

IPANewsletter



Weak Project Systems Imperil Next Generation Nuclear Projects

Edward Merrow, IPA Founder and President

I am among the many observers of our climate change crisis who believe that a robust nuclear power industry will be a necessary ingredient in any successful transition to a radically lower carbon environment. Despite all of the problems with the nuclear fuel cycle, it is difficult to see how a transition to a low-carbon electrified world can be accomplished without large quantities of reliable base-load power from nukes.

Necessary or not, new nuclear power projects are a rare bird indeed in the Western Hemisphere. The primary reason is simple: building a nuclear power station is one of the riskiest endeavors a power utility company could undertake. In the world of industrial megaprojects, nuclear stations have the worst track record of any other set of projects. Nuclear projects data from IPA's capital projects database show a median (half above/half below) cost overrun of 110 percent! The median execution schedule slip is 65 percent. By comparison, unsuccessful \$500 million-plus megaprojects in other industrial sectors (chemicals, oil and gas, refining, etc.) have median cost growth and execution schedule slip of only about 30 percent. Like most large, engineering-intensive megaprojects, nuclear power project outcomes tend to be bimodal. They tend to be very good or very bad. When they start to go wrong, they go very wrong.

So why are nuclear project outcomes so much worse than other industrial megaprojects? Often regulation and community opposition are cited as the culprits. In the early days of nuclear power, regulations were constantly evolving as more was understood about the technology.

IN THIS ISSUE:

Carbon Capture and Storage (CCS) Project Cost Norms Study	3
Sick and Tired of Supplemental Funding: Businesses Are Demanding Better Estimates	4
TrueCost Oil and Gas Data Software	5
Designing the Capital Delivery Framework for Wind Energy	6
Early Estimating Tool for Pharmaceutical Capital Projects	8
Offshore Wind Cost and Schedule Benchmarking Study	9
Site-Based Capital Projects Improvement Journey	10
Unprecedented Collaborative Knowledge Transfer in the Middle East	12
FEL Toolbox Updated for 2021	13
IPA Updates	13-14
IPA Institute Virtual Training Center	15
IPA Events & Presentations	16

Independent Project Analysis, Inc. is the preeminent organization for quantitative analysis of capital project effectiveness worldwide. At IPA, we identify Best Practices to drive successful project outcomes. www.ipaglobal.com

IPANewsletter

Independent Project Analysis, Inc.
Volume 13, Issue 3
September 2021

Edward Merrow
Founder and President

Elizabeth Sanborn
Chief Operating Officer

Nekkhil Mishra
Director, Europe, Middle East, Africa, & Russia

Phyllis Kulkarni
Director, North America

Paul Barshop
Director, Asia-Pacific

Astor Luft
Director, Latin America

Tony Nicholson, *Corp Communications Leader*

Jeanine Clough, *Graphic Designer*

Cheryl Burgess, *Senior Editor*

Loren Farrar, *Editor*

Leigh Ann Hopkins, *Editor*

Sherilyn Holmes, *Communications Coordinator*

IPANewsletter is published and copyrighted ©2021 by Independent Project Analysis (IPA), Inc. Reproduction of material that appears in IPANewsletter is prohibited without prior written permission from IPA.

IPA improves the competitiveness of our customers through enabling more effective use of capital in their businesses. It is our mission and unique competence to conduct research into the functioning of capital projects and project systems and to apply the results of that research to help our customers create and use capital assets more efficiently.



www.ipaglobal.com

But that is largely a problem of the past, not the present. And community opposition is a fact of life for a great many megaprojects, many of which manage to succeed nonetheless by addressing concerns effectively.

The problem with nuclear power projects is they are just bad projects. They fail for the same reasons that many other megaprojects fail. They fail because too many of their owners are not strong enough project organizations to develop, define, and control projects of their size and complexity. These large complex projects really do not have to fail; we let them fail, and that should be considered good news because that means we can fix it.

Applying a generous set of criteria, about one-third of industrial megaprojects overall are successful; the corresponding number for nuclear power projects is about 10 percent. So what is the key difference? Successful megaprojects start with strong, integrated owner teams with all of the key owner functions represented. That team then guides the project through very complete definition of the project, which we call Front-End Loading. This entails understanding the site thoroughly and all of the regulatory requirements around the technology as it applies at the site. It requires progressing the engineering work to the point at which detailed design can be fully mobilized immediately after authorization. And it includes very complete project execution planning by the owner. Execution planning must be complete so that effective controls can be established and maintained. Contractors do execution planning for their work but not for the whole asset; that is owner work.

The ongoing National Academy of Engineering (NAE) study, *Laying the Foundation for New and Advanced Nuclear Reactors in the United States*, is focused on exploring the technical, regulatory, and economic outlook for future nuclear projects, with the added recognition that advanced nuclear technologies could provide a zero-carbon source of power in support of U.S. efforts to decarbonize energy production. It is my view that this mission is all but certain to fail unless the root causes of nuclear project failures are addressed.

The NAE panel is focused on future nuclear reactor technologies and how they might reduce the problems associated with the extraordinarily large and complex projects presented by today's nuclear technology. The problem I see is that by the time those technologies are ready to deploy, time may well have run out on our ability to mitigate climate change. There is no equivalent of the FDA's "emergency use authorization" for new nuclear power plant designs. So if we are going to succeed, we probably will have to succeed with today's pressurized water reactors, not the advanced modular and micro-reactors of the future. That means, in turn, that we have to address the causes of today's project failures.

The primary cause of today's nuclear project failure is organizational: the utility companies in the United States and Europe are not strong enough megaproject development and delivery organizations to get the job done. Historically, only a few utility companies (e.g., Duke and TVA) had the project system strength needed to deliver nuclear power station projects. Most utility organizations will do one megaproject a decade, maybe not even that many. Therefore, they never really build the muscle that is needed within the organization to deliver large complex projects. Electric utilities have been traditionally very dependent on contractors working on generous lump-sum engineering, procurement, and construction (EPC) arrangements to deliver their projects. This strategy limited

both the risk and the personnel requirements for the utilities. It is not a particularly cost-effective strategy, but it has been workable for less complex projects. But it is not a workable strategy for nukes because the risks to the contractors are far too high.

So, is there a path forward for nuclear power? Possibly, but only with significant changes. In the United States, I believe that only a national strategy can work, in which a few utility companies, perhaps one in each region, are designated as the nuclear power providers for that region. Those companies will have to build—from the ground up—the kinds of owner project delivery systems that can develop and execute successful megaprojects. They can be guided by the best project delivery organizations in the oil and chemicals

industries, which do large complex projects much more often. The utility companies must see a payoff for the heavy investment in expertise they will have to make. That can only be provided by multiple projects over a substantial period of time. In Europe, an EU-wide strategy would be needed, which seems very unlikely in light of Germany's rejection of a nuclear-powered future.

Without a significant nuclear-powered component, we may have already lost control of our future.

This paper is based on a presentation to the panel preparing the National Academy of Engineering's (NAE) study, *Laying the Foundation for New and Advanced Nuclear Reactors in the United States*. Merrow's presentation and recorded remarks are available at the National Academies committee's meeting webpage.

Carbon Capture and Storage (CCS) Project Cost Norms to Improve Early Decision-Making



IPA is launching a multi-client research study to establish capital cost norms for carbon capture and storage (CCS) projects. Owner companies that participate in the study will gain access to essential CCS project cost metrics and insights to directly inform and improve early decision making for CCS projects. The study is slated to kick off in the fourth quarter of 2021, and those who join from the start will have the opportunity to directly influence the study scope as part of the steering committee.

Industry Needs Reliable Carbon Capture and Storage Data

CCS projects are increasing in frequency and global significance as regulatory entities, investors, and shareholders further drive the demand for decarbonization and sustainability. However, because relatively few CCS

projects have been completed to date, owner companies do not have access to reliable cost estimate and performance data needed to inform decision-making. While other organizations have previously conducted CCS cost studies, the results are heavily reliant on assumptions and idealized scenarios. Adding to the complexity of unreliable cost metrics in literature is the uncertainty of developing CCS projects with non-commercial capture technologies.

What Sets IPA's CCS Study Apart

In addition to establishing capital cost norms for CCS projects, IPA's study will:

- Identify various implications of moving a CCS project from one location to another
- Address costs associated with first-of-a-kind projects in a new location
- Develop frameworks to assess risks and challenges of commercializing new technologies across different sectors
- Establish learning curves and metrics to help in early-phase technology screening and location
- Develop a common cost breakdown structure for CCS projects to enable fair comparison between projects and help drive adoption of results

IPA's Proven Methodology

- Study sourced by real CCS project data collected directly from project teams and participating companies
- All data normalized for time, location, and currency differences to enable robust analysis
- All data collected and aggregated securely and accurately

Companies interested in joining are urged to **contact Adi Akheramka at aakheramka@ipaglobal.com**.



Sick and Tired of Supplemental Funding: Businesses Are Demanding Better Estimates

Ronell Auld, IPA Advanced Associate Project Analyst

A good carpenter knows to “measure twice and cut once”—that is, plan and prepare to avoid wasting time and materials. This adage is applicable to capital projects too! Unfortunately not everyone involved in capital projects heeds this guidance. Independent Project Analysis (IPA) research shows that major late changes add on average 12 percent to the total project cost. Late changes—and the associated supplemental funding they require—are a threat to achieving the planned return on capital. Business executives are caught off guard and none too pleased when project teams come back for supplemental funding. But very often extra funds are needed because the level of project definition—and therefore the quality of the cost estimate—was not well understood when the project was authorized.

Every business relies on capital managers to deliver a competitive rate of return for their shareholders. Capital managers in turn rely on project teams to plan and execute capital projects (engineering, procurement, and construction). Business executives are typically far removed from the project team, but they are not removed from the project risks. While capital managers and project teams develop project estimates, business executives are responsible for authorizing the funds to execute the project work. Therefore, it is in the best interest of the business sponsor of the project, working on behalf of shareholders, to understand the quality of the estimates presented for sanction.

How is a business sponsor to know if the estimate accurately accounts for project scope and risks? The level of definition, or Front-End Loading (FEL), drives the quality of the estimate and thus lets the sponsor know how accurate the project estimate is likely to be. Projects that are not well defined have more unknowns, and the more unknowns, the less accurate the estimate. However, business discipline that links the level of definition to the quality of the estimate is often missing at the start of project investments. Business sponsors typically cling to the first cost estimate they hear despite a wide range of probable outcomes. AACEI definition of early estimates (e.g., Class 4 estimates), when very little engineering is complete, indicates an outcome range of -30/+50 percent. However, based on IPA’s study of the difference between FEL 1 estimates and final project costs, the variance is really closer to 70 percent! Too often, we have seen business sponsors, eager to see the project field work commence, proceed to full funds authorization with limited definition and too much confidence in the estimate. Business sponsors then become very frustrated with projects for overrunning their budgets.

The problem is not with the estimates; it is a lack of understanding of the basis of the estimates. Business sponsors should make sure the business case is robust on the high end of the estimate, not the mid-point, before authorizing a project with limited definition. Or, better yet,

business should provide the resources required to better define the project and develop a more robust estimate. Businesses often shift their focus to making the cut (i.e., starting construction) at the start of the project instead of measuring twice. It is easier to observe and appreciate the labor and material inputs for construction, but it is harder for business executives to observe and appreciate the resources required for upfront planning (e.g., defining a clear scope of work and developing control-grade cost and schedule estimates). Business is often hesitant to provide early funding to complete this front-end work; in other words, business is reluctant to measure twice.

IPA has done extensive work with business decision makers on understanding the quality of the project estimates and other outstanding risk, which helps executives make more informed decisions when authorizing projects. Recently, IPA was brought in to help a transportation company improve gatekeeping governance for authorization of capital projects. The company was facing several problems, including large overruns on recent projects. IPA evaluated the company's capital delivery process and interviewed key stakeholders to uncover the root causes of late changes. Based on our findings, the company has updated its work process to provide early funding and associated resources to complete basic design. This change gives project teams the bandwidth to further define the project and improve the accuracy of the

estimates presented for full funds authorization. IPA also helped the company add a decision gate for construction readiness (to inform business of risks and get a final baseline before giving construction contractors notice to proceed). The IPA team supported the adoption of these new gatekeeping processes through workshops involving both business representatives and project teams, and trained the gatekeepers to ask the right questions to better understand risk.

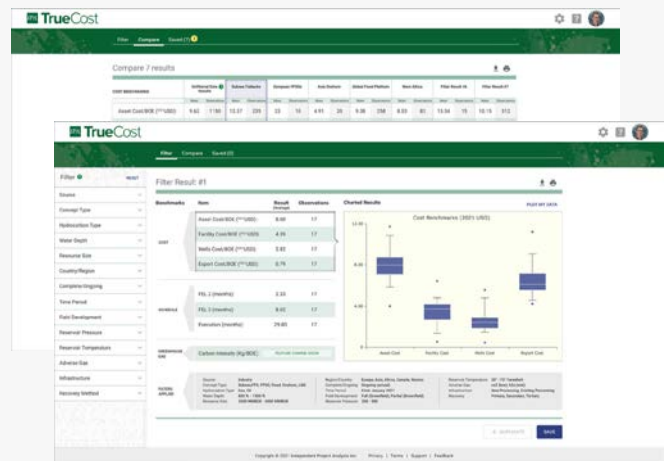
As it relates to capital projects, "measure twice and cut once" encourages companies to ensure that the time and resources required for adequate project definition are available to project teams. This is the optimal approach to reducing the risk of cost overruns, as the accuracy of the cost estimate depends on the level of project planning. Whether a company authorizes with very limited definition or full design specification, those business sponsors who authorize the projects need to be aware of the risk. IPA's Cost Group and Capital Solutions team work together to provide a wide range of services, including cost engineering systems and tools to produce better estimates, work process improvement, and guidance on project governance (e.g., what business should look for to obtain quality targets)—all targeting increased return on capital investments for our clients.

TrueCost Oil and Gas Data Software

Quickly Access Reliable Cost & Schedule Data to Improve Early Stage Opportunity Decision Making

- Assess the attractiveness of upstream oil and gas opportunities using real industry data
- Identify where the optimal opportunities are located for your company
- Compare your company's portfolio performance against competitors
- Eliminate the time consuming process to collect, verify, and normalize industry data from public sources

Contact Jason Walker at jwalker@ipaglobal.com to discuss how your organization can use TrueCost to improve early stage opportunity decision making.



Designing the Capital Delivery Framework for Wind Energy

By Maria Pinilla, IPA Project Analyst

The global drive to increase the use of renewable energy is providing unique opportunities—and unique challenges—for investors. This drive has led to significant investments in green power generation, including offshore wind. Because offshore wind provides one of the best and quickest ways to provide the grid with clean energy, there has been an influx of new developers, increasing competition in an already crowded market. The International Renewable Energy Agency forecasts average annual offshore wind investments to reach US\$61 billion per year by 2030, meaning companies in renewable energy will have larger portfolios with larger projects as the source of the resource gets further from shore. The push to increase investment at this high pace is putting a strain on companies seeking to take advantage of these opportunities.

IPA recently collaborated with an offshore wind company that is seeking to improve its project system to adapt to its

rapidly growing portfolio of capital projects. This company is a major player in offshore wind and expects to execute a large number of projects in the coming years, with several to be done in parallel across different geographical locations. Their corporate focus over the coming years is to deliver this portfolio both with low cost and on time.

Through project evaluations and interviews with key stakeholders, IPA identified focus areas for improvement in project planning and execution. The need to deliver such a large portfolio is pushing the company to review key areas in its system, areas IPA believes will resonate across all companies in this Industry. Questions being addressed include:

- Is the organization adequately set up for the new corporate objectives and rapid growth?
- What infrastructure and governance system gaps might hinder successful delivery of these opportunities?



- How can we drive standardization throughout the portfolio while allowing room for innovation?
- How can we maintain Best-in-Class project controls as the offshore wind markets tighten and the supply chain is stretched?

For projects to be executed well and have successful outcomes (i.e., to be predictable and competitive), owner companies need to have robust project organizations, teams, processes, and governance, as well as close involvement from the owner company throughout the project life cycle. For nearly 35 years, IPA has been working closely with organizations to help them achieve capital projects excellence by bringing our expertise and research on what drives capital project success. We have expanded on this knowledge to help the offshore wind industry. As shown below, IPA's Project System Excellence Model (PSEM) provides the right framework to allow systems to learn quickly and improve.

IPA is working closely with this company to help bring learnings from other industries to these unique issues to help structure mid- and long-term solutions to the challenges it is facing. Although wind energy projects have different risks, the practices that drive success are transferrable. IPA presented the findings to different levels and groups within the company to ensure the recommendations are communicated and to get buy-in to the suggested changes and improvements. The key to the successful relationship with the company is that the engagements have been collaborative, with IPA and the project teams working together.

The company is open and willing to learn from other industries and sees the value in IPA's methodology and data-driven approach. All of IPA's research and recommendations are derived from statistical analysis of real project data that IPA collects from face-to-face discussions with project teams. To date, the IPA database includes more than 20,000 projects with detailed information about project practices, costs, and schedules—more than 3,000 pieces of information per project. IPA's work is continuously validated by clients who routinely compare IPA's predictions with actual results and verify that IPA recommendations yield business value. Trust is the key element and it is achieved through a deep understanding of a company's project system to provide actionable recommendations based on real project data and provided within the context of the organization and any external limitations the company faces.

Improving project performance is not an easy task, especially when

a company finds itself executing more complex projects without the structure to support them. Making changes to a project process takes time, but it is possible and will lead to long-term gains. A successful, capital-effective project system routinely delivers safe assets that operate well, are ready when the business needs them, are delivered at a cost that makes the business more competitive, meet the objectives of all internal and external stakeholders, and maximize resource use. IPA has identified all pieces that need to be in place in the early planning phases to achieve successful projects. It is exciting to be part of the fast growing renewable energy sector and IPA aims to become a long-term partner as it has done with companies in other industries.

Contact Anna Pivovarova at apivovarova@ipaglobal.com

to learn more about how IPA can optimize your organization's capital delivery framework for offshore wind projects.

IPA's Project System Excellence Model Provides a Framework for Systems to Learn Quickly and Improve



IPA Completes Early Estimating Metrics Tool for Pharmaceutical Capital Projects

Yinyan Zhao, IPA Senior Project Analyst

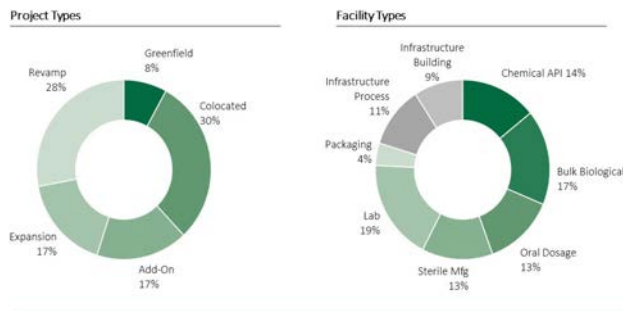
In recent years, businesses in the life sciences industry have been pushing project teams to commit to cost targets early in Front-End Loading (FEL). Early estimates are generally prepared based on limited information and subsequently have wide accuracy ranges. Industry perceptions for FEL 1 and FEL 2 estimate accuracy are significantly more optimistic than IPA data support. The limited information in early project stages creates challenges for estimating, and lack of tools and databases adds more challenges. To help support our pharmaceutical industry clients to overcome these challenges and improve their capital project conceptual estimating performance, IPA has developed a Pharmaceutical Projects Early Estimating Metrics Tool. The tool includes an entire suite of early estimating metrics for delivering various pharmaceutical facilities.

The metrics tool is the result of collaboration between IPA and our life sciences clients. Seven major life sciences companies teamed up to identify data that can empower project teams to improve the accuracy of conceptual project estimates and reliably validate detailed estimates. IPA's pharmaceuticals and biotechnology sectors capital projects database serves as the core of the metrics tool. The database includes project development and execution data from over 900 projects located in North America, Europe, and Asia.

What Types of Life Sciences Metrics Are Included With the Tool?

To ensure creation of a complete set of early estimating metrics, IPA partnered with participating companies and identified four key types of facilities as a starting point for

IPA's Pharmaceutical & Biotech Database
Representation of Project and Facility Types



the tool—bulk biological, sterile form/fill, laboratories, and chemical active pharmaceutical ingredient (API). Data on all project types, including greenfield (process unit costs only), colocated, and brownfield projects (i.e., add-on and expansion projects), were collected and supplemented by data already in the database to create the metrics tool. The projects represent the most current data in the industry, which are either recently authorized or completed within the past 5 years. The minimum project size for this data collection effort is US\$10 million. Notably, a standard Code of Accounts (CoA) was also established, allowing for the continual collection of completed project data in the same format and the eventual expansion of the metrics datasets.

The following early estimating metrics are available to clients:

Cost to Cost Metrics

- Total Installed Costs (TIC) \$ / Equipment \$
- Office Costs \$ / TIC \$
- Process Automation \$ / TIC \$
- Building Automation \$ / TIC \$
- Process Installation (Labor & Materials) \$ / Equipment \$
- Commissioning & Qualification (C&Q) \$ / Equipment \$

Cost to Scope Metrics

- TIC \$ / Square Foot
- Exterior Enclosure \$ / Square Foot
- Direct \$ / Square Foot
- Total Process Costs / Process Area

Scope to scope metrics

- Process Area Square Foot / Gross Square Foot
- Controlled Classified Square Foot / Gross Square Foot

Schedule Metrics

- Design Duration Through OQ Duration / TIC
- Phase Duration / Square Foot

The end product includes 40 cost and schedule metrics, with summary statistics provided for each metric. Each metric comparison, such as mean, median, and interquartile ranges is also provided, along with graphs.

User Group Feedback

Participating owner companies have been using the metrics in the estimating and validation process and gave the tool high marks. Here are a few comments made by current participants:

“We used the early estimating metrics at the feasibility stage for a large project and the information generated by the tool indicated specific areas of concern that needed to be challenged, like area metrics and schedule durations, that lead [sic] to a significant savings on both time and cost as we could contest engineering assumptions and ensure the project was fit for purpose.”

“Benchmarking cost and schedule with our Life Science peers is very important to gauge the effectiveness of our capital projects. The IPA tool is an easy to use, flexible platform that enables us to compare projects across key data elements in a standard, repeatable fashion allowing us to ask the right questions and help guide the correct business decision.”

“Our internal estimating practice is focused on conceptual estimating for option evaluations and estimate validation. Oftentimes, our own sample sizes per facility type are too small to derive meaningful metrics from them. In addition, we would like to understand how our estimates compare with industry benchmarks. Therefore, we are grateful that IPA has created a forum that allows us to share data and insights with peer companies without compromising confidentiality.”

IPA plans to keep the tool current through annual updates with new project data and industry trends that will be available to the tool subscribers. Participating owner companies will also get an opportunity to set direction for future tool expansion into new facility types and output metrics. Owner companies in the life sciences sector are still able to participate in the initiative to provide project teams with the data and capabilities they need to improve the effectiveness of the projects they are responsible for delivering.

Contact Natalia Zwart at nzwart@ipaglobal.com to learn more about the Early Estimating Metrics Tool.

Join IPA's Offshore Wind Industry Cost and Schedule Benchmarking Study



Independent Project Analysis (IPA) is launching a multi-client study to establish cost and schedule benchmarks for both recently completed and ongoing offshore wind projects. The companies that participate in this study will gain insights into how their projects' cost and schedule performance and estimates compare to the competition, and how to set competitive yet achievable, targets for future investments.

For asset owners, project developers, and capital investors, remaining competitive in this environment requires decision making based on reliable industry data rather than incomplete, non-normalized public data.

How to Join the Study

Participating in this first phase of the study is free of charge, but companies are required to provide data to receive the benchmarks. The study is scheduled to kick off later this year. **Contact IPA Associate Project Analyst Anna Pivovarova at apivovarova@ipaglobal.com** to express interest in joining.

Site-Based Capital Projects Improvement Journey— A Case Study Timeline

Katherine Marusin, IPA Product Development Leader, Site & Sustaining Capital



The origins of site-based capital project improvements often take a similar form: projects take too long in the funnel, schedules are overly optimistic, endemic understaffing of key disciplines limits a site's ability to apply Best Practices, and alignment between organizational stakeholders is absent, hindering efficient execution. All of these issues were present at one site IPA partnered with to drive improvements.

The site had already identified the need to develop competent resources (and to ensure that sufficient key personnel were available), recognized the capability limitations of local engineering and construction contractors, and, further, acknowledged that existing performance measurement was inadequate to drive performance. Taken together, these issues served as the impetus for the site to make the first step on their continuous improvement journey and to engage IPA's site-based project expertise. What follows is a high-level look at how IPA has supported a site's leadership team through the first few years of a project performance change effort. We adopted a collaborative engagement model with this client—whose primary areas of focus involved measurement and data-focused change. Our work with this client has resulted in significant progress toward goals, as well as positive feedback. One stakeholder stated that IPA “reinforced and solidified site-based project Best Practices with data,” and added that “our own in-house learnings align with IPA studies.”

Year 0—Baseline Performance Measurement (Expert Review)

In some instances, companies consider performance benchmarking to be IPA's exclusive role in continuous improvement. However, IPA has a strong record of helping clients navigate through their improvement journeys. After recognizing the need for change, site leadership (who understood the importance of an independent, data-centered approach) partnered with IPA to define the best approach to drive meaningful, sustained performance improvement. The first order was an unbiased current state appraisal, which came in the form of a site-wide benchmarking evaluation of projects, processes, and systems.

A strong case for change is the foundation upon which transformational change is built. In addition to what the site had already recognized as problem areas, building the case for change required an independent appraisal of the site's performance across its portfolio of projects. This initial measurement constituted the baseline upon which all future improvements would be referenced and included both quantitative and qualitative measures. IPA and the site leadership team collaborated in selecting the projects and programs to be measured.

IPA led conversations with key site stakeholders (including executive management), conducted project team interviews, and completed an extensive review of project documentation. This client-provided data served as the basis for IPA's performance analysis. IPA evaluated a suite of both leading and lagging performance measures, reviewed industry trends, and provided insights from our work with Industry's Best-in-Class performers. The culminating activity was a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis of the site project portfolio and projects organization to kick off an action planning and change implementation effort.

Years 0 to 2—Action Planning and Implementation of Change Program (In-House)

Based on IPA's recommendations, the site team developed a focused and realistic improvement plan with particular attention given to the key levers of Best-in-Class performance. At this site, the development of strong project teams and the

routine, systematic use of Front-End Loading (FEL) practices were the primary focus. Most of the site's capital projects improvement journey used in-house resources; a side-benefit of this approach was that this provided the opportunity for growth, training, and improved job satisfaction.

Specific actions to strengthen weak practices and introduce Best Practices were taken; first and foremost, these included addressing resource gaps, which IPA had identified and quantified. Secondly, inhibitors of performance identified through the IPA-led benchmarking effort were removed and enablers of performance instituted. Finally, a suite of bespoke Key Performance Indicators (KPIs) proven to drive project performance were put in place. This work coincided with a site-wide reorganization effort begun at the start of year 2, with the objective of fostering better integration across functions to improve asset availability and performance.

Year 2—Site Improvement In-Progress Review (External Review)

While many companies wait 3 years to re-benchmark site portfolio performance, the site wanted a real time appraisal of progress. In partnership with the site, IPA conducted a “health check” review to assess initiatives and actions undertaken and progress made by the site following the baseline benchmarking evaluation. Far from being an “audit,” IPA's work with the site took the form of extensive stakeholder discussions, document reviews, an anonymized survey, and a site walkthrough. IPA independently rated the suite of KPIs the site adopted and highlighted areas of disconnect. Site leadership reiterated the vision of future performance, and IPA provided updated, actionable recommendations to enable the site to reach its goals.

To augment IPA's performance benchmarking approach, staffing levels were quantitatively assessed, using the new organizational framework. This analysis highlighted base staffing needs, provided comparisons with Industry's top performers, and, importantly, highlighted potential areas of contextual risk, such as expected portfolio volatility and the implications on “right sizing” the site based organization. In addition to identifying functional resource gaps, IPA highlighted the need to clarify the remit of certain functions to improve project and portfolio delivery.

Years 2 to 3—Refine and Implement Additional Change Efforts (In-House)

With a number of improvement initiatives solidly in place and demonstrable improvements in KPIs, the site turned its focus to additional areas of improvement: project initiation, portfolio

management, and resource management. The site partnered with IPA to develop tools and templates for new processes. These tools were championed by in-house resources. Meanwhile, new employees were hired to fill specific roles where IPA had identified staffing gaps and to ensure appropriate resourcing across the site's newly instituted organizational framework.

In conjunction with these efforts, learning and development efforts were initiated with the IPA Institute. IPA partnered with the site's learning and development group to develop learning objectives for specific project functions and to reinforce the use of site-based project Best Practices. As one participant said, “Training was effective at communicating data-supported Best Practices. In an [ever-changing] process improvement environment, it was refreshing to see what changes could be made that are truly value-added.”

Year 3—In-House IPA-Led Training, and Repeat Benchmarking (External Review)

The IPA Institute offered slightly adapted training courses on selected topics to the project professionals at the site. The IPA Institute offers both in-house and public courses and builds on IPA's research and experience.

IPA also conducted a repeat benchmarking of the site projects portfolio, based on a selection of more recent projects. The results were compared against the baseline performance to show areas of improvement or gaps.

Looking Ahead

The site can expect the results from the repeat benchmarking to refine its improvement planning and identify focus areas for the next 3-5 years. Further continuous improvement efforts already being pursued include accelerating the team project performance culture and improving capital efficiency.

Our work with this customer has enabled effective decision making, adaptability, and tailored implementation of their change management and improvement efforts. IPA has also provided our in-depth expertise in industry Best Practices to their teams through collaboration and training. The site's leadership remains committed to improving and has identified consistent measurement as an important enabler of achieving efficient project delivery and operational excellence.

Contact Katherine Marusin at kmarusin@ipaglobal.com to learn more about IPA's work with site-based project organizations and involvement in site improvement programs.

IPA Launches Unprecedented Collaborative Knowledge Transfer in the Middle East

Rolando Gachter, IPA Director, Middle East Development
Daoud Kiomjian, IPA Associate Project Analyst

Two of the Largest Project Organizations Participated In the IPA Facilitated Exercise

During the course of the virtual Industry Benchmarking Consortium (IBC) 2021, an IBC member based in the Middle East approached IPA about facilitating a knowledge sharing session with another leading capital project organization in the Middle East that is also a member of the IBC. The resulting gathering between the two IPA clients that took place in May, a Middle East Capital Projects Knowledge Exchange, aimed to foster an environment of collaboration and knowledge sharing to benefit both organizations. Participating representatives stressed the importance of inter-organizational knowledge flow in boosting industry performance.

During the first part of the dialogue, one client showcased its benchmarking journey with IPA. The client explained how IPA supported them on their path toward industry excellence, visible in their recent project performance outcomes. The participants exchanged advice on creating a culture that promotes positive change. Members of both organizations aligned on the criticality of cross-hierarchical onboarding when

implementing a process change or improvement. Participants highlighted as well the importance of securing leadership buy-in before embarking on improvement journeys. Although it might seem trivial, securing C-suite support for implementing change was a massive effort that entailed continuous support from IPA.

Later on, participants touched on novel contracting strategies. This discussion has been overdue in a region where traditional lump-sum engineering, procurement, and construction (EPC) arrangements have reigned for quite some time. The organizations exchanged tips on how to accommodate unorthodox strategies within their project systems. The two clients discussed with some detail preferred project characteristics that render such uncommon methods favorable. One participant concluded this discussion by expressing his contentment with such contracting approaches on recent megaprojects.

The session adjourned with IPA aligning with the clients on the necessity of such interactive sessions in the future. Both participants agreed that this session was the beginning of what they hope to be a long and fruitful interaction.

Contact Rolando Gachter at rgachter@ipaglobal.com to learn more.



IPA Names Neil Frederick as Its New Chief Scientist and Head of the Review Board



Effective September 1, 2021, IPA has announced that Neil Frederick will assume the role of Chief Scientist and Head of the Review Board. In this role, Frederick will lead the global efforts of the IPA Review Board in performing quality checks on all project evaluations

and protecting the integrity of IPA's data, work processes, and client deliverables.

"In his 15 years at IPA, Neil has dedicated himself to excellence in our analysis of capital projects," said IPA President and CEO Edward Merrow. "He brings intelligence, insight, and a physicist's discipline to the review process. As Chief Scientist, Neil will help guide our research efforts into the future."

Frederick joined IPA in 2006 and most recently held the role of Senior Project Analyst and Review Board Member. During his tenure, he has performed risk identification and analysis on over 100 capital projects and has reviewed over 600 project evaluations and research studies across industry sectors. Frederick has also conducted extensive research on the operational performance of chemical, refining, mining, and minerals projects over the years. He earned a Ph.D. in Physics from the University of California in San Diego, California, and a B.S. in Physics from the University of California in Santa Barbara, California.

Frederick succeeds David Gottschlich, who retired from IPA on August 31, 2021, after 31 years of service. Gottschlich joined IPA in 1990, only 3 years after the company was founded, and was instrumental in developing IPA's project evaluation methodologies and models. IPA wishes him continued happiness and success in retirement.

FEL Toolbox Software Updated for 2021!

IPA's **Front-End Loading (FEL) Toolbox** software has been the gold standard for site and sustaining capital project self-assessment for nearly 20 years. We are excited to share that the 2021 release of the software includes significant improvements to the overall user experience:

Redesigned user interface and navigation

Improved page layout, graphics, and readability

Improved navigation

Enhanced security

IPA research has shown that FEL, or project definition, is one of the most significant drivers of success for capital projects. The FEL Toolbox software aids the project definition work process to help improve project outcomes and return on capital investments.



To request a demo, contact Katherine Marusin, IPA Manager, Site and Sustaining Capital, at kmarusin@ipaglobal.com.



Benchmarking Consortium Status Update: Pivoting With the Times

Andrew Griffith, IPA Director, Consortia Membership and the IPA Institute

IPA held the first Industry Benchmarking Consortium (IBC) meeting more than 30 years ago. The face-to-face interactions between member companies have always been a key benefit of membership in the IBC and associated subcommittees. Our plan was to host IBC 2020 again as an in-person meeting in Virginia in March 2020.

However, when COVID-19 pandemic disruptions began spreading across the globe, IPA pivoted to deliver consortium material via online webinars as opposed to the traditional in-person meetings. As the entire world struggled to understand and react to the realities on the ground, IBC 2020 was canceled shortly before it was scheduled to begin once it was clear that most members would not be able to send delegates to the conference in Leesburg, Virginia. Facing a changing situation, IPA immediately set in motion a plan to deliver IBC 2020 material via online webinars. IPA delivered the first IBC webinar on 18 March 2020 and followed a pace of delivering one webinar per week. We scheduled two sessions for each presentation to accommodate different time zones. IPA delivered the final IBC 2020 presentation 17 June 2020.

Driven by the continued disruption from COVID-19 restrictions, IPA delivered five more IBC-related annual meetings via online webinars and secure company online meetings. Online delivery provided an immediate benefit to the membership. Each member company was able to invite an unlimited number of participants to attend online presentations. As one participant commented, the webinars “accommodate more people and are easier to fit in our schedule.” IPA used the platform to facilitate questions, record the sessions, and distribute the recordings and slides

to everyone who registered. We have learned a great deal from this process. For example, we have upgraded the platform used to deliver webinars, adjusted our approach to questions, and modified our delivery schedule to reflect membership input. Not only did the sessions provide “a good break from the COVID world” but participants also found they “got a lot out of the sessions.”

These efforts, borne out of necessity, have been so successful, IPA will be continuing with online only delivery of consortium material for CEC 2021 (September) and UIBC 2021 (November). Although some parts of the world are opening back up, many regions are not yet able to travel to the U.S. for face-to-face meetings. The IBC is a global community and our plan is to return to in-person meetings once all of our member companies can fully participate.

As of now, IPA is planning an in-person IBC 2022 annual meeting in Virginia in March 2022. However, the lessons we have learned about online delivery have led us to plan for a hybrid model for all future consortium meetings. Feedback from the membership has been overwhelmingly positive, and member companies have made it clear that we should continue hosting these webinars even after returning to in-person meetings. As a result, IPA will design a program where we will host in-person annual meetings and then schedule follow-up webinars to allow for wider participation in IBC and related subcommittees.

Look for IPA to announce details regarding future consortium annual meetings and webinars as plans develop. For additional information, **please contact Andrew Griffith at agriffith@ipaglobal.com.**

IPA Institute

Public Virtual Training Courses



Course	Dates	Times	Language	Fee	Click to Register
Project Stakeholder Alignment Through Successful BEAM Implementation	September 29	9 a.m. to 12 p.m. (UTC-4)	English	\$300 USD	REGISTER
Project Stakeholder Alignment Through Successful BEAM Implementation	September 30	9 a.m. to 12 p.m. (UTC-3)	Portuguese	\$300 USD	REGISTER
Front-End Loading (FEL) and the Stage-Gated Process	October 5 & 7	9 a.m. to 11 a.m. (UTC-4)	English	\$400 USD	REGISTER
Front-End Loading (FEL) and the Stage-Gated Process	October 6 & 8	9 a.m. to 11 a.m. (UTC-3)	Portuguese	\$300 USD	REGISTER
Best Practices for Site-Based Projects*	October 11–15	9 a.m. to 12 p.m. (UTC-4)	English	\$1,200 USD	REGISTER
Project Management Best Practices*	October 18–22	9 a.m. to 12 p.m. (UTC-4)	Spanish	\$1,200 USD	REGISTER
Establishing Effective Capital Cost & Schedule Processes*	October 18–22	9 a.m. to 11 a.m. (UTC-4)	English	\$1,000 USD	REGISTER
Capital Project Execution Excellence and Project Controls	October 26 & 28	9 a.m. to 11 a.m. (UTC-4)	English	\$400 USD	REGISTER
Gatekeeping for Capital Project Governance	November 1, 3, & 5	9 a.m. to 11 a.m. (UTC-4)	English	\$600 USD	REGISTER
Project Execution Planning for Capital Projects	November 9 & 11	9 a.m. to 11 a.m. (UTC-4)	English	\$400 USD	REGISTER
Project Stakeholder Alignment Through Successful BEAM Implementation	November 10	9 a.m. to 12 a.m. (UTC-4)	English	\$300 USD	REGISTER
Project Stakeholder Alignment Through Successful BEAM Implementation	November 12	8 a.m. to 11 a.m. (UTC-4)	Spanish	\$300 USD	REGISTER
Front-End Loading (FEL) and the Stage-Gated Process	November 16 & 18	9 a.m. to 11 a.m. (UTC-4)	English	\$400 USD	REGISTER
Front-End Loading (FEL) and the Stage-Gated Process	November 17 & 19	8 a.m. to 10 a.m. (UTC-4)	Spanish	\$300 USD	REGISTER
Project Management Best Practices*	November 29–December 3	9 a.m. to 12 p.m. (UTC-4)	English	\$1,200 USD	REGISTER
Capital Project Execution Excellence and Project Controls	December 7 & 9	9 a.m. to 11 a.m. (UTC-4)	English	\$400 USD	REGISTER

* **Group Discount Available:** Register 3 and send a 4th for free!

IPA Events and Presentations

Cost Engineering Committee (CEC)

Begins in September 2021

Virtual Meetings

The CEC is a working subcommittee under the Industry Benchmarking Consortium (IBC) that assists cost engineers by providing metrics and tools that offer an unbiased snapshot of industry cost and schedule estimates and trends. The CEC focuses on all aspects of cost (or investment) engineering, including cost estimating, scheduling, and project control practices and metrics, with the goal of expanding the owner cost engineer's capabilities. The primary vehicles for accomplishing these objectives are validation metrics, Best Practices research, and practice sharing. Contact Andrew Griffith at agriffith@ipaglobal.com for more information.

CCUS Management—Achieving Net Zero Carbon and Sustainability Goals

September 28-30, 2021

Virtual Conference

Manoj Prabhakar, Asia-Pacific Business Development Manager for IPA, will speak on the topic of Carbon Capture, Utilization, and Storage (CCUS) at this upcoming virtual symposium hosted by the Society of Petroleum Engineers (SPE). Visit www.spe.org for more information.

International Meeting for Applied Geoscience and Energy (IMAGE) 2021 Conference

September 26 to October 1, 2021

Hybrid Conference

Adi Akheramka, Carbon Management & Sustainability Research Team Leader for IPA, will participate in a panel discussion as part of the IMAGE 2021 Conference on September 28, 2021. The panel theme is *From Petroleum Industry to Energy Industry: Global Young Professionals' Perspectives on a Sustainable Future*. Visit www.imageevent.org for more information.

Upstream Industry Benchmarking Consortium (UIBC)

Begins in November 2021

Virtual Meetings

The UIBC is solely dedicated to the exploration and production (E&P) industry. It provides an independent forum for each participating company to view key metrics of its project system performance such as cost and schedule, Front-End Loading (FEL), and many others against the performance of other companies and share pointed and detailed information about their practices. The consortium highlights Best Practices, reinforcing their importance in driving improvements in asset development and capital effectiveness. Contact Andrew Griffith at agriffith@ipaglobal.com for more information.