



FD-EICS OVERALL EXPERIENCE

EICS has experience on a number of projects ranging in T.I.C. size from \$100,000 USD to \$4,000,000,000 USD. EICS is currently executing projects for Pipelines, Petrochemicals, Refining, Specialty Chemicals, Power Utility Companies, U.S. Department of Energy, Enterprise Master Plan consulting projects, FD-EICS and Computer Sciences Corp. joint projects, services to clients for document management systems, and project infrastructure areas. EICS assists and provides Enterprise Master Planning (PERA), Program Management, EPC support systems, and engineering and design services to projects such as these in a wide range of systems integration, information systems and communications systems areas. EICS is also experienced in the execution, project integration and program management of large projects. In this area EICS can provide conceptual estimating, scoping, contractor scope package development, contractor technical evaluation, contractor technical management and field support on startup and turnover. Currently our largest project contains an EICS scope of \$150,000,000 USD. The pictorial below provides an overview of EICS capabilities.



Fluor Daniel

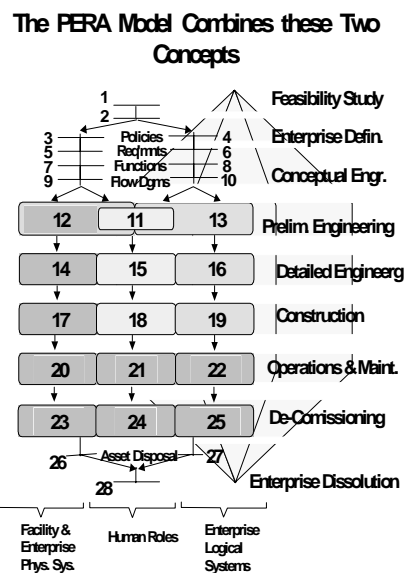


LOGICAL SYSTEMS		PHYSICAL SYSTEMS		PROJECT INTEGRATION		DESIGN	
PERMANENT PLANT		EPC CYCLE		PERMANENT PLANT		EPC CYCLE & PERMANENT	
<p>ENTERPRISE</p> <ul style="list-style-type: none"> •Enterprise Solutions - PERA Master Plan - Business Function - Business Process Modeling - Configuration Mgt.. - SAP, BAAN, Oracle, Etc.. <p>•Office Systems</p> <ul style="list-style-type: none"> - PC Desktop - Document Mgt.. Sys. <p>•Manufacturing Sys.</p> <ul style="list-style-type: none"> - Data Historians - DCS Interfaces - Production Logistics <p>•Production Mgt. Systems</p> <ul style="list-style-type: none"> - Warehousing - Product Distribution <p>•Lab Info Mgt. Systems</p> <p>•Maintenance Mgt. Sys.</p> <p>•Specialized Systems</p> <ul style="list-style-type: none"> - Production Tuning - APC Interfaces - GIS Systems <p>COMM. SYSTEMS</p> <ul style="list-style-type: none"> •WAN Logical Definition •LAN Logical Definition •Interfaces Logical Definition •Internet/Intranet <p>PERMANENT OFFICE</p> <ul style="list-style-type: none"> •PC's / Server's •PC Desktop Systems •Interfaces to Enterprise Sys. •CAD & PDS Systems •Fax's, Plotters, Printers •Desktop Environment •Web & Browser Applications 	<p>ENTERPRISE</p> <ul style="list-style-type: none"> •Enterprise Planning - PERA Master Plan - Business Entities - Work Category & Function <p>•Integration</p> <ul style="list-style-type: none"> - Integrator Development - Documentation - Training <p>•Geographic Info. Sys. (GIS)</p> <p>OFFICE SYSTEMS</p> <ul style="list-style-type: none"> •Identify Applications •Application Specs. •Desktop Envir. & Support. •Format & Media Specs •Document Mgt. Sys. •Internet/Intranet Apps. •Web & Browser Apps. <p>COMM. SYSTEMS</p> <ul style="list-style-type: none"> •Temp. Comm. Sys. - WAN's - Telephones - Satellite - Microwave <p>CONSTR. SUPPORT</p> <ul style="list-style-type: none"> •PC's, Server's & Hardware •Desktop Sys & Support. •CAD & PDS Systems •Fax's, Plotters, Printers 	<p>OVERALL NETWORKS</p> <ul style="list-style-type: none"> •Site Backbone Systems •Local Area Networks •Network Equipment •Building UTWS Systems •Inter DCS LANs •DCS to Site LAN Interfaces •SCADA Interfaces <p>PERM. OFFICE SYSTEMS</p> <ul style="list-style-type: none"> •PC's / Server's Hardware •PC Desktop Systems •PDS & CAD Systems •Desktop Environment •Web & Browser Applications •Geographic Info. Sys. (GIS) <p>COMMUNICATION SYSTEMS</p> <ul style="list-style-type: none"> •Permanent Comm. Systems - WAN's - Telephones - Satellite Systems - Microwave - Site Wide Radio Systems - Site Wide Telephone Sys. - Wireless LANs - Spread Spectrum <p>AUXILIARY SYSTEMS</p> <ul style="list-style-type: none"> •Site Security Sys. •Site Access Sys. •Weather Monitoring •Site Notification Sys. •Fire Protection Integration •Facility Management Sys. •Video Systems •Spread Spectrum Interface 	<p>ENTERPRISE</p> <ul style="list-style-type: none"> •Logical & Physical Architecture Development •Architecture Diagrams •Planning Methods - Master Planning P.E.R.A. <p>•Overall Planning</p> <ul style="list-style-type: none"> - Owners Objectives - Function Identification - Function Benchmarking - Major Work Function I.D. <p>•Geographic Info. Sys. (GIS)</p> <p>•MIS Procedures</p> <p>EPC & EPC INTERFACES</p> <ul style="list-style-type: none"> •Office Information Mgt.. •Office Automation Tools •Interface Identification •Communication Systems - FD with EPC's - FD Office with Field - FD with Suppliers •Work Scope Interface Specs •Application, Media & Format Interface Specifications <p>OVERALL FUNCTIONS</p> <ul style="list-style-type: none"> •EICS Project Management •Y2k Projects •Project Information Systems •Interfaces W/ Controls & Electrical •Project Execution Plan •Work Breakdown Structure •Subcontract Planning •Estimates •Budgets •Project Controls •Procurement & Subcontracts •Field Support 	<p>OVERALL NETWORKS</p> <ul style="list-style-type: none"> •Architecture Diagrams •Block Diagrams •Standards •Logical & Physical Design •Schematic Design •Design Databases •Material Identification <p>AUXILIARY SYSTEMS</p> <ul style="list-style-type: none"> •Standards •Logical & Physical Design •Schematic Design •Design Databases •Material Identification •UTWS Cable Management <p>COMMUNICATION SYSTEMS</p> <ul style="list-style-type: none"> •Standards •Logical & Physical Design •Schematic Design •Design Databases •Material Identification 			

ENTERPRISE MASTER PLANNING

EICS develops Enterprise Master Plans for enterprise solutions and development / integration of all physical, people and logical systems. This includes enterprise, communications and information systems needed for both permanent plant facilities and also systems for the execution of the EPC work on the project. The Enterprise Master Plan approach identifies the lowest cost solutions for execution of the EPC work and also for the permanent plant facilities. With early involvement on the project we can provide for the information and communication systems used during the EPC phases of the project to be smoothly integrated into those required for the permanent plant facilities. This can save time and reduce capital expenditures by reusing and reconfiguring the systems used for EPC for later use in the permanent plant. EICS can also apply these approaches to migrate an enterprise from an existing 'as-is' state to a future 'to-be' improved state. In this mode, EICS reviews the existing data and work processes systems and provide recommendations / assistance in implementation and integration, and operation support for migrating/ integrating systems and providing a consolidated, uniform approach for 'Logical', 'People' and 'Physical' systems.

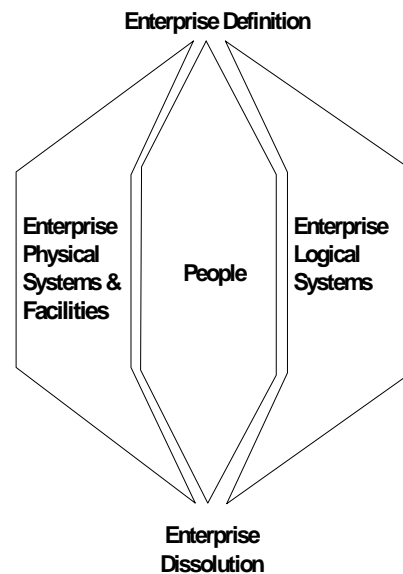
For Enterprise Master Planning, EICS uses a total life cycle, comprehensive Enterprise Master Planning Architecture called the **Purdue Enterprise Reference Architecture** or **PERA**. We have worked with Dr. Theodore Williams of Purdue University for the past 10 years pioneering the practical use of this architecture on small projects and large mega-projects. Fluor Daniel EICS is the only EPC contractor with these credentials and experience. PERA is also being used as the base architecture for development of ANSI – ISA standard SP95 which defines the standards for information communications from the manufacturing control systems layers to middle level and Enterprise systems. EICS personnel are participating in the development of these standards. PERA has also been proposed as the international standard in this area. PERA combines the concept of the 3 major components of an Enterprise with the total life cycle of an Enterprise to produce a totally integrated comprehensive approach as follows:



This Provides:

- A full "life-cycle" model for the Enterprise
- Integration of Human & Organizational Factors
- A "Phased" approach to reduce rework

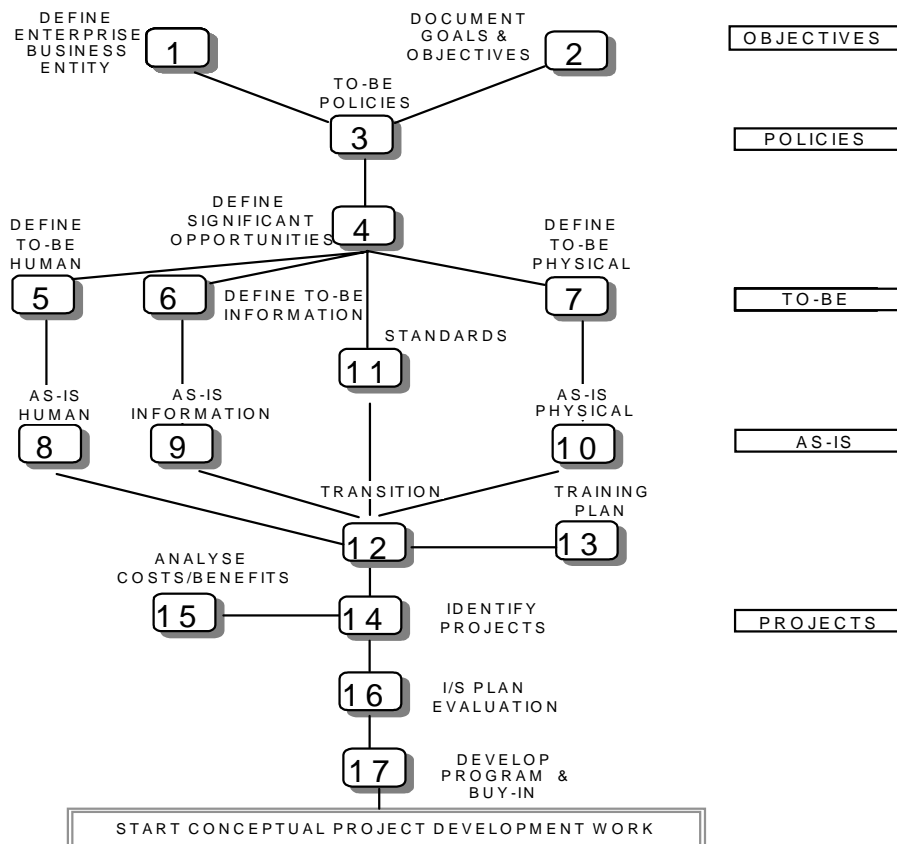
An Enterprise Consists of 3 Major Components



PERA ENTERPRISE MASTER PLANNING STEPS

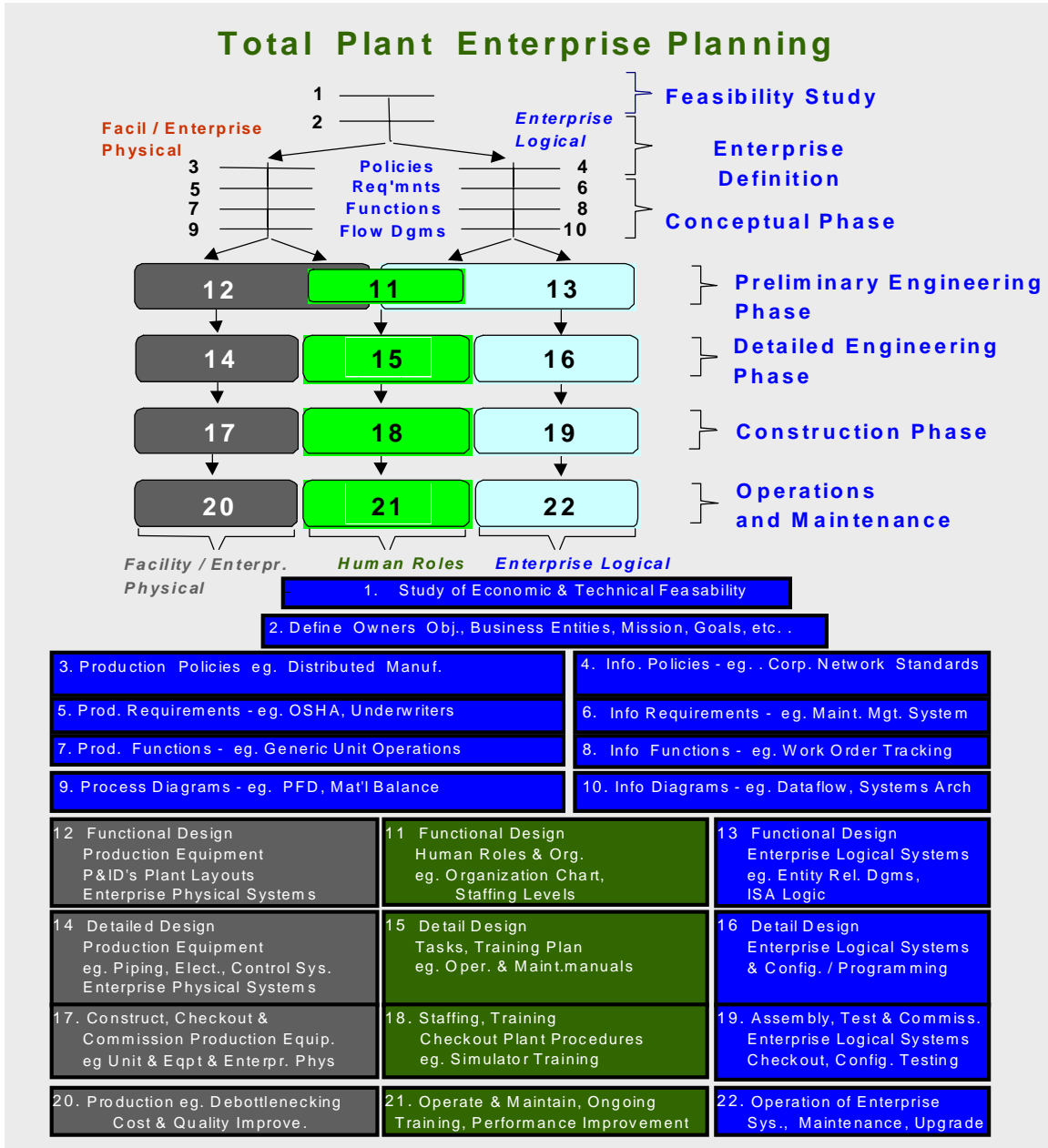
The PERA Master Planning Steps are shown in the pictorial below. The master planning effort is initiated at the feasibility phase and developed during the enterprise definition phase of the overall enterprise life cycle. Depending on the size, scope and schedule of the project, the initial enterprise master plan is usually developed during the first 2 to 6 months of the project. The effort typically requires a work force of 4 to 8 Senior EICS personnel working with the Clients project sponsor and a selected group of the Client's knowledge and subject matter experts. The output of the 17 step process develops the enterprise definition and the integration of Logical, People and Physical systems. Cost effectiveness evaluations of opportunities are made and a program of modularized projects developed to proceed with the project. The definition of the projects completes the 'Enterprise Definition' phase of the enterprise and provides a solid basis for proceeding into the 'Conceptual' development phase of the total enterprise's life cycle.

PERA Enterprise Master Planning Steps



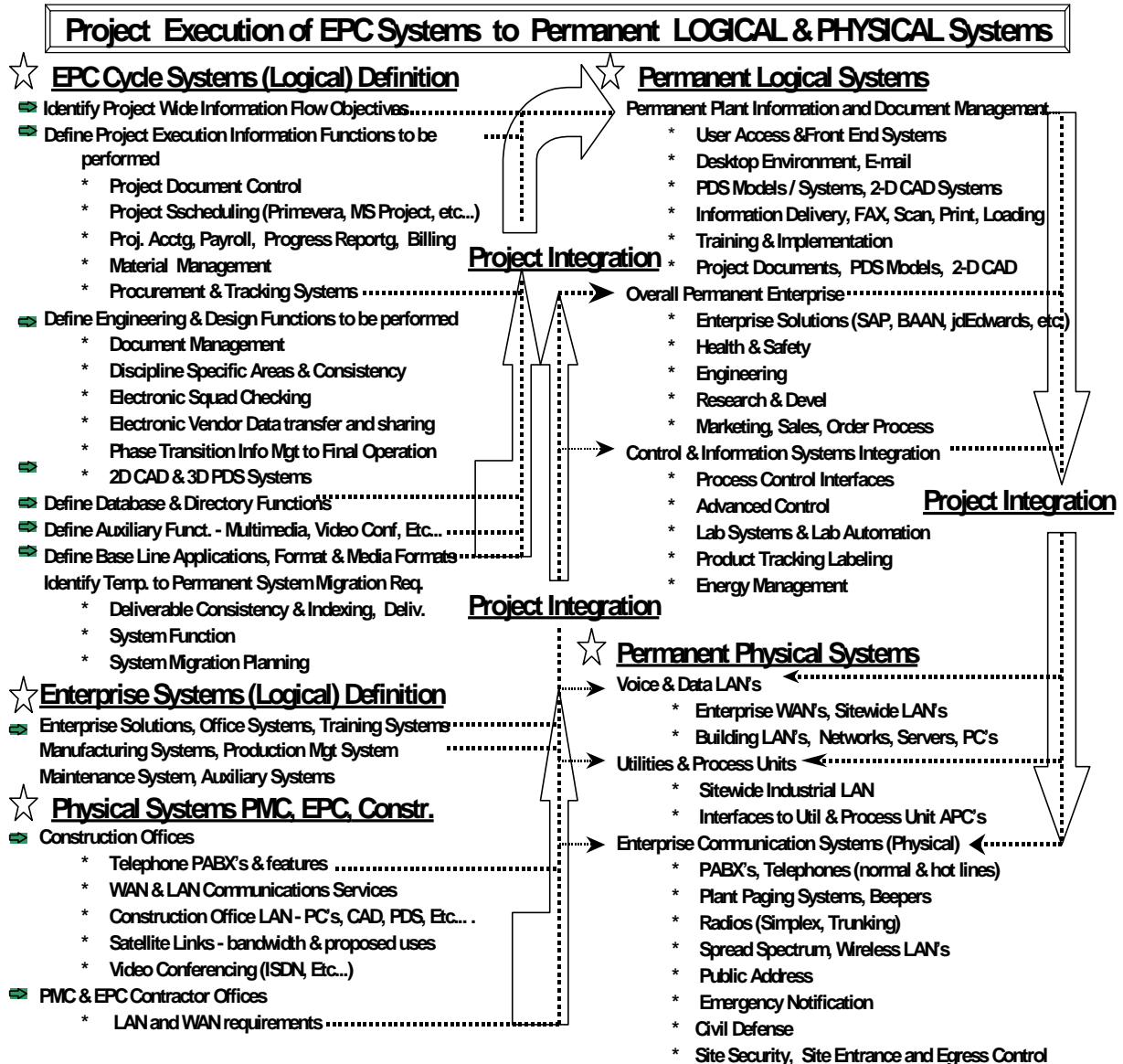
PERA TOTAL LIFE CYCLE

The complete life cycle encompassed by PERA is shown below. As noted previously the 'Enterprise Definition' phase is completed during the initial PERA Master Plan. The full life cycle which follows develops the enterprise systems through their 'Conceptual', 'Preliminary', 'Detailed', 'Construction' and 'Operations & Maintenance' phases. As seen in the diagram below the full definition of functional Human/ People roles in the enterprise start once the 'Conceptual' definition is completed. This provides for the most efficient development, since the enterprise definition is known at that point and the automation effects on people can then be defined and integrated.



PERA - EPC TO PERMANENT SYSTEMS MIGRATION

During the 'Conceptual' through the 'Operations' phases of the enterprise's development, Project Integration between Engineering Prourement and Construction (EPC) support systems and Permanent Site systems must occur. By using PERA Enterprise Master Planning and Total Life Cycle, the EPC support systems and permanent site systems are planned and executed with the integration of the constituent parts of each in mind. With this approach, the EPC support systems integrate and flow smoothly into the permanent systems as indicated in the following pictorial.





MAJOR PROJECTS EXPERIENCE SUMMARIES

Petrochemicals Client - Location: Middle East

Grassroots Project with an approximate Total Indicated Cost of 3.2 Billion US \$

Process Units:

Ethylene, Polyethylene, Polypropylene, Ethylene Glycol, Offsites, Utility Systems, Plant Buildings and Infrastructure

P.E.R.A.

Working with the client FD-EICS developed the P.E.R.A. Enterprise Master Plan for the EPC support systems and the Permanent facility (Enterprise Systems, Logical Systems and Physical Systems). Opportunities were identified and cost estimates developed. The opportunity scope items were then evaluated for cost effectiveness in accordance with the owner's objectives and policies. The opportunities, which provided cost effectiveness, were developed into conceptual project scope documents and the systems architecture diagrams were prepared. The project conceptual scopes were then approved by the Client and used for the start of FD-EICS preliminary and detailed engineering and design work. The FD-EICS scope was \$20,000,000 USD and approximately \$6,000,000 USD in savings was realized on the project.

Overall

FD provided the overall program management for the project. FD-EICS provided project execution planning and assisted with work category/work function definition for a SAP Rev 3/c Enterprise solution and assisted the client with Enterprise solution planning. FD-EICS engineered and designed the Physical Networks for Data, Voice and Wireless systems, provided detailed project interface specifications for multiple contractors and integrated the Physical systems work with the Logical Systems and the Enterprise Solutions. FD-EICS also provided field construction assistance, training and startup/turnover services.

Personnel

FD-EICS manpower required for the PERA Master Plan were 4 personnel and the project execution manpower peak was 18 personnel

Petrochemicals Client - Location: Middle East

Grassroots Project with an approximate Total Indicated Cost of 600 Million US \$

Process Units:

Aeromax, Utility Systems and Infrastructure

P.E.R.A.

Using a P.E.R.A. approach, FD-EICS worked with the Client to provide Enterprise definition and cost estimates for the Enterprise solution alternatives which were comprised of systems including jdEdwards, Indus Group, Meridium, SAP, etc. . Approximately \$1,000,000 USD in savings were identified FD-EICS assisted with project budget allocations and development of cost effective plans for these systems.

Overall

FD provided the overall program management for the project.

FD-EICS provided engineering and design services for the incoming communications services, telephone systems and radio systems.

Personnel

FD-EICS manpower required for the PERA Master Plan was 3 personnel and the Project execution manpower peak was 4 personnel.

Petrochemicals Client - Location: South America

Grassroots Project with an approximate Total Indicated Cost of 2.5 Billion US \$

Process Units:

Ethylene, Polyethylene, Polypropylene, Ethylene Glycol, Offsites, Utility Systems, Plant Buildings and Infrastructure

P.E.R.A.

Using the P.E.R.A. approach, FD-EICS worked with the client to develop planning for the EPC support systems and the permanent facility. We assisted the client with definition of the SAP R/3c business function definition and evaluation of Enterprise and Middle Level systems options. Cost estimating assistance and evaluation of the cost effectiveness of alternatives is also being provided. Should the project should continue into the next phase, FD-EICS may provide services for the detailed program management for the Enterprise Systems, systems integration and engineering and design services for the Middle level Logical Systems and the Physical Networks for Data, Voice and Wireless systems.

Overall

FD provided the overall program management for the project's 'Conceptual' definition phase.

Personnel

FD-EICS manpower required for the PERA Master Plan were 4 personnel and the project execution manpower peak for development of the projects 'Conceptual' work packages was 15 personnel

Petrochemicals Client - Location: Middle East

Grassroots Project with an approximate Total Indicated Cost of 3.0 Billion US \$

Process Units:

Ethylene, Polyethylene, Polypropylene, Ethylene Glycol, Offsites, Utility Systems, Plant Buildings and Infrastructure

P.E.R.A.

Using the P.E.R.A. approach, FD-EICS worked with the client to develop planning for the EPC support systems and the permanent facility 'Physical Systems'. We assisted the client with evaluation of Enterprise and Middle Level systems options. Cost estimating assistance and evaluation of the cost effectiveness of alternatives was also provided.

Overall

FD provided the overall program management for the project. FD-EICS assisted with engineering and design of the EPC support systems. FD-EICS engineered and designed the Physical Networks for Data, Voice and Wireless systems, provided detailed project interface specifications for multiple contractors and integrated the Physical systems work with the Logical Systems and the Enterprise Solutions. FD-EICS is providing field construction assistance.

Personnel

FD-EICS manpower required for the PERA Master Plan was 3 personnel and the project execution manpower peak was 15 personnel. We also integrated the detailed engineering and design services for the 'Physical' Systems (Data, Voice and Wireless) with the other engineering disciplines (Control Systems, Electrical, Architectural, HVAC, etc.) using a detailed interface matrix.

Chemicals Client - Location: Thailand

Grassroots Project with an approximate Total Indicated Cost of 1.1 Billion US \$

Process Units:

Paraxylene, Benzene, Offsites, Utility Systems, Plant Buildings and Infrastructure

P.E.R.A.

Working with the client, FD-EICS developed the P.E.R.A. Enterprise Master Plan for the EPC support systems and for the Permanent facility (Enterprise Systems, Logical Systems and Physical Systems). Opportunities were identified and cost estimates developed. The opportunity scope items were then evaluated for cost effectiveness in accordance with the owner's objectives and policies. The opportunities, which provided cost effectiveness, were developed into conceptual project scope documents and the systems architecture diagrams were prepared. FD-EICS also worked with the client to develop comparisons of Enterprise Solutions (including SAP, PeopleSoft, jdEdwards, etc.). FD-EICS also provided enterprise solution evaluation of the corporate wide SAP R3/c enterprise system for its applicability as a project solution.

Overall

FD provided the overall program management for the project. FD-EICS assisted with engineering and design of the EPC support systems. FD-EICS engineered and designed the Physical Networks for Data, Voice and Wireless systems, provided 'Conceptual' project specifications for the project. Should the project should continue into the next phase, FD-EICS may provide services for detailed program management of the Enterprise Systems, systems integration and engineering and design for the Middle level Logical Systems and the design of Physical Networks for Data, Voice and Wireless systems.

Personnel

FD-EICS manpower required for the PERA Master Plan was 3 personnel and the project execution manpower peak was 6 personnel

Oil Gathering, Transportation and Shipping Client - Location: Africa

Grassroots Project with an approximate Total Indicated Cost of 3.1 Billion US \$

Process Units:

Oil Gathering systems, Pipelines, Pumping Stations, Marine Shipping Terminals, Utility Systems, Buildings and Infrastructure

P.E.R.A.

Working with the client, FD-EICS developed the P.E.R.A. Enterprise Master Plan for the EPC support systems and for the Permanent facility (Logical Systems, Physical Systems, and SCADA Systems). Opportunities were identified and cost estimates developed. The opportunity scope items were then evaluated for cost effectiveness in accordance with the owner's objectives and policies. 32 project opportunities were identified. These opportunities were combined into 11 project groupings resulting in an overall savings of 12 Million US\$ and produced the definition to start the 'Conceptual' phase of the projects. 'Conceptual' project scope documents and the systems architecture diagrams were prepared and the Client moved forward with the projects. FD-EICS also worked with this client to integrate an existing SAP R2 implementation and SAROS document management system with the worldwide infrastructure required for this project. We provided assistance (in Houston & Africa) with the systems required during EPC support and for later operation of the permanent facilities.

Overall

FD provided the overall program management for the project. FD-EICS assisted with engineering and design for the EPC support systems and some permanent systems. We also provided project execution support and engineering and design services on the Wide Area Networks, Data Acquisition Networks, and Local Area Networks for Data and Voice Systems.

Personnel

FD-EICS manpower required for the PERA Master Plan were 3 personnel and the project execution manpower peak was 5 personnel

Oil Transportation Client - Location: Russia/Kazakhstan

Grassroots Project with an approximate initial Total Indicated Cost of > 2 Billion US \$

Process Units:

Crude Oil Pipeline, Pumping Stations, Marine Shipping Terminal, Utility Systems, Buildings and Infrastructure

P.E.R.A.

Working with the client FD-EICS developed the P.E.R.A. Enterprise Master Plan for the EPC support systems and for the Permanent facility (Logical Systems, Physical Systems, and SCADA Systems). Opportunities were identified and cost estimates developed. The opportunity scope items were then evaluated for cost effectiveness in accordance with the owner's objectives and policies. The opportunities, which provided cost effectiveness, were developed into conceptual project scope documents and the systems architecture diagrams were prepared. 50 project opportunities were identified. These 50 opportunities were combined into 11 project groupings resulting in an overall savings of 16 Million US\$ and produced the definition to start the 'Conceptual' phase of the projects. EPC Cycle Systems (Logical & Physical) were implemented using new Internet and MS Office Technology. A web site repository was created for all EPC execution. Internet Windows NT 4.0 IIS, Internet and office productivity tools were implemented for connectivity with the Russian design Institutes. Full English and Russian support is also being provided on web site.

Oil Transportation Client - Location: Russia/Kazakhstan

Overall

FD is providing the overall program management for the project. FD-EICS is providing systems integration, engineering and design work for Construction Support Systems, Enterprise Systems, Document Management Systems, and Permanent Logical & Physical Systems (Enterprise Data, Voice, Video, LAN / WAN, Supervisory Control & Data Acquisition Systems, etc.). The project is in the early 'Detailed' phase, and FD-EICS is providing services for detailed program management of the Enterprise Systems, systems integration and engineering and design for the Middle level Logical Systems and the design of Physical Networks for Data, Voice, Wireless and SCADA systems.

Personnel

FD-EICS manpower required for the PERA Master Plan was 6 personnel. Currently we are entering the 'Detailed' phase of the project. Project execution manpower requirements for FD-EICS work scope items are approximately 50 personnel including local Russian personnel.

Oil Gathering, Transportation and Shipping Client - Location: Russia/Sakhalin Island

Grassroots Project with an approximate initial Total Indicated Cost of > 5 Billion US \$

Process Units:

Oil Gathering systems, Pipelines, Pumping Stations, Marine Shipping Terminal, Utility Systems, Buildings and Infrastructure

P.E.R.A.

Working with the client FD-EICS developed the P.E.R.A. Enterprise Master Plan for the EPC support systems and for the Permanent facility (Logical Systems, Physical Systems, and SCADA Systems). Opportunities were identified and cost estimates developed. The opportunity items were evaluated for cost effectiveness in accordance with the owner's objectives and policies. The opportunities, which provided cost effectiveness, were developed into project scope documents and a preliminary systems architecture diagram prepared. EPC Cycle Systems (Logical & Physical) were implemented using new Internet and MS Office Technology. A web site repository was created for all EPC execution. Internet and office productivity tools were implemented for connectivity. Should the project should continue into the 'Conceptual' phase, FD-EICS may provide services for detailed program management of the Enterprise Systems, systems integration and engineering and design for the Middle level Logical Systems and the design of Physical Networks for Data, Voice, Wireless and SCADA systems.

Overall

FD is providing the overall program management for the project.

Personnel

FD-EICS manpower required for the PERA Master Plan were 4 personnel and the project execution manpower peak for the 'Conceptual' phase was 6 personnel

Department of Energy / TRW

Civilian Radioactive Waste Management System - Location: United States

Grassroots Project , overall project costs are being estimated

Process Units:

Spent Nuclear Fuels Gathering, Transportation, Repackaging and Long Term Storage

P.E.R.A.

Using the P.E.R.A. approach, FD-EICS worked with the client to develop planning for the permanent facility. We provided pre conceptual P.E.R.A. Enterprise Master Planning and estimating for Enterprise Solutions, Document Management Systems, and surface facilities Logical and Physical Systems. Opportunities have not been identified, since this project is still in very early definition.

Overall

FD is providing services to TRW who is providing overall program management for the project.

Personnel

FD-EICS manpower required for the PERA Master Plan and early definition and estimating work was 4 personnel.

GENERAL FD-EICS EXPERIENCE CONCLUSIONS

- ❑ The use of Purdue's PERA Master Planning and Total Life Cycle Architecture on projects has proved to be a complete and robust architecture. It provides a structure for early evaluation of which systems will provide the most cost-effective results. The complete life cycle planning encompassed by PERA provides for systems defined and used during the Engineering Procurement and Construction process to migrate into the operation of the permanent facility. PERA also saves a great deal of money during the project by identifying opportunities early where financial leverage is the greatest and then grouping them into modular project groupings which minimizes recycle and rework. PERA also includes the 'People' aspects of master planning, providing for these impacts to be planned and executed earlier so rework and recycle from these areas are minimized. As such, when the PERA structure is used on a project, system integration needs are executed smoothly facilitating "On Time" startups that enable the Enterprise to begin its production phases earlier. This allows for plant investments to be recovered faster through quicker and more efficient product sales.
- ❑ PERA opportunities / projects using Internet / Intranet systems coupled with consistent office productivity tools greatly improve the execution effectiveness of large and complex multinational projects. In addition the support required for multiple languages can usually be simplified. The cost effectiveness of the wide area network required for executing large projects can sometimes be greatly improved by using Internet approaches.
- ❑ PERA opportunities / projects combining multifunctional use of fiber, copper cable, wireless backbone systems provide a very cost effective approach. Many systems can "piggy-back" on the backbone allowing it to provide for most of the data, voice, auxiliary systems described in this paper. The backbone also provides for great flexibility by allowing additional services to be added to spare fiber strands or copper cable pairs.
- ❑ The adoption of consistent applications to be used for executing the project, using agreed upon data formats for EPC contractors and suppliers early in the project has been shown to greatly improve electronic information exchange between companies and provide an easier path for migrating information into permanent document management systems.
- ❑ A high level of horizontal and vertical integration is required between the Middle Level systems and the Enterprise Systems Levels. To minimize scope and interface problem areas, projects in these areas should be modularized where the interfaces are the smallest.
- ❑ Large Enterprise solutions, Document management and other Logical systems should be staged and tested on their related equipment if possible. Personnel can then become familiar with them and provide input on "bugs" that need to be corrected before they become problems in starting up the plant.
- ❑ The larger projects have long time durations. When a projects EPC phase is expected to last over 3 years, the design and flexibility of backbone systems should be robust so changes in technology can be accommodated. The equipment that changes most quickly is at the desktop level. It should be procured as late in the project as possible.
- ❑ Where projects are in remote areas, the physical design of communications racks should be detailed so they can be prefabricated and pre-tested. These items have many small structural members, nuts, bolts and specialized fittings. These are very difficult to obtain in some places. Prefabrication also provides for coordination with other Disciplines on space in the buildings as well as electrical and HVAC requirements.
- ❑ The results of working on very large "grass roots" projects and "unit addition/modernization" projects has shown that using PERA and integrating the full life cycle of the 'Logical', 'People' and 'Physical' systems provides the best environment for cost effective and well integrated project execution.

VISIT THE PERA WEBSITE @ <http://www.pera.net> for additional information on Enterprise Master Planning