How Oil & Gas Technology Investments Help Executives Secure Project Payback in a Low Commodity Price Environment

by Eric Koenig, Safouan Hage, Joe McMullen, and Philippe Grandperrin

Executive summary

The fall in oil prices has driven Oil & Gas executives to focus on reducing production costs. However, are the benefits accrued from this price-influenced cost cutting only temporary or can they be made permanent and sustainable? Engineering and integration tools designed to optimize existing architectures, increase production efficiency, and improve safety performance are currently available and are powerful tools for succeeding in today's challenging marketplace. This paper explores how Oil & Gas companies can reinvent their control engineering processes, and leverage these tools to sustain and improve project delivery payback and efficiencies.

Introduction

Most Oil & Gas companies are continuing to face numerous challenges as they attempt to work their way through an extended period of marketplace-driven changes. Trends such as low commodity prices and oversupply, industry consolidation, stricter environmental and safety regulations, geopolitical uncertainties, and worker generational shifts are all disrupting traditional upstream, midstream and downstream business practices. In all likelihood, some of these trends, such as the shift in workforce dynamics, are more permanent than temporary and will play a role as major influencers as the industry re-invents itself. Together, these marketplace variables drive to one fundamental short term challenge: how Oil & Gas companies can reinvent their business to maintain profitability in a low-price environment.

In such a challenging business environment, the ability to execute projects and to select and converge the right technologies are keys to success. The initial stages of planning a project, where business requirements are **identified and assessed**, lays the critical foundation for everything that follows. Yet despite this crucial importance, this initial project phase has historically provided the greatest opportunity for confusion, misunderstanding, and miscommunication. Mistakes made here will magnify and propagate through the later definition and execution phases; the typical result is delays, restarts, cost overruns, wasted time, frustration, and ultimately a compromised system. Research shows that 65% of multibillion dollar startup projects exceed their budget. Likewise, 73% miss their original deadlines.[1] These problems can be avoided if the right decision makers are given the right information in the right sequence.

Influence over costs is high during these early stages, and expertise is required to ensure that the **front-end design** elements are specified in a way that provides the necessary and sufficient information to the downstream **execution** portion of the process, to assure a successful outcome. The technical and business considerations, variables, tradeoffs, and constraints can be daunting to even the most experienced professional. Even with an expert consultant engaged in assessment, there is a critical hierarchical sequence of user interaction and input that can be modeled by a standardized methodology that minimizes backtracking and wasted effort by all parties (see **Figure 1**)

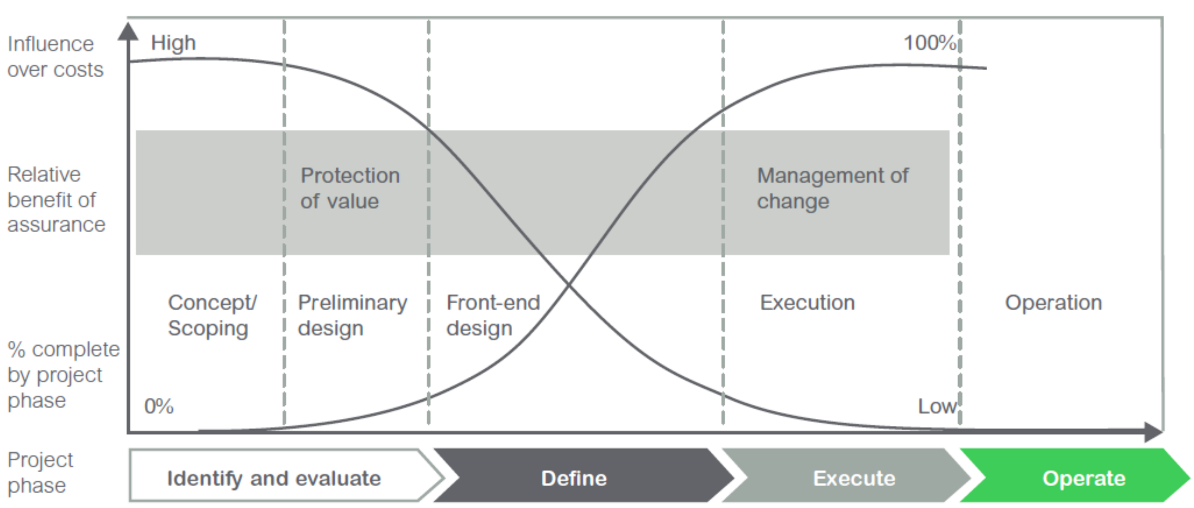


Figure 1

The link between influence over costs and project stage

[1] EY, "Spotlight on Oil and Gas Megaprojects", 2014

Beyond the importance of upfront project planning, the challenging marketplace conditions and the new oil barrel pricing context have forced upon the industry a new level of discipline when it comes to efficiency improvements and related cost control. According to McKinsey & Company, low oil and gas prices have forced the Oil & Gas industry to lower production costs. These costs have fallen by an estimated $44 billion (29%) since 2014 (see **Figure 2**), in contrast to the steeply rising costs of previous years.[2]

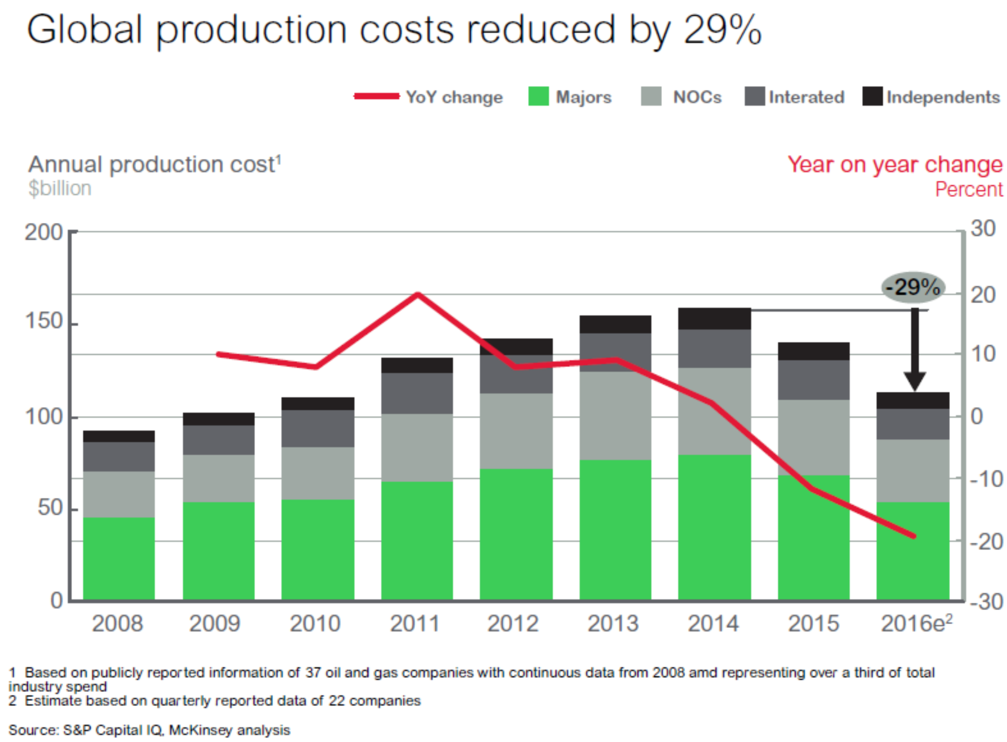


Figure 2

A lean environment has driven a number of cost cutting initiatives. But are these reductions permanent?

In essence, the industry is in the process of reinventing itself, and for Oil & Gas industry stakeholders, the critical success factors for achieving business growth, ROI and competitiveness now center around both improving efficiencies and injecting innovation into the core upstream, midstream and downstream business processes.

Execution of efficiency improvements

Efficiency improvement, however, is not achieved by waving a magic wand. Successful efficiency initiatives require, on a project by project basis, implementation of technology standardization, process simplification and integration best practices. A fundamental driver for facilitating development of these three core efficiency elements is a reinvention of control engineering processes and the tools that support the key business systems. In fact, engineering tools will drive much of the ongoing business transformation for many years to come.

Reliance on older tools increases the complexity and cost of systems convergence and the resulting complexities often fuel production errors. New engineering tools in the domain of Integrated Power and Process Management (IPPM), for example, reduce deployment costs by up to 35% and shorten delivery times by 6 to 12 months (see Schneider Electric white paper "Integrating Process and Power Automation: A Value for the Oil & Gas Industry" for more information).

[2] McKinsey & Company, "Preserving the downturn's upside", 2017

Traditional process engineering practices are failing to keep pace with the ever-increasing size and complexity of Oil & Gas on-shore, off-shore, pipeline and refinery projects. As a result, most recent oil and gas company projects are being delivered late and over budget. Sound engineering practices take time to develop, and unfortunately, many experienced engineers are leaving the workforce and are taking their knowledge with them. In fact, during this latest industry downcycle Deloitte estimates that the Oil & Gas industry has lost about 350,000 seasoned professionals, including up to 160,000 in the US alone.[3] In addition, each day 10,000 "Baby Boomers" turn 65 and retire; a statistic projected by the Pew Research Center to be true through 2030.

This is having profound impact on the industry. A major Asian oil supplier, for example, recently identified a need to retrofit existing refineries in addition to building several new refinery facilities. This was their first project of this type in at least 20 years. Over that period of time, they had lost much of their core refinery process engineering expertise. As a result, they found themselves in the position of having to send hundreds of new inexperienced engineers across the globe.

These trends will, to some degree, be alleviated through technological advancements and accelerated digitization of production assets, trends which will encourage young workers to join the industry. The new generation of workers coming in, however, will need to be provided with the most modern productivity tools, if high operational efficiencies are to be achieved. These newcomers regard high speed Internet access, mobile devices, touch screens and virtual reality as characteristic of any productivity tools they are required to work with. In this regard, the deployment of innovative simulation-based training tools will be expanded to quickly improve workforce capabilities.

"Big oil spends $25 in support costs to achieve $1000 in optimization benefits."

While the current challenges faced by the Oil & Gas industry will be difficult to quickly overcome, they are not intractable. Significant breakthroughs in technology are beginning to emerge that, together, enable quantum leaps in efficiency improvement across all Oil & Gas core operations. These new technology-driven efficiencies will help Oil & Gas companies to establish a leadership role in helping the planet to resolve the "growth vs. CO_2 emissions" paradox. That is, how can the planet as a whole manage, economic growth without a corresponding increase in CO_2 emissions.

Over the next 40 years, energy consumption will rise by 50% while, at the same time, environmental scientists across the globe are stressing that we humans have to become three times more efficient, if we want to reduce emissions. In order to achieve the COP21 goal of limiting global warming to 1.5°C, low-emission alternatives must be quickly embraced and integrated. Such a mandate implies a need improve our efficiencies across a vast array of core human activities including the key area of energy generation, distribution and consumption.

While addressing these issues, the Oil & Gas industry must manage through capital expenditure constraints and implement operational efficiency to drive profitability. This can be achieved by attaining increased visibility to business performance, enhancing decision support capabilities, improving asset reliability and availability, and through the deployment of innovative simulation-based training tools that quickly improve workforce capabilities.

Efficiencies can also be gained through the integration of systems and the introduction of innovation at every level of the operation. By pursuing such sustainability and

[3] Oil and Gas Financial Journal, "Early stages of a recovery", April 2017

efficiency goals, organizations can grow profitability, even while managing through low market price conditions.

This paper identifies some key project lifecycle phases where technology and process optimization can provide sustained efficiency and cost reduction gains. The paper will also demonstrate how modern process engineering tools can decrease project risk and positively impact corporate profitability.

Table 1

Key areas where modernization impacts corporate profitability

Areas impacting profitability	Actions	Installation Time Savings	Impact on efficiency
Process Engineering	Implement updated process simulators	20%* *Reduction in field commissioning time for instrument technicians and system integrators.	Up to 20% increased production capacity
Power Engineering	Abandon 'Rules of Thumb' and historical 'Cut-Copy-Paste' power engineering approaches	10%* *Timeline savings	Up to 10-15% in CapEx reduction
Power Distribution	Modular electrical distribution	15 – 20% * *Dependent upon project location (can go higher for remote areas)	Up to 15-20% in power distribution CapEx reduction. Up to 25% in OpEx reduction
Power and Process Management	Converged power and process systems to accelerate system optimization	>25%* *Faster project execution from FEED to Factor Acceptable Testing	Up to 14% in power distribution CapEx reduction. Up to 11% in power distribution OpEx reduction
Process Simulation	Implement virtual reality training simulators to secure higher uptime operations	50%* *Reduced training time	Reduced risk of operational human error

Rethink process engineering

New technology trends such as digitization, cloud, mobility, big data, and the Industrial Internet of Things (IIoT) are all helping to create a data-driven bridge that establishes tighter links between efficient operations and business profitability. Today, new generation process simulation tools are leveraging these trends to boost operational efficiency.

Process simulation refers to powerful software tools that allow Oil & Gas company operators and engineers to virtually model a process in extreme detail without having to spend the time, manpower, or money physically testing their design in a real-world environment. It's often performed during the design phase of a project or before a plant becomes fully operational to see how changes in equipment specifications, scheduling, downtime, and maintenance can affect a process throughout the duration of its life cycle.

Most process engineering simulation tools used by engineers today don't leverage the new technology trends and trace their origin and design to legacy architectures, operating systems and user interfaces. However, for the first time in many years, new process simulators built from the ground up are being released which are designed as single software control solutions. These new simulators take full advantage of current web and cloud technologies.

Early adopters of these new approaches, include both end users and process design engineers working at Engineering, Procurement and Construction (EPC) firms. Both are experiencing speed, quality and productivity gains as a result of working with one application that allows them to visualize, test and implement process improvement. One global EPC leader, for instance, used dynamic simulation to evaluate the design of a flare stack operation. The optimization resulted in savings of more than $25 Million on a single new facility.

"ExxonMobil saved $500 million annually from optimization roll out."

From a practical field deployment perspective, benefits are realized across multiple implementation areas. Chevron Oil with total assets of $266 Billion (2016) and worldwide net production of 2.6 million barrels of oil-equivalent per day reported the following results from several months of testing gas collection optimization across their gas fields:

- Improved quality – The consolidated process engineering solution avoided the need for field programming and the multiple errors that are often propagated in field situations.
- Reduced commissioning time – The tools cut the typical commissioning time in half, which resulted in $840K in savings. The various systems can link together in a synchronized fashion very quickly because communication protocols are standardized. Connected products are designed to identify and communicate with each other automatically through machine-to-machine communication. Field commissioning time for instrument technicians and system integrators was also cut by 20%.
- Reduced training time – New generation Operation Training Simulation (OTS) tools saved about four weeks of time over the course of the project.
- Increased production capacity – Testing of new control strategies helped to eliminate existing bottlenecks and improved production capacity by 20%.

These new tools help to enable good engineering practice (GEP) for process efficiency, a methodology that encompasses linkages between software, automation and energy management for the purpose of streamlining engineering design processes.

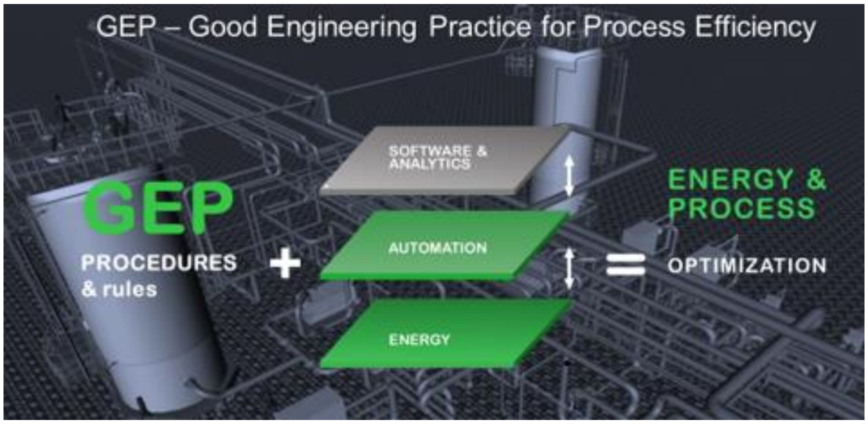


Figure 3

Modern engineering methodologies combine analytics, automation, and energy considerations to help drive profitability.

Time and labor-intensive engineering projects are often constrained by more than just technical requirements. As design accuracy improves, capital costs often increase, but so do the modeling possibilities. A Front-End Engineering Design (FEED) process (a subset of the GEP methodology) is a useful design approach for planning, estimating, and controlling project schedules and expenses to meet the specified technical requirements, before a project is even considered for construction.

In order to realize the true value that the technology provides, operations control and optimization strategies must be built into detailed engineering design models. A single software solution that is able to consider safety, control, and training during the design phase requires more work up front, but the economic benefits are significant. For example, the cost of correcting an error at the feed or pre-feed stage is minimal. However, if faced with having to correct that problem at the later stages of the project, costs can spiral up by a factor of 10 – 100 X.

The key FEED deliverable is a dynamic simulation of the validated design. This model can be used to test safety and control schemes, conduct startup commissioning procedures, and develop operator training. The same model can also be used for advanced control system design and troubleshooting, providing hooks for the plant's control systems. Once connected to a Distributed Control System (DCS), the model can be used for real-time optimization, together with automation software, to determine the optimal operating parameters for a process when specific targets and constraints are applied. In fact, one leading LNG carrier saved over $1 Million on a DCS project by using dynamic simulation to test and optimize controls.[4]

For engineering teams, a single set of technology can be used across an asset's complete lifecycle to provide significant value. Benefits include:

- Fewer possibilities for error and redundant data entry
- A moderate learning curve through an optimized workflow
- Superior operational efficiency through optimized performance

In addition to driving maximum profit and performance, by embracing a holistic view that ties together technology, people and process during the engineering design phase, the modeling process, and control system are configured correctly the first time. This lowers overall project cost and promotes productivity and efficiency.

Generating profitability through systems convergence

New tools for addressing the efficiency and profitability challenges of the Oil & Gas industry can be leveraged today by forward-thinking stakeholders. In recent years, technological developments have evolved to a point where the technology itself no longer constrains how systems solutions are architected. Consider distributed control systems (DCS), for example. These systems were originally designed to manage process control. In today's world, the DCS system is capable of much more such as building efficiencies and value by aligning with other operational areas such as power, safety management, and business systems.

Convergence of systems is now a requirement, not an option

In order to enable this evolution in profitability, once siloed domains will need to come together. Traditional systems are quite proprietary. Industry stakeholders are pushing to make them more open and more interoperable. But the openness of the

[4] Wiley, Livia, Schneider Electric, "“How to Remain Profitable in a Tough Oil Market”, 2015

vendors systems means that the client's fundamental architectures will need to change. Although disruptive, in the long run this is a very healthy development.

There are some very recent examples of more open and interoperable systems converging like the integration of process and power management systems (IPPM) so that profitability, and not technology, becomes the driver for the decision-making.

Oil & Gas enterprises generate avoidable and unnecessary expense by operating process management and power management systems as separate silos. As the end users engage multiple vendors across wide domains of process control, the vendor-supplied solutions use different disparate technologies. Thus, integration work at the outset is costly and time consuming because of the additional engineering and programming that needs to take place.

Gateways need to be built so that cross systems communications can occur. The cost of supporting these forced fixes across the lifetime of these assets is high. Whenever upgrades to the process systems occur, changes have to be implemented on a project-by-project or even device-by-device basis. In some cases, systems have no means for exchanging data. Thus, the ability to easily time stamp an event (i.e., "did that motor failure happen before or after that valve shutdown") is lost and a more complex analysis of operational issues is required.

"A Brazilian oil company experienced s Safety Instrumented System (SIS) loop test that took 75% less time than projected because it was first simulated on an integrated OTS/DCS/SIS model."

When specifying work for converging a process/safety and power management system, a number of key considerations should be factored in. The recommended architecture should provide a common unified operational platform in the control room. At the same time, provisions should be made for autonomous engineering and maintenance of safety, process and electric sub-functions within the converged systems, while facilitating unified cybersecurity and user management policies from plant to enterprise.

A subset of IPPM, Intelligent Power & Motor Control Centers (IPMCC), also serve as a good example of how these systems drive profitability through a combination of improved operational efficiency, improved safety and improved asset reliability. In nondigitized systems, Motor Control Centers and low voltage systems that are linked to DCS require many cables and a significant assortment of hardware in order to function properly. In the newly converged digitized systems, an element of "smart" low voltage emerges which enables a reduction of cables, faster commissioning, easier maintenance and an optimized footprint. Such systems are designed around a profit engine functional architecture that combines process and low voltage electrical measurement and control. By closely linking electrical and automation systems, risks are reduced, costs are lowered and process and energy efficiency is improved.

In the domain of specialized hardware and controllers, technology suppliers should be mandated to support open object-oriented interchange protocols including IEC61850. Connection points and gateways between the Energy Management Control System (EMCS) and the Integrated Control and Safety System (ICSS) should also be minimized.

Real-time interaction between process and electrical systems can be enabled with an appropriate unified supervisory layer or with an integrated control network layer. Here, the power and process disciplines can interact resulting in additional operational decision-making value.

When designing converged systems, a top priority should be simplification. The creation of simpler and largely autonomous set of control systems should avoid duplicated architectural elements, and simplify interaction at an appropriate level while embracing standards.

A converged architecture should also be designed to allow diagnostic and asset reporting of smart controllers to bypass the control hierarchy. This allows the control hierarchy to be more responsive and more scalable and retains an independence of performance between the electrical and process control systems.

The following additional best practices are recommended when planning process and power management convergence projects:

- Use Ethernet communication – This facilitates the sharing of information between protection relays, PLCs, measurement units and distributed electrical devices. An open and connected system design means guaranteed compatibility with motor control solutions via intelligent variable speed drives.
- Build a system capable of load management - Critical loads need to remain connected and non-critical loads shed when necessary, and then restored only at the right time and in order of priority. If a fault in the system occurs, the system allows intelligent recreation of the network and avoids or limits the consequences of a major power outage.
- Develop accurate network models - The fundamental architecture must include a design where a central master network model is shared and updated across all operational systems, including the SCADA, DCS, ICSS, EMCS or other related systems.
- Design for operational efficiency – Improved efficiency can result from numerous best practices such as migrating HMI, Historians, Power Management, and Engineering to one common platform, eliminating or combining standalone components (servers, switches, converters, remote I/O, operator screens), and utilizing components that are standard between the Instrument and Controls (I&C) and electrical design.
- Incorporate time and cost-saving pre-configured and pre-packaged modular electrical and control centers – Enclosed in a “house”, these solutions can incorporate both electrical, telecom and control and instrumentation devices and can be deployed in a “plug and play” manner.

Marketplace changes and technology advancements now make the once daunting task of power and process system convergence an attainable, cost justifiable goal.

Pre-configured, prepackaged electrical distribution

Deployment of electrical distribution systems has often been challenging for the Oil & Gas industry. Harsh environments, such as offshore platforms, often make it difficult for electrical distribution and power systems to be installed, commissioned and operated in traditional ways. Implementations are often costly and systems uptime is often a concern because of the complexity involved in making all the part pieces work together in a reliable fashion.

Two recent innovations have now made it possible for Oil & Gas companies with power distribution challenges to streamline the power system deployment process while contributing to profitability. The first is a “fit for purpose” methodology, that helps to avoid the oversizing that has typically burdened many power distribution projects with high costs and low efficiencies.

The second is a new trend involving the delivery of end-to-end pre-packaged electrical distribution systems that are pre-assembled and pre-tested in the factory and that are ready to plug in upon arrival to a designated site (i.e., an off-shore platform, or a drill and extraction site).

Fit-for-purpose power systems

In the case of the fit-for-purpose approach, the goal is to implement a step by step methodology that redefines traditional modelling of electrical architectures by abandoning "Rules of Thumb" and historical "Cut-Copy-Paste" approaches. During the years when oil prices were high, many in the Oil & Gas industry fell into an accepted practice of relying on 30-40-year-old electrical distribution designs that were reused again and again. The mindset was "It's ok, we have the money, it's expensive, but we know the 'old reliable' approach has always worked in the past and will work in the future".

However, in today's new and different business environment, cost pressures demand a reexamination of inefficient traditional practices. Now, digital tools allow designers to propose co-designed solutions that incorporate both energy supply, process automation and energy management systems. New power system engineering simulation and calculation tools allow for much higher degrees of optimization than in the past. Consider the example presented in **Table 2**. The table compares a traditional design and configuration approach, one that does not account for any possible optimization, to a more streamlined approach where optimized linking of assets requires less capital expense.

Table 2

Example of benefits derived from a "fit-for-purpose" power systems deployment approach

Equipment category	Units specified (traditional)	Units (optimized)	Cost reduction
MV switchgear	30 columns	20 columns	30%
LV switchboard	16 columns	12 columns	25%
Power transformers	6 (15 MVA) units	5 (10MVA) units	20%
Distribution transformers	18 units	17 units	10%

What's driving the 25-30% power distribution architecture CAPEX reduction in **Table 2**? The approach exploits optimization on two levels. On one level, the availability science is based on a global level rather than on a local level of individual components. Availability research studies help to maximize the efficiency of the equipment as it works together as a coordinated whole. On a second level, the optimization-driven design is based on practical analysis of the customer environment and business need so that a "fit for purpose" solution is proposed as opposed to a more generic "traditional" solution that is less efficient. For example, where a traditional, "rough approximation" set up would habitually specify 20 transformers to address a given need, now 10 may be enough, with assured reliability and redundancy. The new emphasis is on a methodology that eliminates waste and that specifies more compact solutions with less risk.

Pre-assembled modular power distribution center

In the case of the second innovation, the prefabricated modular power distribution center or "e-house", the pre-configured transformers, switches, cables, circuit breakers, uninterruptible power supplies, precision cooling, and other electrical and mechanical devices arrive on site, enclosed in a "house", which offers protection from the outside elements. In addition to electrical distribution systems, small data centers can also be delivered on site in a similar fashion (i.e. small pre-packaged data center computer, cooling and/or power containers that can be quickly deployed during an exploration phase, for instance).

Figure 4

Pre-fabricated "e-houses" are 30-50% more productive than traditional deployments

Cost optimization and schedule optimization are two significant advantages of the e-house approach. The delivery of a pre-built, pre-tested self-enclosed unit avoids a situation where dozens of contractors need to be dispatched to the site, all scrambling to finish their piece of the project. This results in fewer project scheduling interdependencies and higher safety and efficiency. The responsibility for the proper configuration, testing, delivery, installation, and commissioning all lies with the manufacturer of the e-house. Planning for mechanical, electrical, and systems interoperability is simplified.

If issues come up, the system users have one team of people to deal with, and finger-pointing situations are avoided. This approach also helps to alleviate the issue of lack of access to specialized experts in remote or underdeveloped regions. It's far easier to have the power systems assembly work performed in the plant where all the top experts are readily available when questions come up or inconsistencies occur. Since these experts have intimate knowledge of all the products involved in the integration, they are aware of how to connect them without mistake or risk.

The manufacturer also has a deep understanding of product costs and constraints which helps the end user optimize the solution during the design phase. This means that more compact solutions can be configured to help lower costs, especially in off-shore situations where power system installations are typically four times more expensive than comparable on-shore sites. Delivery of such an integrated unit is simplified when compared to a situation where all the components are shipped separately, each having to be managed individually for customs, import, and scheduling requirements.

Shorter delivery times, fewer people in the field and pre-fabricated design are all elements of this new plug-and-play deployment mentality. This new approach has resulted in productivity gains in the range of 30-50% when compared to traditional deployments.

Table 3

E-house approach benefits summary

	Power Distribution CapEx	Power Distribution OpEx	Schedule
E-house advantages vs. traditional approach	15 – 20 % (depends on the project location, can go higher in remote areas)	25%	15 – 20 % depend on the project location (can go higher for remote areas)

Training the new workforce

As the Oil & Gas marketplace recalibrates its profitability models, the ability of the major players to remain nimble depends on how quickly the workforce can adjust not only to the new ways of conducting business, but also to the generational migration taking place throughout the industry.

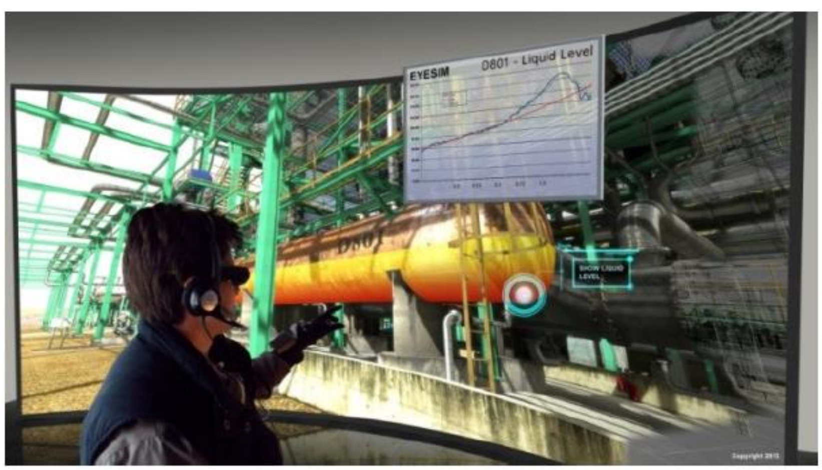
Millennial operators and engineers coming on board are replacing Baby Boomer retirees and are forcing the industry to migrate to different user interfaces that incorporate elements of virtual reality/augmented reality for both training and process operation. In such an environment, technology holds the key to engaging the next generation of engineers and operators, both in the control room and in the field. Proper training is critical as operator error causes 42% of unscheduled plant shutdowns[5] and 22% of all accidents.[6]

Well-defined operator training simulator training tools consider all the necessary training elements including hands-on experience, direct feedback, evaluation and assessment of trainee progress. An OTS uses dynamic simulation technology to produce a high definition representation of the processing system including the process equipment, controls, and automated procedures.

These advanced training systems can be applied to a number of Oil & Gas industry environments. In a refinery, for instance, modern instrumentation collects data on tens of thousands of variables. All of that data is accessible in order for simulation process models to be optimized as they are tied into the plant control system. Therefore, when simulation-driven changes are applied to live production systems they are the best changes for the plant, from a safety, efficiency and productivity perspective.

Figure 5

A new employee undergoes 3D Immersive Training System (ITS) exercises



[5] ARC Advisory Group

[6] Health and Safety Executive

The Chevron company prides itself as a leader in the area of process simulation. They utilize simulation software to model the performance of their natural gas extraction fields. They conducted a series of simulation-based studies to improve the efficiency of some of their gas lines and were able to boost their capacity by 20%. Simulators were used by both field engineers and control room operators. In Chevron's case, the simulation software allowed them to analyze the process from the beginning and then follow the entire lifecycle of the gas moving through their plant.

"Chevron reduced commissioning and training time by 50% with improved control strategies."

Chevron also built a dynamic simulation of their model for training that reacts exactly as the live plant would react once changes are made. The system model reacts to any change in temperature, pressure, or flow, in the same way as the actual plant. The risk is eliminated because the changes are only being made to the model. The model is also overlaid with a human machine interface (HMI) that looks exactly the same as the actual control room operator's screen. The control room operator does not need to see all the aspects of the rigorous dynamic model, only those elements that involve their particular set of responsibilities.

These tools will be key to the way Oil & Gas executives manage their workforce engineering and operator skill shortage challenges. The future has arrived, and for the moment, simulation and virtual reality tools are providing critical assistance.

Conclusion

Oil & Gas industry leaders now possess the means to address current market-driven efficiency, cost control and profitability challenges. By encouraging their executive teams to embrace a business approach that reexamines existing processes and prioritizes standardization, simplification and integration of operations, healthy profits can still be realized, even in an economy where oil & gas prices are relatively low.

A roadmap exists for a logical way to tie together the concepts discussed in this paper (see **Figure 6**). Vendors such as Schneider Electric can provide consultative guidance surrounding which products make the most sense for addressing the critical milestones that need to be achieved throughout the project lifecycle phases.

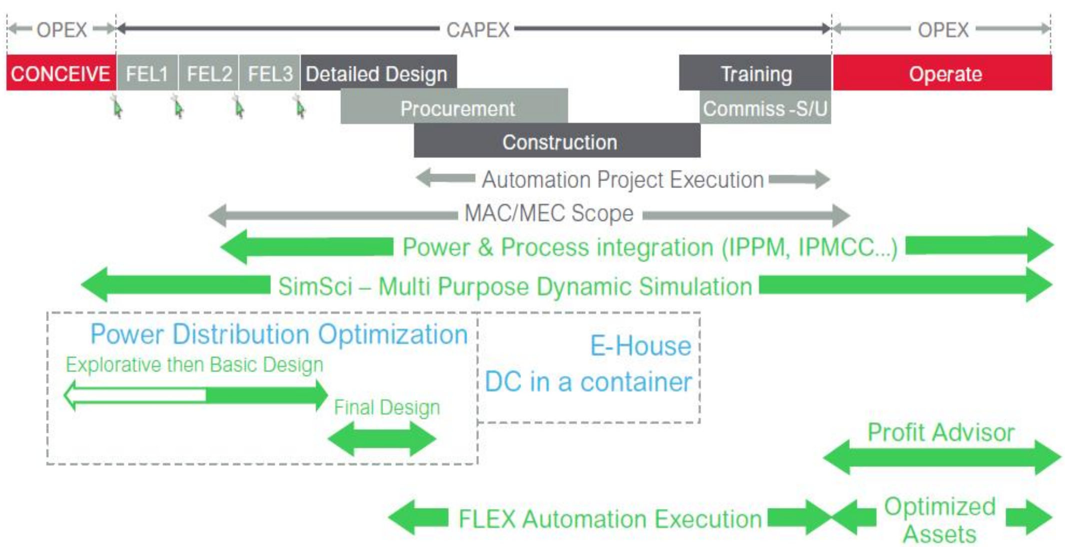


Figure 6

Project lifecycle phases that incorporate solutions for maximizing profitability

Some examples of where quick progress can be made optimizing core upstream, midstream and downstream processes include:

Good engineering practice (GEP) - A methodology that encompasses linkages between software, automation and energy management for the purpose of stream-lining engineering design processes.

Systems and architecture convergence – Merging power and process systems, along with power and motor control systems helps drive profitability through a com-bination of improved operational efficiency, safety and asset reliability.

Control engineering tools – Modern engineering simulation tools correct potential errors and avoid having to correct the problem at the later stages of the project, where costs can spiral up by a factor of 10 – 100 X.

Power distribution – Fit-for-purpose architectures and innovations such as preas-sembled, pre-packaged power distribution solutions can reduce costs and speed up implementation by factors of 2-4X.

Training simulation – 3D virtual reality solutions now accelerate the training of Mil-lennial employees as they come in to replace retiring Baby Boomers. The high effi-ciency of these model tools means that fewer bodies are needed to manage more of the operation with a higher degree of reliability.

About the authors

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Joseph McMullen, Marketing Director at Schneider Electric, manages SimSci product line marketing. Joe earned his Bachelor's degree in Chemical Engineering in 2000 and MBA in 2004, both from Villanova University. Joe started at Schneider Electric (formerly Invensys) as a Senior Technical Support Specialist in 2001. Joe spent 5 years as the Product Manager for steady-state simulation software products for the SimSci brand. In April, 2011, he began his new role in Product Marketing, responsible for developing and expanding the SimSci brand awareness and strengthening the marketing behind SimSci software for design, simulation, training, advanced control, and optimization. Recently Joe has taken a role responsible for effectively marketing Schneider Electric's entire software portfolio across the process industries.