Project Success Assurance For Major CAPEX

Best Practices and Lessons Learned

Presented at the GasPRO Americas 2016 Conference in Houston, TX

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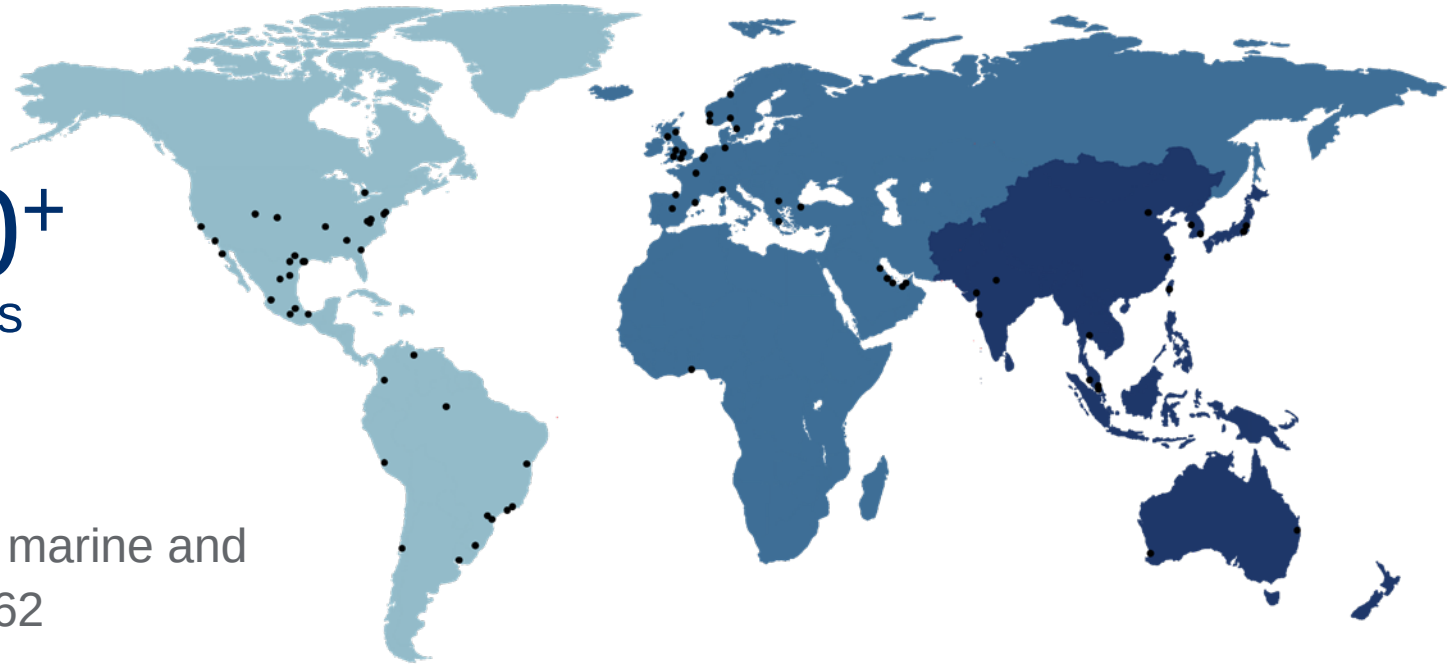
Company Mission

The mission of ABS Group of Companies is to be a leading global provider of technical services that better enable our clients to operate safely, reliably, efficiently, and in compliance with applicable regulations and standards. We are focused on adding value to the industries we serve and strategically capturing synergies with ABS.

1300+
Employees

30+
Countries

40+
Years



Parent company, ABS, is the world's leading marine and offshore classification society, founded in 1862

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Value Proposition/Service Lines/Goals

Project Success Assurance | **Preserve License to Operate** | **Improve Profitability**

Total Performance Management Services to help Companies Achieve Operational Excellence

Technical Inspection & Verification	Safety, Risk, Compliance	Asset Performance Optimization	Advanced Engineering	Management Systems Certification
CAPEX Phase PQM/TPI ASME/PED Source Inspection Engineering Verification & Certification Project Supervision Software & Control System Integrity MI/AIM Program Development MI ITPM Plan and Procedures	**CAPEX Phase** PSM/RMP Development Construction HSE Services PHA/SIL/LOPA/QRA Natural Hazard Risk Security Risk-Cyber PSSR/Commissioning Support Environmental Permitting & EIS Enterprise Risk Management	**CAPEX Phase** EAM Program Development Reliability Engineering and RAM Studies CMMS Selection & Implementation Spares Optimizing Maintenance Procedures	**CAPEX Phase** Facility Siting Studies Buildings & Infrastructure Structural Engineering Studies	**CAPEX Phase** Vendor Audits
OPEX Phase Asset Register Verification Mechanical Integrity/AIM Implementation In-service Inspection & RBI Fitness for Service MI ITPM Plan and Procedures	**OPEX Phase** PSMRMP Implementation Risk Analysis Incident Investigation/Root Cause Analysis PSM Metrics Safety Culture Software Tools Training	**OPEX Phase** EAM Implementation Field Reliability Consulting Maintenance Planning Condition Monitoring Solutions Spares Optimizing Operational Excellence Training	**OPEX Phase** Facility Siting Studies Building/Structure Remediation Incident Investigation Engineering Failure Analysis Life extension Studies	**OPEX Phase** Third-party Audit & Certification: • ISO-9000/14000 • AS-9000 • ISO-28000 • ISO-27000 • ISO-50000 • Responsible Care • Training

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Why We Are Here Today?

Topics at this conference

- The future of mega-projects
- Avoid project train wrecks
- Capital effectiveness
- Improved project efficiency
- Contracting strategies/trends for success

Bigger projects - too big to fail

Declining CAPEX budgets

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Prelude

- Many projects experience failures that result in poor project delivery performance or process capacity/reliability degradations after commissioning
- Many studies have shown that 60% to 95% of equipment life cycle costs (TLCC) are a result of decisions made (in CAPEX) prior to handover/start-up and transfer to owners (maintenance or operations) in OPEX
- Wouldn’t it make common sense to manage the risk of CAPEX project failures in advance and address equipment life cycle decisions in (CAPEX) rather than after commission handover phase (OPEX)?
- Shouldn't owners "invest" in project success "insurance" to help ensure that these multi-billion dollar projects are delivered as they were intended?

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Owners Need to Ask Themselves

- Are you receiving the value proposition from your chosen EPC that they committed to delivering and that you are paying them to deliver?
- Can you stand behind the lifecycle assurance you are receiving and that it is “As Designed”…”As Built”…to “As Operating?”
- Has your Project Quality Assurance function transformed from “we think” …to “we know”… and verified by “we’re sure?”
- As an owner has your project team acquiesced the quality assurance function to the EPC?
- Do you as the owner have confidence that the EPC is representing you in an un-biased, impartial, objective manner and provides you with a 3rd party perspective?
- Do you believe that you don’t have to “inspect what you expect?”

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Owner Perspective of EPC Project Capabilities

Selected EPC firm is well-respected and selected based on blended industry experience, technical knowledge, and financial capabilities

Assembled the best project delivery team supported by strong executive leadership

Technical system capabilities well developed, integrated across the project lifecycle

Well-developed back office support systems…integrated, proven, tested, and previously deployed on similar projects

Common project management methodology and framework developed…shared agreement between owner and EPC

Conclusion… “It looks good on paper and we’re ready”

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Owner Reality Sets In

- Regulatory challenges hinder progress
- Project more complex than originally believed
- Governmental bureaucracy creeps in
- Risk management challenges surface
- Labor suddenly becomes scarce and difficult to identify needed skills and qualification
- Economic landscape changes impacting ever-changing demand forecasts
- Similar projects launched and create competition for resources (labor, materials, equipment)
- Over-optimistic schedule…poorly estimated budget
- Owner and EPC become project myopic

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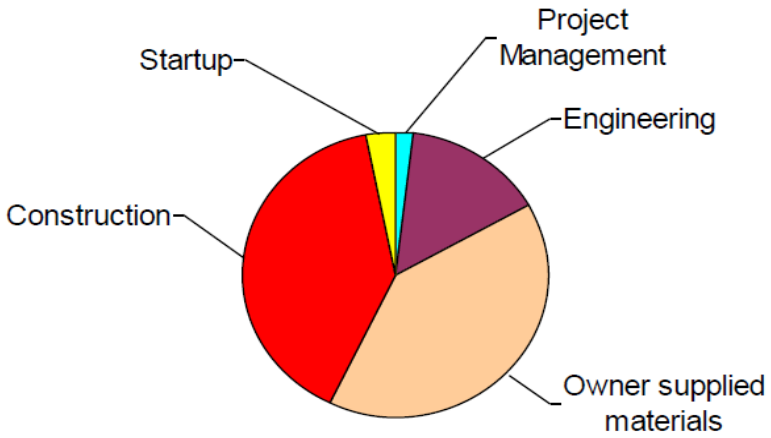
Industry Allocation of EPC Project Costs

1. Project Management (2%)
2. Engineering (15%)
3. Owner Supplied Materials (40%)
   (Equipment and Materials purchased directly by the owner)
4. Construction (40%)
5. Startup (3%)



What if you could…

- Reduce costs associated with construction AND improve productivity?
- Assure predictable and competitive project performance?
- Verify construction progress and results through “boots on the ground” assurance?
- Verified assurance that the EPC is delivering the results you (the owner) are expecting and are paying them to deliver?
- Dramatically reduce schedule variance and delays resulting in faster time to production?
- Imagine transforming your PROJECT SUCCESS ASSURANCE from “we think” to “we know” and then verify that “we’re sure?”

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Recurring Themes on Delivering Capital Project Assurance (1/3)

Perspectives on Quality Attributes in Capital Project Execution –

Accenture White Paper… "Delivering Strategies for the Effective Delivery of Capital Projects"

- Effective project delivery is critical to project success
  - 87% agree
- Percent of project delivered to budget
  - 30%
- Percent of project delivered to schedule
  - 15%
- Regulatory compliance cited as #1 challenge
  - 45%
- Lack of inability to acquire or source skills and competency
  - 37%
- Completed project delivered reliable production capacity
  - 31%
- Project team delivered to quality requirements
  - 21%
- Customer received expected business value from new assets…delivered to expectations
  - 19%

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Recurring Themes on Delivering Capital Project Assurance (2/3)

Perspectives on Quality Attributes in Capital Project Execution –

EY (Ernst & Young) White paper… "How Value Assurance Drives Successful Delivery of Oil and Gas Capital Projects"

- Percent of projects that are over-budget
  - 50%
- Percent of projects delivered late vs. scheduled delivery date
  - 58%
- Percent of projects with post-completion quality issues (defects)
  - 42%
- Percent of project total cost attributed to rework
  - 30% - 40%
- Percent of projects reporting insufficient due diligence performed prior to pre-FID (Fixed Investment Decision) planning and estimation
  - 56%
- Estimated budget percent spent on project assurance in oil and gas projects
  - 1.5%

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Recurring Theses on Delivering Capital Project Assurance (3/3)

Perspectives on Quality Attributes in Capital Project Execution -

Deloitte Whitepaper… “Effective Operational Readiness of Large Capital Projects”

- 30% of CAPEX value can be destroyed due to poor operational readiness

Booz-Allen Whitepaper… “Capital Project Execution in the Oil and Gas Industry”

- Over 40% of projects are plagued by budget and schedule over-runs

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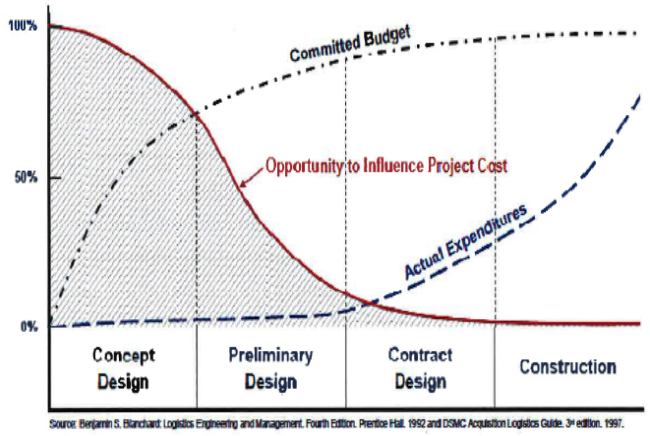
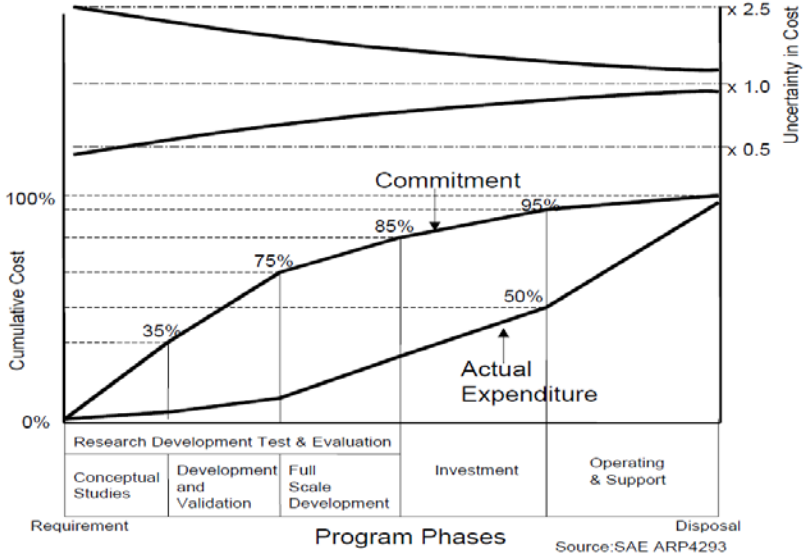
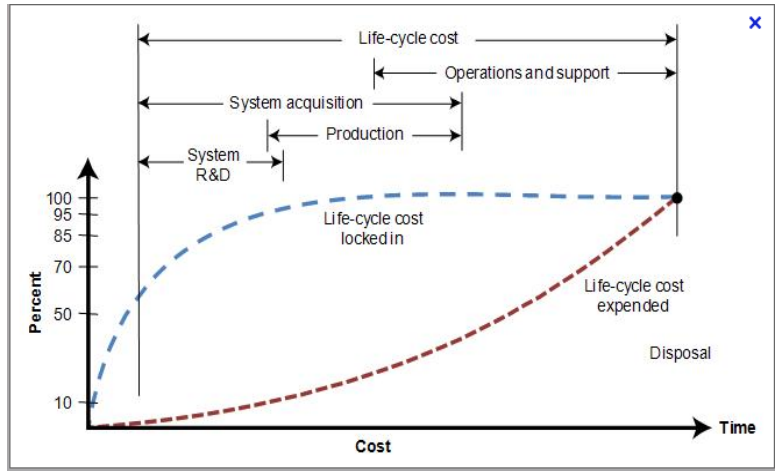
Diminishing Influence with EPC Project Phase Progression

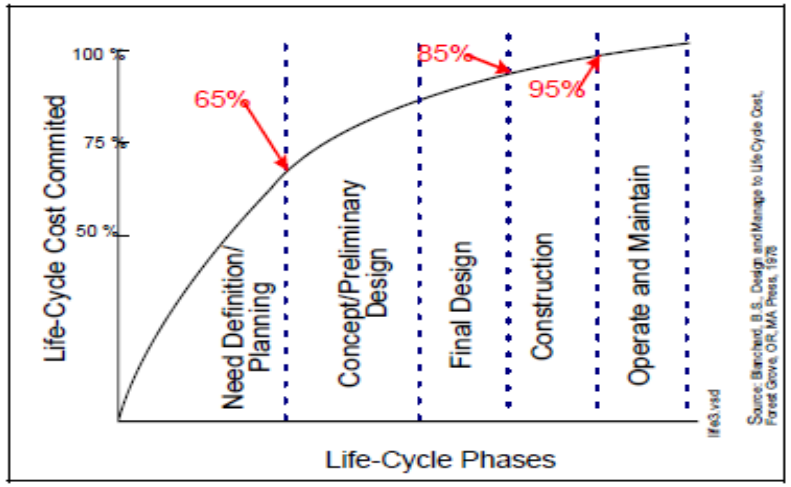
Per Blanchard[1]: The largest opportunity to influence total project costs are in the conceptual design and preliminary design phases







Pioneering work by Benjamin Blanchard and Paul Barringer



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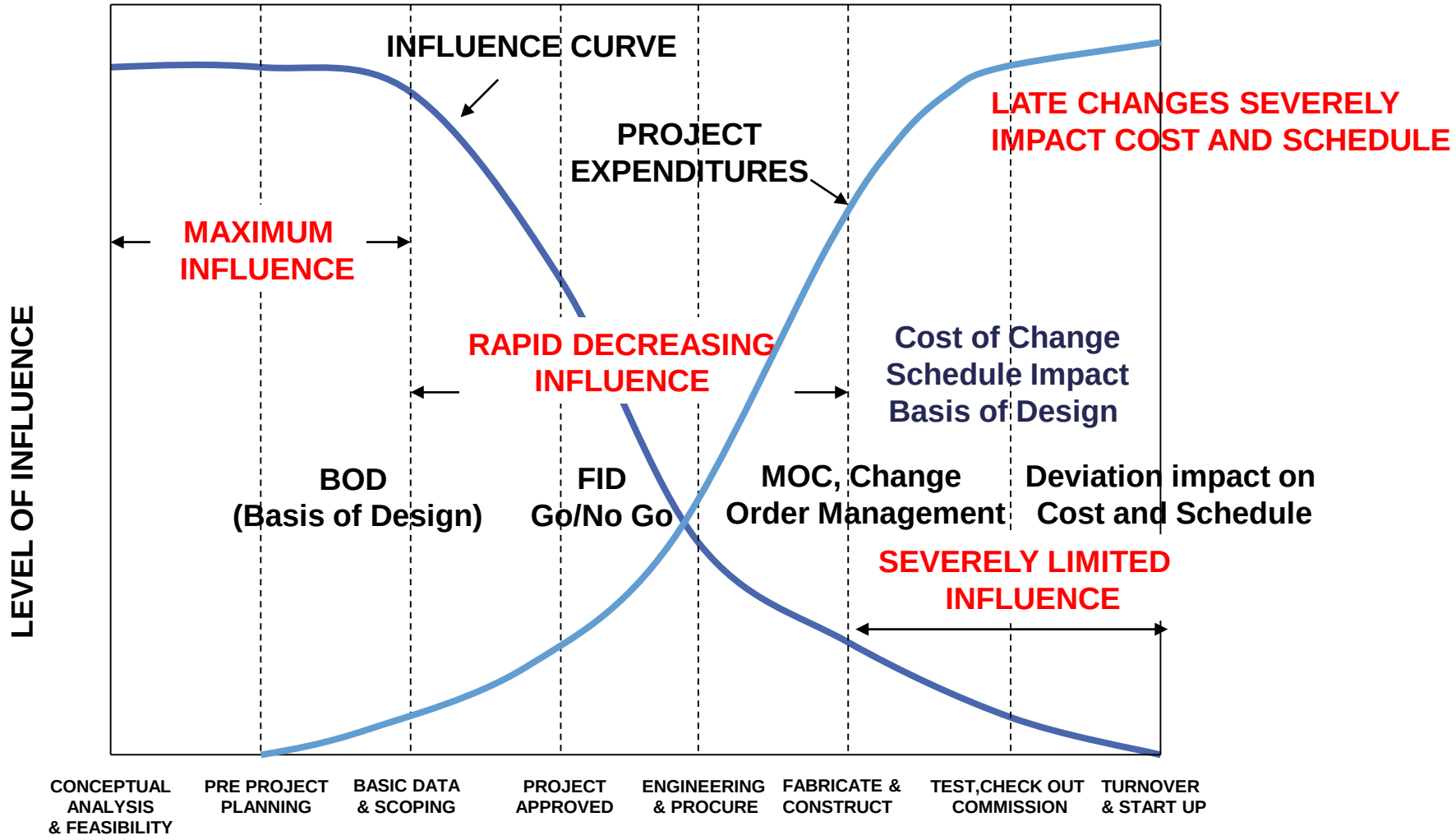
Diminishing Opportunity to Influence Safety/Costs/Operations



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Case Study: Owner Oversight on Procurement Quality and Inspection

Client: Owner Project Team Oversight on $multi-BUSD LNG Project

Background:

- ❑ Owner Procurement selected and approved vendor
- ❑ Qualified as “Approved Vendor” for Low Temperature Carbon Steal Valves
- ❑ Contract value to supply LTCS est. at $500KUSD

Process:

- ❑ Approved supplier couldn’t meet demand
- ❑ Without approval from owner, supplier went outside supply chain and sourced supply from un-qualified supplier
- ❑ Owner Procurement Dept. was un-aware of developments
- ❑ LTCS valves were “sampled” upon arrival and deemed acceptable and thus installed

Outcome:

- ❑ Upon EPC pre-commission check valves failed; owner was notified
- ❑ Owner inspection dept. sent to site and inspection revealed almost 100% failure and non-acceptance
- ❑ EPC removed defective LTCS valves and installed correct LTCS
- ❑ Cost of Quality estimated 4X original cost for: detection – QA/QC – removal – installation – project delay
- ❑ Serious Process Safety issue adverted
- ❑ Lesson Learned: “Move owner procurement team and EPC supplier from “we think to we know because we’re sure” QA/QC verification and validation

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Case Study: Inspection/Surveillance Technical Selection

Client: Owner Qualification and Selection of 3rd Party QA/QC Services provider

Background:

- ❑ **Owner technical qualification and verification of provider capabilities for $19BUSD LNG project.**
- ❑ **Eight (8) providers presented their technical capabilities. Estimated QA/QC contract value of $80MUSD.**

Process:

- ❑ **All providers claimed technical superiority and owner team performed technical vetting and due diligence**
- ❑ **Owner technical team selected preferred provider during 4 months of verification**
- ❑ **Owner Sr. Exec mgmt. recommended #1 highest bidder (based on cost) over #2 bidder**

Outcome:

- ❑ **Owners technical team performed a series of technical verification “deep dives” over a 2 month window between the #1 and #2 bidders**
- ❑ **Owners technical team recommended and exec leadership ultimately agreed with decision based on technical merit and capabilities to award contract to #2 bidder based on technical superiority**
- ❑ **Decision saved project $20MUSD and provided a superior technical solution**

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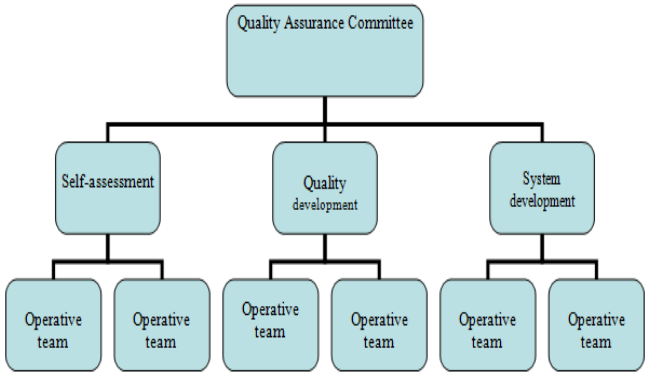
Case Study: Owner QA/QC Organizational and Strategic Development

Client: Owner Launches New Greenfield LNG Project



Background:

- ❑ **Owner project team needed to align organization and quality function in support of $29BUSD EPC LNG project**
- ❑ **Global project scope involving: Korea, China, Philippines, Australia, and Japan**

Process:

- ❑ **Developed and implemented in less than 2 months the following strategy, plans, procedures in support of owner project management PMO (project management office)**
  - ❑ Project Quality Plan
  - ❑ Verification of Contractor Activities
  - ❑ Audit Plan complete with Corrective Action Plan and Procedure
  - ❑ Corrective and Preventive Action Plan and Procedure
  - ❑ Inspection Procedure
  - ❑ Quality Surveillance and Surveillance Monitoring for Site and Vendor Inspection
  - ❑ Contractor Supplier Procedure
  - ❑ EPC Preservation Plan and Procedure
  - ❑ QA Readiness and Pre-Commission Plan and Procedure
  - ❑ Management of Change (MOC)

Outcome:

- ❑ **Plans and Procedures delivered on schedule and on budget**
- ❑ **Served as plan and procedural “go by” for EPC**
- ❑ **Reduced historical QA/QC project developmental cycle-time by 33%**

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Case Study: Construction Worksite Productivity Improvement

Client: Owner Oversight of EPC Construction Site

Background:

- ❑ Workface sampling revealed “gap” between hours charged VOWD/Claimed vs. schedule
- ❑ Owner had QA Team conduct “gap” analysis

Process:

- ❑ Low productivity was rampant as evidenced by:
  - ❑ No cascading of Look Ahead into 90-60-30-2 week and daily work schedules
  - ❑ No assignment by individual craftperson to the daily schedule…”by name to assigned jobs”
  - ❑ No reconciliation of the weekly work schedule on a daily basis noting any carry-over jobs, OT
  - ❑ Late start – early quits – no SIMOPS – extended breaks – mystery workers – no accountability – no capacity-based scheduling practices – little “planned work” practices…desktop scheduling virtually eliminated – no integration schedule X all shifts
  - ❑ Management had poor control/accountability – no “boots on the ground”

❑ Outcome:

- ❑ Work sampling indicated productivity at 25%...”Should be” 50% to 65%
- ❑ Implemented “Work Excellence”…Within 4 months productivity was measured at increasing 30%to approximately 55%
- ❑ Accomplished by:
  - ❑ Updated and accurate project schedule…WBS cascaded to 90-60-30-2 week and then into daily work schedule
  - ❑ Capacity-based scheduling was implemented – Field-based planning executed with coordination by Materials – delivered to the job-site
  - ❑ Integrated with Project Controls reporting improved accuracy of VOWD/Claimed…dispute claims dropped
  - ❑ Field Supers (Owner and EPC) required to jointly sign-off on completed WBS weekly/daily work schedules
  - ❑ Worker incentive plan and safety plan implemented
- ❑ Productivity improved 30%...labor “netback factor” of 1,100 employees (3,000 + 1,100 (30%) = 4,100
- ❑ Percent of Weekly Schedule Compliance improved over 6 mths. to 85%+ from low 40%
- ❑ Planned jobs improved safety/reduced accident rate
- ❑ Unplanned/Unscheduled O.T. reduced from 25% to 7%

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Case Study: Mechanical Integrity Assessment

Client: Independent Verification on behalf of owner and EPC

Background:

- Owner and EPC agreed to retain the services of a 3rd party to investigate problems associated with operational challenges and mechanical integrity issues
- ABS selected to perform independent design and MI assurance review
- A rupture in the flare line resulted in plant shutdown

Process:

- 3rd party investigated and conducted a through site assessment
- Early findings pointed to possible acoustic and flow-induced vibration

Outcome:

- An investment of $400,000USD over a 2 month period with a 7 day, 3 person team on-site resulted in:
  - Identified 105 issues
  - Developed 70 recommendations
  - Recommendations issued to the EPC for follow-up and closure

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Recurring Themes for Project Failures

- Incomplete view of project risks
- Project competence gaps
- Lack of attention to detail
- No trust but verify approach used
- Project risk mitigation too late
- Poor project culture

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What Defines Project Success?

- Within budget
- On schedule
- Meeting HSE goals during construction
- No security/theft problems
- Efficient commissioning
- Regulatory compliant
- Process capacity/performance delivered
- Other aspects for you…

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Steps for Project Success Assurance

1. Define success factors of interest
2. Determine how to monitor and mitigate success risks
3. Select options for project risk mitigation
4. Determine investment required for project success assurance
5. Implement scalable solution for Project Success Assurance based on project TIV
   - TIV $2M $20M $200M $2B $20B
   - PSA $20K $200K $2M $20M $40M
6. Execute project success assurance approach
7. Measure project success - lagging and leading
8. Evaluate project success
9. Evaluate project success assurance success

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Options for Assuring Project Success

- Depends upon starting point
- Depends upon investment willingness
- Depends upon project team capability/dependability
- Continuous project risk mitigation
- Stage-gate project risk mitigation
- Episodic project risk mitigation

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What You Can Do

- Learn/remember from your past projects
- Learn/remember from others
- Plan Project Success Assurance in advance for next project
- Invest in Project Success Assurance
- Reap the benefits from a more successful project

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Project Success Management Assurance Building Blocks

Preservation

Progress Measurement
And Performance

Strategy – Plans - Procedures

- Design and Constructability Reviews
- HSE On-boarding
- Capacity-based Scheduling
- Assurance Verification
- Project Controls
- Craft Skill and Competency Assurance
- Productivity
- Project Gate Management
- Risk Register
- Licensing and Certification
- Work Face Planning
- Audit
- QA/QC
- PEP – PQP
  CMP - PCP
- MOC
- Contractual Review
- VOWD
- RAM
- RBI
- RCM
- RCA
- KPI’s
- Plans

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Project Assurance Landscape

EPC firms too project-centric and not provide objectivity representing the owners perspective…"fox over-seeing the hen house" …leave before OPEX Phase and next project motivated
Top tier consulting typically lack expertise to adequately know where to look and apply boots on the ground from a construction site perspective…more strategy/PMO-based and lack execution ability based on CAPEX experience
Boutique consulting – lack staffing to cover long-duration projects and complex scope
Technical consulting – typically excel at process design but lack business perspective
Maintenance Consulting – largely focus on OPEX and not CAPEX
3rd Party Inspection/surveillance – experience in TPI/In-Service Inspection/Staffing but typically ignore assurance-based CAPEX/OPEX opportunities to reduce cost/identify savings/CI nor provide CMMS capability.

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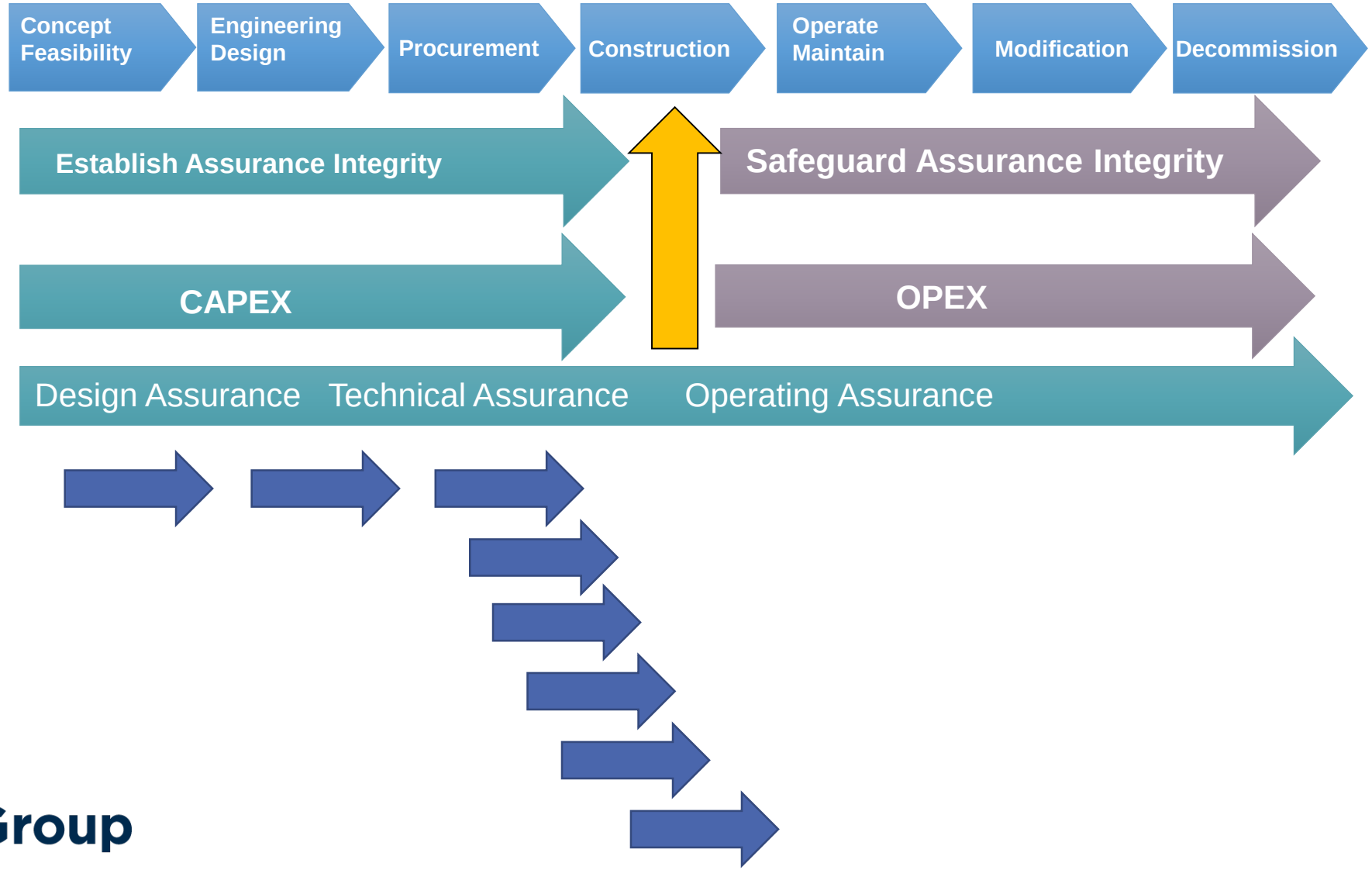
Project Success Assurance Across the Project Lifecycle



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Operational Excellence in Project Success Assurance

Instill a project success culture

1. Make project success factors a company value - not a priority
2. Sustain success leadership throughout project organization
3. Prevent normalization of deviance
4. Drive performance via fit-for-purpose management systems
5. Maintain a healthy sense of vulnerability
6. Empower everyone to achieve project success
7. Defer to expertise
8. Maintain effective communications
9. Create a question/learning environment
10. Understand the trust/verify level
11. Promptly respond to success threats
12. Continuously monitor and improve

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