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Unprecedented and Unseen: The Next Great Energy Challenge

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While oil and gas industries ramp up "megaprojects" to meet demand, few companies really know how to manage them effectively.

by Herve Wilczynski, Matthew McKenna, and David VanderSchee

In September 2006, Chevron Oil Company announced that it had tapped a 3 billion– to 15 billion–barrel pool of oil in the Gulf of Mexico, a new source of fuel that could potentially rival Alaska's Prudhoe Bay. Jack 2, as the well is called, spurred hopes that the United States could become more energy self-sufficient, or at least replenish its own dwindling oil reserves. As *Fortune* columnist and now managing editor Andy Serwer noted in October 2006, the discovery might challenge the peak theory of oil — the idea that the world has used up more than half of the available inexpensive petroleum.

But, as Mr. Serwer writes, this is no cause for complacency. Because projects like Jack 2 are so much more complex than they used to be, no country should rely heavily on the fuel that they generate. Bringing Jack 2 to fruition takes unprecedented technological mastery: The drilling rig sits in a hurricane zone, and must delve 28,000 feet below the Gulf's surface. Even more complex, however, are the managerial issues at play. At Jack 2, three oil companies — Chevron, Statoil, and their smaller partner, Devon Energy — share the risk and responsibilities, reinforced by an army of suppliers. A similarly sized project in Nigeria undertaken in 2005, the $3.5 billion Bonga oil field, has four investors: Shell Nigeria (55 percent), Esso Exploration and Production Nigeria (20 percent), Nigerian Agip, and Elf Petroleum Nigeria (12.5 percent each). And there are at least three megaprojects in Angola (Kizomba B, Dalia, and Xikomba B) with four or more partners splitting a cost of more than $3 billion for each. (The Web site Rigzone tracks these and other oil and gas exploration and production megaprojects.) Such bets are bold, long-term endeavors. Production on Jack 2 won't start until 2010, with each well costing between $80 million and $120 million.

All of these factors stretch the capabilities of the companies involved. In short, what hinders the oil industry in providing energy independence to countries like the U.S. is the managerial complexity of the oil and gas projects of the future. And that helps explain why capital project execution has become a hot topic in executive suites — for big oil producers; smaller producers; and related engineering, procurement, and construction contractors (or EPC firms, as they're known in the industry).

Megaproject Mega Tensions

Recently, Booz Allen Hamilton surveyed the leaders of 20 companies, including super-majors, independents, and EPC firms, as well as some heavy industrial companies from the United States, Europe, and Asia, with combined capital spending of over $100 billion. Eighty

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percent of the respondents say that they expect their companies to increase capital expenditures over the next five years, with many planning increases of 30 percent in 2006 alone. (Industry-wide spending for exploration and production is expected to exceed $275 billion in 2006, mostly in megaprojects.)

The push, of course, is a response to an unprecedented surge in oil demand. Although the United States currently consumes 25 percent of global production, developing nations — once barely a blip on consumption charts — are starting to close the gap: China and India have more than doubled their consumption since 1990, and the trend is expected to continue. World energy consumption is projected to increase by 71 percent from 2003 to 2030. Politicians have taken note, and in October 2005 the U.S. House of Representatives' "Peak Oil Caucus" introduced a resolution calling for a multilateral energy project equivalent to the "Man on the Moon project."

But walking on the moon may turn out to be a garden stroll by comparison, at least in terms of management. More than half of the executives who were surveyed are dissatisfied with their companies' overall project performance. All of them say costly budget and schedule overruns plague 40 percent of their projects. Producers and contractors disagree frequently, but both groups identify the same points of pain: risk management, performance risk, and human resources. Contractors are also dissatisfied with the lack of collaborative project planning on the part of the owners.

Individually, each of the tensions facing capital projects would be difficult to deal with; taken together, the difficulty escalates. The result is an oil and gas environment that has changed so fundamentally that many traditional ways of doing business have become anachronistic:

• **Frontier Regions:** Most new capital projects take place in regions that are politically and socially unstable, such as West Africa, parts of Eastern Europe, and the Middle East. Investment in Africa and the Asia Pacific region has shot up 25 to 40 percent per year, while (the aforementioned Gulf of Mexico opportunity notwithstanding) investment in traditional production regions in the U.S. and Europe has stagnated or fallen. Oil and gas executives note that operating in frontier regions challenges companies' political, diplomatic, and security capabilities as never before. Many of these countries, such as Indonesia, are new democracies, in which the old, autocratic way of doing business under former governments (Indonesia's Suharto regime is an example) has given way to an even more daunting, decentralized maze, with laws that are not always transparent and court rulings that are often inconsistent. Nationally owned oil production companies, such as Indonesia's Pertamina, Malaysia's Petronas, or Kazakhstan's PetroKazakhstan, play an ambiguous role; they sometimes represent government interests and sometimes expand internationally; some, like PetroKazakhstan, have been partially bought by overseas interests, for example, in China.

• **Local Pressures:** Projects in both frontier and developed regions face increased supply chain complexity. Host governments frequently require international partners to use local suppliers that have no established track records with oil and gas companies. Tight labor markets and stringent government regulations can lead to project delays and cost overruns, as they have in the oil sands project in Alberta, Canada.

• **More Intense Competition:** Big oil companies are no longer the only game in town, and they are facing increased competition from small and mid-sized producers, as well as national oil companies (NOCs), which now hold more than 75 percent of proven reserves. This represents a critical shift for the major companies; increasingly, they have to deal with these new players, either as direct competitors or as joint-venture partners.

• **Project Performance Volatility:** As the megaproject risk profiles change, it becomes more difficult to manage costs and other performance targets. Oil and gas companies and contractors are struggling to set budgets that are at once competitive and realistic. Traditional benchmarks, such as the Independent Project Assessment (IPA), are less helpful than they used to be in setting targets — there just aren't enough "typical" projects to provide a reliable standard. The result, according to the survey: One-third of all oil and gas projects exceed budget and time projections by more than 10 percent. Failures to deliver big projects on budget and on schedule are highly publicized and damage the companies' profile with capital markets that expect predictability and strong returns.

• **Contractor Relationships:** An uneasy "upstairs/downstairs" relationship between owners and contractors has resulted in a major disconnect, particularly in the planning and contracting stages. Oil and gas companies tend to look for lowest-cost contractors and to prefer short-term contracts; the contractors call for more integrated, long-term relationships that foster advance planning, effective use of resources, and more equitable sharing of risks and incentives. In high-risk projects, the contracts themselves are a bone of contention: Contractors seek time and material arrangements, whereas owners insist on lump sum contracts. Contractors argue that these turnkey contracts force them to include excessive contingency arrangements, and thus are not conducive to a collaborative approach to risk management.

• **The Technical Talent Drain:** The graying of the baby boomers is having a substantial impact on the oil and gas industry. The median age for technicians in operating companies is over 45, and it is over 50 for contractors. More than half of the workers in these companies will retire in the next five to 10 years. Moreover, this talent pool is not being replenished. The number of petroleum engineering diplomas awarded in the United States in 2002 was just one-quarter the number awarded annually in the 1980s. China, India, and even Europe currently outpace the U.S. in actual numbers of engineering graduates.

Personnel managers tick off reasons for the industry's failure to attract, develop, and retain young talent: uncertain employment, the lack of formal career paths, and the greater likelihood that engineers would have to move to frontier regions — a lifestyle many reject because it creates hardship for their families. It doesn't help that oil and gas extraction, despite its importance to the economy, is seen as a "sunset industry" in the United States, a view backed by Department of Labor projections that employment in the industry will decline by 6 percent through the year 2014.

• **Risk Mitigation:** As projects have become more complex and expensive (Jack 2 could ultimately cost more than $3 billion), even major corporations cannot afford to miscalculate the risks. Most oil and natural gas company executives say they believe they have a good sense of the risks involved, but they do not always know how to mitigate them, for instance, how best to deal with joint-venture partners and host governments. Suppliers and contractors express even greater concern, with a heightened sense of urgency: They believe oil and gas companies do not fully recognize, evaluate, and manage the risks, and consequently are not addressing them effectively.

Power Shift

Unless companies make quantum shifts in their management practices, they may not be able to manage a significant wave of capital investment and meet the future energy needs of the global economy. The survey as well as our own observations suggest that there are four vital agenda items for both owners and contractors who want to ensure the future well-being of the industry and thus of the world's oil supply:

• *Adopt a global project-management framework to increase performance.* Some of the companies that responded to the survey have adopted central management of key functions; they report significantly improved performance, particularly in megaprojects. They have done this in several arenas: human resources, where more formal career paths can help junior staff members assume new, challenging, and more rewarding roles; knowledge management, including on-the-job mentoring, structured training, and other ways to capture and spread in-depth technical knowledge; and supply chain management. The leading companies have learned to forecast their needs across several projects,

looking for opportunities to aggregate and possibly standardize the demand for specific components, such as pumps, or raw material, such as steel, and share this information with the supply base. In turn, this helps contractors better manage their resources, anticipate needs, and plan their production and procurement activities. Costs can be reduced by as much as 15 percent by centralizing operations and purchasing in bulk.

• *Train and tap into local talent.* To address the talent gap, some EPC companies have established engineering centers in developing nations such as India and Indonesia. This benefits a company's bottom line, and also builds goodwill with the host government and a public eager for jobs. In a period of increasing sophistication and activism on the part of host governments and civic groups, and in some regions, civil unrest targeting the oil industry, it helps companies gain recognition as good corporate citizens.

• *Balance technology innovation with cost and schedule.* By leveraging design similarities across projects, companies can reduce capital costs and cycle time while improving operations and engineering productivity. Leading oil and gas companies are following the lead of automotive companies that use the concept of "platform" and "subassembly" for new model introduction. Recently, the CEO of ExxonMobil promoted the concept of "design one, build many" as a means to allow his company to execute megaprojects more effectively. Supply-base companies have already aggressively moved to a modular approach to design and manufacture complex engineering equipment, providing quick turnaround time. A leading manufacturer currently starts assembly of gas compression engines even before their design is finalized. This flexible production system allows the supplier to respond to last-minute changes.

• *Revisit the nature of the relationship between owner and supplier, so that they can jointly manage the surge in activity while meeting project performance targets.* Historically, the quality and availability of contractors have been key to the success of a project. Today, the supply base is consolidating at a fast pace — a situation that is likely to have far-reaching implications regarding the nature of contractor/field owner relationships. Contractors are already being selective about who they work with. A senior manager of a large EPC firm in Houston states that, far from chasing work (as was done in years past), his firm will pick and choose projects in the future.

This is a sobering situation for large oil and gas companies. A senior executive who oversees project management in one such company estimates that the current contractor base has enough capacity to manage only 70 percent of the projects currently in the pipeline. It is imperative that the industry work to bridge the divide and start a dialogue, so that both sides can align their interests and collaborate. Now more than ever before, the world, struggling to secure energy supplies, needs an oil industry that can effectively manage complexity. +

Resources

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