

Front-End Engineering and Design (FEED)

Whether initiating a brownfield or greenfield project, success is dependent on the proper planning.



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 Allen-Bradley • Rockwell Software

**Rockwell
Automation**

Front-End Engineering and Design

Will we finish on time? Are we going over budget? How can we incorporate the latest design changes while managing cost and schedule plans we committed to? What risks will installation and commissioning bring? These questions can not be answered unless the proper time and care have been taken to consider all aspects of the project before beginning.

Front-end engineering and design (FEED) plays a critical role in preparing projects for success. More than simply providing a project cost estimate, FEED comprises a thorough project scope, complete project budget, total cost of ownership, implementation timeline and initial risk assessment. All of these factors combine to help reduce risk and uncertainty during the detailed engineering and commissioning phases, and can help create value lasting throughout the production lifecycle.

Through a FEED, you can realize:

- Lower lifecycle costs
- Reduced project technical, schedule and cost risks
- Faster time to achieve plant startup and turnover
- Reduced EHS and compliance risks
- Improved risk identification and mitigation

FEED helps establish a well-defined scope, budget, schedule, and identifies risks, resulting in greater success during implementation, start-up, and beyond. By undertaking FEED at the beginning of your project, you can minimize your overall project risks.

In fact, benchmark studies show benefits of up to 30 percent reduced cost and shorter project execution times when FEED studies are performed.

“An evaluation of 975 light and heavy industrial projects by the Construction Industry Institute found that only 5.4% met “best in class” predictability in terms of cost and schedule”

pwc, April 2013

Reducing Risk and Creating Value Throughout Your Production Lifecycle

Feasibility
& Conceptual
Studies

Front End
Engineering
& Design

Design &
Engineering

Installation &
Commissioning

Operation &
Maintenance

Upgrades &
Migrations



Why Rockwell Automation

The Global Solutions team at Rockwell Automation has been delivering FEED services for decades. With a global pool of domain experts that combines the right balance of technology and industry expertise, Rockwell Automation provides FEED services in chemical, oil & gas, food & beverage, life science, mining & cement and other industries. Our mission is to reduce your risk, and maximize your ROI.

Our FEED process

Our Global Solutions team understands that poor project definition can lead to cost and schedule overruns. If the design basis is thoroughly reviewed and, if necessary, challenged, it provides a springboard for the project. If design decisions are based on too many assumptions and price estimates are made in haste; it could haunt an organization during the project execution phase.

Because of our fundamental belief in the benefits of FEED, we ensure your project is carefully planned and executed following a gated process, resulting in successful project completion within budget, and on time.

“Poor planning estimates and missed deadlines are among the largest contributors to project failure, according to Insights and Trends, PwC’s 2012 Global Project Management Survey of participants in 38 countries”

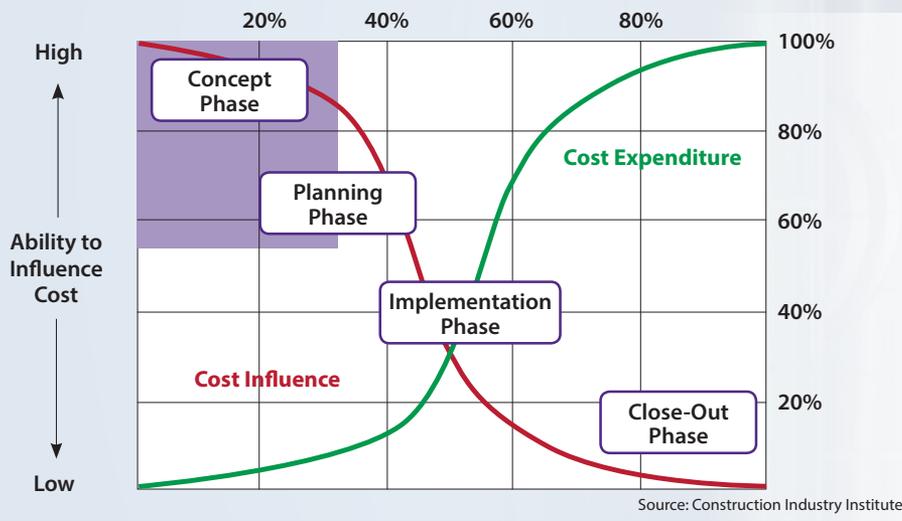
pwc, April 2013





Survey - We will initiate a project kick-off meeting to review the technical and commercial objectives so that all stakeholders are clear on the expectations of the FEED. Following the kick-off, we will ensure that we have all the appropriate project information in order to efficiently commence the preliminary design work. This will include gathering any previously completed design documentation and may involve an on-site survey for brownfield projects.

Resourcing & Execution - Rockwell Automation will select an experienced and dedicated project team composed of engineers with an engineering background and industry expertise specific to your application. Typical activities that we will perform in collaboration with your team include developing the basis of design, specifying the scope of supply and developing project schedule. We will develop a project strategy that is tailored to your needs once we analyze and understand your schedule, cost, resource, and other project and business constraints.



The above graph from the Construction Industry Institute demonstrates how engineering completed at the Concept & Planning Phases, i.e., the FEED phase, has a higher ability to influence the overall project costs. Even though the cost expenditure for FEED is very low relative to the rest of the project, some organizations keep the investments minimal, either because they don't see the value in the FEED or because of time or cost restraints. As a result, they limit their ability to accurately define the scope of the project, leading to cost and schedule overruns.





“The best-defined projects had facilities costs that averaged about 15% less than industry while poorly defined projects cost 15% more. This is a swing of 30%, which, given the size of most companies spending on facilities, is a huge amount of annual cost”

Offshore Magazine, 2003

What is the Deliverable from a FEED?

While we recognize that all projects are unique, there is a standard execution approach and there are typical deliverables during FEED. Rockwell Automation FEED may include key design deliverables such as:

- Requirements specifications
- Package specifications
- MCC, panel Designs
- Advanced control and optimization specifications
- Migration strategy
- PFD, P&ID electrical diagrams
- Equipment general arrangements
- Utility loads
- HAZID reports
- Basis of design
- Lists including equipment lists, instrument lists, motor lists, I/O lists
- Control narratives
- Control, safety and operational procedures
- Network architectures
- Validation strategy

These deliverables would then be used to generate:

- Overall project cost estimate, ROI justification and Procurement scenarios
- Project schedule / Gantt chart



FEED Capabilities



Process

- Generation of Process Flow Diagrams (PFD) and P&IDs
- Process modeling
- Technical specification and basis of design development
- Equipment specification and sizing
- Safety device sizing and selection
- Full hydraulic calculations
- PFD review, estimate and report of process performance with MPC system



Mechanical

- Development of modular process solutions
- Layouts
- Process and utility piping systems
- Including hygienic processes



Power/Electrical

- Power system load studies
- Electrical design diagrams
- Electrical load list
- Equipment specifications & design (LV/MV Switchgear, MCC, etc.)
- Electrical heat trace
- Cable sizing



Control & Network

- Preparation of system architecture
- Preparation of operation and control philosophy
- Preparation of control narratives
- Advanced process control reviews
- Hardware specifications
- I/O lists, drawings
- Installed base assessment and obsolescence study
- Network design, security assessment
- IT infrastructure assessment



Safety

- Hot safety system migration strategies
- Risk analysis, HAZID studies
- Safety system design and documentation
- Preparation of safety philosophy / narratives
- SIL target determination and analysis
- ATEX (Hazardous Area Classification compliance)
- Machine safety assessments



Quality

- GMP risk assessment
- Gap analysis vs current regulation study
- Quality documentation (quality plan, validation master plan, etc.)



Instrumentation

- Instrument specifications and selection
- Preparation of instrument indexes and I/O lists
- Preparation of Instrument data sheets
- Cable block diagrams
- P&ID review of instruments required for unit or plant-wide model predictive control (MPC)
- Gap analysis report on optimization instruments



Information (MES/MIS)

- Installed base assessment
- Preparation of requirements and/or upgrade specifications
- Line integration, line performance
- Plant / multi-site reporting, KPI dashboards, web-forms, analytics



Packaged Equipment

- Site-wide standards and specifications for packaged equipment
- Package equipment upgrade specifications
- Packaged equipment integration



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