Independent Project Analysis, Inc. | Volume 13, Issue 4 | December 2021

IPANewsletter

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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.
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Supply Chain Headwinds in Store for Offshore Wind

Luke Wallace, Director, IPA Capital Solutions

Offshore wind became the new bacon in 2020. Although capacity has grown significantly over the past decade (going from about 3GW up to near 30GW), it is a drop in the bucket compared to the forecast growth over just the next 5 years. Per the National Renewable Energy Laboratory (NREL), announced offshore wind projects amount to an increase of nearly 100 gigawatts of newly installed capacity by 2025. At an aggressive US$3,000 per kW, that is only about US$300 billion in capital investment in 5 years.

The demand, so far, is very real. Europe—the clear first mover in offshore wind (and other renewable energy sources)—made and drove significant policy changes over the last decade, requiring more energy to come from renewables. Europe has the majority of existing installations with many planned in the future.

Though arriving casually late to the party, much of the eastern United States has recently enacted its own policy changes to bring about more clean energy—particularly from offshore wind. On the U.S. East Coast alone, over 15 new projects are in development—the vast majority of which are in the early planning and permitting phases.

In addition, many in the energy sector (including major players from the oil and gas industry) have recognized that offshore wind is one of the quickest ways to green the grid and thus have added wind as a new pillar to their businesses as they focus on becoming carbon neutral.

With all this excitement, what could go wrong? Well, we have seen exponential investment cycles in the energy sector many times before, most recently between 2003 and the financial crisis (2009) and again between 2010 and 2014. Unfortunately, growth of this scale is typically associated

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with significant cost escalation and a greater frequency of project failure (major cost overruns and schedule delays, as well as operational failures) perpetuated by a stressed supply chain. This is especially true in markets that rely on highly specialized manufacturers and service providers—something offshore wind has in abundance. This view runs counter to the more popular opinion that offshore wind costs will continue to come down, but given past experience in other comparable industrial sectors, we believe there are still strong headwinds in store for offshore wind's capital cost.

The Ugly Step Sister

Though arguably the antithesis to offshore wind, the oil and gas industry bears an eerie resemblance when it comes to supply chain challenges. In fact, the two industries even share some of the same supply chain. This makes some of the recent history in oil and gas a good proxy for what we might expect in offshore wind in the coming years if the capacity growth lives up to the forecast.

To understand the similarities, consider the scope of an offshore wind farm. At a high level, it includes a few key components—turbines, subsea foundations, subsea power cables, and offshore and onshore substations. **Figure 1** gives a nice visual.

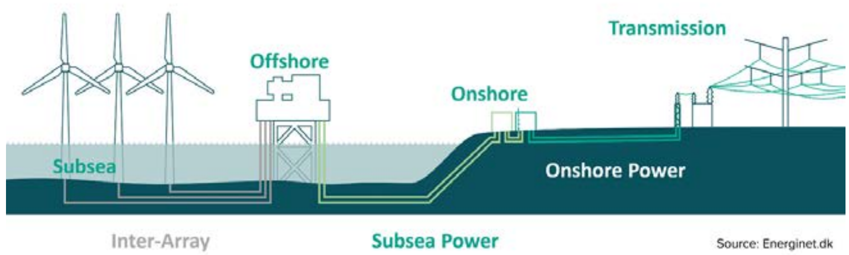


Figure 1

Except for the turbines, you can find a lot of the same scope in an offshore oil field. And that's where the challenges come in. Unlike an onshore development, offshore construction is complex and highly specialized, resulting in a short list of players who can do it. This scarcity has continuously hampered oil and gas over the years. When oil prices are high, the heightened demand has driven near exponential increases in prices and lead times for offshore services. In **Figure 2**, we show historic price escalation for offshore heavy lift (used to install offshore platforms) and marine pipe lay vessels through 2014, right before oil prices crashed. Prices more than doubled in about 10 years and the 2009 recession only slowed them down for a short period of time.[1]

At the Mercy of the OEMs

When you look at the players needed to fabricate, install, and connect offshore wind infrastructure, you find only a few names. For example, for turbines, which make up a good chunk of the capital costs for a wind farm (about 30 percent of the capital expenditure), there really are only three players—Vestas, Siemens Gamesa, and GE. This market concentration is

[1]Source: IPA Offshore Database. IPA collects spread rates and vessel data from project teams as part of our standard project evaluation process. The trend line is normalized for vessel class and region.

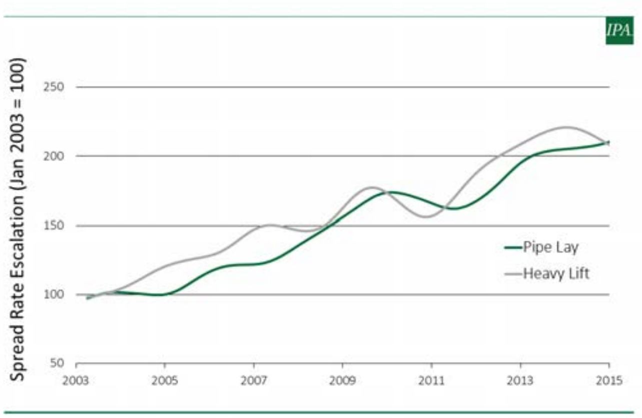


Figure 2

similar to what we see in subsea gathering systems for oil and gas. Subsea gathering, or subsea for short, reflects the infrastructure (pipelines, cables, wellheads, etc.) needed to transport oil and gas from the subsea well to the processing facility. In addition to the direct analogs (subsea cables, foundations, etc.), the offshore wind and subsea supply chains have many similarities.

For example, consider subsea hardware. Subsea hardware consists primarily of manifolds and trees, which control and route the oil and gas production from the subsea wells. Like offshore wind, the vendor market for subsea hardware consists of just a couple players (today really only two—TechnipFMC and OneSubsea). When we look back at periods of high demand (high oil price), we see that as the orders for trees began piling up, the prices for trees more than doubled. Further, the lead-time for a tree went from a year to over 2 years. In **Figure 3**, we show the subsea hardware price escalation over two hot market periods, 2004 to 2009 and 2011 to 2015. Onshore construction cost escalation is included in the figure as a reference.[2]

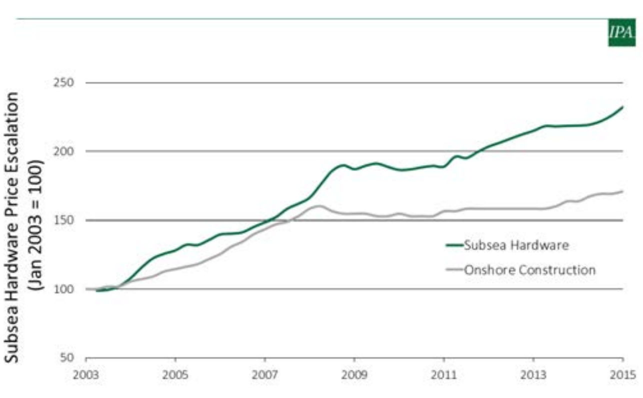


Figure 3

Although speculative, it would not be beyond imagination to expect that the costs for turbines—because of supply constraints—will experience a fair amount of price escalation given the rapid increase in demand. However, unlike oil and gas, offshore wind has a major mitigating factor working in its favor, at least so far as the turbines go. Over the past 10 years, turbine sizes in both megawatts and blade size have increased by over 50 percent, and projections have them increasing by roughly the same amount by 2025.[3]

Of course, the cost of the turbines will go up to accommodate the innovation and size increase, but this will be offset by the additional power generated by each turbine. Note, it will not be entirely offset because the bigger turbines require larger transport vessels, which are not cheap and just sitting around idle. As indicated above, the supply of offshore installation and support vessels is by no means vast. The same is true for heavy transport. When the market heats up, these services come at a premium.

When we examine the data, we see that both the field and turbine capacities have increased. The two characteristics are not perfectly correlated (because you could just install more turbines), but a lot of the overall increase can be attributed to the bigger turbines. In **Figure 4**, we show turbine capacity over time using both completed and planned projects.[4]

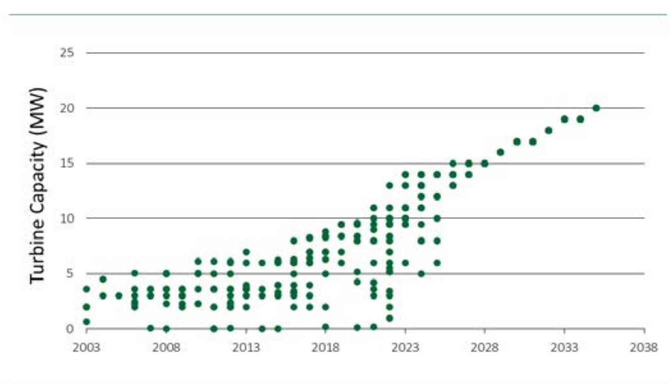


Figure 4

The data for completed projects do show that, as a result of these capacity increases, the overall cost to develop a wind farm has come down, which is entirely consistent with what we see in any industrial manufacturing setting. The bigger the plant, the lower the cost per unit output. This does not mean that the projects are cheaper—it just means you have to build bigger to lower the cost.

[2] Source: IPA Offshore Database. IPA collects information on subsea kit from project teams as part of our standard project evaluation process. The trend line for subsea hardware is normalized for functionality (pressure, fluid characteristics, etc.). The onshore construction trend is a composite index made up of a typical mix of input cost time series for commodity bulks, engineered equipment, labor rates, etc. Input costs are collected by IPA for each project we evaluate.

[3] Musial, Beiter, Spitsen, Nunemaker, Gevorgian, Cooperman, Hammond, and Shields, 2019 Offshore Wind Technology Data Update, National Renewable Energy Laboratory, October 2020.

[4] Data source: 4C Offshore Global Offshore Wind Farm Database.

Figure 5 shows both windfarm capacity in megawatts (MW) and cost per MW over time.[5] The windfarm cost per capacity is shown on the first y-axis (in green) and windfarm capacity is shown on the second y-axis (in orange). The chart is a little busy, but the pattern is clear. As field capacities began to increase sharply around 2015, the cost per MW began to decrease.

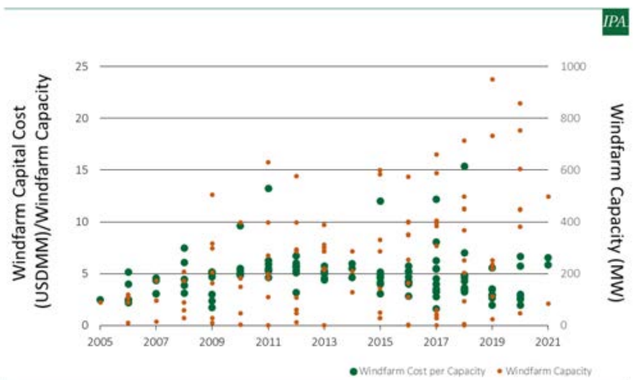


Figure 5

This is an important nuance when thinking about windfarm capital costs. The cost savings are in the size and reflect pre-pandemic and pre-wind boom pricing. This does not mean that the projects are cheaper, and, given the economics, there is no reason to believe the turbine cost will do anything but increase.

Although the turbines make up a significant portion of the cost, they are not the only major cost or the only component subject to a tight market. The remaining balance of plant scope—substation topsides, jackets, subsea cables, and subsea installation—each has supplier limitations and can be expected to experience escalation over and above the 2 to 3 percent annual escalation seen in cooler markets (not to mention the sharp increase in commodity material costs, like steel, that we have seen coming out of the pandemic).

Offshore Constraints

Schedule delay is another concern owners and project stakeholders need to consider when planning projects during periods of heightened activity. The same scarcity driving up prices also extends lead times for equipment, materials, and services. In **Figure 6**, we contrast the delay (measured as the actual duration divided by the planned duration) for subsea trees between hot (2005 to 2015) and cold (<2005 or >2015) market periods. In the hot market, nearly all durations were longer than planned, with many experiencing delays of over a year.

In offshore, where schedules are always tricky due to the environment and weather windows, fabrication slip

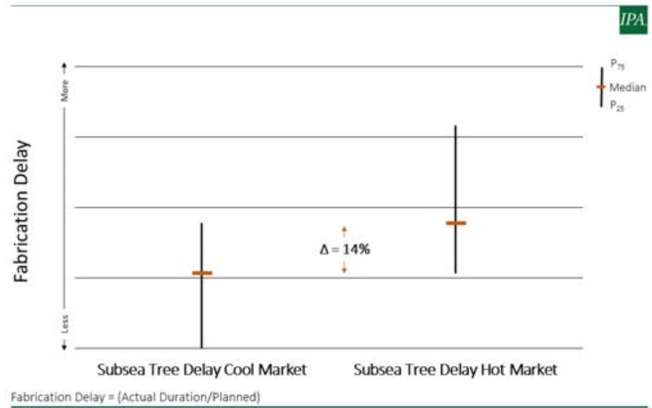


Figure 6

can cause installation targets to be missed, delaying project completions by months and sometimes years. The constraint here is with the installation vessels that are booked out years in advance. When equipment and facilities (e.g., the substation topsides) fabrication is delayed, the project may lose its installation contractor who has to move on to the next job.

Leveraging some learnings from another analog, offshore fixed platforms, **Figure 7** shows fabrication and installation delays between the hot and cold markets. Both fabrication and installation experienced significant delays during the hot market periods, but where fabrication only deviates by about 16 percent from the target, installation slips an average of over 40 percent. The average is skewed by several outliers, but that is part of the story. The variability between the two periods is massive, and most projects in the hot market period slipped their installation targets.

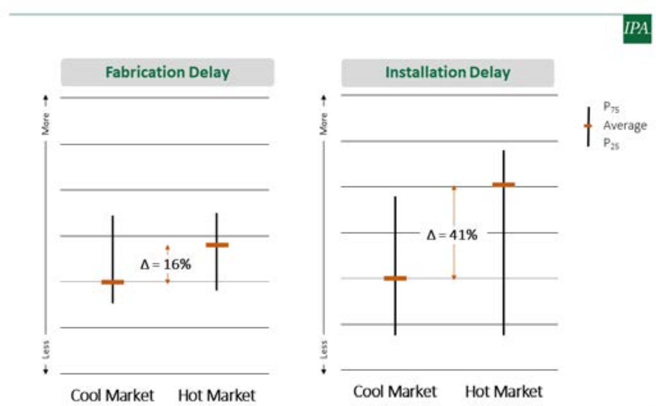


Figure 7

Masters of Supply Chain

Fortunately, it is not all doom and gloom. From what our oil and gas peers have shown us, harmony can be achieved between the owner operator and the supply chain. However, it takes some forward thinking and a mindset that the suppliers are partners, not just vendors and contractors.

[5] Data source: 4C Offshore Global Offshore Wind Farm Database.
[6] Source: IPA Offshore Database.

Between the hot market periods of 2005 to 2014 (ignoring the short financial crisis excursion in 2009), most players in the energy sector, particularly oil and gas, experienced significant cost escalation and schedule delays, but not everyone. Two players in oil and gas—two very different players—leveraged similar strategies that kept cost and durations down. In its simplest form, you could call it standardization, but it really was a lot more than that.

Using the subsea analog again, a big part of the price escalation (in addition to demand) was driven by owner specifications. Owners were systematically telling the original equipment manufacturers (OEMs) how to fabricate. The two successful companies took a different approach. They worked with the OEMs to identify equipment that would meet their needs and they ran with it, installing hundreds of the same pieces of equipment over and over again. **Figure 8** shows a time trend of subsea tree escalation costs and compares the industry (full sample of owners) against the two companies using standardized equipment. As shown in **Figure 8**, the companies employing standardization had systematically lower escalation than Industry (which includes them) for this specialized equipment.[7]

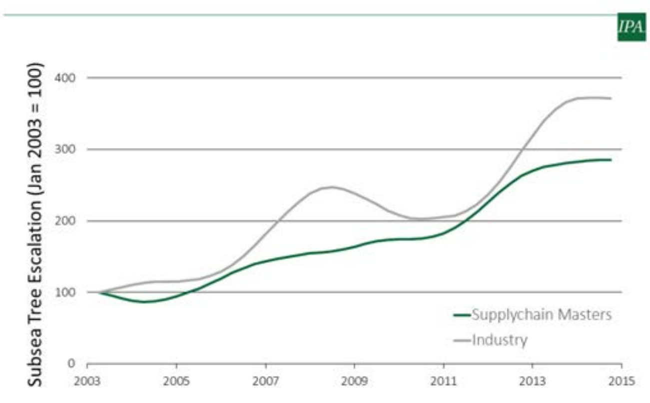


Figure 8

This same philosophy was extended throughout the supply chain and these owners were consistently completing projects faster and cheaper than their peers for well over a decade. They worked with the same vendors and suppliers on every job and built relationships on trust and openness, all to the mutual benefit of everyone involved. We have seen this model used effectively across a variety of offshore project types and believe that offshore wind is perfectly suited to implement this style of project development.

Follow the Data

Of course, analogs have limits, so IPA will be watching closely (through data) as this market continues to develop. Ultimately, although it may cost us a little more than we hoped, the world is putting in a significant amount of renewable energy with these windfarms, which is a big step in the right direction and long overdue.

If you are interested in learning more about the information shared in this short article, please reach out. IPA is first and foremost a data-based company—our insight is a combination of access to real project data provided to us by the world's best and over 30 years' experience learning through those data what makes projects tick.

Because of the heightened demand for offshore wind, IPA is currently conducting a study for owner operators on offshore wind development costs. See below for details.

Cost & Schedule Benchmarks for Offshore Wind Projects

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 in early 2022. Contact Nick Farrar at **nfarrar@ipaglobal.com** to express interest in joining.

[7] Source: IPA Offshore Database.

Closing the Operational Performance Gap

Adam Pountney, IPA Advanced Associate Project Analyst

Although business may pay the most attention to a project's cost and schedule, stable and predictable operational performance has the strongest effect on a project's return on investment. It doesn't matter how cost effectively or fast a project was executed if the asset doesn't work. Owners would be better off investing their money in the stock market. Moreover, the most valuable product a unit makes is in the first months of operation. Projects with large losses in the first few years following startup cannot recover the NPV that has been lost.

IPA has collected extensive early operational performance data on projects to understand how well assets perform in early operations and whether they achieve their intended value. Through extensive research, we have found that business-led decision-making on the factors that drive project economics is significantly more influential than technical or design shortfalls in shaping the early operations. That is, business decisions contribute to operability success or failure more often than technical problems.

To diagnose the specific causes, we looked at projects that made less than 80 percent of their design, or nameplate, capacity in the first 12 months of operation due to external failure-modes as a result of over-optimistic (or in some cases woefully flawed) business planning. Whether or not the low production rate was planned, these projects still represent highly under-utilized assets. Some of the projects were marginal investments to begin with; others were disasters that failed to deliver any return on investment whatsoever due to owner companies misjudging the external risks.

As shown in **Figure 9**, the most common major loss categories included:

- Market mis-assessment, including overestimated product demand, slow ramp-up into the market, or unplanned regional fluctuations
- Individual customer issues, such as dropout, contract mis-steps, or product mix changes
- Deliberate overdesign
- Feedstock issues, comprising supply and/or quality issues, or market-driven slate-changes
- Internal bottlenecks, including process, logistical, interferences with other work, or lack of storage

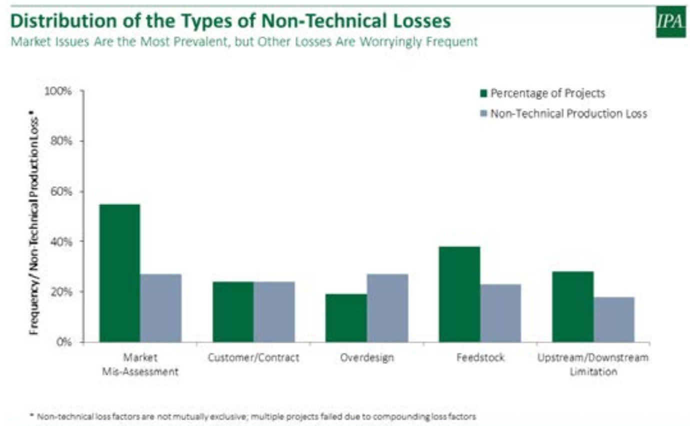


Figure 9

We found that market mis-assessment issues were the most prevalent, occurring in about half the affected projects. We also noticed a common perception among owners is that market losses resolve themselves eventually. However, our data show that these losses do not disappear after 12 months—or even after 18 months—and hence added a minimum of 2 years to the planned economic recovery.

The other factors shown in the graph above were worryingly common, occurring in 20 to 30 percent of affected projects, and contributing at least 25 percent to production loss. Notably, these issues were much more prevalent for new standalone facilities, projects designed to enter new markets or regions for the owner company, and projects deemed "strategic investments" by their business sponsors. Capital projects deemed strategic investments require even closer scrutiny to avoid being a colossal waste of capital.

The taxonomy of the root causes of failure is broad, but can generally be broken down to projects that:

- Enter markets or regions with unpredictable market conditions
- Face overwhelming schedule pressure to get to market
- Have fundamentally weak business cases, often driven by overly aggressive demand projections

Owner companies cannot let market uncertainty be an excuse for failure. Thorough examination of the business opportunity and risk is critical in the transition process between the business shaping and scope definition phases. This is crucial to translate the opportunity into an asset tailored to meet the real need, while minimizing the capital wasted in under-utilization. Whatever else owners do, rushing to the market too often kills project economics. The early FEL process should be as much about challenging the business case assumptions to develop the right project as it should be about setting the right project up for success.

Examination of successful projects that were able to avoid the pitfalls of early production disasters uncovered some key practices that allowed the project team to define a scope that was aligned with the real business need:

- Robust engineering feasibility studies done in FEL 1 to establish boundary conditions and identify bottlenecks
- Involvement of the FEED contractor in FEL 1 provided teams the benefit of engineering know-how early on to help develop the scope more holistically
- Rigorous management of change processes that avoided a check-the-box mentality and involved thorough assessment of every proposed change
- Developing FEL 1 cost estimates that drove scope vs. capacity choices and helped the alternative selection process
- Pausing FEL 1 and recycling as necessary if the demand projections were risky or the business case could not be closed
- Evaluating capacity alternatives during early FEL 2, and employing third-party consultants to validate internal market projections and scope choices

Finally, successful projects had a healthy back-and-forth, a communication equilibrium, between the business and project teams while discussing the economics and trade-offs. IPA's Business and Engineering Alignment Meeting (BEAM) is one tool that can improve decision quality by formally facilitating this discussion. It is also a good time to challenge the business teams if the process is being rushed or fast-tracked. Finally, the exit criteria should be clear. The key question to ask is: How much of a loss can the business case handle losing before the project becomes unviable?

Clearly, with so many influential risk factors, there is no magic bullet to avoid every pitfall. But owners owe it to their stockholders to reinforce the early discussions between business and project teams to make sure projects are inoculated against future uncertainties.

Contact Adam Pountney at **apountney@ipaglobal.com** to discuss the operational performance of your capital projects.

Case Study: **Hydrogen Early Cost Metrics for Strategic Decision Making**

Cheryl Burgess, IPA Staff Writer

As organizations grapple with decarbonization policies and goals, many have looked to hydrogen as an energy transition tool. Hydrogen has the potential to decarbonize several sectors that cannot easily be electrified and could serve as a viable energy carrier in regions where electrical infrastructure is insufficient to meet renewable energy loads. The vast majority of hydrogen produced today is derived from natural gas and emits large amounts of greenhouse gases. However, with the addition of carbon capture technology, the process can be decarbonized to produce blue hydrogen. Alternatively, hydrogen can be produced without carbon through the electrolysis of water using electricity from renewable sources.

Although this new energy initiative is promising, making the transition can seem daunting. When a long-time client of IPA's decided to get into the hydrogen business, they called us looking for help with this new technology. This oil and gas company had potential markets for hydrogen—both locally and abroad—but needed more information on the pathway to an economic hydrogen new energy value chain to make strategic decisions for its future portfolio.

Commercializing hydrogen is something that has not been done before on the scale being considered. So how was IPA able to provide early cost and schedule benchmarks in this cutting-edge energy transition area? Our work for this client reflects our basic business model of research, development, and delivery. Using the tools we have developed over the company's 30+ years, we applied our model building skills and used both proprietary and public data to build new models. We then used these new models to give our client the information needed to assess various pathways to economic hydrogen production.

The client was assessing various pathways for both blue and green hydrogen. IPA evaluated each step along the value chain to provide cost metrics, under different design capacity scenarios, that could be used in a very high-level business evaluation. **Figure 10** illustrates the components we considered.

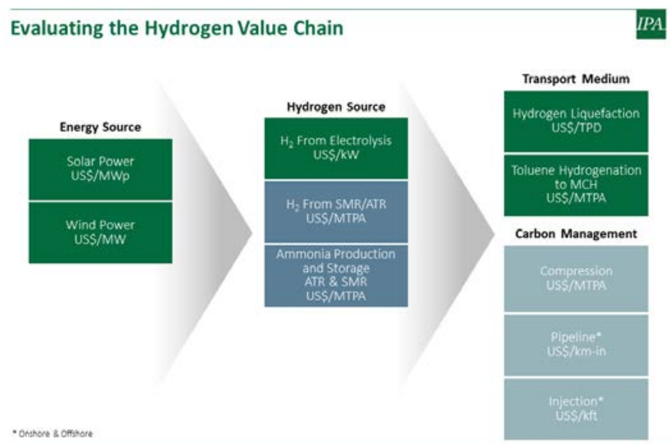


Figure 10

As shown above, each step has several options for the energy source, hydrogen source, transport medium, and carbon management. Summing the early benchmarks along the path results in a total cost benchmark that can be compared with other options along the path. For example, we could consider solar power as the energy source, producing hydrogen from electrolysis, and transporting it using liquefaction. As shown in **Figure 11**, after the total cost for each scope is calculated (based on a capacity within the ranges identified), the costs are combined to give the total scenario benchmark:

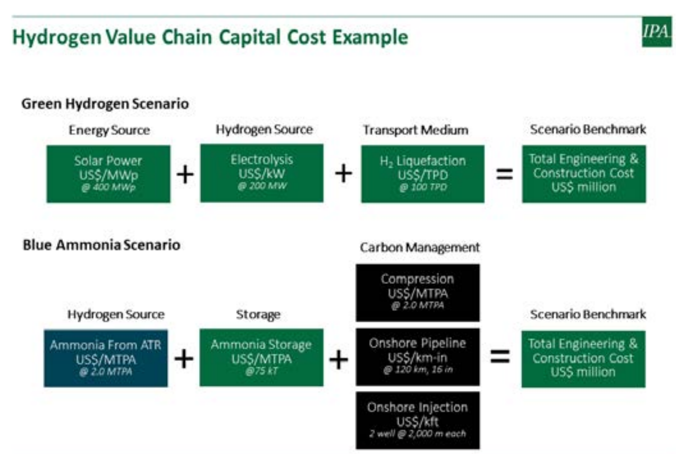


Figure 11

This benchmark then can be compared with another option along the pathway—for example, we could consider production of blue ammonia via auto-thermal reforming (ATR), with associated storage and carbon management.

Having these very early benchmarks provides our clients with the information needed to make high-level business decisions about different hydrogen pathways. So, although carbon-neutral and green energy initiatives are new for everyone, the path to success in these areas is one IPA knows well. IPA can use its tested methodology—statistical analysis and data—to support strategies to commercialize innovative technology to underpin new green project initiatives.

As part of our New Energy Transition Initiative, IPA is helping clients implementing cutting-edge innovation—and those just beginning to consider green energy initiatives. Contact Andras Marton at **amarton@ipaglobal.com** for more information.

Carbon Capture Utilization and Storage (CCUS) Project Performance Norms

IPA is launching a cross-industry research study to establish capital cost norms for carbon capture utilization and storage (CCUS) projects. Owner companies that participate in the study will gain access to essential CCUS project cost metrics and insights to directly inform and improve early decision making for CCUS projects. The study is slated to kick off in early 2022, and those who join from the start will have the opportunity to directly influence the study scope as part of the steering committee.

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

- Identify various implications of moving a CCUS 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 CCUS projects to enable fair comparison between projects and help drive adoption of results

Contact Adi Akheramka at **aakheramka@ipaglobal.com** to request more details on joining the CCUS study.

Carbon Working Group Now Accepting New Members

IPA's Carbon Working Group (CWG) is currently accepting new member companies across all industrial sectors! Launched in April 2020, this voluntary group of owner firms in the oil & gas, energy, chemicals, and mining sectors is actively working together to advance the energy industry's low-carbon agenda. Specifically, the CWG's core objective is to develop practical, relevant, and effective frameworks and methods to measure and benchmark low-carbon performance and competitiveness of project systems and individual projects.

The work has quickly resulted in the launch of the Greenhouse Gas (GHG) Performance Toolkit, a suite of IPA project evaluations that help companies optimize the balance between GHG intensity and project costs.

In 2022, the CWG will continue to develop more concept-specific GHG Intensity benchmarking capabilities and continue identifying and validating industry Best Practices to deliver low-carbon projects moving forward.

Contact Adi Akheramka at **aakheramka@ipaglobal.com** to express interest in joining this important voluntary initiative.

Light Industrial Projects: **Limiting Risk and Maintaining Flexibility in a Fast Growth Environment**

Greg Ray, IPA Senior Project Analyst

As the world emerges from the global pandemic, we are witnessing growing customer demand for products and services across a variety of sectors, leading to increasing capital expenditure on everything from warehouses and distribution networks to the manufacturing of computer chips and electrical components. Many companies in the light industries—organizations that are focused on customer fulfillment—are growing rapidly to meet this increased demand. Although opportunities abound in these industries, the question is how can such companies keep up with their ever-growing portfolio of light industrial projects? How can they remain fast and nimble to respond to customer needs, while implementing the right work processes and governance to serve what are now multi-billion dollar project portfolios?

Drawing on IPA's recent experience supporting various light industrial projects, we offer a high-level roadmap to effective growth.

The first step is to have people with the right experience in the organization plan and execute the work. Organizations that have traditionally only completed a few small maintenance and optimization projects per year typically do not have the experience in-house to plan and execute multiple large projects without bringing extensive risk into the organization.

As companies expand, human resource groups and senior management face the challenge of increasing their teams to meet the staffing needs of their growing portfolios—without making the mistake of staffing for the "peak" in CAPEX. One way to understand these needs is to benchmark the company's structure and manpower against other similar size organizations to gain an understanding of what the right-sized teams should look like: number of people, key positions, areas that can be delegated to contractors, and functions that must be kept in-house at the owner.

One trend we are currently witnessing is that light industry companies are bringing in experienced project management people from diverse processing industries such as oil, gas, chemicals, and mining. These diverse team members provide the needed experience, but also present some challenges because of their varied experiences and different perspectives on what "Best-in-Class" looks like. This leads us to the second consideration, work process. IPA has worked with a few light industry organizations that have already staffed up, but do not have existing stage-gated processes to follow as projects are approved for scoping. The lack of a standardized stage-gated process adds significant risk to the organization. Without a standard process, the organization's ability to collect information and data on projects—and, thus, leverage learnings and develop projects that are faster to market—is lacking.

Therefore, in addition to hiring people for the company, senior management needs to develop a fit-for-purpose stage-gated system that guides all projects through key milestones: business opportunity and objectives finalization, scope closure, and final cost and schedule authorization. When the process is standardized, adequately detailed, and used on all projects, it significantly reduces the variability within the project implementation system that naturally

occurs when drawing in new employees from diverse backgrounds as they bring different ways of doing things from their previous organizations.

Once organizations have a standard "way of doing projects" in place that has stop-check points along the planning phases up to authorization, they need gatekeepers to review the deliverables at each gate. These gatekeepers have the authority to decide whether the project moves forward, is recycled for more clarity and risk reduction, or is even canceled due to unacceptable risk to the organization.

Finally, the objective for organizations is not simply to have a repeatable and standardized process that is staffed by experienced project teams who use the system, but also to improve over time to develop competitive advantages. This requires a standardized data collection built from the projects in the system to be able to develop analytical tools for improvement. What are the organization's strengths? Speed? Quality? Price? A combination of the three? Without standardized data, the organization's ability to analyze planning, estimating, and scheduling versus operational performance, cost, and the actual durations of activities across the project life cycle is limited.

IPA recently worked with an organization that saw a 10-fold project CAPEX increase over each of the past 2 years. This organization provided service equipment to a major retailer and was known for fast and reliable delivery. However, the rapid project expansion exceeded the organization's capabilities, and it started to see some projects go off the rails with large cost growth and schedule slip. IPA's Organization and Teams group completed a detailed evaluation to establish the ideal owner organization and recommended where it should staff up rapidly and where it could make more effective use of third-party service providers. To complement the staffing analysis, IPA Capital Solutions completed a desktop review of the very minimal existing project authorization process and worked with the client, from the sales organization to HR, to develop a stage-gated work process with clear, fit-for-purpose deliverables at each gate. IPA then worked with the client to establish key data and formats to be collected at each gate, including at project closeout, to feed back into the system for measuring performance, developing tools, and enabling continuous improvement plans. The client has reported back to IPA that the use of the new project system has enabled it to increase predictability, reduce individual project risk, and vastly improve the management of its overall portfolio of projects.

For more information on light industrial project planning, please contact Greg Ray at **gray@ipaglobal.com**.

Early Estimating Tool for Pharmaceutical Capital Projects

Businesses in the life sciences industry have recently been pushing project teams to commit to cost targets early in Front-End Loading (FEL). 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 overcome these challenges and improve their capital project conceptual estimating performance, IPA has developed a Pharmaceutical Projects Early Estimating Metrics Tool.

The metrics tool is the result of collaboration between IPA and seven major life sciences companies 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.

Learn More

Contact Yinyan Zhao at **yzhao@ipaglobal.com** to learn more about the *Pharmaceutical Projects Early Estimating Metrics Tool.*

Case Study: **Taking Control of the Project Execution Process**

Cheryl Burgess, IPA Staff Writer

The Problem

A large infrastructure and utilities company in the Middle East reached out to IPA after it recognized the need for a better execution process. The company had gone through a reorganization that resulted in decentralized and fragmented policies and procedures, with gaps and inconsistencies causing inefficiencies across the project lifecycle. The company, one of several in the region for which IPA has benchmarked project performance, understood that gaps in the execution process were affecting project performance.

As various stakeholders encountered issues in the process, they often created new requirements to fill gaps or address inconsistencies. The constant changes and lack of clarity in the governing documents made it difficult for project management teams to keep up with stakeholder demands and varying requirements across the organization. Of particular concern was the organization's underlying capability to manage contractors in execution (post-engineering, procurement, and construction [EPC] contract award) without the documentation to guide them. The company asked IPA to help unify, enhance, and standardize the policies and procedures for the project execution stage of its capital project system.

The Approach

To support the company's desire to have a stronger execution process, IPA started by understanding the company's current state. We assessed the work process documentation within the context of the overall project system following the outline of our Project System Excellence Model (PSEM). The PSEM illustrates (**Figure 12**) how portfolio characteristics and investment decision rules provide the foundation for a company's work process, organization, governance, and performance management. To be fit-for-purpose, the process must work within the organization executing the projects. And, the documentation of the work process should be structured in a way that is easily understood and accessible.

The Results

IPA confirmed that most documents were standalone and not part of an integrated and centralized documentation system. Many documents were orphans, with no clear owner, approval process, or link to other procedures or work instructions. Redundancies in documents from different operating areas and project divisions resulted in gaps and inconsistencies from project to project through execution.

Therefore, IPA first recommended that the client create a well-designed centralized document hierarchy that is accessible to all stakeholders involved in project execution.

IPA provided the client a Best Practice document hierarchy that encompasses the full suite of EPC requirements and that drives and supports owner management and control. The role of each level in the documentation hierarchy is illustrated in **Figure 13**.

IPA listed a total of 216 documents, covering Policies, Manual & Procedures, and Work Instructions, that are necessary to encompass the owner role in execution. In addition, IPA detailed the existing client documents that can be reused and incorporated into the proposed hierarchy while identifying others that must be rewritten or extensively revised.

Next Steps

Following change management principles, next steps included gaining buy-in from key company stakeholders on the needed changes and roadmapping implementation.

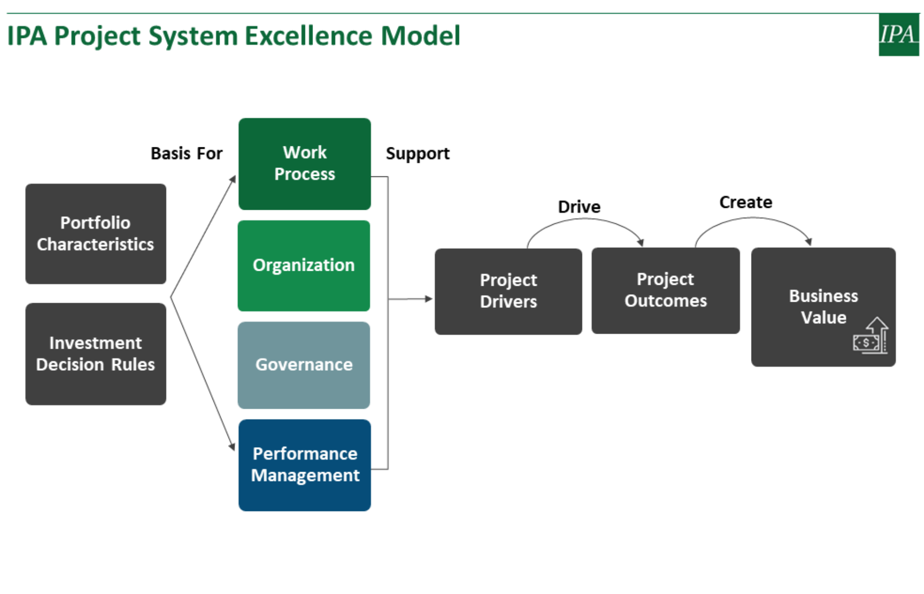


Figure 12

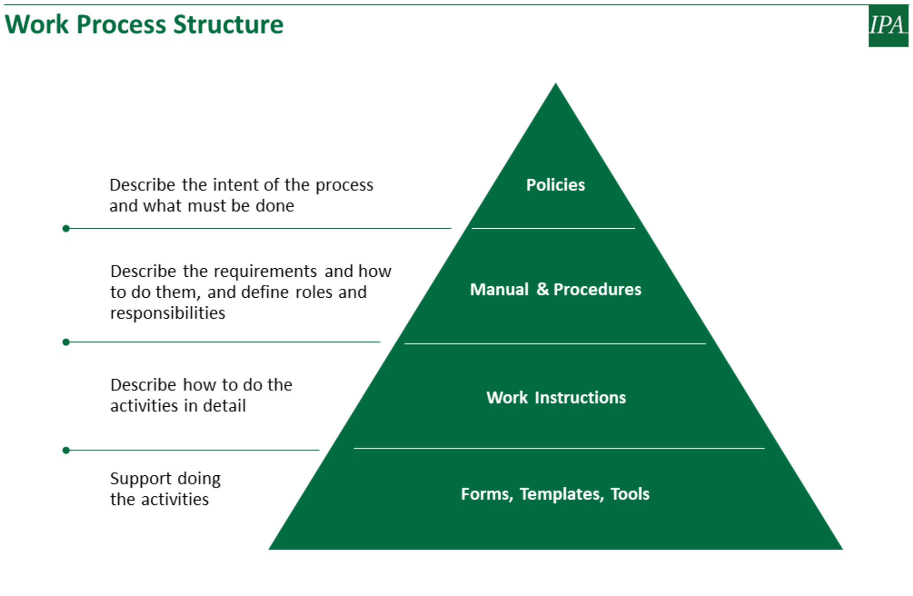


Figure 13

Fit-for-Purpose Series

This case study is part of IPA's continuing series on developing fit-for-purpose systems for our clients. The first article in the series addressed project planning and development. Visit Establishing a Fit-for-Purpose Project System for this related article on the front-end aspects of the project process.

For more information on implementing fit-for-purpose project systems, visit IPA's Consulting & Solutions Implementation page. Our next case study will address the work process for a light industrial company.

UIBC Comes to a Close This December

Cheryl Burgess, IPA Staff Writer

This year's annual meeting of the Upstream Industry Benchmarking Consortium (UIBC), which began in November, is set to wrap up in mid-December with the final virtual presentation given by IPA President and CEO Edward Merrow on Business Front-End Loading for E&P Projects. IPA shared industry research and Best Practices for upstream sector owner companies that benchmark their capital projects with IPA through virtual sessions over a span of several weeks. UIBC 2021 kicked off on Tuesday, November 9, 2021, with the welcome address by Carlos Tapia, IPA Director of Energy Practice, followed by the keynote address given by Mr. Merrow. IPA delivered each live webinar twice to accommodate different time zones.

Below we highlight the new industry research and focused topics being delivered for the first time during the UIBC 2021 webinar series:

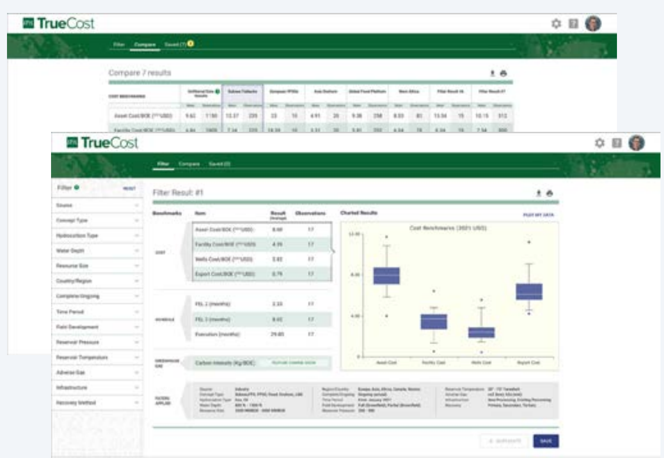
- Industry Survey: How the Capital Projects Industry Is Reacting to COVID-19
- Improving GHG Performance of Projects—Why, How, and What
- Agile Project Management In E&P

- Topside Modifications
- Production Ramp-Up Performance
- Business Front-End Loading (FEL) of E&P Projects

Visit the UIBC 2021 page to read high-level summaries of each of these presentations. Contact Andrew Griffith at **agriffith@ipaglobal.com** to learn how your company can become a member of UIBC.

TrueCost Oil and Gas Data Software Reliable Data for Quick 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.

IPA Institute
2022 Virtual Training Courses

THE IPA INSTITUTE
Advancing Project Knowledge

Course	Dates	Times	Language	Fee	Click to Register
Front-End Loading (FEL) and the Stage-Gated Process	January 11 & 13, 2022	9 a.m. to 11 a.m. (U.S. Eastern Time)	English	$400 USD	REGISTER
Project Management Best Practices*	January 24–28, 2022	9 a.m. to 12 p.m. (U.S. Eastern Time)	English	$1,200 USD	REGISTER
Gatekeeping for Capital Project Governance	February 1–3, 2022	9 a.m. to 11 a.m. (U.S. Eastern Time)	English	$600 USD	REGISTER
Project Stakeholder Alignment Through Successful BEAM Implementation	February 9, 2022	9 a.m. to 12 p.m. (U.S. Eastern Time)	English	$300 USD	REGISTER
Capital Project Execution Excellence and Project Controls	February 22 & 24, 2022	9 a.m. to 11 a.m. (U.S. Eastern Time)	English	$400 USD	REGISTER
Establishing Effective Capital Cost & Schedule Processes*	February 28– March 4, 2022	9 a.m. to 11 a.m. (U.S. Eastern Time)	English	$1,000 USD	REGISTER
Front-End Loading (FEL) and the Stage-Gated Process	March 9 & 11, 2022	11 a.m. to 1 p.m. (E. South America Time)	Spanish	$300 USD	REGISTER
Front-End Loading (FEL) and the Stage-Gated Process	March 16 & 18, 2022	10 a.m. to 12 p.m. (E. South America Time)	Portuguese	$300 USD	REGISTER
Project Stakeholder Alignment Through Successful BEAM Implementation	March 23, 2022	10 a.m. to 1 p.m (E. South America Time)	Spanish	$300 USD	REGISTER
Capital Project Execution Excellence and Project Controls	March 30 & April 1, 2022	10 a.m. to 12 p.m. (E. South America Time)	Portuguese	$400 USD	REGISTER
Capital Project Execution Excellence and Project Controls	April 6 & 8, 2022	11 a.m. to 1 p.m. (E. South America Time)	Spanish	$400 USD	REGISTER
Project Stakeholder Alignment Through Successful BEAM Implementation	April 13, 2022	9 a.m. to 12 p.m. (E. South America Time)	Portuguese	$300 USD	REGISTER
Capital Project Execution Excellence and Project Controls	April 19 & 21, 2022	9 a.m. to 11 a.m. (U.S. Eastern time)	English	$400 USD	REGISTER
Project Management Best Practices*	April 25–29, 2022	10 a.m. to 1 p.m. (E. South America Time)	Spanish	$1,200 USD	REGISTER
Gatekeeping for Capital Project Governance	May 3, 4, 5, 2022	9 a.m. to 11 a.m. (U.S. Eastern Time)	English	$600 USD	REGISTER
Project Management Best Practices*	May 9–13, 2022	9 a.m. to 12 p.m. (E. South America Time)	Portuguese	$1,200 USD	REGISTER
Best Practices for Site-Based Projects*	May 16–20, 2022	9 a.m. to 12 p.m. (U.S. Eastern Time)	English	$1,200 USD	REGISTER

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

IPA Events and Presentations

American College of Construction Lawyers 33rd Annual Meeting
February 24-27, 2022
Laguna Beach, CA

IPA Founder and President Edward Merrow will deliver a plenary speech titled, Construction Mega-Projects: How They Succeed and Why They Fail. Merrow will share insights into why more than 50% of mega-projects fail to meet the successful criteria for budget, duration, and operability. Merrow will also share his findings on the role of contracts and risk-shifting provisions, and how construction lawyers can best contribute to mega-project success. Visit **www.accl.org** for details.

Industry Benchmarking Consortium
March 21-23, 2022
Lansdowne, VA

Established in 1992, the IBC is a premiere group of the world's leading industrial companies in the processing, refining, infrastructure, and mining and minerals sectors. Through benchmarkings of both large and site-based systems conducted by IPA, IBC member companies receive exclusive insights into how their capital project systems and outcomes stack up against their industry peers with respect to safety, cost, schedule, and operational performance. IBC member companies actively discuss the latest capital project industry trends and performance hurdles at the annual meeting, as well as through competency-focused subcommittees, communities of practice, and periodic webinars. Contact Andrew Griffith at **agriffith@ipaglobal.com** for more information.

Upstream Cost Engineering Committee (UCEC) Conference
June 2022
Details to Be Announced

The UCEC strives to improve upstream project and business results by providing metrics for better cost engineering. Member company representatives gather once a year to learn about and review new UCEC metrics packages prepared by IPA. The upstream metrics packages are used by companies to compare their upstream project cost and schedule outcomes with industry cost and schedule norms and, in general, boost business project estimate assurance and evaluation quality. Contact Andrew Griffith at **agriffith@ipaglobal.com** for more information.

Cost Engineering Committee (CEC)
September 2022
Details to Be Announced

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.