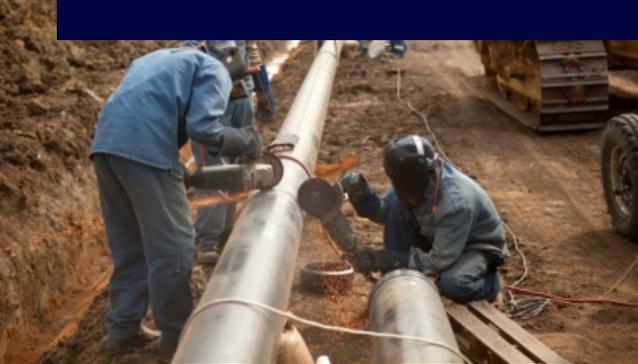


Frontier Energy Services, LLC

Concept to Construction: Design and Build Management

Energy Pipeline Management Summit

July 16 – 17, 2018 Dallas, Texas



Overview

- Project Development
- Best Practices
- Critical Project Concepts

Overview

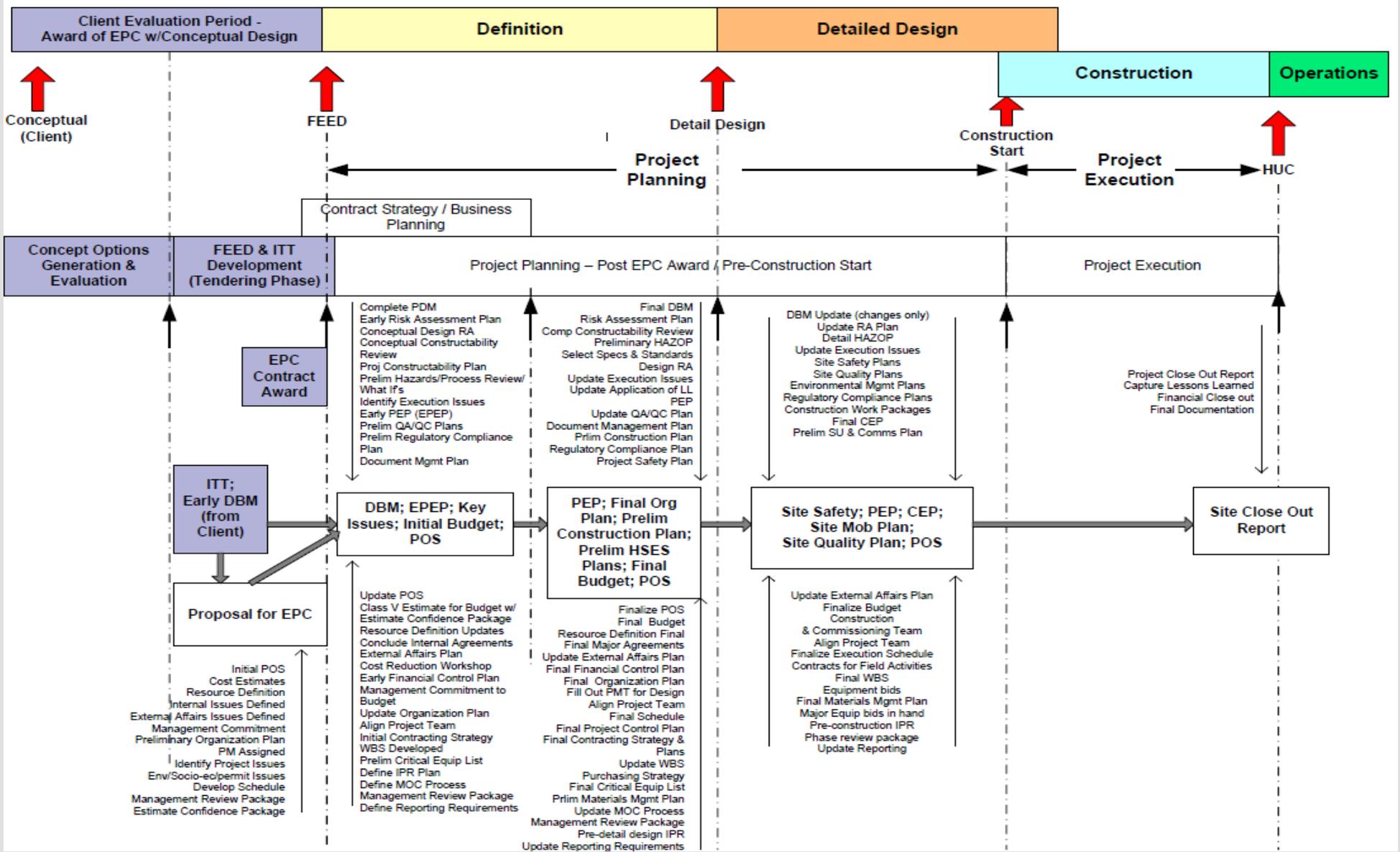
- Project Development
- Best Practices
- Critical Project Concepts

Oversight and Management

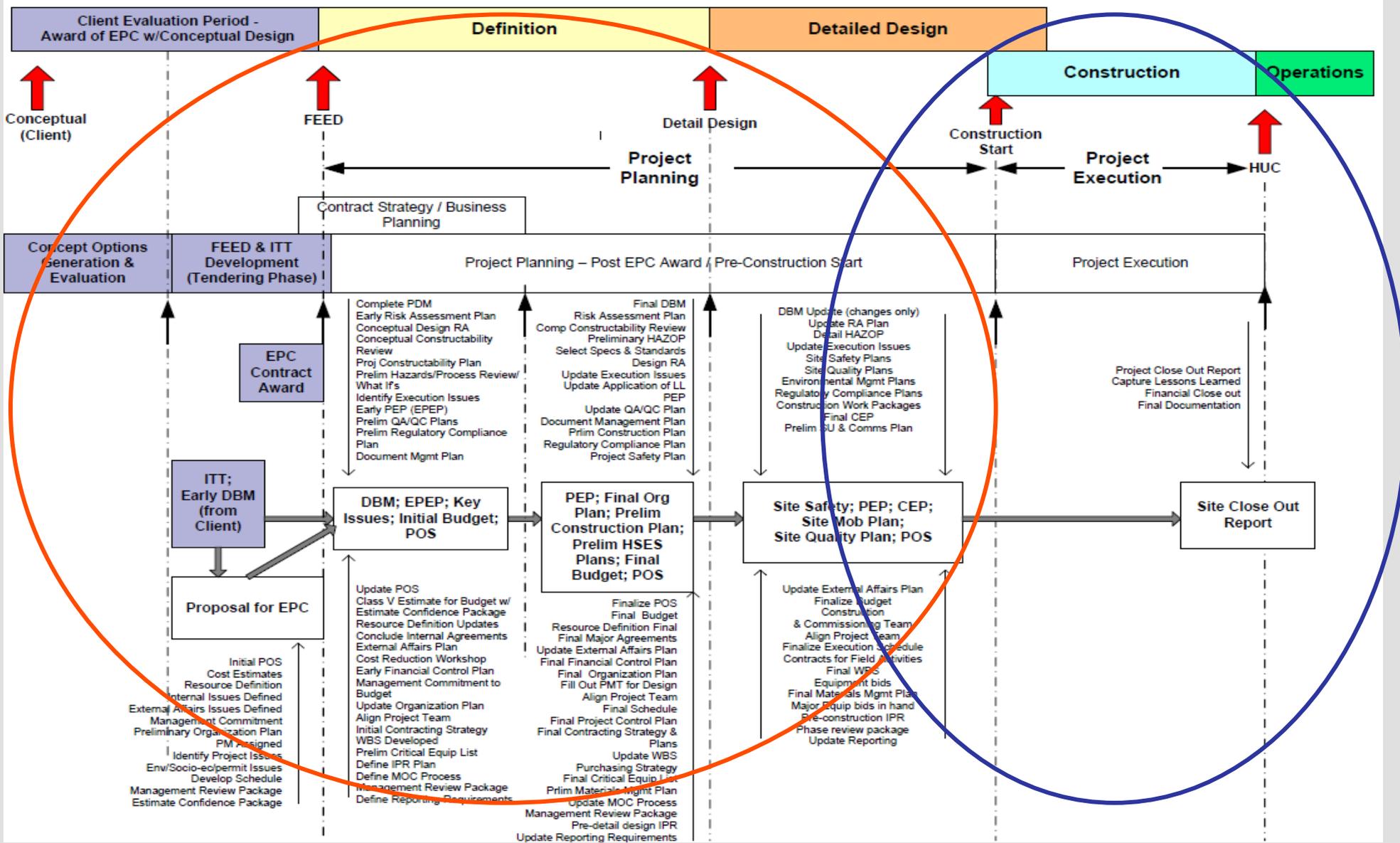
Key Project Development Phases:

- Concept
- Feasibility
- FEED
- Engineering & Design
- Procurement
- Construction & Construction Management
- Commissioning & Start Up
- Operations

Oversight and Management



Oversight and Management



Concept

Key Project Development Phases:

- **Concept**
- *Feasibility*
 - *FEED*
- *Engineering & Design*
- *Procurement*
- *Construction & Construction Management*
- *Commissioning & Start Up*
- *Operations*

Concept

Why?

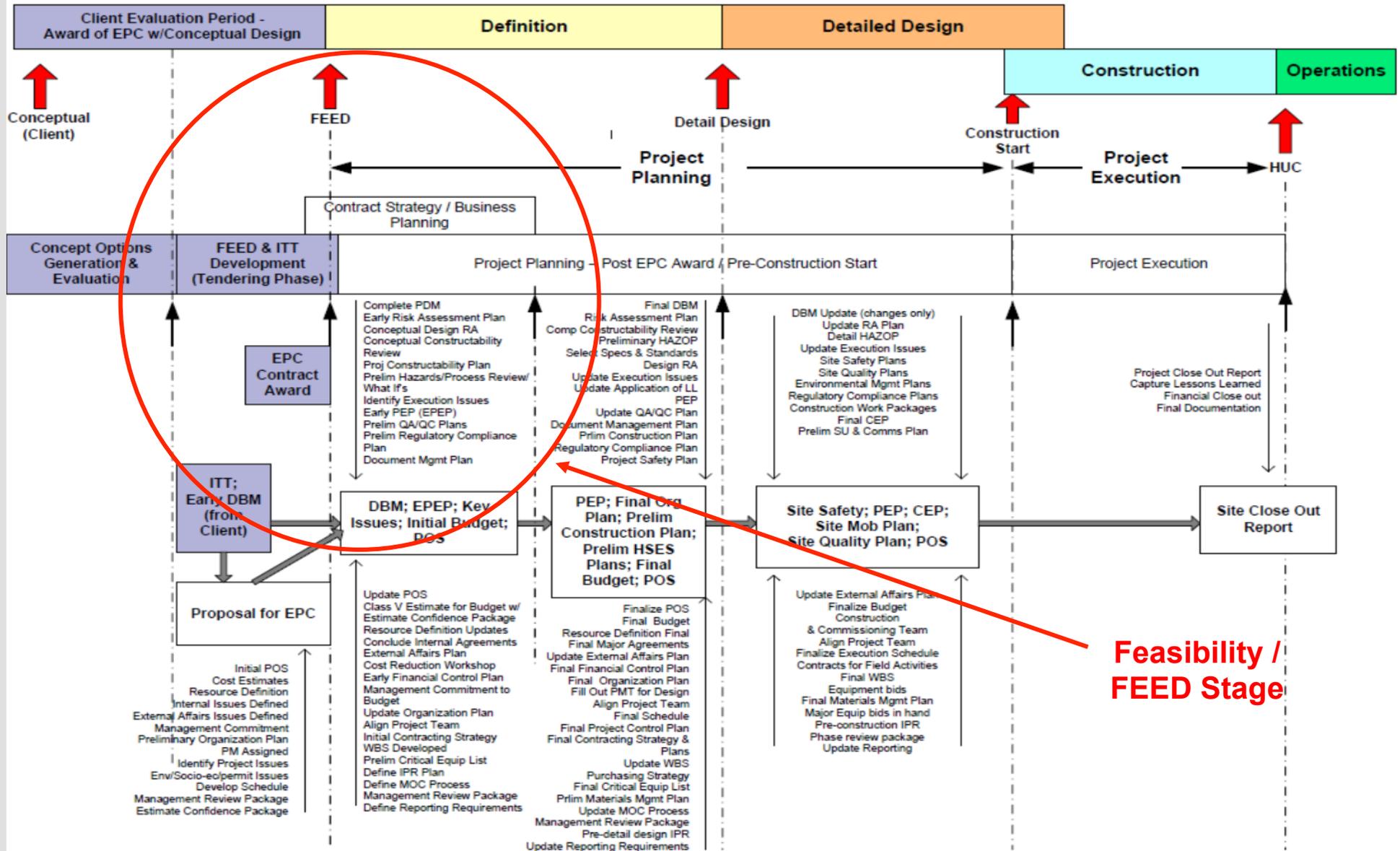
- Starts as an Idea / Why do it?
- Meets a Need?
- Fit with Current Business Environment?
- Fit with Corporate Strategy?
- Competition?
- Exit Strategy Required?

Feasibility

Key Project Phases:

- *Concept*
- ***Feasibility***
 - ***FEED***
- *Engineering & Design*
- *Procurement*
- *Construction & Construction Management*
- *Commissioning & Start Up*
- *Operations*

Feasibility



Feasibility

Two (2) Contracting Tactics:

- Internally
 - With SME Support
- 3rd Party Consulting Firm

Feasibility

If Using a 3rd Party for Feasibility and / or FEED:

- Preclude 3rd Party from Bidding Next Phase
- Set Firm Completion Date
- Bid Lump Sum

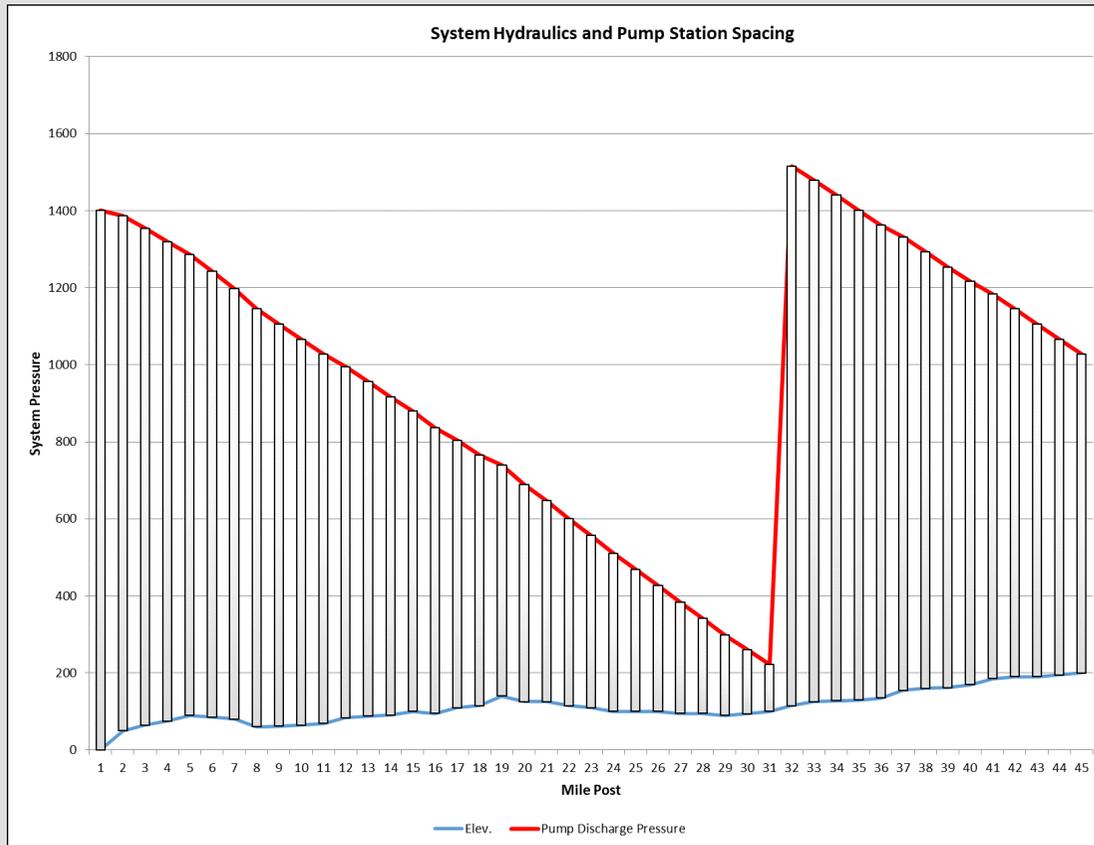
Feasibility

The Key Deliverables for Feasibility Study:

- *Route Selection (desk top), Including Options*
- *Hydraulics for Pipe Sizing & Facility Placement*
- *Level 4 Cost Estimates – CAPEX and OPEX*
- *Technical Basis / EBOD – Pipelines & Facilities*
- *Market Analysis (**may be internal**)*
- *Level 2 Schedule*
- *Risks & Key Issues, i.e. Environmental, Species, Logistics, Housing, Crossings, etc.*

Feasibility

Pipe Size vs Pump Station Spacing Assessment



Pipeline Costs:	
Pipe Diameter	10
Pipeline Length	237,600
TIC per foot	\$ 134.68
Total Pipeline Cost	\$ 32,000,000
Pump Station Costs:	
# Pump Stations	2
HP per Pump Station	1,200
Total HP	2,400
Cost per HP	\$ 2,100.00
Total Pump Station Costs	\$ 5,040,000
TIC:	\$ 42,080,000

Economic Comparison			
DIA	# PS	TIC	% Diff
8	5	\$ 41,525,000	-22%
10	2	\$ 42,080,000	-21%
12	1	\$ 38,117,000	-28%
14	1	\$ 44,443,000	-16%
16	1	\$ 47,693,000	-10%
18	1	\$ 52,949,000	0%

Feasibility

Project Structure

Project Execution / Financing:

- Develop Yourself
 - Internal / External Financing
 - Debt / Equity
- Partner to Reduce CAPEX or Gain a Strategic Advantage
- Combinations

Feasibility

FEED Phase - If Required

If Project is Feasible; Move to FEED

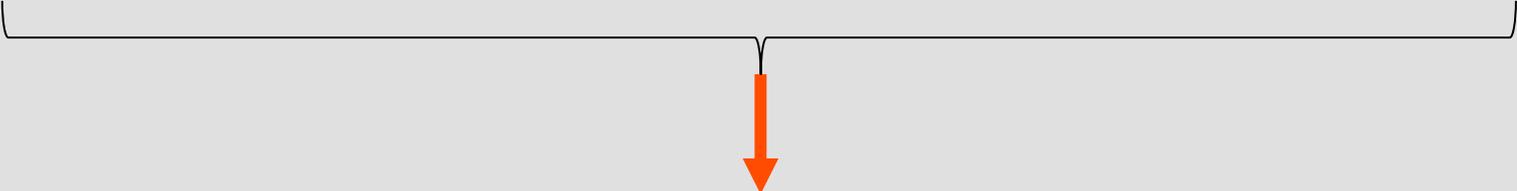
If FEED is Not Required – Move to
Detail Engineering & Design.

FEED on a Lump Sum Basis.

The principle deliverables for FEED:

- Basis of Design (BOD)
 - PFD's & P&ID's; Electrical 1-lines; Area Classifications (Facilities); Calculations; Control Philosophy; etc.
- Project Specifications
- Environmental Assessment & Mitigations

FEED

- Vendor Quotes for Major Equipment
 - Long Lead Items & RFQ's
- 
- Class III Cost Estimate - CAPEX & OPEX
 - Level II Schedule
 - Risk Assessment / Key Issues

Behind the Scenes

- Execution Planning:
 - Organization
 - Cost and Schedule
 - Procurement
 - Management of Change
 - Reporting
- Independent Project Reviews

Keys to Success

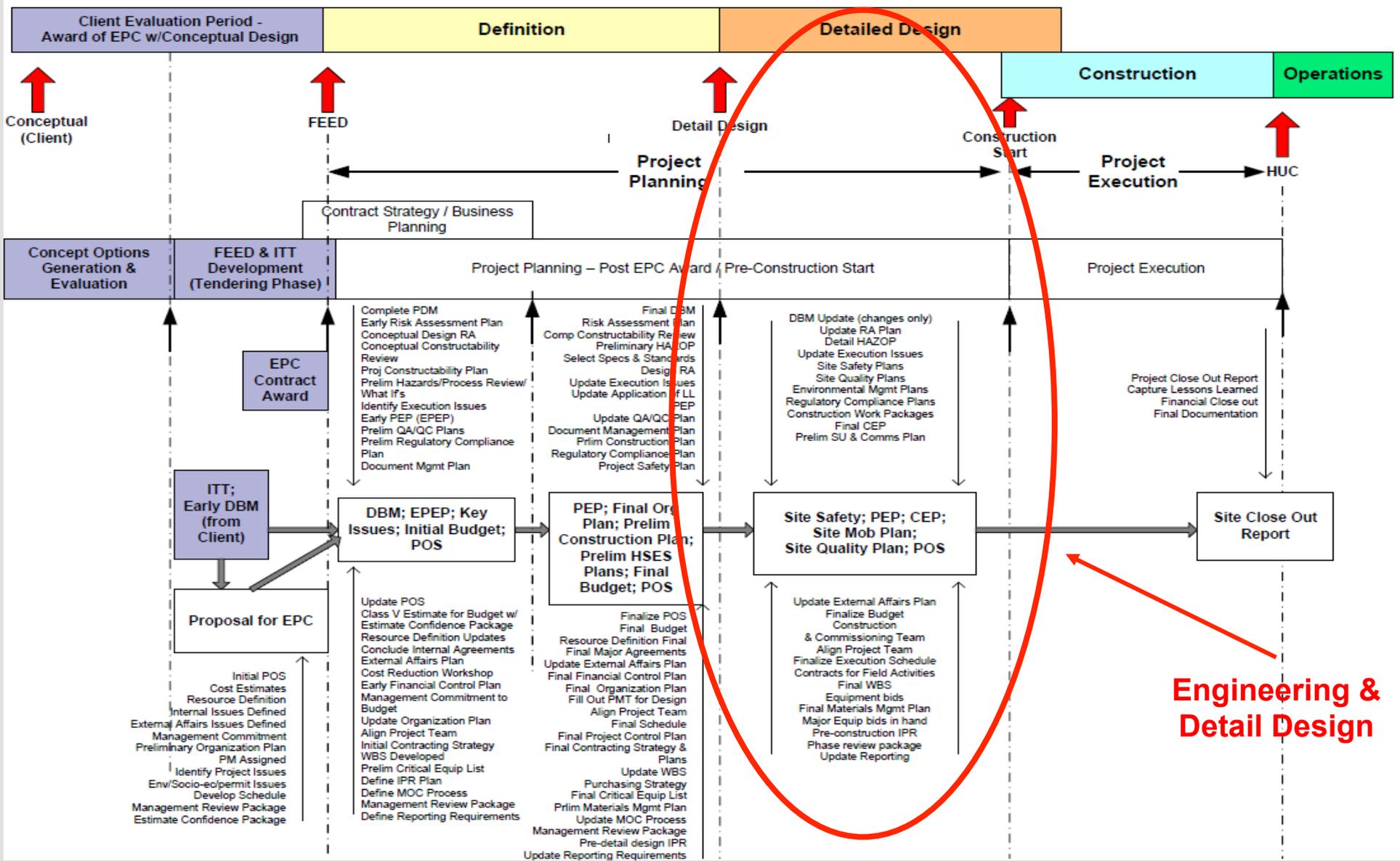
- **Alignment** Across all Stakeholders
- Do the Work to Support the Next Decision. **Be Decision Driven.**
- Key Objectives for the Project:
Prioritize & Communicate

Engineering and Design

Key Project Phases:

- *Concept*
- *Feasibility*
 - *FEED*
- ***Engineering & Design***
- *Procurement*
- *Construction & Construction Management*
- *Commissioning & Start Up*
- *Operations*

Engineering and Design



Engineering & Detail Design

Engineering and Design

**To Be Successful -
Engineering & Procurement
must be Construction-
Driven**

What Does that Mean?

Engineering and Design

What Construction-Driven does not mean:

- Construction Calls the Shots -
What Construction Wants,
Construction Gets

Engineering and Design

What Construction-Driven does mean:

- Construction's Schedule Drives Engineering & Procurement Schedule.
- Drawings, Equipment & Materials Ready When Required (ROS Dates).

Engineering and Design

Engineering Management

- Manage Interfaces & Division of Responsibilities on Company Design Team and Contractor(s)
- Drive Engineering Schedule & Deliverables to Meet Construction's Schedule.

Procurement

Key Project Phases:

- *Concept*
- *Feasibility*
 - *FEED*
- *Engineering & Design*
- ***Procurement***
- *Construction & Construction Management*
- *Commissioning & Start Up*
- *Operations*

Procurement

Procurement Management

- Three Key Areas:
 - Purchasing
 - Materials Management
 - Contract Management

Procurement

Purchasing

- Procurement of Long Lead Items
- Ship of Equipment and Materials to Support Construction's Schedule

Procurement

Materials Management

- Identify Most Efficient Laydown Yard Location(s)
- Determine Best Methodology for Pipe Transport & Interim Storage

Procurement

Contract Management

- Assure Major Areas of Risk are Prudently Allocated
- Develop Technical & Commercial Bid Evaluation Process

Construction Management

Key Project Phases:

- *Concept*
- *Feasibility*
 - *FEED*
- *Engineering & Design*
- *Procurement*
- ***Construction & Construction Management***
- *Commissioning & Start Up*
- *Operations*

Construction Management

Construction Management

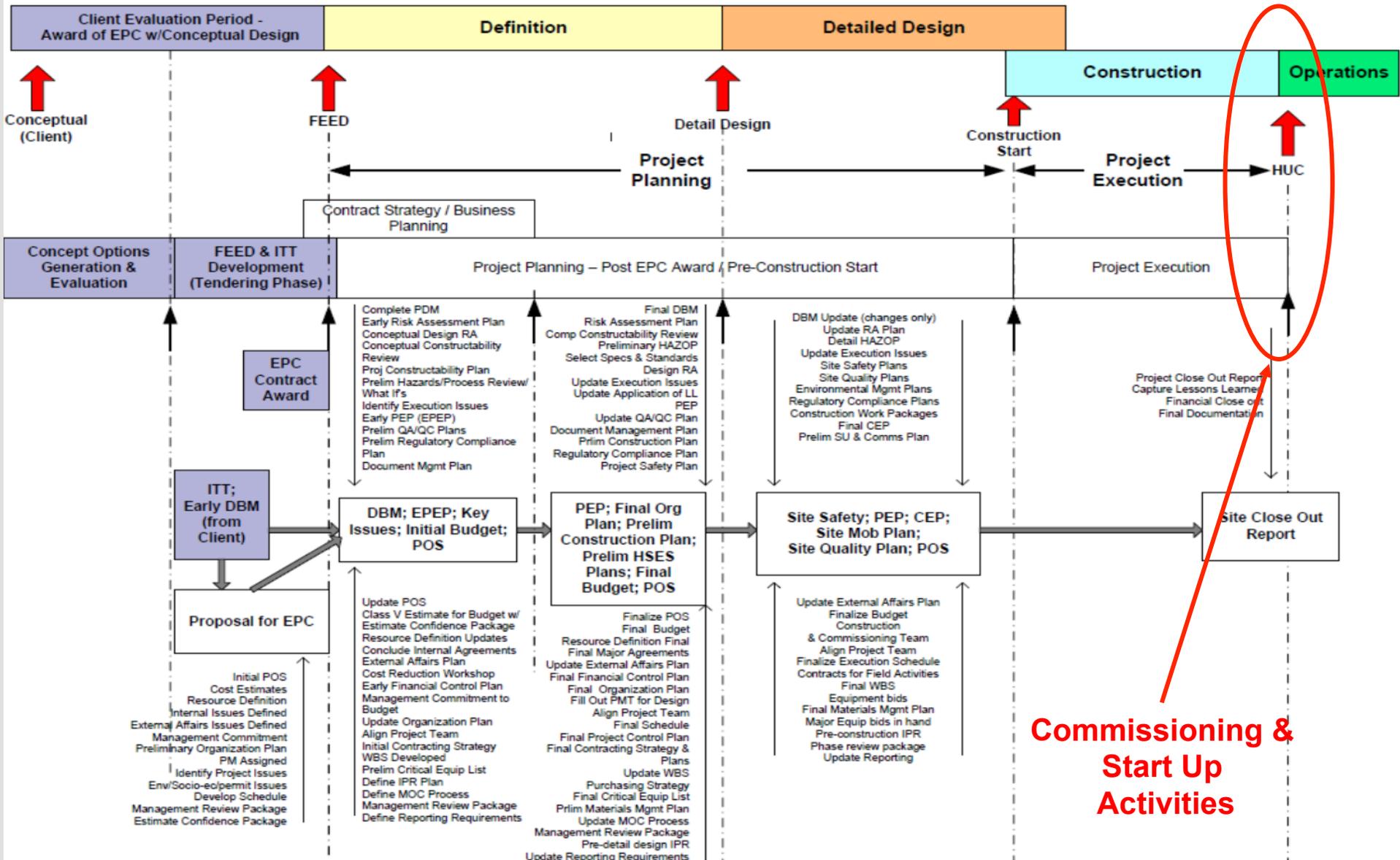
- Start at Conceptual Stage - Input for Organization, Schedule & CAPEX Cost
- Provides ROS dates for Equipment and Material.
- *Move Sense of Urgency from Backend of the Project to Front End.*

Commissioning and Start Up

Key Project Phases:

- *Concept*
- *Feasibility*
 - *FEED*
- *Engineering & Design*
- *Procurement*
- *Construction & Construction Management*
- **Commissioning & Start Up**
- *Operations*

Commissioning and Start Up



Commissioning and Start Up

Commissioning - Integrated Team Effort:

- **Project Team**
 - Construction
 - Engineering
 - Major Equipment Vendors
- **Operations Team**
 - Operations Manager
 - Commissioning Manager

Commissioning and Start Up

Four Basic Steps:

1. Pre-Commissioning – Construction Led
2. Mechanical Completion – Construction Led
3. Turnover & Commissioning – Operations Led
4. Start Up – Operations Led

Operations

Key Project Phases:

- *Concept*
- *Feasibility*
 - *FEED*
- *Engineering & Design*
- *Procurement*
- *Construction & Construction Management*
- *Commissioning & Start Up*
- ***Operations***

Operations

Operations

- Early Participation:
 - Operational Risks
 - Operations Assurance
 - OPEX Organization & Cost Estimates
 - Scheduling for Commissioning & Start-Up

Overview

- Oversight and Management
- **Best Practices**
- Critical Project Concepts

What is a Best Practice?

- * A **best practice** is a method or technique that has been generally accepted as superior to any alternatives because it produces results that are superior to those achieved by other means or because it has become a standard way of doing things, e.g., a standard way of complying with legal or ethical requirements.

* *Definition per Wikipedia*

Where We Get Best Practices?

- Internal
- Partners / Competitors
- Colleagues
- Workshops / Seminars
- Industry Websites
 - Project Management Institute (PMI)
 - Construction Industry Institute (CII)

Best Practices

**CII Best Practices Guide—Improving Project Performance* includes:

- Front End Planning
- Alignment
- Constructability
- Materials Management
- Planning for Start Up
- Team Building
- Partnering
- Lessons Learned
- Quality Management
- Benchmarking & Metrics
- Change Management
- Dispute Prevention & Resolution
- Zero Accidents Techniques

They offer excellent ideas and thoughts, but are not designed for cut & paste.

** CII Implementation Resource 166-3, Version 3.1 / www.construction.institute.org*

Overview

- Oversight and Management
- Best Practices
- **Critical Project Concepts**

Critical Project Concepts

1. Management of Change
2. Contracting & Strategies
3. Transitions
4. Lessons Learned
5. Written Plans

Management of Change

MOC by Phase

- Concept, Feasibility, FEED, early Engineering (until Design is Frozen):
 - Changes Encouraged to Capture Cost & Schedule Saving Opportunities.

Management of Change

MOC by Phase

- After Design Freeze:
 - NO Discretionary Changes.
 - Robust Hurdles Put in Place.

Management of Change

MOC Objectives by Phase

After Engineering/Design freeze:

- Changes Considered Only If:
 - Not Safe
 - Does Not Meet Regs or Specs
 - Does Not Work (HAZOP Re-validated?)

Management of Change

MOC Coverage Areas

MOC Covers at a Minimum Approved:

- BOD
- PEP
- Project Specifications
- PFD's & P&ID's
- IFC / AFC Drawings
- Baseline Schedule
- Budget

Standardized Documents Available:

- Feasibility / FEED Agreements
- Major Contract Outline Agreements
 - EPC
 - Engineering / Survey
 - Procurement
 - Construction
 - Land Acquisition
 - Inspection (Personnel, NDT, Vendor, etc.)
 - Others

Advantages:

- Reduces Bid Cycle Time by Using Documents 95% Complete
- Reduces Legal & Procurement Resources
- Ability to Move Fast & Maintaining a Competitive Position

FEED Phase

- Use FEED Competitions to Optimize Design
- Issue as Lump Sum

EPC

- EPC Can Create Efficiencies & Synergies Between Project Phases
- Fixed Pricing (i.e. Lump Sum or Fixed Unit Prices) is Preferred for EPC Contracts
- Long Lead Items - Purchased by Company and Assigned to EPC Contractor

Typical Transitions:

- Bidding & Award to Start Work
- Detail Design to Construction
 - Fabrication to Installation
 - Structural to Piping
- Construction to Operations

Management of Transitions is Often Overlooked (Fighting Today's "Fire"):

- Disruptions From Poor Timing (Transitions Too Early or Late)

While One Phase is Underway, Plan the Next Transition

Prepare a Transition Plan:

- Identify Activities to Mitigate Impacts of Transitions
- Structured Approach to Time the Transition
- Get Organizations & Systems Ready Before Needed

Application Plan:

- Select Top 10
 - Develop a Plan for Each
 - Actions
 - Deliverables
 - Responsibilities
 - Timing

Why Written Plans:

- Forces You to Think Through What You are Doing and How
- Great Tool for Communicating Across All Levels
- Eliminates Ambiguities & Misunderstandings

Questions and Answers