

Knowledge@Wharton – Wipro Future of the Industry Series: ENU
**Energy, Utility and Natural Resources
Companies Meet Uncertainty with Technology**



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Oil and gas companies today want faster returns on their investments and reduced risks. To get there, they are heading to new geographies, and advanced exploration and drilling technologies. Utilities, meanwhile, are layering value-added services onto their offerings and aligning themselves closer to the customers, and natural resources companies, like mine operators, want more engagement with local governments and communities. At the same time, they all are responding to challenges around price volatility, regulations, the environment, health and safety measures, and more demanding customers. In this Future of Industry series white paper, Wharton management professor Witold Henisz and Wipro Technologies' senior vice president, Anand Padmanabhan, explore the opportunities and challenges ahead.



New Geographies and Technologies Boost Oil and Gas

The landscape facing oil and gas companies has changed dramatically in the last 10-15 years. "It has crossed boundaries into new geographies where production and consumption occur, and it has changed in terms of consumption

patterns and how energy sources are exploited," says Anand Padmanabhan, who heads Wipro's energy, utilities and natural resources businesses. Oil and gas companies also have had to adjust to local regulations. Major recent controversies, notably the BP oil spill in the Gulf of Mexico in 2010, prompted tighter scrutiny.

These companies must seek out new exploration markets because their supplies in many developed markets are already well-tapped, says

Wharton management professor Witold Henisz. In new markets, they face more uncertainty about regulations and local acceptance for reserve exploitation.

Ongoing price volatility for crude oil prices is nothing new, but it does require energy companies to frequently rethink long-term capital investments. "Oil and gas investments are expected to yield returns over 40 or 50 years, whether it is in pipelines, rigs or oil wells," says Padmanabhan. "It is also a cyclical industry where you could have controversies, such as oil spills..." Meanwhile, new technologies, like shale gas fracking, allow extraction of natural gas by applying water and chemicals to rocks at high pressure (called hydraulic fracturing). Experts estimate there are huge reserves of shale gas in South Africa, the U.S., Europe and China. But concerns abound about fracking's environmental impact on water supplies and agriculture – and even earthquakes – and evolving regulatory regimes are causing much anxiety for energy companies, says Henisz.

Henisz sees fracking as offering “an enormous opportunity to create energy security” in the U.S. and Europe, and notably in Poland, which has one of the largest reserves of extractable shale gas. But the new technologies of deep-water fracking need clear regulations on water safety and disposal. “It is in the best interests of those governments to formulate some national or international harmonized standards, lest it be seen like the Wild West or wildcatting, because that is just eroding confidence in fracking.” He calls for a regulatory environment for shale gas “that people have confidence in.” In emerging markets, oil and gas companies need to recognize that local governments may not have the regulatory capacity and expertise, “and the firm has to be an active political player even in the absence of government regulation.”

Renewable Fuels: Promise amid Uncertainty

To reduce dependence on traditional hydrocarbons and address concerns about global warming, oil and gas companies are investing in renewable fuels like solar and wind power. However, that route also carries uncertainties. The investment arithmetic depends on the prices of those fuels relative to natural gas, notes Henisz, and natural gas prices in the U.S. have significantly dropped. “There is real uncertainty about whether and when the alternative energy sources will be cost effective. All the major energy companies are watching the space closely and making their investments based on their best forecasts of future price paths. But it’s very hard to forecast on solar, wind, biofuels and biomass, and so I don’t think there is a consensus on what the right investments are and who is making the right bets.”

Henisz offers an example of the risks energy companies face in placing their bets across different types of fuels. Plentiful supplies of

natural gas have made it conceivable for the U.S. and China to potentially become energy exporters. As a result, natural gas supplies “will probably postpone the adoption of certain renewable energy sources by some time. I don’t think we are looking at a 10-year time horizon for a big shift away from oil and gas to other energies as we would have five years ago,” when many observers thought renewables would account for 20%-30% of total energy supplies in 15 years. “But that is not just clear at this point.”

The outlook for nuclear power is also highly uncertain after the Fukushima nuclear disaster in Japan in March 2011 in the wake of a tsunami and earthquakes. Japan recently said it will end dependence on nuclear power by the 2030s, and Germany is abandoning nuclear power too. “With nuclear power, there are real questions,” says Henisz, referring to the Japanese tilting away from it after the Fukushima disaster and the increasing importance of natural gas and shale oil. “Nuclear has lost its case, and for a long time.”

Another big constraint is a shortage of skilled talent, says Padmanabhan. Ten or 20 years ago, college graduates did not naturally gravitate towards careers in oil and gas as they did in telecommunications and information technology (IT) — the resulting shortage of capabilities is showing up now.

Energy: Emerging Solutions

Energy companies are responding to myriad challenges in several ways. For one, they are increasing investments in environmental health and safety (EHS) measures, says Padmanabhan. And to overcome the talent shortage, they are tapping retirees and using technology for remote (or digital) management of oil rigs. “They are adopting social media networks to connect with people who have the skills.”

Technology promises other, newer opportunities. Padmanabhan points to the opportunity in converting gas to liquids, as liquefied natural gas or liquefied petroleum. Natural gas prices were hovering at around \$3.5 per mBtu (million British thermal units) at Henry Hub in Louisiana, which sets the benchmark prices for gas in the U.S. “You could transport that to Asia where the end price could be \$20 and it will still be cheaper than oil currently,” he says. But technology investments are needed to convert, transport and store the gas.

Data analytics and related IT expertise are also helping energy companies better manage their investment programs. In the emerging scenario, instead of spending several years drilling oil wells and exploiting them over the next 20 years, a company might accelerate that by digging 500 gas wells at once. “They are looking to perform the same task repeatedly in a much shorter period,” says Padmanabhan. “They don’t have the luxury of spending two years analyzing seismic data as you might do with oil fields. Now they need to analyze the data in two months.” That brings fresh challenges regarding how to manage, analyze, transport and store all that data, which could be six to 10 times bigger than it was previously.

Energy companies also are finding solutions in standardized processes, templates, IT capabilities, and data management and analytical capabilities. With cloud technology and analytics, oil and gas companies could tap into their process skills across different locations worldwide, and have centralized storage, management and analytics of most data, says Padmanabhan.

Energy companies are also more actively attempting to ease the regulatory and policy paths in new geographies with an increased emphasis on government affairs and stakeholder relationship management, according to Henisz. “In emerging markets, the challenge is to

move from a model in which they focused on the relationship with the government and the security of the supply to one in which they are building a broader constituency of support. They are demonstrating that an oil or gas company can contribute to national development and not be seen as one that is lining the pockets of the ruling elites. They need to do that by pushing back sometimes against the national government, which is a very delicate balancing act.”

Utilities: Navigating Demanding Customers, Margin Pressures and Regulators

Like energy companies, utilities are heavily regulated globally across pricing, investments, health and safety, green technologies and the like. “All of those regulations limit their ability to change and evolve,” says Padmanabhan. They also now have “a whole new level of engagement with their consumers,” which impacts supply, demand and prices. “You have new technologies with alternative energies, customers wanting more services at cheaper prices, and regulators putting pressure on quality of services and sustaining price points.” Today’s customers demand a lot more regarding fuel choice, energy efficiency and access to devices like smart meters and home energy-management devices.

Unlike oil and gas companies, utilities have relatively narrow markets to make their fortunes because the source and the supply are within a defined geographical area, says Padmanabhan. As they navigate pressures on margins, they offer premium, value-added services such as wastewater treatment, home services, and energy management to expand into new geographies and consolidate. The expansionary trend is already underway in Europe. German electric utility E.ON, for example, is present in more than 30 countries while Vattenfall of Sweden, RWE of Germany, and French water utility Veolia

Environnement have operations across Europe and elsewhere, Padmanabhan points out. “You will also see a lot of M&A activity among utilities companies.”

Driven by regulators to foster more competition, utilities also are witnessing a widening middle order, with intermediaries in transmission and distribution. “In earlier years, a utility would have undertaken the whole nine yards of generation, transmission, distribution, retail supply and payments collection,” says Padmanabhan. “Now you see the chain broken up. A transmission and distribution company owns the pipes and does only that, for example.”

Henisz says the intermediation will continue to expand and put more pressure on margins. While that will create better matches between utilities’ supply and demand, it’s not a “revolutionary” trend. “Upstream, you still need billions of dollars of investments to extract oil and gas or to invest in alternatives, and downstream you still need to connect into people’s homes.... The margins may change, and things may become more competitive as you have more opportunities to match supply and demand, but I don’t think all that is a sea change.”

Managing assets, such as transmission pipelines, also brings huge costs, says Padmanabhan. Leakage management, regulatory penalties and the cost of repairing leakages are 10 times more than prevention. So, utilities are investing more in data systems to monitor pressure points and valves across their networks.

Data analytics has become extremely important for utilities at the retail end too, with smart meters and similar devices helping customers to choose fuel types, the times of day and quantities of energy they consume, and related dynamic pricing options. Some early investments in this area have backfired — customers rebelled against managing all that data themselves. They are now

asking the utilities to analyze and manage it, and to suggest usage and pricing options, says Padmanabhan. “The onus of using the data is falling back upon the utilities.”

Henisz too sees real-time pricing of utility offerings as unachievable. “Customers won’t tolerate massive uncertainty over their energy prices. At the extreme, the idea that we could price electricity like we price commodity — like oil or platinum with real-time market pricing — just doesn’t work ... customers want stable prices. [Companies] must come up with pricing schemes taking on more risk; they can’t pass all of the risk down to customers.”

Digital media networks are also being designed to give customers more control of energy usage with smart meters offering an ability to switch home appliances on or off remotely. That is in addition to enabling online payments and account management. “It achieves stickiness of the customer to the service provider and the ability to manage their energy consumption better, and, for the utility, to manage supply and demand better,” says Padmanabhan.

Natural Resources: Strategically Using New Tools, Public Affairs

Natural resources companies, such as mine operators, are using advanced technology to boost performance on several fronts. Prominent among those are efforts to foster a collaborative work environment and streamline remote field operations, especially where safety might be an issue. Third-party service providers these days offer expertise in areas including managing remote office centers, pit-to-port solutions, transportation management and risk management. They also help address gaps in the applications of mining systems, reduce project implementation times and optimize work distribution. Collaborative development

environments are made possible with protocols to manage production systems, workflow data analytics and tools to reduce physical barriers to collaboration.

Mining for natural resources faces challenges on other fronts. It is fraught with a different set of uncertainties than those faced by energy companies and utilities. Memories are fresh from the Chilean gold mine cave-in of August 2010, where 33 trapped miners were heroically rescued after spending 69 days underground. Wildcat strikes in South Africa's gold and platinum mines in recent months — and the ensuing violence — point to a trust deficit mining companies must deal with. "Big time" price and demand fluctuations add to the woes of once-flourishing mining companies, notes Padmanabhan. "You could have kept opening new mines as demand seemed plentiful, but today mining companies have to carefully consider that," he adds.

There is huge uncertainty on what types of contractual terms and regulatory regimes will give citizens confidence when exploiting natural resources, says Henisz. The recent scandal in India involving the granting of coal mining permits to select companies — termed Coalgate — is emblematic of the need for greater transparency by governments. "Governments have an incentive to give [rights] out to their friends and to capture bribes through that. What's happening in India is a great example of the risk of opacity and corruption when rights aren't allocated in a transparent manner."

Big concerns also involve companies shortchanging host countries. "That is a huge issue in continental Africa and Latin America," Henisz says, adding that in Chile and Peru, mining companies have to develop much better systems to navigate conflict with communities, nongovernmental organizations and government agencies.

Henisz sees big regulatory risks for natural resources companies in overcoming those conflicts, and relates them to better management of government affairs and stakeholder relations. "Mining companies are realizing that in contrast to oil and gas companies, they don't face a technological challenge — they face a public affairs or stakeholder challenge. So, companies are changing their business models and making big investments in environment, safety and community development to convince people they should have a social license to operate."

Also, governments are trying to claw back some of the returns that they see as excessive, says Henisz. Workers' unions also want more, and he points to the recent South African example of unions demanding 40% wage increases. "Everybody sees the prices of these minerals and everybody feels they should get more," he says. "The mining companies have to navigate a very difficult situation where, historically they don't have a very good reputation." He maintains that it is critical for them to come up with "strong but defensible negotiating positions that recognize legitimate demands and isolate those that are more extreme."

In a research project funded by the National Science Foundation, Henisz demonstrated that improved public affairs management is an imperative for mining companies if they want to be successful. Henisz worked on that project with Sinziana Dorobantu, a senior research fellow and lecturer at Wharton, and Lite Nartey, an assistant professor at the University of South Carolina. They linked the degree of cooperation or conflict with external stakeholders to market capitalization for 26 gold mines owned by 19 publicly traded firms over 15 years.

"What we find is both heartwarming and quite striking: The value of cooperative relationships with external stakeholders is worth twice as much

as the value of the gold that these 19 companies ostensibly control," Henisz wrote in the January-February 2012 edition of *The Pennsylvania Gazette*, published by the University of Pennsylvania. "Our research quantifies what many firms have already realized: reducing conflict with

external stakeholders in favor of winning their cooperation improves the companies' chances that a business plan can proceed on budget and on time, and most importantly, generate sustainable shareholder value."

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