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Energy Predictions 2011

Energy & Resources

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Foreword

Welcome to the 2011 Energy Predictions report for the energy & resources sector.

This is the second year in which the Global Energy & Resources group of Deloitte Touche Tohmatsu Limited has published its predictions for the year ahead.

As the fog lifts over the global economy, a recovery is clearly underway in places as disparate as China, the United States, Brazil, Australia and India. Other markets are showing signs of recovery and there is no significant economy that remains mired in recession. Bearish economic indicators released in the last few weeks notwithstanding, oil prices are pushing upward, testing the upper limits of the US$70-80/per barrel range. Serving as a simple yet global and unified measure of economic recovery, it is oil's price range and the strength and sustainability of the recovery which will impact the ways in which all forms of energy are produced and consumed.

Some have questioned whether predictions are useful in the everyday course of managing an energy business. How accurate can forecasts be, given the uncertain economic outlook in many countries and the role of government in a stimulus-focused world?

Anticipating the course of the next 12 months won't be easy. But, in my view, that makes having a considered perspective more important than ever.

Predictions by themselves are not facts and can't be relied on to solely make informed business decisions. However, predictions can be useful when formulating strategy since they encompass a wide array of views and inputs. These inputs can stimulate debate, inform of possible industry directions and even help identify potential courses of action.

The methodology for developing this set of predictions included in-depth interviews with clients, industry analysts and the most senior energy practitioners from Deloitte member firms around the world. I am most grateful to all who offered up their insights and expertise at a time when their attention was in high demand.

Even as the recession begins to subside, the energy sector is still likely to experience challenging conditions as we enter 2011. It should be remembered how very important a role energy plays in driving the global economy.

I wish you all the best for 2011.

Peter Bommel
Global Industry Leader
Energy & Resources

M&A

Converging on emerging markets

Mergers and acquisitions (M&A) in the energy industry is an essential tool for controlling intellectual property, obtaining leading-edge technology, and assuring access to sources of raw materials and commodities. In 2011, the drive to secure global energy resources will likely make emerging markets the fastest-growing area for M&A. According to data from Dealogic, deals by companies in emerging markets (across all industries) already account for 30 percent of global M&A activity, while Europe's share has fallen to 29 percent – the lowest in 12 years.[1]

M&A activity in the energy industry appears to be occurring in waves, with the oil and gas companies from emerging markets leading the way. First there was the Chinese wave of M&A activity in Africa, Asia and now South America, as national oil companies from China moved aggressively to get a foothold in these resource-rich nations. The second wave, which has already begun, involves the next tier of national oil companies, which consists primarily of state-owned companies from Russia, South Korea, Brazil and Malaysia. These organizations are currently using aggressive bidding tactics to land their quarry, as in the case of Korea National Oil Corporation, which launched the country's first cross-border hostile takeover attempt to win control of UK oil group Dana Petroleum. The third-wave, which is just beginning to take shape, will likely consist of state-owned companies from India and the Commonwealth of Independent States (CIS).

In 2011, this enthusiasm for deal-making is likely to continue; however, as in everyday life, finding a suitable partner and making a proposal doesn't always lead to long-term success.

Moving forward, a company's post-merger integration (PMI) skills will be paramount, particularly in emerging markets where complex financings, cultural differences and uncertain regulatory environments often impede the realization of anticipated synergies.

Companies must be wary of a number of post-merger risks such as the quality of financial figures, the complexity of synergy goals and the viability of the execution plan. Structural differences also come into play, particularly in transactions involving the acquisition of independent companies by state-owned entities. An empirical analysis of PMI data suggests that PMI risks in cross-border transactions are driven not primarily by external factors like the nationality of the buyer or target but by internal structural risks.[2] Furthermore, these risks typically arise from differences in the organizational and management structures or from dissimilar business processes.

Bottom line

Given the importance of PMI to the successful execution of cross-border transactions, companies targeting acquisitions in emerging markets will need to improve their abilities to navigate all sorts of merger-related risks. This means developing both hard analytical skills as well as softer change-management capabilities in order to complete these transactions in a way that improves, not hinders, performance.

Refining
The industry moves east

The global refining industry has had its share of volatility over the years. Tight worldwide spare capacity led to a peak in refining margins in 2007 while falling demand during the economic recession led to estimated global utilization rates of 80 percent, resulting in depressed refining margins only two years later.

Increased demand for refined products led to improved worldwide refining capacities during 2010. Utilization rates of U.S. refiners averaged 88 percent in 2Q10, up from 80.3 percent in 1Q10 and 84.3 percent in 2Q09.[3] Europe's oil refining sector faces a challenging recovery from the cyclical lows of 2009 given the persistently weak demand for oil products in Europe and the Organization for Economic Co-operation Development (OECD) countries.[4] During 2009, five new refineries were brought online, all in the Middle East and Asia. Accordingly, refining capacity in Asia increased by more than one million barrels per day (bbl/d) in 2009 while it increased by roughly 393,000 bbl/d in North America, and by about 200,000 bbl/d in the Middle East.[5] One industry commentator predicts that between 2011 and 2015, an additional 2.75 million bbl/d of refining capacity will be added in Asia.[6] This suggests a longer-lasting trend is taking shape: as long-term demand for petrol and distillates stabilizes and perhaps begins a long lasting decline in western economies, demand is on the increase in Asia and, as the size of the plants suggests, it is expected to remain so for decades. This is the great refining continental shift; the largest consuming centers of the West move to the largest potential consuming centers of the East.

Why is this considered to be a monumental change? Because Asian oil companies, representing the fastest growing and potentially the largest energy consuming market, will, and may *already* possess the market power historically enjoyed by western international oil companies. Their size, government support and financial strength allows Asian energy companies to invest in building larger, complex and efficient refineries and chemical plants which are designed to serve the requirements of the Asian markets. The implications for the Asian refining sector are numerous and positive, albeit currently challenging.

The magnitude of this shift reflects Asian economic growth rates. Although Chinese gross domestic product or GDP is forecast to slow somewhat over the next five years, it is nonetheless likely to remain impressive. The *Economist* puts Chinese GDP growth at 8.6 percent; India follows closely behind with 6.3 percent and Vietnam at 6.0 percent. In comparison, annual growth rates are predicted to be significantly lower in the West, at no more than 2.4 percent in the U.S. and 2.0 percent in the EU27.[8]

But it's not just GDP growth that is striking. Asia has been described as the "one billion car market." This prediction reflects changing views about Asia, and especially China, from only a few years ago. Furthermore, the Chinese government is looking to reeducate its people in the "manners" of consumerism. By providing for targeted tax incentives, rebates and price concessions, the government hopes to increase consumption by China for both imported luxury products as well as for locally manufactured products. The most obvious market is automobiles. During the 1990s, the public highway system in China was going through a developmental phase and the prevailing view at the time was that there were very few places to drive. Thus, few people would want to buy cars and fill their tanks with gasoline. Moreover, many analysts speculated that the Asian population didn't earn enough money to buy cars. This sentiment has now changed. With millions of Asian consumers expected to enter the middle class by 2024, there will likely be close to 250 million cars in China alone. Cars allow easier travel, as well as enable the population to develop and get used to the new concept of leisure time, all of which contribute to increase consumption and consequently demand for refined products.

Bottom line

The great refinery continental shift is a reality. What is difficult to predict is how fast Asian consumers will increase their purchases in the years ahead and which refined products will take the lead. It is safe to assume that gasoline and its derivatives will remain in high demand and consequently will require refineries to increase up-time to fill this demand.

Nuclear power
Electrifying emerging nations

A nuclear energy renaissance is shaping up around the world in some unlikely regions, perhaps none more than in emerging nations that include the Middle East and China. The Middle East region is home to roughly 75 percent of the world's oil reserves as well as to the largest global oil producer, Saudi Arabia. Now, many of these oil-rich nations are embarking on a new roadmap destined to shape future energy usage in the Gulf region. Kuwait, the fifth biggest oil producer among OPEC members, plans to build four nuclear power reactors by 2022, joining a push toward atomic energy among Gulf countries.[9] China, the second largest economy and the largest oil importer is planning to increase its nuclear capacity more than tenfold to 80GWe by 2020 and 400GWe by 2050. With 12 nuclear plants in operation, 24 under construction and upwards of 75 nuclear units being planned, the China State Energy Bureau targets at least 5 percent of the 1000GWe to come from nuclear power plants. So why are these nations increasing the use of nuclear power? Several answers come to the forefront, including diversification in order to decrease the risk of over-relying on a single fuel source for electricity generation and reducing the use of oil now to save it for future generations, and, in the case of China, emission reduction.

At present, nuclear power appears to be the best choice for these nations and many others around the world in terms of providing diversified, sustainable, independent and clean energy where it is needed i.e. close to the demand centers such as China's eastern seaboard. However, integrating nuclear power into a country's energy infrastructure is not without its challenges.

When real costs are taken into account, nuclear is often more expensive than fossil fuels. For instance, nuclear energy takes a long time to produce. The process of permitting, environmental impact studies and the length of time from planning to design and construction of the nuclear infrastructure typically lasts no less than several decades. Plus, nuclear waste is still considered to be more controversial than fossil fuel emissions, often requiring large underground storage facilities. Despite these obvious hurdles, perhaps the most important challenge for the industry is the shortage of nuclear talent within the industry.

Generally speaking, over the last three decades there was very little progress in bringing new nuclear plants online. This lack of project activity has had a profound impact on the number of people entering the nuclear field. Many governments are finding that a skills gap exists within the nuclear energy profession.

One way governments are rectifying this situation is to implement workforce development programs in the hopes of growing talent in the fields of construction, manufacturing, engineering and nuclear power. In particular, there is a short-term need for technical experts who can deploy and maintain nuclear projects. In the long-term, governments should consider campaigns that educate the general populace on the benefits of nuclear power in order to stimulate interest in the field.

Bottom line

Clean energy development is a leading priority for many governments. With nuclear power being one of the cleanest and most reliable sources of energy, the nuclear industry is poised for tremendous growth that is likely to fit well with many established government policies. While governments may have developed a roadmap to building new nuclear power plants, many have yet to account for the industry's current and future talent needs, which they must do if they are to succeed at reenergizing their nuclear programs.

Renewables
Here comes the sun

The sun delivers more energy to the earth in an hour than the entire world consumes in a year.[10] This fact alone makes it easy to understand why both experts and laymen alike believe solar energy offers vast potential as a renewable resource. Many countries around the world are investing aggressively to realize this potential energy source as they seek energy independence and ways to reduce greenhouse gas emissions.

Until recently, solar energy has been confined primarily to industrial uses. Around the world, people have grown accustomed to seeing solar arrays on the rooftops of factories and office buildings as well as on the grounds of government buildings and military installations. What has been conspicuously absent in most places, however, has been wide-scale consumer adoption. That absence is now beginning to change.

In 2011 and beyond, solar technologies will increasingly trickle down from industrial users to be embraced by residential consumers and small business. Just how fast solar energy can become mainstream will depend heavily upon how quickly solar technologies can achieve grid parity – the point at which the cost of electricity from renewable sources rivals that of electricity derived from more traditional sources such as coal, oil, natural gas or nuclear. The time it takes to achieve grid parity is a function of local climate, utility rates, and government support, among other factors.

Two analyses by the IEA – the Solar Photovoltaic (PV) and Concentrating Solar Power (CSP) roadmaps – suggest that grid parity could be just around the corner in some instances. The study suggests that PV on residential and commercial buildings could achieve grid parity – i.e. with electricity grid retail prices – by 2020 in many regions, and it could become competitive at utility-scale in the sunniest areas by 2030.[11]

But are solar panels really ready to take their place at major retailers alongside replacement windows, storm doors, and other staples of the home improvement industry? Early indicators suggest that the answer is yes – if appropriate policies are in place. For instance, consumers can now purchase rooftop panels at many retail stores. This has largely been made possible by government policies which provide subsidies for residential solar applications as a means of spurring a lagging job market.

Meanwhile, the IEA analyses also suggest that major gains will be made in CSP production within the next decade. The IEA expects CSP to become competitive for peak and mid-peak loads by 2020 in the sunniest places, once again if appropriate policies are adopted. CSP production will also hinge largely on the development of dedicated transport lines that will bring electricity from the world's deserts to large consumption centers. Some of these lines will need to be developed within countries such as China, India and the U.S., as well as across borders. For instance, the Desertec Industrial Initiative aims to provide Europe with electricity generated from solar thermal power plants and wind farms in the Sahara by laying high-voltage direct current transmission cables under the Mediterranean Sea.

Bottom line

As both PV and CSP technologies mature, issues related to grid integration as well as energy storage, transmission and distribution will need to be resolved. Even so, solar has a characteristic that could help it to advance faster than any other energy source, renewable or otherwise: it is community friendly as well as environmentally safe. Because it is quiet and unobtrusive, it meets little resistance from consumer watchdogs and next-door neighbors, melting a common barrier that often freezes development plans in their tracks.

Water usage
Every drop is precious

Present-day challenges, both economic and political, have created turmoil within the entire energy industry resulting in higher energy prices as well as volatile parts of the value chain that include water usage. Water availability affects hydro-electricity and thermal power generation as well as playing a critical role in nuclear-generated power, bioethanol production, coal and gasoline from conventional crude and Canadian oil sands. In short, water is the common denominator among all energy.

Six billion people in the world are currently using about 54 percent of all accessible fresh water. Within the next 15 years, humanity is expected to consume about 70 percent of fresh water resources. If current predictions hold true and per capita consumption of water continues to rise, humankind will likely be using over 90 percent of all available fresh water by 2025.[12] These trends portray a scenario that is unsustainable.

In one recent study, several researchers assessed current water consumption during liquid fuel production, evaluating major steps of the fuel lifecycle for five fuel pathways: bioethanol from corn, bioethanol from cellulosic feedstocks, gasoline from U.S. conventional crude obtained from onshore wells, gasoline from Saudi Arabian crude, and gasoline from Canadian oil sands.[13] The analysis revealed that the amount of irrigation water used to grow biofuel feedstocks varies significantly from one country to another and that water consumption for biofuel production varies with processing technology. In oil exploration and production, water consumption depends on the source and location of crude, the recovery technology, and the amount of produced water re-injected for oil recovery.

The study results also indicate that crop irrigation is the most important factor determining water consumption in the production of corn ethanol. For example, nearly 70 percent of U.S. corn used for ethanol is produced in regions where 10–17 liters of water are consumed to produce one liter of ethanol.[14] Ethanol production plants are less water intensive and there is a downward trend in water consumption. Water requirements for switchgrass ethanol production vary from 1.9 to 9.8 liters for each liter of ethanol produced. The study found that water is consumed at a rate of 2.8–6.6 liters for each liter of gasoline produced for more than 90% of crude oil obtained from conventional onshore sources in the U.S. and more than half of crude oil imported from Saudi Arabia. For more than 55 percent of crude oil from Canadian oil sands, about 5.2 liters of water are consumed for each liter of gasoline produced.

Bottom line

Water is an essential part of energy production, required both for resource extraction and fuel production. In today's business climate, sustainability considerations are becoming not only key inputs for business decisions, but decisive factors affecting competition worldwide. Worldwide water management during the fuel lifecycle will become increasingly important.

E&P operations
Exploiting hidden depths

Technology remains a critical component in petroleum exploration and production (E&P) operations. From seismic surveys to deepwater drilling and artificial intelligence, the operations of today's oil companies' exploration and production departments resemble a vibrant, high-tech nerve center easily mistaken for use in deep space exploration. Motivated to improve competitive advantages and efficiencies, as well as the reward of the "next big find," the oil industry has historically been supportive of exploration and production technology development. However, in no time in the past has the complexities of exploration in remote, deeper, and geographically challenging locations been as high. The expertise and costs required to address these challenges result in joint ventures, consolidation, and joint developments between independent oil and gas companies, international oil companies (IOCs) and national oil companies (NOCs) and even cooperation across industries. The technologies used may serve to increase the probability of a find, enhance the ability to extract heavy crude and the capability to limit risks and costs by remotely operating rigs in extreme location and weather areas such as the Antarctic.

In one recent example, two giants in their respective fields, HP and Royal Dutch Shell PLC have teamed up to develop a next-generation wireless sensing system to acquire extremely high resolution seismic data to find and measure underground reservoirs of oil and gas.[15] This new technology improves on traditional 3D techniques by allowing images to be created on land rather than in a marine environment. It does so by sensing echoes of vibrations that pass through rock and bounce back from geological structures such as fault lines and salt domes. In a marine environment, seawater acts as a natural insulator to extraneous noise, but on land this is a much bigger challenge to overcome.

Steam Assisted Gravity Drainage (SAGD) is another advanced oil extraction technique that is greatly enhancing the industry's production capacity. It is currently being used in PetroChina's heavy oil E&P project in northwestern China's Xinjiang Uygur Autonomous Region.[16] This new technology is extremely useful in boosting production of heavy oil, which does not flow when the temperature is below 80˚C. Heavy crude oil has long been a challenge for the industry because of the difficulty in pumping the sticky substance from underground wells; however, SAGD technology appears to be an effective solution.

Norway's state-owned oil company Statoil has also made a notable breakthrough. Having been at the forefront of technology use in E&P operations for many years, it is a key partner in the development of an innovative seabed drilling rig. Developed in partnership with the Stavanger-based company Seabed Rig, the drilling equipment features a patented encapsulated design, which allows it to withstand extreme conditions and be remotely controlled from a surface vessel.[17] The rig began testing this summer, and it is likely to see action in deepwater and Arctic seas soon. The new rig development is part of a strategy that seeks to break down the drilling process into steps, analyzing them for optimization and comparing performance at individual rigs.[18]

Bottom line

Out of necessity, oil and gas companies have exhibited greater flexibility and adaptability to the shifting global economics and aggressive fluctuations in demand, production and price. Readiness – being able to accommodate and react to the latest information and data – has become a key differentiator in the fight to acquire or maintain a competitive advantage. Support of new technology is paramount to maintaining industry supremacy.

Electric cars
Giving automakers a jolt

Purchasing a new vehicle is getting more complicated. Consumers have always had plenty of options concerning the look and feel of their cars and trucks but soon they will have just as many choices concerning what powers them. Automakers around the world are betting R&D dollars as well as first-mover advantages that conventional power¬trains will ultimately be replaced by nascent, climate-friendly technologies such as hybrid electrics (HEVs), plug-in hybrids, pure electrics, hydrogen fuel cells, compressed natural gas, ethanol, clean diesel, or some other concept. The question is which of these choices have the power to convince consumers to switch?

To date, compressed natural gas is being used predominantly in heavy vehicles and in fleet applications such as transit buses, semi-trucks, school buses, waste disposal trucks and delivery vehicles. Clean diesel has made significant inroads in commercial trucking, school, and transit bus fleets as well as with auto buyers in Europe (i.e., BMW and Volkswagen), but it has not been as readily embraced elsewhere as a top consumer choice. Ethanol has gained widespread acceptance as a gasoline additive but few countries other than Brazil, which has an ideal climate and ample landmass to produce sugar-cane ethanol, see it as a viable replacement for gasoline. Hydrogen fuel cells have now been successfully demonstrated in test vehicles but are thought to be a decade or two away from mass production. These conditions have led some analysts and industry observers to conclude that the future of the automotive industry lies with electric-powered vehicles, which have the most immediate potential for decreasing the world's dependency on oil as a transportation fuel.

The move toward electric-powered vehicles is already underway. In the past few years, several commercial HEVs, which are powered simultaneously by batteries and fuel, have become mainstream. Toyota, Honda, Nissan, Ford, and General Motors all have popular models on the market, and automakers are expecting this trend to continue. For instance, building on the mass-market success of its Prius HEV, Toyota Motor Corporation has recently announced that it will produce six all-new hybrid electric vehicles worldwide by 2012. Even more, these vehicles will all be new models, not updated versions of current ones.[19]

Progressive automakers now believe that consumers are ready to take the next step in transitioning to electricity-based transportation. In 2011, HEVs will likely remain popular, but plug-in electric hybrids and pure electric vehicles are also likely to proliferate based on consumer demand. This likelihood is already being reflected in production trends. Renault and Nissan have begun to produce electric vehicles en masse while General Motors, Toyota, and Ford have projects in the works. The automotive industry is also experiencing a number of innovative joint ventures and partnerships, such as the recent deal between Toyota and Tesla as well as the Renault-Nissan Alliance, which is developing a complete range of 100 percent electric powertrains with power ratings of between 50 kW (70 hp) and 100 kW (140 hp).[20]

Bottom line

Some see major automakers' commitment to producing electric vehicles as acknowledgement that the transportation industry is on the cusp of a major transformation. This shift is being driven largely by technological advances, such as capacity to store and use energy in batteries in a cost-effective way, but perhaps even more so by consumers, who have an intense desire to move away from oil-based transportation due to concerns about energy security and climate change.

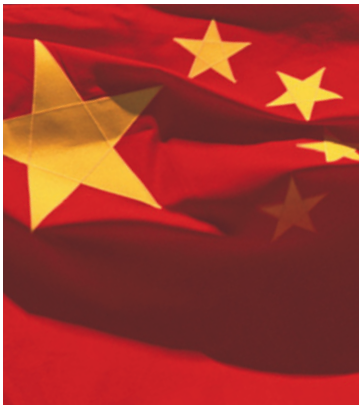
The 'China Effect'
No signs of slowing down

Almost every news publication has detailed China's increased involvement in the oil, natural gas and mining sectors. Trade between China and Saudi Arabia is forecasted to reach US$60 billion before 2015.[21] Companies based in China or Hong Kong participated in US$13 billion of outbound mining acquisitions and investments in 2009 – one hundred times the amount spent in 2005.[22] According to the International Energy Agency (IEA), China consumed 2.252 billion tons of oil equivalents in 2009 – about four percent more than the U.S.[23] China's Export-Import Bank and China's Development Bank has committed billions of dollars to construction, infrastructure development and loans to Ghana, Nigeria and other resource-rich African countries. China National Offshore Oil Company (CNOOC) and China National Petroleum Corporation (CNPC) have committed to joint ownership and projects in Nigeria, Ghana, Angola and other African countries. What these statistics demonstrate is the ever-increasing investment ties China has with natural-resource-rich nations including Ghana, Nigeria, Saudi Arabia, Brazil, Australia and Canada.

China's increased global reach through its banks, oil and gas companies and other State Owned Enterprises indicates that the Chinese government and financial system are capable of continuing to back its energy industry and secure long term natural resources supply to fuel its economic growth. By committing resources, China can foster growth in these economies and create demand for its own manufactured products.[24] China holds US$1.5 trillion of U.S. securities. In 2011, GDP growth is forecast at 2.5 percent in the U.S. and 1.1 percent in the EU27, while China is expected to grow 7.0 percent.[25] One example of the 'China Effect' is the country's insatiable demand for raw materials, which has helped to push Brazil's growth rates close to 9.0 percent during the first half of 2010.[26] But Brazil is not the only country that can directly trace its growth to China's demand for natural resources. Australia can be proud of being one of the largest suppliers of commodities, raw materials, natural gas and other resources required to fuel China's growth plans.

Foreign exchange investors seeking higher yields are looking toward the Australian dollar and other currencies that are riding on the coattails of China's economic expansion. For instance, China continues to buy raw materials from Australia, which has provided stable foundation for its economy and consequently contributed to the strength of the Australian dollar in comparison to other western currencies, specifically the U.S. dollar and the Euro.

Extending its quest for natural resources, China is strengthening its relationships with Canada's oil producers. In 2005, the first vessel loaded with Alberta crude sailed past Vancouver on its way to refining locations in Asia. In 2008, four ships made the journey. This year one vessel a month – each carrying roughly 600,000 barrels of oil – will head west to Asia.[27] In addition, new pipelines are being built in Canada to support the export of additional supplies to this region. An even bigger shift is occurring with Chinese investment in companies that are developing the Canadian oil sands. In the last few years, PetroChina and CNOOC have invested millions to exploit this vast resource. The ultimate aim is to send some of this oil to China, where refineries are waiting to fuel the country's growing energy demand and ambitions.



Bottom line

China's growing partnerships with resource-rich nations will likely provide an economic boost to the country itself and to the global economy in the years ahead. Not only will this have a positive effect on energy markets in these nations but also on infrastructure and industry. These investments are being made possible by China's cut-rate pricing, increasingly sophisticated manufacturing processes and by the flexible financing terms it can offer. The 'China Effect' shows no signs of abating.

The green economy
Job creation through workforce development

Governments around the world have been betting massive sums that the green economy will deliver jobs. With unemployment rates at record levels in many nations, some see job creation as a do or die proposition for economic recovery as well as political survival. While there has been much debate surrounding the ability of stimulus packages to create net new employment opportunities, it is likely that despite the pressures on government budgets and incentives, green energy investment will keep rising over the next few years.

But where will these investment dollars flow and whom will they benefit? In general, wind turbine manufacturers are building plants close to the markets they intend to supply, prompting governments in Europe and North America to funnel funds into wind expansion as a means of creating high-value domestic jobs. Solar PV manufacturing, on the other hand, is following labor costs since transport and technical skill requirements are lower for lightweight, silicon-based products. This suggests that Asia could be the primary beneficiary of stimulus funds aimed at boosting solar production, regardless of where those monies originate.

Wind and solar, however, are just parts of the green-collar juggernaut. As countries around the world make long-term investments in environmental and clean power projects, the need for engineering, project management, logistics, accounting, and IT skills will also rise, along with demand for skilled tradesmen such as electricians, welders, and machinists. Even amid a recessionary environment, labor shortages are already becoming apparent. For instance, Middle Eastern oil producing nations, many of which are also investing heavily in renewable projects, have been grappling with a shortage of skilled workers for years. Meanwhile, Germany and other European nations are struggling to staff their clean energy investments with enough workers to make them viable.

North America too is not immune: Researchers are predicting a shortfall of 24,000 energy workers in Canada by 2014[28]; and The National Renewable Energy Lab in the United States has identified a shortage of skills and training as a leading barrier to renewable energy and energy efficiency growth. This includes lack in the workforce of adequate scientific, technical, and manufacturing skills required for energy efficiency and renewable energy development; a paucity of reliable installation, maintenance, and inspection services; and failure of the educational system to provide adequate training in new technologies.[29]

In 2011 and beyond, governments will need to promote workforce development, as well as job creation, if the anticipated benefits of the green economy are to be realized. This typically includes activities such as evaluating the nation's overall goals in relation to energy security and all types of energy production, assessing the current supply of talent in light of attrition from retirement and other factors; forecasting the demand for talent in specific areas; and analyzing the gap between supply and demand. These efforts should ultimately result in the creation of a workforce development plan and institutions that can execute on these objectives. This is necessary to guide governments in putting training programs in place, recruiting new personnel into the energy industry, and applying succession planning techniques to ensure knowledge is transferred to future generations.

Bottom line

Moving ahead, more and more nations will likely come to acknowledge a growing paradox of the green movement: Without a continuous means of developing talent, even an economy based on renewable energy will not be sustainable.

Unconventional gas
From unusual to undeniable

Unconventional natural gas is any gas that is not located in porous permeable reservoir rock, and in particular, can include coal bed methane (CMB), tight gas, shale gas, and methane hydrates. While the industry's ability to access these unconventional energy sources is not new, its ability to do so economically and on a large-scale is. For the last five years, companies have been jumping on the unconventional bandwagon – and for good reason: technological advances have made it easier and cheaper to access these resources than it is to produce conventional natural gas from permeable rocks in rapidly depleting fields.

Production potential from tight shales and other unconventional resources has already altered the world's natural gas outlook. With the profusion of unconventional supplies, the U.S. now has 2,247 tcf of proved natural gas reserves, enough to last 118 years at 2007 demand levels according to a recent study from the American Clean Skies Foundation.[30] This abundance isn't just a U.S. phenomenon. By 2035, shale gas could represent 62 percent of the total gas produced in China and 50 percent in Australia.[31] Canada, too, is looking to shale gas to boost its supply. There is also shale gas in Europe but faces greater obstacles to development because few of the resources are located on private property and that the region does not yet have a particularly robust oilfield service industry to support it. Yet some still see the potential of European shale gas resources as sufficiently robust to alter the energy supply picture.

The proliferation of unconventional natural gas production is a game-changing event, especially in light of growing concerns about climate change. Natural gas emits about half the CO_2 of coal. Its high efficiency and widespread availability further strengthen its proposition as a clean resource. Furthermore, many regions in the U.S. and elsewhere are under-saturated when it comes to using natural gas for electricity production. This provides near-term opportunities for natural-gas suppliers to grow their businesses while helping electricity generators to comply with emissions mandates.

The outlook for unconventional natural gas appears to be very bright, but is its future being seen through rose-colored glasses? A number of trends are on the horizon, which could dampen enthusiasm for natural gas, even though it is widely viewed as the cleanest of the fossil fuels. For instance, in the wake of several environmental, health and safety (EH&S) incidents, a not-in-my-backyard (NIMBY) movement is gaining momentum in the Marcellus shale region, which spans Pennsylvania, New York, Ohio and West Virginia in the United States.

Critics contend that evidence is mounting about the dangers of hydraulic fracturing techniques, which involve injecting a mix of water and chemicals into the rock formations in order to crack them and to release the gas. Of particular concern are issues involving water supply, water quality, wastewater treatment operations, local and regional air quality, and management of naturally occurring radioactive materials disturbed during drilling operations. Several reviews of these concerns are currently underway by state agencies in the Marcellus region as well as by the U.S. Environmental Protection Agency. Community groups in the region are also sponsoring protests in the form of town hall meetings and billboard advertising campaigns to raise awareness of possible dangers to the local water supply as well as to the region's pristine lakes and natural habitats. Some industry observers believe that this grassroots backlash will ultimately translate into tighter state and federal regulation of the industry's drilling activities.

Bottom line

The recent series of EH&S incidents in the oil and gas industry will likely result in greater governmental oversight of all types of energy production. Consequently, while the boom in unconventional natural gas is likely to continue in the short-term, its impact may not be as loud or as long as first anticipated.

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