plant. This system provides functions to record and manage information on waste streams; Request for Disposal; repackaging activities; TSD, and monitoring activities; inventories; and validation tables.

Contact: Tina Heath.

Status: Long range; will be migrated/converted to another use or application.

Processing facilities: The application currently resides on the unclassified OCU VAX cluster and the classified OCA VAX cluster. Users access the system through PCs and VT terminals.

Application software: DBMS is Rdb. The system development facilities include FORTRAN, IEF, VAX FMS, and VAX DECforms. The software was custom built by C&TS. Technical support is available from C&TS and from Energy Systems Waste Management Organization Computer Applications.

Interfaces/interactions: The system interfaces with LIMS and the Account Work Order Management System).

Application functionality: The application is used to support Waste Management.

3. STRATEGY FOR APPLICATION DEVELOPMENT

3.1 SCOPE

This strategy applies to applications developed internally (by organizations within Energy Systems) and externally (by subcontracting organizations).

3.2 DEVELOPMENT STRATEGY

3.2.1 Reuse

Upon project initiation and after finalizing system requirements, the project manager should coordinate with the ER Program Information Resources Manager to determine if software components (e.g., models, data, data structures, source code) exist for possible reuse.

3.2.2 Methodology

The recommended methodology for applications development is IEM. Several reference guides are available within Energy Systems:

- *Information Engineering Methodology* by James Martin & Associates (also known as the red books).
- *A Guide to Information Engineering using the IEF* by Texas Instruments (also known as the blue book).

Because of the lack of a fully supported ISP project for the ER Program and subsequent BAA projects, application development projects using a standard IEM approach must start with the IEM BAA phase in order to collect data and functional requirements.

3.2.3 Application Platform

The ER TA should be used to guide application platform decisions. See Chap. 4 in the ER TA for recommended hardware and software components.

3.2.4 Application Development Tools

The IEF was recommended in Sect. 4.5 of the ER TA as the preferred tool for development of information systems applications. Information systems are applications whose primary functions are to collect data and store it in an efficient manner for on-line queries and reporting purposes. When the IEF cannot generate the targeted application environment (e.g., hardware, software, user interface), the use of IEF is recommended as far as possible through the life cycle; then, use of one of the following is preferred through application implementation: UNIFACE or PowerBuilder, ORACLE SQL*Forms, or SYBASE APT Workbench. (See Sects. 4.3.3 and 4.3.4 of the ER TA for more details.) The use of IEF in concert with another application development tool requires the minimum deliverables of data and process models to document information and functional requirements.

These high-level or upper-end tools (IEF, UNIFACE, PowerBuilder, ORACLE SQL*Forms, and SYBASE APT Workbench) all are capable of performing more complex tasks than data management within applications they produce, but there may be a subset of needed functionality that may be better handled by interfacing from them to other tools that specialize in a certain type of processing. Examples include statistical summarizations, using SAS, or graphical presentations.

In addition, for some specialized areas of scientific, engineering, and other technical computing, other tools may be appropriate.

3.2.5 Documentation

Documentation shall be developed for each application development project according to the specifications in the Automated Data Processing Software Development Methodology (SDM). Graphic outputs from IEF shall be used to supplement the SDM deliverables. Appendix A gives an example of how the Y-12 Plant 80 Series Software Development and Control procedures were mapped to IEF. The purpose of Appendix A is to show how SDM-type documentation can be produced from the IEF tool.

Included as part of the delivered documentation shall be a completed copy of the System/Application Questionnaire (see Appendix B). Another copy shall be forwarded to the ER Program Information Resources Manager to facilitate future reuse and information management resource inventory purposes.

3.2.6 Distribution of Applications

The partitioning of applications and subsequent allocation of components to various platforms is a key element of systems design in a modern information management environment. Guidelines for application distribution are presented in Sect. 5.7 of the ER TA.

3.3 TYPES OF APPLICATIONS

This strategy addresses two types of applications:

- Shared data applications that create or update data to be shared among various business units of the ER Program and/or Energy Systems.
  NOTE: This class of application includes large, multi-user systems as well as stand-alone PC systems that are viewed as a central source either for storing certain data or for producing certain reports.
- End-user-developed applications, applications that are developed by ER Program personnel using desktop tool software.
  NOTE: These applications are intended for personal productivity use and not for departmental or divisional support.

Acknowledging the fact that the scope of an application may not warrant the execution of a full life cycle development strategy, the following guidance is offered for the types of applications described in this section:

- Shared data applications shall follow the strategy as described in Sect. 3.2.
- End-user-developed applications shall investigate the possibility of reuse as described in Sect. 3.2.1 and forward the completed System/Application Questionnaire to the ER Program Information Resources Manager as described in Sect. 3.2.5.

3.4 DEVIATIONS/WAIVERS

Any deviations from this strategy shall have prior approval from the ER Program Information Resources Manager. The approved deviations/waivers must then be documented and included as part of the application documentation.

4. COMMERCIAL OFF-THE-SHELF

COTS refers to standard information system products or technologies that are purchased, as opposed to software that is developed for exclusive use by or for Energy Systems.

4.1 STRATEGY FOR INFORMATION RESOURCES MANAGEMENT

The Information Resources Management (IRM) program considers the acquisition of COTS software to be one of its key success factors. Recommendations contained in the IRM Strategic Plan include procuring information resources, where practical, rather than building them; optimizing the procurement process; and establishing volume pricing agreements for COTS software.

An enabling mechanism for the COTS software's role in the success of the IRM objectives is the requirement that COTS software be acquired in compliance with the company's business system architecture and information systems plan.

4.2 APPLICABILITY TO ENVIRONMENTAL RESTORATION

The applications architecture provides a framework for documenting the current environment, as well as for defining the target environment. Any COTS software pursued must be able to be integrated into this framework.

This set of ER Program Interim Information Management Architecture documents should be used as the basic framework for the evaluation of COTS software to meet the information systems and technologies planning within the ER Program.

Appendix A

80 SERIES DELIVERABLES MAPPED TO INFORMATION ENGINEERING FACILITY

80 SERIES DELIVERABLES MAPPED TO INFORMATION ENGINEERING FACILITY

Table A.1 is an example of how IEF can be mapped to the Y-12 Plant 80 Series Software Development and Control procedures. The 80 Series is an implementation of the Energy Systems Automated Data Processing SDM guidelines. This mapping will show how the outputs of IEF can be used to produce SDM documentation that is consistent across IEF projects, timely, and cost-effective.

Acronyms not defined in the document but used in Table A.1

ADP	automated data processing	DDL	Data Definition Language
ASSC	Applications Security Specification and Control	DRA	Data Resource Administration
CE	Central Encyclopedia	ERD	Entity Relationship Diagram
CIIR	Configuration Item Inventory Record	FSD	Functional System Design
CSD	Computer System Design	PADs	Process Action Diagrams
CTSO	Computing and Telecommunications Security Organization	PRADs	Procedure Action Diagrams
DBA	Data Base Administration	PSI	Protected Software Identification

Table A.1. 80 Series deliverables mapped to IEF (5-14-93)

80 Series deliverable	IEF deliverable	IEF path/tool support	IEF required? Description of necessary outside action
	Project Initiation Phase		
Project Initiation Form			Yes
Protected Software Identification (PSI) Form			Yes
Project Plan and Schedule			Yes
Project Notebook			Yes
	Feasibility Study Phase		
Feasibility Study Document			Yes
	Requirements Definition Phase		
Create Configuration Item Inventory Record (CIIR)			
Requirements Definition Document	If the model already exists in the Central Encyclopedia (CE), it will be used for current system analysis		Define scope with user Walkthrough—Requirements definition and scope approval with Data Base Administration (DBA)/Data Resource Administration (DRA)/Computing and Telecommunications Security Organization (CTSO)/user
	High-level Entity Relationship Diagram		
	High-level Activity Hierarchy		

Table A.1 (continued)

80 Series deliverable	IEF deliverable	IEF path/tool support	IEF required? Description of necessary outside action
	Functional System Design Phase		
Functional System Design Document	Copy of model in CE or on diskette with same date as printed document		Yes
Requirements List			Yes
Functions of proposed system with principal inputs and outputs list	Activity Definition Report	Model/Reports	Yes
	Activity Dependency Diagram (as required)	BAA/Activity Dependency	
		Prototype tool	
Interface List	Process Action Diagrams (PADs) (with the views expanded)	BAA/Activity Dependency	
Functional decomposition to subfunctions	Activity Hierarchy Diagram	BAA/Activity Dependency	
Description of subfunctions	Prototype to allow user review[a]		
	Screen Design (including user view)	BSD/Screen Design	
	PADs (with views expanded)	BAA/Action Diagram	

Table A.1 (continued)

80 Series deliverable	IEF deliverable	IEF path/tool support	IEF required? Description of necessary outside action
	Common action blocks		Walkthrough—Model and Screen Prototype with DBA/DRA/CTSO/user
	Global exit states		
Contents of all data stores:			
Logical data model and data dictionary report	Entity Relationship Diagram (ERD)	BAA/Data Model	Yes
	Entity Type Hierarchy	Model/Reports	
	Entity Type Definition	Model/Reports	
	Attribute Definition Report		
Logical data access views	User roles matrix	Analysis/Matrix/user-defined matrix	Yes
Performance requirements			Yes
Design constraints			Yes
Make-versus-buy analysis			Yes
Alternative selected			Yes
Procurement spec. and automated data processing (ADP) security certification, if procured			Yes
Functional System Requirements			Yes

Table A.1 (continued)

80 Series deliverable	IEF deliverable	IEF path/tool support	IEF required? Description of necessary outside action
The following are normal Computer System Design (CSD) functions:			
Design of system overall structure and module relationships	Dialog Flow/Flow Maintenance	BSD/Dialog Flow diagrammer	
	Load Module Packaging	BSD/On-line packaging	
Internal and external interfaces with other software systems	Reference Functional System Design (FSD) PADs with views expanded	BAA/Action Diagrams	Possibly
	Procedure Action Diagrams (PRADs) and Action Blocks (with views expanded)	BSD/Action Diagrams	
Design/document software modules	Procedure Definition Report	Model/Report/Where Used	
	PRADs and Action Blocks	Model/Reports/View Maintenance	
Reports layouts, if applicable			Yes
Plot layouts, if applicable			Yes
Screen layouts	Screen Design	BSD/Screen Design	
Help Screen layouts	Screen Design	BSD/Screen Design	
On-line error messages	Exit States List Report	BSD/Report	

Table A.1 (continued)

80 Series deliverable	IEF deliverable	IEF path/tool support	IEF required? Description of necessary outside action
Manufacturing Application Peer Review Form	Screen Design/Prototype	BSD/Prototype tool	Walkthrough—PADs and PRADs with DBA/DRA/CTSO/user
	BSD Defaults-Command Uses	BSD/Business System Definition Report	
	BSD Defaults-PF keys	BSD/modified Procedure Step Definition Report	
	Exit States Uses	BSD/Business System Definition Report	
FSD Review Report			Walkthrough—FSD Sign-off with DBA/DRA/CTSO/user
	Computer System Design Phase		
CSD Document	Updated copy of model on CE or diskette with same date as printed document		
Select/document hardware, sofware, DBMS, and communications environment			Yes
Physical data structures	Data Structure List	BSD/Data Structure List	
	Data Definition Language (DDL) from DBA/project analyst		

Table A.1 (continued)

80 Series deliverable	IEF deliverable	IEF path/tool support	IEF required? Description of necessary outside action
	Implemented Data List		
Security specifications	User Access Table	Analysis/Matrix/User-defined matrix	Yes
System test plan outline			Yes
Transition design for system conversion, if necessary			Yes
Applications Security Specification and Control (ASSC), if protected			
User Acceptance Test Plan			Yes
CSD Review Report and Peer Review Form		BAA, BSD	Walkthrough—CSD Sign-off with DBA/CTSO
	Programming and Implementation Phase		
Source code and instructions	Copy of project model on CE	Construction/generated C code	
		OS2/Action Diagram Trace Facility	
		VAX/Build and install VAX code and data base	
Completed System Test Plan, if system developed internally			Yes

Table A.1 (continued)

80 Series deliverable	IEF deliverable	IEF path/tool support	IEF required? Description of necessary outside action
Certification Test Plan			Yes
Contingency plans for mission-essential software			Yes
System Documentation:			
Program Documentation	Copy of project model in CE	CE/Print Load Mod. Pkg./all above documentation	Possibly
User's guide			Yes
Computer Operations Manual			Yes
User training plan (identify personnel to be trained, make training schedule; identify personnel to conduct training)			
	Validation and Acceptance Phase		
Master Library		CE	
Product Baseline			Yes
Software Components List	Load Module Packaging	Construction/Packaging	
Documentation		Production Model in CE	Yes
Software Components			
Software Version Release			Yes
Test Report			Yes

Table A.1 (continued)

80 Series deliverable	IEF deliverable	IEF path/tool support	IEF required? Description of necessary outside action
Contingency Plan Test Results, if required			Yes
	Configuration Control Phase		
Operating, master, and backup copies of the production software	Copies of these model versions on CE		
Updated product baseline	Copy of updated model and any supporting paper documentation		Yes
	Multiphase Activities		
Update Project Plan and schedule			Yes
Update PSI Form			Yes
Update cost estimate			Yes
Update CIIR			Yes
Prepare progress and milestone reports, highlighting accomplishments and trouble spots in on-going development			Yes
Update allocated baseline			Yes

[a]It was felt that Prototyping is necessary before users really understand a system enough to sign-off on its functions. Therefore, a skeletal Dialog Flow (only flows between procedures necessary for prototyping), the import and export views, and screen designs should be completed during FSD.

Appendix B

SYSTEM/APPLICATION QUESTIONNAIRE

SYSTEM/APPLICATION QUESTIONNAIRE

Application/system: _____

General description/purpose: _____

_____

_____

_____

Form completed by: _____

Personnel position or title: _____

A. Status of the application:

Temporary_____ Long range_____ Will be migrated/converted to another use or application_____

B. Processing facilities:

Host where the application currently resides: _____

PC systems (user interface): _____

Communications facility (LANs/NOS): _____

Are any changes or upgrades to the current host planned? Yes_____ No_____
If yes, please describe: _____

C. Application software

DBMS: _____

System development facilities (languages, 4GL, case): _____

_____

_____

Report generators: _____

Does the application use "off-the-shelf" software?

Off the shelf:_____ Custom_____ Mixture_____

If custom, which organization developed it? _____

Is technical support available?

Locally (within the work group)_____

Locally (from Energy Systems Central Organization)_____

Externally (from a vendor representative)_____

D. Interfaces

Do interfaces to other systems exist? Yes_____ No_____

If so, please describe: _____

_____

E. Geographical Requirements/User Base—estimate no. of users:_____

How is the system accessed?

Stand Alone_____	Read/Write_____	Read Only_____
Work Group/Department_____	Read/Write_____	Read Only_____
Multi-site_____	Read/Write_____	Read Only_____
External_____	Read/Write_____	Read Only_____

Please list external organizations requiring access, and the means of access.

Organization _____	Access Connection _____
_____	_____
_____	_____

What type of user accesses the application and how frequently?

Stand Alone_____	User _____	Frequency _____
Work Group/Department_____	User _____	Frequency _____
Multi-site_____	User _____	Frequency _____
External_____	User _____	Frequency _____

F. Application Parameters

What is the estimated size of the Master File/Data Base(s)?

Current: _____

Planned: _____

Expected Rate of Growth: _____

Retention period of data: _____

How active is the Master File/Data Base? _____

_____

G. Application Functionality

In what area of the business is the application used? _____

Does the application meet current business requirements? _____

If not, please discuss shortcomings _____

_____

_____

Will the application meet planned business requirements? _____

Please discuss general strengths and weaknesses _____

_____

_____

What is the impact of incorrect data? _____

_____

_____

H. Security

What is the current level of security of the host? _____

What is the current level of security of the network? _____

What is the current level of security of the data base? _____

Are there plans to upgrade the security classification of the host, network, or data base, and if so, to what level? _____

I. Recommendations

Please list any recommendations or ideas concerning this application that may be helpful in developing the information strategy for this application.

_____

_____

_____

J. Problems/Issues

List any technical constraints that inhibit the user(s) from meeting current business requirements. Identify by hardware, software, or communications.

_____

_____

_____

_____

_____

List any constraints, technical or operational, with data bases, systems, or applications accessed by the user(s).

_____

_____

_____

_____

_____

Are there likely to be any business changes or changes in volumes of work that would change the requirements for the system or application for the next five years?

_____

_____

_____

_____

_____

Please list recommendations for improvement of the systems, platform, etc., from the system manager's perspective.

_____

_____

_____

_____

_____