



# 2019 AAACE Northeast Symposium



# Owner Project Planning Supports Estimate and Schedule Accuracy

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## Owner Project Planning Supports Estimate and Schedule Accuracy

The purpose of this presentation is to identify industry best practices for content of the project plan and the typical evolution of the plan through the project front end efforts and execution.

At the end of this presentation you will be able to:

- Understand the importance of a well-developed Project Execution Plan in the development of Cost and Schedule Project Baselines.
- Recognize a Project Execution plan evolves with each phase of a project.
- Explain typical topical content of a Project Execution Plan.
- Identify examples of how Execution Planning drives outcomes in project delivery.

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- Introduction
- The Project Execution Plan (PEP)
  - General Structure and Topical Content
  - Evolution during Each Project Phase
  - Impact and Influence on Cost, Schedule and Risk Assessments during Each Phase
- Case Studies - Actual Projects
- Conclusion

# Introduction



# Introduction

- Most owner companies have Project Delivery Process (PDP)
  - Best practice in capital project effectiveness
  - Guides project teams from early project development to handover to operations
- Processes have different names for pre full-funding stages but principles are similar
  - Align with AACE® International Recommended Practices for cost estimate classification and project schedule development
- At the core is the development & implementation of:
  - Comprehensive scope of work supported by Work Breakdown Structure (WBS)
  - Well-developed Project Execution Plan (PEP)

# Introduction

- Development of comprehensive PEP early in process provides significant benefits
  - Maximizes effectiveness of project management team
- PEP provides basis for accurate estimates and schedules as they progress through Project Delivery Process
- To take advantage of early PEP development, owners should understand PEP's:
  - General structure and topical content
  - Evolution during each project phase
  - Impact and influence on cost, schedule and risk assessments during each phase

# Introduction

- Owner's PEP evolves through each FEL stage
  - FEL 1 - Feasibility or Business Planning
  - FEL 2 - Alternatives Analysis
  - FEL 3 - Definition
- Specific terminology and number of stages may vary from company to company
- Principles/practices remain the same from best practices perspective





# The Project Execution Plan (PEP)

General Structure and Topical Content

# Project Execution Plan

## PEP Table of Contents

### Part I - Project Charter

1. Business Goals
2. Project Goals and Drivers
3. Scope of Work
4. Execution Strategies
5. Risk Management Plan

### Part II – Project Planning Basis

6. Communications Plan
7. Contracting Plan
8. Organization & Division of Responsibilities Plan
9. Master Plan Schedule

### Part III – Management Plans

10. Value Improving Practices Plan
11. Regulatory, Environmental and Permitting Plan
12. Health Safety and Security Plan
13. Quality Plan
14. Engineering Execution Plan
15. Procurement and Materials Management Plan
16. Contracting Management Plan
17. Constructability Review Plan
18. Construction Execution Plan
19. Construction Management Plan
20. Logistics Management Plan
21. Estimating & Cost Management Plan
22. Schedule Baseline & Schedule Management Plan
23. Labor Relations Management Plan
24. Pre-Commissioning Plan
25. Commissioning and Start-Up Plan
26. Operations Management Plan

*Figure 1 - PEP Table of Contents*

# Project Execution Plan

## General Structure and Topical Content

### Three Parts:

- Part I – Project Charter - Developed with the business to define guiding principles by which project must be developed
- Part II – Project Planning Basis - Developed by project team to define and record the basis to be used in executing project's scope, schedule, and cost
- Part III – Management Plans - Developed by project team to define all requirements for managing various aspects of the project during execution

# Project Execution Plan

## General Structure and Topical Content

- Typically 26 sections
- Owner PEP is different from ones developed from contractor's perspective
  - Contractor develops execution details for scope of work awarded
  - Often not all the scope involved in a major capital project, so contractors' PEPs needs to be integrated into owner's PEP
  - Most contractor-developed PEPs don't include business aspects of project, as they are driven by owner (& kept confidential)

# Project Execution Plan

## General Structure and Topical Content

- Part I – Project Charter
  - Section 1 – Business Goals
  - Section 2 – Project Goals and Drivers
  - Section 3 – Scope of Work
  - Section 4 – Execution Strategies
  - Section 5 – Risk Management Plan

# Project Execution Plan

## General Structure and Topical Content

- Part II – Project Planning Basis
  - Section 6 – Communications Plan
  - Section 7 – Contracting Plan
  - Section 8 – Organization & Division of Responsibilities Plan
  - Section 9 – Master Plan Schedule



# Project Execution Plan

## General Structure and Topical Content

- Part III – Management Plans
  - Section 10 – Value Improving Practices Plan
  - Section 11 – Regulatory, Environmental, & Permitting Plan
  - Section 12 – Health, Safety, and Security Plan
  - Section 13 – Quality Plan
  - Section 14 – Engineering Execution Plan
  - Section 15 – Procurement & Materials Management Plan
  - Section 16 – Contracting Management Plan
  - Section 17 – Constructability Review Plan
  - Section 18 – Construction Execution Plan

# Project Execution Plan

## General Structure and Topical Content

- Part III – Management Plans
  - Section 19 – Construction Management Plan
  - Section 20 – Logistics Management Plan
  - Section 21 – Estimating and Cost Management Plan
  - Section 22 – Schedule Baseline & Schedule Management Plan
  - Section 23 – Labor Relations Management Plan
  - Section 24 – Pre-Commissioning Plan
  - Section 25 – Commissioning and Start-Up Plan
  - Section 26 – Operations Management Plan

# The Project Execution Plan

Evolution During Each Project Phase



# Project Execution Plan

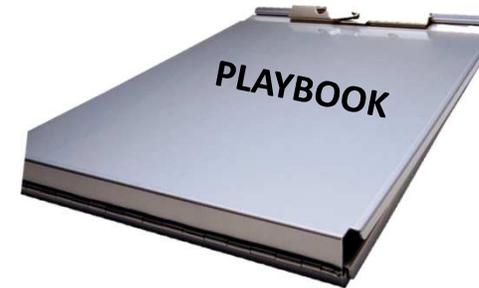
## Evolution During Each Project Phase

- Preparing sections of the PEP (with level of detail/ maturity) is related to how well project's been defined
  - Certain sections set bases needed to guide project development
    - Must be finalized in earliest project phases
  - Other sections done after project technical definition progresses to point enabling their preparation to move from strategic to tactical/detailed levels
- Key principle - PEP is a **dynamic** reference document
  - Defines current basis for how project's technical basis is to be executed

# Project Execution Plan

## Evolution During Each Project Phase

- PEP is the 'playbook,' with detailed content in each section
  - project team members use to plan/execute work efforts during each project phase
  - All working from same page
  - Recognize interrelated/interdependent nature of each section as it relates to overall project



# Project Execution Plan

PEP Section Maturity Levels  
by Project Development Phase

Part I - Project Charter	FEL 1	FEL 2	FEL 3	Implementation
1. Business Goals	Fully Defined	Fully Defined	Fully Defined	Maintain
2. Project Objectives and Drivers	Fully Defined	Fully Defined		
3. Scope of Work	Alternatives *	Functional *		
4. Execution Strategies	Conceptual *	Fully Defined		
5. Risk Management Plan		Preliminary *		

Part II – Project Planning Basis	FEL 1	FEL 2	FEL 3	Implementation
6. Communications Plan	Strategic *	Preliminary *	Fully Defined	Maintain
7. Contracting Plan				
8. Organization & Division of Responsibilities Plan				
9. Master Plan Schedule				

Part III – Execution Management Plans	FEL 1	FEL 2	FEL 3	Implementation
10. Value Improving Practices Plan	Conceptual *	Preliminary *	Fully Defined	Maintain
11. Regulatory, Environmental and Permitting Plan				
12. Health, Safety and Security Plan				
13. Quality Plan				
14. Engineering Execution Plan				
15. Procurement & Materials Management Plan				
16. Contracting Management Plan				
17. Constructability Review Plan				
18. Construction Execution Plan				
19. Construction Management Plan				
20. Logistics Management Plan				
21. Estimating & Cost Management Plan				
22. Schedule Baseline & Schedule Management Plan				
23. Labor Relations Management Plan	Conceptual or not required	Preliminary		
24. Pre-Commissioning Plan				
25. Commissioning and Start-Up Plan				
26. Operations Management Plan				

\* Must be Fully Defined for any aspects applicable to the upcoming Project Phase

Figure 2 - PEP Section Maturity Levels by Project Development Phase

# The Project Execution Plan

Impact on Cost, Schedule and Risk Assessments During each Phase

# Project Execution Plan

## Impact on Cost, Schedule & Risk Assessments During each Phase

### Part I – Project Charter

- Section 1 – Business Goals
  - Drive FEL 1 team focus, avoid investigations of unacceptable alternatives
  - Changes cause confusion, generate re-work, delay funding, cost money
- Section 2 – Project Goals and Drivers
  - FEL 1, FEL 2, and FEL 3 teams must appreciate balance of Cost, Schedule, Maintenance, and Operations to be effective
  - Inconsistent perceptions lead to FEL recycle, overruns, and delay
  - Delayed funding may needlessly add risks or compression to execution, wasting time and money

# Project Execution Plan

## Impact on Cost, Schedule & Risk Assessments During each Phase

### Part I – Project Charter

- Section 3 – Scope of Work
  - A singular Functional Scope must be defined at end of FEL 2 for detailed technical and battery limits development in FEL 3
  - Failures may lead to underestimated funding requests, cost shortfalls during execution, adding late changes that threaten schedule delivery
- Section 4 – Execution Strategies
  - Strategy defined in FEL 2 is basis for FEL 3 refinement
  - Later changes in strategy jeopardize prior cost and delivery assumptions
- Section 5 – Risk Management Plan
  - Failures to fully define/implement risk management plans and assignments during FEL 2, and in their FEL 3 and execution utilization, will compromise mitigation efforts to contain cost/schedule growth

# Project Execution Plan

## Impact on Cost, Schedule & Risk Assessments During each Phase

### Part II – Project Planning Basis

- Section 6 – Communications Plan
  - Ineffective communication leads to confusion, inefficiency, and lack of coordination throughout project
  - Effective communication requires planning and clear definition - or else FEL recycle, inadequacies, and delays result, impacting cost/schedule
- Section 7 – Contracting Plan
  - Initial plan defined in FEL 2 is basis for FEL 3 refinement
  - Changes impact final funding basis assumptions
  - Disrupts agreed staffing levels, roles & responsibilities, commercial planning, allocation of risks and schedule interfaces
  - Cost/Schedule impacts can be felt across the EPC spectrum

# Project Execution Plan

## Impact on Cost, Schedule & Risk Assessments During each Phase

### Part II – Project Planning Basis

- Section 8 – Organization and Division of Responsibilities Plan
  - A well-considered plan is foundation for deploying effective/time-efficient project processes
  - Changes to FEL 3 and execution organizations affect these processes
  - Fixing a plan’s implementation may be preferable to changing it
  - Failures to revise and communicate coordinated process changes can endanger cost/schedule success
- Section 9 – Master Plan Schedule
  - Contemporaneous schedule planning must align with the master schedule plans of increasing detail created during prior project phases
  - Failure to implement a suitable Master Plan early in FEL can lead to unrealistic schedule and resource plans, generating delays/delay costs

# Project Execution Plan

## Impact on Cost, Schedule & Risk Assessments During each Phase

### Part III – Management Plans

- Section 10 – Value Improving Practices Plan
  - FEL 3 efforts must follow through on VIP Plans established in FEL 3
  - Ineffective VIP efforts increase cost and may impact schedule
- Section 11 – Regulatory, Environmental, & Permitting Plan
  - Planning in detail in FEL 2 is needed to ensure design schedules are structured to support-not just procurement & construction needs, but these requirements as well
  - Delays lead to inefficiencies, added engineering costs, possible delays to (or increased costs for) construction
- Section 12 – Health, Safety, & Security Plan
  - Comprehensive FEL 2 definition is critical to FEL 3 project development
  - Changes can impact FEL 3 estimate accuracy, lead to change orders in contracts awarded on that basis, place design and delivery schedules at risk

# Project Execution Plan

## Impact on Cost, Schedule & Risk Assessments During each Phase

### Part III – Management Plans

- Section 13 – Quality Plan
  - Late revisions to the FEL 1 plan can lead to design rework, under or over designs, and schedule delays during FEL 2, FEL 3, and execution
  - A well-defined plan, suitably communicated, allows teams to deliver a project scope neither more nor less functional than required
- Section 14 – Engineering Execution Plan
  - FEL 2 definition of how & by whom design will be executed- a prerequisite for refinement in FEL 3
  - Unless all participants are working from the same page, inefficiencies and delays will be inevitable
- Section 15 – Procurement & Materials Management Plan
  - Long lead item procurement & contracting of design work often start in FEL 3
  - Failure to have defined plan in place by FEL 2 completion can impose cost/ schedule impacts on FEL 3 and acquisition of funding

# Project Execution Plan

## Impact on Cost, Schedule & Risk Assessments During each Phase

### Part III – Management Plans

- Section 16 – Contracting Management Plan
  - Contracting of early field work and investigations often starts in FEL 3
  - Failure to have a defined plan in place by FEL 2 completion can result in inaccurate estimates, and impose cost/schedule impacts on FEL 3 and acquisition of funding
- Section 17 – Constructability Review Plan
  - A plan for ensuring appropriate reviews must be put in place during FEL 2
  - Failure to do so degrades coordination between estimating, design & construction, which may lead to rework, schedule delays, and added cost
- Section 18 – Construction Execution Plan
  - FEL 3 detailed planning require strategies to be developed in FEL 2
  - FEL 3 schedules/estimates require clear definition of construction approaches, methods, and infrastructure needed to define associated costs and delivery durations

# Project Execution Plan

## Impact on Cost, Schedule & Risk Assessments During each Phase

### Part III – Management Plans

- Section 19 – Construction Management Plan
  - FEL 3 detailed planning requires strategies to be developed in FEL 2
  - FEL 3 schedules/estimates require clear definition of construction management approaches, etc. in order to define costs
- Section 20 – Logistics Management Plan
  - FEL 3 detailed planning require strategies to be developed in FEL 2
  - FEL 3 schedules and estimates require clear definition how material and labor are to be moved onto, out of, and around the site to define costs
- Section 21 – Estimating & Cost Management Plan
  - Prior stage detailed planning- prerequisite to managing costs in any given phase and preparing necessary estimates
  - Shortfalls in such planning lead to inadequate controls of cost during the phase and inaccurate estimates of future costs
  - Inaccurate cost estimates can spill over as inaccuracies in schedules based on those estimates

# Project Execution Plan

## Impact on Cost, Schedule & Risk Assessments During each Phase

### Part III – Management Plans

- Section 22 – Schedule Baseline & Schedule Management Plan
  - Definitive plans must be completed in prior phases to specify all requirements for scheduling methods and deliverables and the processes for approving their baselines in any given phase
  - Planning shortfalls lead to inaccurate schedules, delays, increased cost
- Section 23 – Labor Relations Management Plan
  - Estimators, planners, construction managers, and risk analysts need plans to be completed in FEL 2 to accurately assess costs/schedules in FEL 3
  - Insufficient documentation leads to inaccurate estimates/schedules

# Project Execution Plan

## Impact on Cost, Schedule & Risk Assessments During each Phase

### Part III – Management Plans

- Section 24 – Pre-Commissioning Plan
  - Failure to document Pre-Commissioning plans in advance of estimate & schedule development can cause inaccurate estimates, schedules, delays, increases in cost
- Section 25 – Commissioning & Start-Up Plan
  - Failure to document Pre-Commissioning plans in advance of estimate and schedule development share same pitfalls as above
- Section 26 – Operations Management Plan
  - Planning for how project-related work will be reviewed by operations staff and how additional staff will be brought on board during/at completion of the project is imperative to begin in FEL 2
  - Failure to define these approaches as estimates/schedules are prepared may significantly impair cost estimate/schedule assumptions, accuracy, predictability, and reliability

# Case Studies - Actual Projects



## ***Ex. 1: Section 2 – Project Goals & Drivers***

- **Background** - Quality set of objectives were developed by business unit in collaboration with core project team assigned to project at end of FEL 1
  - Business & project objectives were developed/communicated to team in prioritized order based on criticality to project success through use of Class of Facility Quality (CFQ) workshop and Business and Engineering Alignment Meeting (BEAM) session
  - CFQ/BEAM sessions enabled business unit & core project team representatives to collaborate & align on more specific project objectives
    - Including safety, capital cost limits, project schedule, product quality specifications, service/utilization factor, reliability and other technical and PM success factor requirements

## ***Ex. 1: Section 2 – Project Goals & Drivers***

- **Results/Impacts** - project team used guidance/direction to draft/maintain the PEP, reaffirming business & project objectives with business unit leadership at each stage of development
  - Rigorous application of PEP/ frequent communication with steering committee helped team be successful in carrying out project within pre-established success factor parameters

## Ex. 2: Section 5 – Risk Management Plan

- **Background** - Refinery expansion project developed by a major oil company needed to be integrated with major turnaround based on an aggressive schedule
  - To meet business/project objectives - project team developed a risk management plan based on an ambitious/rigorous Risk Management program with detailed Risk Register development & follow-up process
  - Risk Management Plan included an initial risk workshop at an early stage of FEL 2 - Risks were identified & mitigation measures developed with single point of accountability assigned for each item.
  - The process (documented in project's PEP) included minimum follow-up sessions monthly, with high risk items assigned more frequent (weekly) follow-up using Risk Matrix as a guide
  - Plan also included formal risk workshops no later than end of each phase to facilitate cost and schedule risk analysis

## **Ex. 2: Section 5 – Risk Management Plan**

- **Results/Impacts** - Project team adhered to process as per PEP and achieved project's goals, but labor availability issue was problematic despite project team/EPC contractor efforts
  - Additional premiums and craft labor incentives were applied and appropriate levels of resources were secured to support work planned for pre-turnaround period which now had to be accomplished during the turnaround
  - Schedule objectives were achieved with an approximate 15% Budget overrun
  - The post-project Lessons Learned workshop indicated that Risk Management Plan posture adopted by project team minimized even further cost impacts due to proactive actions stimulated by the process

## ***Ex. 3: Section 18 – Construction Execution Plan***

- **Background** - Less than 3 weeks prior to FEL 3 completion of USGC Ethylene Unit Revamp Project (valued \$400M - \$500M), no owner construction execution plan existed. In talks with plant staff during a pre-gate Independent Project Review (IPR), it was found that no consideration had been given to what aspects of pre-turnaround work had to be carried out in order to be ready for turnaround required at end of project
  - Statements by owner technical team members assumed that number of “early work” packages would be executed far in advance of scheduled plant turnaround
  - Timing requirements were driven by weather/other considerations affecting construction. No PEP existed, where such restraints would have been recorded
  - Scheduling work done by owner’s planner to-date was not conducted at level of detail capable of addressing this concern, or to make its omission apparent

### ***Ex. 3: Section 18 – Construction Execution Plan***

- **Results/Impacts** - Had this data had been reflected in draft-level construction execution plan, the owner's planner would have incorporated it into schedule approved for the project
  - Project time available was inadequate for necessary pre-turnaround contracting and installation work – forced associated engineering be planned on a crash basis with U.G. piping and foundation construction having to be planned during the rainy season
  - Impacted both previous cost assumptions and increased pre-turnaround schedule risks to unacceptable levels – resulting in a last minute two-month re-scheduling (delay) of plant turnaround

# Conclusions



# Conclusions

- Project success relies on well-defined and frozen scope of work
  - Achieves cost estimate and project schedule accuracy/reliability/predictability
  - Includes effective quantification of materials, manhours, pricing, schedule durations, etc.
  - Must also consider context/environment in which project will be executed

# Conclusions

- Considerations must be relayed to cost estimators, project schedulers and project team members responsible for carrying out project
  - Project Execution Plan is best way to do so
- Owner PEPs need to capture detailed plans of each focus area and integrate them across all areas/parties responsible for development of their plans
  - PEP then supports ability to create accurate/reliable cost and schedule targets
- A well-defined scope of work alone cannot support these estimate and schedule baselines

# Questions?

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