Project & Construction Management Techniques

Successful methods and processes for managing power delivery projects

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Travel through a typical power delivery project work scope to introduce and develop project and construction processes and skills.

Included will be industry best techniques and considerations for specifically developing project & construction plans.
Objectives

- Understand the major steps & general flow of power delivery project development
- Understand project management techniques and processes to better manage projects
- Develop key practices to ensure project performance
Objectives

- Understand construction management techniques and processes to better manage projects.
- Develop understanding of project and construction outlooks to improve performance.
Due to an increase in load growth, need to increase power delivery capacity on northern section of transmission system to support new build out of industrial and residential load.

- 1st Priority → short term load growth (380 MW) and long term forecast (420 MW)
- 2nd Priority → voltage stability of northern section by means of alternate load transfer means capable of 800 MW
River Plus+

When Will This Be Done?
Project Management Phase

Project Management basics and application to River Plus+ project.
What is Project Management

- Application of knowledge, skills, tools, and techniques to plan and execute activities to meet project requirements.

- Accomplished through the use of processes and techniques to achieve project success.
What is Project Success

- Completion of a group of tasks or activities grouped towards a specific project that encompasses the following:
  - Within budgeted cost
  - At proper performance/specification level
  - With acceptance by customer/user
  - With minimum or mutually agreed upon scope changes
  - Without disturbing main work flow or company culture
Project Life Cycle

Initiation ➔ Planning and Design ➔ Executing ➔ Monitoring and Controlling ➔ Closing
Project versus Construction Mgmt

- Project management is overseeing all of the tasks and activities to project completion.
- Construction management is overseeing and coordinating tasks related to field construction in support of project completion.
Construction Mgmt

- Construction management utilizes many of the same basic techniques and principles, but places those in a completely different environment and set of factors than in project management.
1. Plan the work by utilizing a project definition document
   - Overview, objectives, scope, assumptions & risks, approach, organization, stakeholders, cost estimates

2. Create a planning horizon
   - That level of project detail that can be realized out as far as practical
3. Define project management procedures up front
   - Common practices to manage issues, scope changes, risk, quality, communications, etc.

4. Manage work plan and monitor schedule & budget
   - Update work plans and progress, identify new tasks on planning horizon, progress vs. cost
5. Look for warning signs
   - Small variance can grow, tasks completed but activity, schedule slips, QA/QC issues, scope issues

6. Proper approval of scope change requests
   - Project goals vs. impact of additions, sponsor & stakeholder buy-in
7. Guard against scope creep
   - Multiple minor result in large deviations, support project goals, all changes full scope review

8. Identify risks up front
   - Risk identification part of planning process, plan for managing & dealing with risks
9. Continue to access potential risk throughout project
   › Eye on planning horizon (obstacles/risk), early risk mitigation, impact on critical path

10. Resolve issues as quickly as possible
    › Manage issues, quick resolution allows planning & mitigation, actions may take time → resolution quick
Project Initiation

- Plan the work by utilizing project definition document
  - Overview
  - Objectives
  - Scope
  - Assumptions & Risks
  - Approach
  - Organization
  - Stakeholders
Overview → new transmission to support load growth & load transfer/reliability

Objectives → load supply to new distribution, load transfer to northern sector, multiple interconnection points, new substation & transmission facilities, upgrade existing substation

Organization → System Planning, Engineering (T&S), ROW, Environmental, Construction, etc.
Stakeholders → System Operator, Ops/Maint, Board, Utility Partners, Regulatory Agencies, Land Owners

Cost Estimates → preliminary budget

Preliminary cost estimates ‘presented’ hold more value than detailed project budgets
Stakeholder Input

- **Stakeholder** = entity that has definable interest in project (stakeholders = customers)

- Interests & needs of stakeholders must be understood by PM before project is defined

- Interests & needs of stakeholders define project goals
Project defined but does not match stakeholder needs & interests will fail.

Changing goals to match stakeholder needs & interests is leading cause of significant scope changes.

Leading cause of budget failure is project activity not aligned with project goals.
You may think you understand stakeholder needs & interests → but you don’t know until you ask.

Stakeholder interests, once established, must be managed by PM:
> Needs shouldn’t change, interests can be managed.

Document needs & interests (listen + write)
Stakeholders Are/Are Not

- Are our customers & require customer service
- Are Not tasks experts → focus on needs & interests, not tasks
- Are input for project definition → why we’re doing the project
- Are Not responsible for performance → deliver them results
River Plus+ Goals

- Provide for load supply & transfer to northern grid section
- Improve system reliability & flexibility of northern grid section
- Complete project with minimal impacts
- Project alignment with Company strategic goals & plans
Assumptions & Risks

- Based on planning horizon......
  - .....(some typical areas)
  - System interface/interconnection
  - Project lifecycle defined approach (series or parallel)
  - Project acceptance (internal & external)
  - Constructability
  - Project team experience & expertise
There is no such thing as invalid risk....

....there is realized and unrealized risk

Every project has risks....

.....it’s a matter of whether PM identifies & understands them or not
Scope

- Work Breakdown Structure (WBS)
  - Deliverable orientated hierarchical decomposition of the work to be executed by the project team
  - Incremental decomposition (break down) of areas of scope into the tasks necessary to complete that work scope
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WBS

- Developed at project level based on objectives, then refined (decomposed) by task areas into known tasks

- As planning horizon changes so will definition & detail of WBS

- WBS should be combined into project schedule & become interchangeable with project plan/schedule
Planning Horizon

- That level of project detail that can be realized out as far as practical
- Function of experience/expertise of project team
- Don’t Squint to See → more important to see clearly from present to your planning horizon than it is to try and ‘squint’ to see further
- Items fuzzy on horizon can be put on sideboard until better understood
Define PM Procedures

- Common practices to manage issues, scope changes, risk, quality, communications, etc.
- Develop means by which these common tasks will be handled
- Project Administration Manual → admin specification
Project Schedule

- Integrates WBS into visual form & time based plan
- Use scheduling tool (Primavera, Project, etc.)
- Scheduling tools are adjustable & provide feedback & understanding
- Up front set-up & maintenance of integrated schedule allows project team to manage from schedule
Scheduling Techniques

- Integrate entire schedule → can always be sorted into manageable sections
- Assign resources & resource load
- Logic tie activities (resource & sequence)
- WBS change = schedule change
River Plus+ Objectives

- Load supply to new distribution
- Load transfer to northern section
- Multiple interconnection points
- Upgrade facilities (T&S)
River Plus+ WBS
Scheduling Concepts

- Task = specific identifiable activity with define output
- Duration = measure of time from start to completion
- Resource = assigned work entity performing task
- Resource Hours = amount of labor time to complete task
Scheduling Concepts

- **Calendar** = layout of working vs. non-working time periods
- **Predecessor** = list of applied logic ties
- **Baseline Finish** = date of task completion based on initial schedule
- **Schedule Slip** = amount of time task completion moved from baseline to actual finish
Scheduling Concepts

- **Critical Path** = sequence of tasks that will result in the latest completion
- **Float** = amount of time that an activity has until becomes critical path
- **Slack** = amount of time between critical path completion and required finish
Scheduling Concepts

- Logic Tie = representation of defined link between 2 or more tasks
- Tasks linked with logic ties will move in schedule based on logic tie sequence
- Types: finish-start, start-start, finish-finish
- Methods: sequence (this than that), resource (available vs. assigned)
River Plus+ Schedule
Project Budget

BUDGETING

A decision-making process in which management dangles less-than-adequate resources over our heads to see which of us begs most convincingly.
Detailed Budget

- Preliminary (overall) budget based on industry practices & past projects
- Preliminary cost estimates ‘presented’ hold more value than detailed project budgets
- WBS-Schedule resources & hours x labor $ = internal development budget
- Construction budget requires specific construction expertise & research
Detailed Budget

- Establish budgeting monitoring methods to align with goals/objectives
- Consideration to required reporting methods and groups
- Align scheduling progress with budget performance
- Budget control is function of approving spending → establish budget control methods
River Plus+ Budget

- River Plus+ Preliminary Design
  - 46 miles double circuit 345kV line
  - 71 miles single circuit 115kV line
  - 1 new 345kV substation bay
  - 2 new 115kV substation bay
  - New substation 345kV section
River Plus+ Budget

- 46 mi x $1.9M/mi = $87.4M (345 Line)
- 71 mi x $350K/mi = $24.6M (115 Line)
- 345kV Bay Addition = $18.7M
- 2 115kV Bay Addition = $14.8M
- 345kV Section Addition = $32.2M
- Design & Engineering = $17.8M
- Environmental & PM = $8.6M
- Total = $204.1M (Prelim Budget $240M+)
River Plus+ System Upgrade

- Foxtrot Substation 345/115 Ring Bus
  - New 345kV Bay
  - New Double Circuit 345kV Line
  - New 345 Section

- Kilo Substation 345/115/41.6 Bkr¾
  - New 115kV Line
  - New 41.6kV Line
  - 41.6kV Load

- River Plus+
  - New Industrial Load
  - New Residential Load

- Tango Substation 115/41.6 Bkr¾
  - 41.6kV Load

- Zulu Substation 345/115 Ring Bus
  - New 115kV Line

- Papa Substation 345/115 Ring Bus
  - New 115kV Bay

- Bravo Substation 115/41.6 Bkr¾
  - 41.6kV Load
Managing Work

- Use performance metrics to monitor progress
- Establish what needs to be monitored & establish metrics early
- Small variances tend to grow if not resolved quickly
- Managing performance includes looking for warning signs
Performance Metrics (KPI)

- Progress burn curves (progress vs. time)
- Budget performance (actual vs. budget)
- QA/QC (quantity comments/issues)
- Deliverable vs. Schedule
- Earned Value (resource loading based)
Developing KPIs

- Measureable performance with specific goals
- Ease of reading & understanding
- Should ‘tell the story’ of performance
- Production based on schedule
KPI Language

- **Scheduled** = planned progress
- **Forecast** = extending our new plan past actual production
- **Trend** = production based on past performance average
- **Recovery** = plan to make adjustments to forecast a reality
**Earned Value (EV)**

- WBS → Resource Load → Schedule
- Assign specific value to each task (typical: cost, hours)
- Establish EV rules (% complete, 0/100, 20/80, etc.)
- EV comparison of planned vs. actual value completed
**EV Advantages**

- Better indicator of true performance as value tracked against planned value
- Provides indication of schedule performance and cost performance
- Not just track ‘items’ but value weighted
- Better means of forecasting end of project performance (variance)
EV Examples
EV Examples

Earned Value Method
Project Warning Signs

- Small variances tend to grow
- Tasks completed but still have activity
- Schedule slips or excessive use of unplanned OT
- QA/QC issues
Project Standards

- Project Document
- Project Administration Manual
- Preliminary Design Packages
- Design Criteria
- Environmental Reports
Project Standards

- Land Acquisition Strategy
- Electrical Studies
- Permit Documents
- Technical Specifications
- Construction Packages
Project Communications

- Establish clear communication protocols at start (who/what/how)
- Different levels of tasks require different communications → plan for it!
- Classify communications and what level is appropriate
Prioritize communications

- Time for response, how documented, etc.
- “If everything is important, then nothing is important”

Ensure communications are ‘searchable’

Rinse & Repeat → once is not enough
River Plus+ Definition Phase

Putting definition and detail into the project fundamentals that have been established
Due to an increase in load growth, need to increase power delivery capacity on northern section of transmission system to support new build out of industrial and residential load.

1st Priority → short term load growth (380 MW) and long term forecast (420 MW)

2nd Priority → voltage stability of northern section by means of alternate load transfer means capable of 800 MW
River Plus+ Goals

- Provide for load supply & transfer to northern grid section
- Improve system reliability & flexibility of northern grid section
- Complete project with minimal impacts
- Project alignment with Company strategic goals & plans
Project Document

- Defined means & methods for project performance
- Project team determined
- Project Administration Manual
- Project Initiation → foundation for success
Time to Get Started!!

GET TO WORK
YOU AIN'T BEING PAID TO BELIEVE IN THE POWER OF YOUR DREAMS.
River Plus+ Objectives

- Load supply to new distribution
- Load transfer to northern section
- Multiple interconnection points
- Upgrade facilities (T&S)
System Definition

- System Studies → operating characteristics
- Develop design alternatives
- Feasibility Studies → compare alternatives
- Selection of ‘best’ alternative
‘Best’ Alternative

- Meets project objectives
- Satisfies project goals
- Reviewed with stakeholders (all of them!) → feedback
- ‘Best’ alternative is not the same as the coolest tech design!
River Plus+ System Overview

- Installation of new double circuit 345kV line from Foxtrot-Kilo substations
- New lines for industrial (115kV) & residential (41.6kV) loads
- Upgrades to Foxtrot, Kilo, Bravo substations
- New Bravo-Kilo 115kV line
River Plus+ System Study

- Interconnection study that determines system impacts
- Identify required modifications → determines work scope
- Result = who does what (WBS) & how much (Budget)
PM Focus

- Public Involvement → review of project, impacts, route challenges
- Agency Involvement → defining permitting process
- Corridor Studies → potential impacts, preliminary routes
- Constructability → compatibility with system
Stakeholder Refinement

- Determining who specific outside stakeholders are
- Refine interests with stakeholders
  - Needs should not change within organization
- Stakeholder feedback defines tasks in WBS
Standards & Practices

- Detailed Design Criteria
  - Foundation for design parameters & how to design
- Key document to ‘guide’ design efforts
- Design Criteria meets project goals & objectives
Design Criteria

- Guidelines for consistent approach to design & engineering
- Develops standards which will be utilized
- Agreement between design & project for how facility will meet operating characteristics
- Coordinate with permitting documents → consistency throughout
Definition Phase Deliverables

- Physical definition (what & where)
- Design Criteria
- Defined permitting requirements
- WBS
Definition Phase Schedule
River Plus+ Design Phase

Putting detail to the project and detailing physical description & operations
Design Concepts

- Fundamental: Interconnection, Type selection, Routing, Configuration
- Physical: Structure, Loading, Foundation
- Electrical: Insulation Coordination, Stress/Strength, TRV/TOV, Fault
- Auxiliary: Parallel, Induction, EMF, Grounding
Preliminary vs. Detailed Design

- Preliminary → design output for others
  - Route Centerline, ROW, Configuration

- Detailed → design output for construction

- Preliminary accounts for ~70% of design efforts
Transmission Design Phases

- Design Criteria
- Electrical → Configuration
- Structural → Conductor, Structure, Foundation
- Interactive → Electrical & Design studies
Substation Design Phases

- Design Criteria
- Electrical → Configuration, Wiring Layout
- General → Physical, Structure/Bus, Foundation
- Protection & Control → Relay, Controls, Instrumentation, Monitoring & Communications
River Plus+ Design Schedule
Design Phase Interactions

- **Land Acquisition:** Route, ROW, Structure, EMF, Induction
- **Environmental:** Route, Structure, Electrical Performance, Construction Means & Methods
- **Procurement:** Specifications, Materials
- **Legal:** Route, Design Criteria, Electrical Performance
Parallel Activities

- Land Acquisition → structure location adjustments
- Environmental → surveys impact locations
- Public Involvement → setting up permitting
- Procurement → material availability
PM Focus

IF WE WAIT

UNTIL THE LAST MINUTE TO DO IT
THEN IT WILL ONLY TAKE A MINUTE

motifake.com
PM Focus

- Sequence & priority of tasks (maintain priority)
- Schedule for deliverables (impacts on other sequences)
- Design scope creep → tech supports goals/objectives
- Design supports constructability
Contracted Design

- Staffing & expertise challenges may necessitate assistance
- Benefit experience & expertise → specialists
- WBS set-up for value added components
- PM Focus → look for ‘fit’ with organization
Utilizing Consultants

- Like-minded Lead with overall experience & expertise
- Clear defined WBS for work to be performed
- Defined process for scope control & changes
- Balance of involvement & scope (value added)
Additional Considerations

- Means of QA/QC checks on contracted scope
- Liability & scope → partial work of defined deliverable
- Contract type & project controls
- Align deliverables for ease of integration
River Plus+ Permit & Procurement Phase

Accomplishing permitting tasks to allow construction.

Procurement of materials and contractors.
Permitting Phase

- Regulatory requirements → applications → permits
- Environmental surveys → reports → applications & routing → permit support
- Public Involvement → data collection → routing → permit support
- Design → inputs to applications → routing → restrictions
Permitting Phase Keys

- Gather early (survey, PI) → harvest late (last before construction)

- More you know → quicker/easier the process

- Define WBS and interactions → quick/simple but very impactful

- Repetitive PI → listen/discuss/answer → understanding & support
Federal vs. State

- Meet with regulators early (stakeholders) → needs & interests
- Requirement may differ → but not enough that can’t coordinate
- Use parallel approach & keep communicating
- Needs & interests are very similar
County & Local

- Meet with authorities early (stakeholders) → needs & interests
- Understand restrictions/limitations → can be very different
- Follow-up and communicate regularly
- Most susceptible to local perceptions
Permitting Success

- Define WBS and interactions early & monitor
- Missing interactions is #1 cause of significant pre-construction delays
- Understand needs & interests and make them part of design
- Design with constructability in mind
Procurement

- 2 major types: material & contractor
- Goal is to align materials & contractors to support project timeline
- Extremely hard (if possible) to be too early → don’t delay
**Material Procurement**

- Define WBS → who has what part
- Schedule activities → don’t ‘hope’ they’ll get done
- Know your vendor → more than a deliverable
- ‘Procurement’ group is part of team → not just paper pushers
Material Success

- Clearly defined material specifications
- Vendor pre-qualification
- Adequate timing → lead time x 1.5 (minimum)
- Utilize vendor expertise as part of design process (detailed)
Material Delivery

- Delivery schedules as part of contract terms
- Balance laydown yards vs. delivery vs. construction efforts
- Storage & packaging defined in specifications (or contract)
- Testing and QA?QC requirements identified in specifications
Contractor Procurement

- Experience/expertise/capabilities most important factor in qualification
- Key to construction success is ability & working relationship of contractor & PM/CM
- Pre-qualify contractors and sub-contractors
Contractor Qualification

- Pre-qualification required to make process realistic
- Qualification needs to include relationship & workability
- Relationship starts during pre-contract interactions
- Be thorough in qualification → highest risk relationship
Contractor Pre-Qualification

- Simple submittal of information
- Information: experience, expertise, financial, resources, equipment, safety
- Installation procedures → meet specification requirements
- Past performance → cost, schedule, safety
Contractor Qualification

- Know contractor → interviews & pre-bid meetings
- References → past performance (objective & subjective)
- Know project leaders → relationship key to success
- Is this someone who we would want to work with?
Contractor Selection

- Pre-qualification item scoring
- Construction means & methods
- Project due diligence
- Cost → direct & indirect
Contract Types & Methods

- Contract types & methods vary based on scope, risk, methods
- Every type/method has advantages/disadvantages → no ideal type/method
- Types & methods may vary within project based on application
- Support goals & objectives and agreed with stakeholders
There is no such thing as invalid risk.....
.....there is realized and unrealized risk

Risk has tangible cost

- Construction cost will vary based on viability & perceived risk → amount of variation will be based on contract type/method
- Contract type/method determines who is responsible
Contract Types

- **Lump Sum**: specified cost for specified amount of work

- **Unit Price**: specified cost for specified unit of work (time & materials is subset)

- **Cost Plus**: profit set at fixed amount

- **Guaranteed Maximum Price (GMP)**: estimate + profit = GMP
Contract Methods

- Design-Bid-Build: design phase $\rightarrow$ bid period $\rightarrow$ construction phase
- Design-Build: contractor hires design group and builds
- Engineer-Procure-Construction: EPC team $\rightarrow$ turnkey project
- Construction Mgmt: CM as advisor during design + general during construction
Contract Type Basis

- Contract types based on how contractor paid
- Risk management & viability determine which is best type
- Viability = measure of project definition (detailed)
- \[ \uparrow \text{Viability} \rightarrow \downarrow \text{Risk} \]
Contract Type vs. Owner Risk

- Lump Sum: ↑ Viability, ↓ Risk if specified (↑ Risk not specified)
- Unit Price: ↓ Viability, ↓ Risk (if units managed)
- Cost Plus: ↓ Viability, ↑ Risk (cost based on viability)
- GMP: ↑ Viability, ↓ Risk
Contract Method Basis

- Methods based on Owner involvement
- Who performs what tasks determines method
- Risk management will refine which method to use
- Cost differences can be significant (shared vs. total risk)
**Methods-Involvement-Risk**

- **DBB:** Design ↑, Construction ↔, Risk = Shared
- **DB:** Design ↓, Construction ↔, Risk = Contractor/Shared
- **EPC:** Design ↓, Construction ↓, Risk = Contractor
- **CM:** Design ↑, Construction ↑, Risk = Shared
Contract Add-Ons

- Profit & Overhead → 12% - 16%
- Sub-Contractor Mark-Up → 10% - 20%
- Materials → 5% - 10%
- Realized Risk → maximum amount realized
- Unrealized Risk → maximum amount of probability to become realized
Type/Method Considerations

- Who is doing design?
- How much risk does project want to accept?
- What will level of viability be?
- How much cost can be withstood?
Construction Contract Success

- Defined WBS with comprehensive unit costs
- Detailed unit cost controls viability based cost decisions
- Defined communication and change protocols
- Defined responsibility for risk decision making
Permit & Procurement Schedule
PM Focus

- Contract type/methods that support project goals
- Know & understand internal resources & management methods
- Well defined construction contracts
- Building relationships to support management methods
Deliverables

- Applications submitted that lead to receipt of applicable permits
- Material contracts & supporting delivery schedules
- Contractor selected and part of project team
Value Optimization

- Exercise of project review by design & contractors
- Focuses on meeting objectives & keys on constructability
- Utilizes the experience & expertise of vendors/contractors
- Cost savings & team building → project ownership
Value Optimization

- Brain storming session → let questions & thoughts flow
- Follow-up with additional research & cost
- Open forum → have team selected so team benefits
- Decision basis must be towards meeting project objectives
River Plus+ Construction Phase

Building the design leading to operational facility
Project Reporting

- Part of Project Administration Manual
- Varied levels of reporting based on stakeholder needs
- Key elements: Progress, Performance, Forecasting
Project Reporting

DISTINCTION
Looking Sharp is Easy When You Haven’t Done Any Work.
Reporting Progress

- Means of daily (POD) and monthly (Report) reviews
- Comparison to schedule/planned progress
- KPIs provide quick visual reference
- Include obstacles to progress → identify risk
Performance is the level at which progress has been completed.

Key areas: Safety, QA/QC, Cost, Risk, Impacts.

Performance provides an indication of expertise in completing tasks.

Impacts: ROW, environmental, public perception, requests for direction, etc.
Reporting Forecast

- Forecast is the exercise to look ahead and predict project completion based on current progress & performance

- Key areas: Progress, Cost

- PM Focus: utilize dual means → KPIs and contractor reporting

- Differences should be reviewed and analyzed (risk?)
Construction Metrics

- Progress & forecasting can be combined
- Measure against baseline from bid
- Measure against interim milestones → not just 100%
- Display metrics → increase project ownership
Metric Example

Completion Dates
Milestone: 12/23/2015
Scheduled: 12/1/2015
Forecast: 11/20/2015
Trend: 11/20/2015

Scheduled Week
Complete Week
Scheduled Total
Actual Total
Forecast

Foundations Installed

Construction Milestones

- Defined progress points during construction sequence
- Progress goals to meet to ensure timely completion of project (or phase)
- Typically defined in contract terms & tied to award/penalty
- Necessary to keep project completion on track
Interim Milestones

- Used as intermediary check points to gauge project progress
- Should be contractually defined & tied to award/penalty
- Allows for mid-schedule progress discussion & adjustments
- Eliminate ‘tidal wave’ of end of project activities
Construction Budgeting

- Initial based on experience & industry information (past projects)
- Better experience = better estimate
- Utilize ‘right’ resources up front to develop quality estimate
- Adjusted following Value Optimization (before construction)
Construction Mgmt Methods

- Critical Path Method (CPM): detailed schedule & logic sequence
- Program Evaluation & Review Technique (PERT): CPM schedule + risk probability
- Lean Construction: maximizing efficiency & building task sequence
- Monte Carlo: forecasting & managing probability to build task sequence
- Line of Balance: production rate of parallel/interrelated activities to build sequence
CM Role & Function

- On site field manager of construction activity groups
- Manages construction activity sequence to ensure work completed
- Provides oversight for the coordination of construction activities
- Handling of field related issues that arise
PM-CM Coordination

- PM = Overall Project, CM = Field
- CM field representative of PM
- CM modeling processes & procedures for field personnel
- CM responsible for alternatives & solutions to field issues (PM approval)
Scope Control

OH CRAP!
That was beyond the scope of authorized work, wasn't it?
Scope Control

- Process defined during bid process
- Approval levels based on impact
- Supported by reference to project objectives
- Communication means with stakeholders
Scope Control

- On-going process → not lump sum approach
- Make decisions in timely manner → festering scope grows
- Define decision making authority
- Scope changes must have same diligence to detail as WBS
- Proactive → not after the fact review & approval
Information Flow

- Define how information flows and to whom & when

- Be alert for informational tidal waves that build up and crash late in project

- Utilize multiple means of passing information (meetings, email, reports)
Information Flow Means

- Request For Information (RFI)
- Instructions to Contractor (ITC)
- Action Items
- Change Orders
Key Information

- Schedule status and ‘look ahead’
- Technical changes/adjustments (drawings, specifications, ITCs, etc.)
- Construction Reports → performance reviews & acceptance
- Realized risk & mitigation means & methods
Substation vs. Transmission

- Substation is single point location → design & build focus on singularity

- Transmission is multiple point based → build introduces multiple points of induced risk
Performance Success

- Know specifications & standards
- Track progress and performance
- Monitor & adjust for quality
- Don’t allow ‘process’ to hinder progress
Quality Success

- Defined specifications
- Observation → eyes & ears
- Engineering review of means & methods
- Engineering review of results (construction reports)
Quality Measures

- Review & approval of installation plans
- Mock-ups & walkthroughs → training the trained
- Train observers specifications & expectations on means & methods
- Early Engineering quality reviews
Inspection/Observation

- Eyes & ears of Owner & Engineer
- Observe & report → not direct
- Assist in determining what quality is
- Foundation in quality based relationship
Construction Risk

- Most construction risk comes from lack of due diligence
- #1 form of construction risk is site access related
- Risk is realized by continually defining new planning horizon
- Manage realized risk the same as scope control
Delay Basis

- Progress based → ability to complete tasks
- Material based → availability of materials
- Quality based → re-work delaying progress
- Risk based → ability to recognize & mitigate risk
Managing Risk

- Utilize due diligence & experience to identify risk early (Value Optimization)

- Use combined ‘look ahead’ process

- Track realized risks & take action (Action Items, RFI, etc.)

- Murphy’s Law (Risk) → realized risk not acted upon will not only occur, but will multiply in impact when it occurs
**Construction Cost Traps**

- Unrealized construction costs come from 2 areas: scope changes, unrealized risks

- Most impacting scope changes → design changes during construction

- Most impacting risk → site access (#1 transmission cost increase)
Site Access

- Design with constructability in mind
- Due diligence during bid process identifies risk (unrealized → realized)
- Identify means of mitigating realized site access needs
- On-going ‘look ahead’ process → identify & mitigate
Construction Schedule
CM Focus

- Progress & Performance vs. Schedule
  - Coordination of work activities
- Identifying & mitigating field risk
- Alternatives & solutions to field issues
- Controlling work scope & schedule sequence
PM Focus

- Scope control levels & identified responders → adequate & timely control
- Reporting methods → progress, performance, forecasting
- Cost control through risk mitigation
- Activities support project goals & objectives
Conflict Resolution

- Dispute resolution as part of Project Administration Manual
- Standards of documentation & investigation
- Timely response & resolution → festering disputes grow
- Most disputes are risk based → managing risk will manage disputes
Conflict Response

It is very difficult to be polite if you are right.
Construction Success

- On Time – Under Budget
- Risk managed & has minimal impact on progress
- Disputes settled in mutually agreeable manner
- Quality construction that yields long lifecycle
- ‘We’d work together again’
Project Closeout

- Lessons Learned → identify & change based on what learned
- Project documentation → ability to recover info & basis
- Project objectives met → supporting documentation
- Stakeholder follow-up → reviews with each/every group
What is Project Success

- Completion of a group of tasks or activities grouped towards a specific project that encompasses the following:
  - Within budgeted cost
  - At proper performance/specification level
  - With acceptance by customer/user
  - With minimum or mutually agreed upon scope changes
  - Without disturbing main work flow or company culture
Successful Project Mgmt

1. Plan the work by utilizing a project definition document
2. Create a planning horizon
3. Define project management procedures up front
4. Manage work plan and monitor schedule & budget
5. Look for warning signs
Successful Project Mgmt

- 6. Proper approval of scope change requests
- 7. Guard against scope creep
- 8. Identify risks up front
- 9. Continue to access potential risk throughout project
- 10. Resolve issues as quickly as possible
Project & Construction Management Techniques

Successful methods and processes for managing power delivery projects

Duane Phillips
Senior Project/Construction Manager

Stanley Consultants INC.