



2012 Deloitte Energy Conference
Solving the Energy Equation:
Demand, Supply, and Infrastructure

Conference Report
May 21-22, 2012, Washington, D.C.

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Mark Your Calendars:
2013 Deloitte Energy Conference
May 21–22, 2013, Washington, D.C.

If you have questions or need additional copies, please contact sblitch@deloitte.com.

2012 Deloitte Energy Conference

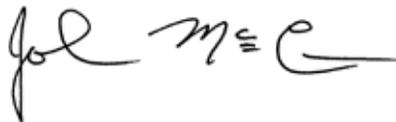


Dear Energy Industry Colleague,

Thank you for attending the Deloitte Energy Conference held in Washington, D.C., on May 21-22, 2012. This year's speakers addressed the theme "Solving the Energy Equation: Demand, Supply and Infrastructure." The dialogue was thought-provoking as speakers discussed the variables in the energy equation and speculated about what types of strategy, innovation and investment will be needed to balance them. Throughout the day, speakers challenged themselves to describe the future energy landscape and shared their opinions on the opportunities it might bring. They also discussed the implications of the shale gas revolution and debated the policy decisions and infrastructure investments required to keep it going—all while spurring technological innovation to support the cleaner use of fossil fuels as well as the development of renewables.

The discussions spanned markets, policy, public affairs, the investment climate, geopolitics and technology, as speakers emphasized that the world is going to need every existing source of energy, plus several new ones, in order to meet the needs of a growing global population and a rising middle class in developing nations. The audience too played an active role, contributing insights and posing stimulating questions. Throughout the Conference, sessions were intriguing, and often triggered active discourse from the audience as well as among the speakers themselves. We are pleased to provide you with this report of our speakers' views and presentations.

We hope you will find this report from the 2012 Deloitte Energy Conference a convenient and useful reference. Please feel free to pass it along to your colleagues. Additional copies are, of course, available upon request. We look forward to seeing you in Washington D.C. for the 2013 Deloitte Energy Conference on May 21-22, 2013. As always, we welcome your suggestions for themes, topics and speakers.



John McCue
Vice Chairman — U.S. Energy & Resources Industry Leader
Deloitte LLP



Our Featured Guest Speakers and Panelists

Plenary Session Speakers

F. William Brownell, Chairman,
Hunton & Williams

David C. Carroll, President and CEO,
Gas Technology Institute

Dr. Anthony Cugini, Director, National Energy
Technology Laboratory, U.S. Department of Energy

The Honorable Thomas M. Davis, Director of
Federal Government Affairs, Deloitte & Touche LLP
and former Congressman, Virginia (R)

Dr. Michael J. Economides, Editor-in-Chief,
Energy Tribune, Professor of Chemical and
Biomolecular Engineering, University of Houston

Susan Eisenhower, President, Eisenhower
Group, Inc.

Dr. Hans-Ulrich Engel, CEO, BASF Corporation

The Honorable Martin Frost, Shareholder,
Polsinelli Shughart and former Congressman,
Texas (D)

Kimberly S. Greene, Executive Vice President
and Chief Generation Officer, Tennessee Valley
Authority

Sheeraz Haji, CEO, Cleantech Group LLC

Ambassador Richard H. Jones, Deputy
Executive Director, International Energy Agency

Richard Kauffman, Senior Advisor to the
Secretary of Energy, U.S. Department of Energy

Curt N. Launer, Managing Director, National
Resources Corporate Finance Coverage Group,
Deutsche Bank

Greg P. Leveille, Manager, Unconventional
Reservoirs Technology Development,
ConocoPhillips

Daniel B. More, Managing Director, Global
Energy Group, Morgan Stanley

Luke Popovich, Vice President, External
Communications, National Mining Association

Peter J. Robertson, Independent Senior Advisor,
Oil & Gas, Deloitte LLP

Dr. Joseph A. Stanislaw, Independent Senior
Advisor, Energy & Sustainability, Deloitte LLP

Alex Urquhart, President and CEO, GE Energy
Financial Services

Bertrand Valdman, Senior Vice President,
Strategic Planning, Edison International

The Honorable Jon Wellinghoff, Chairman,
Federal Energy Regulatory Commission

Ethan Zindler, Head of Policy Analysis,
Bloomberg New Energy Finance

Breakout Session Speakers

Eric Ackerman, Director, Alternative Regulation,
Edison Electric Institute

Donna L. Bell, Manager, Electric Vehicle
Infrastructure and Smart Grid Technology,
Ford Motor Company

Dr. Charles K. Ebinger, Senior Fellow and
Director, Energy Security Initiative, Brookings
Institution

Lillian A. Federico, President, Regulatory
Research Associates

Andrew Good, Senior Vice President and CFO,
Exelon Generation

Linda Jackman, Group Vice President, Industry
Strategy, Utilities Global Business Unit, Oracle
Utilities

Badar Khan, President, Upstream and Trading,
Direct Energy

Ronald Y. Kim, Vice President and Head of IT for
Exelon Utilities, Exelon Corporation

Edward T. Kjaer, Director, Electric Vehicle
Readiness, Southern California Edison

Kevin Lauckner, Director, Business Development,
Honeywell Building Solutions

Cynthia J. Marple, Director, Rates and
Regulatory Affairs, American Gas Association

David McAndrew, Project Manager, Federal
Energy Management Program, U.S. Department
of Energy

Mark F. McGranaghan, Vice President, Power
Delivery and Utilization, Electric Power Research
Institute

Paul J. Pantano, Jr., Partner, Cadwalader,
Wickersham & Taft LLP

Sandra Pinto de Bader, Environmental
Sustainability Coordinator, Seattle Office of
Sustainability and Environment, City of Seattle

Nicole Poindexter, Director, Global Business
Development, Opower

Bob Reilley, Vice President, Regulatory Affairs,
Shell Energy North America (U.S.) L.P.

John E. Shelk, President and CEO, Electric Power
Supply Association

Andrew Ware, Director, Corporate Affairs and
Communications, Cheniere Energy, Inc.

Conference Overview

The 2012 Deloitte Energy Conference, *Solving the Energy Equation: Demand, Supply and Infrastructure*, examined the interrelationships between supply and demand and the economic challenges and opportunities that accompany them. Speakers pointed out that demand for energy in developed countries over the next 30 years looks fairly flat as population growth slows and energy efficiency and conservation shave consumption. However, demand is growing in the developing world at a much greater rate, outpacing the slowdowns elsewhere. Accordingly, the International Energy Agency (IEA) forecasts a 33 percent increase in global energy demand by 2035, with China and India accounting for roughly 50 percent of that growth.¹ This demand is “pulling” energy to the developing world almost inexorably as emerging nations look to fulfill the basic human desire to improve the wellbeing of their families and their communities. At the same time, the balance of the world’s energy supply is shifting, in some instances more towards the developed world. The remainder of this report examines the impact of these shifts on the energy equation and explores the policy decisions, technological innovation, and infrastructure investments it may take to rebalance it.

Major Themes

The Energy Equation

What will it take to align supply sources, develop new ones, distribute the energy where it is needed, and ultimately to satisfy the world’s growing energy appetite? Speakers asserted that infrastructure provides the foundation for solving the energy equation, with technology being the key variable. They further explained that the energy industry’s increasing reliance on technology is putting a new twist on “the great game”: No longer is the game about controlling resources; it’s about controlling the technology needed to extract, distribute and use those resources most efficiently.

Global Energy Landscape

Rising incomes and population growth in developing nations are pushing energy needs higher. At the same time, some key trends are pointing in worrisome directions: Global CO₂ emissions have rebounded to a record high, the energy efficiency of the global economy worsened for the second straight year and global spending on oil imports is nearing a historic apex.² But the global energy landscape isn’t nearly as foreboding as it might seem. Speakers emphasized that this intense pressure is producing many “diamonds.” U.S. oil imports are declining due to more stringent vehicle fuel efficiency standards and expanding domestic production from traditional and non-traditional formations; China’s energy demand is likely to support a potential resurgence in the international coal trade; and, new options are opening up for increasingly abundant supplies of natural gas. The intense pressure within the global energy landscape is also compelling more and more companies to adopt energy management strategies, potentially leading to enhanced competitiveness and profitability.

Domestic Energy Landscape

Electricity demand in the United States is expected to grow by 0.8 percent per year through 2035.³ This nearly flat demand growth is occurring at a time when operating costs and capital investments are increasing because of the need to replace aging infrastructure and to comply with new regulatory requirements. Consequently, speakers asserted that the old equation of balancing higher operating costs with growing load no longer works. Instead, utilities will need to counter these costs, and the accompanying pressure they put on electricity prices, with operational excellence, supply diversity, and technological innovation. Speakers also contended that the Federal Energy Regulatory Commission (FERC) can help facilitate this transformation by continuing to focus on making wholesale electricity markets robust and efficient, and facilitating the build-out of the transmission infrastructure to support them.

Natural Gas Supply—Reshaping the Energy Portfolio

Speakers characterized shale gas as one of the most transformational events to occur in the energy industry in a very long time, and America is now undergoing a fundamental shift as a result of its abundant supplies. This shift includes a more favorable balance of trade due to export opportunities, a chemical industry renaissance, a new foundation upon which to rebuild the manufacturing industry, and reductions in CO₂ as power producers incorporate more gas-fired units into their fleets. Nonetheless, speakers cautioned that in order to continue along this trajectory, the industry must continue to operate responsibly and do a better job of communicating the uniqueness of this opportunity for bolstering the economic wellbeing and energy security of the United States.

¹ *World Energy Outlook 2011*, International Energy Agency

² Ibid

³ “2012 Early Release Overview,” *Annual Energy Outlook*, U.S. Energy Information Administration

A Competitive Response to Natural Gas Supply

Is the spotlight on shale gas casting a shadow on other fuels? Low natural gas prices are exerting pressure on competitive options, but speakers asserted that this pressure may move other supply sources to seek out new opportunities and to improve the ways in which they operate and finance their businesses. Coal, they explained, provides an excellent example. With many coal-fired plants being retired and few new ones being built in America, the coal industry is now looking abroad. Speakers asserted that coal will be the fuel of choice in Asia for the foreseeable future, thus setting the stage for exports not only of the resource itself but also of the technology to make it cleaner. Renewables too are adjusting to the natural gas boom by aggressively seeking ways to become more competitive. One proposed method is to lower capital costs by accessing the public capital markets as opposed to relying upon old-fashioned project finance, venture capital and private equity. Speakers further stressed that regardless of how low gas prices go, they won't stay there forever. Consequently, many utilities and power producers are still pursuing fuel-diversification strategies to ensure supply security and price stability over the long haul.

Linking Supply and Demand—Financing Infrastructure

The energy industry is huge and it is a voracious consumer of capital. In the North American power and utilities sector, a large portion of this capital has traditionally been allocated toward constructing new generating capacity, but flat electricity demand growth has led to a slowdown in the build cycle. Since investors perceive utilities to be a safe haven in difficult economic times, this has created the converse of the market conditions experienced just a few years ago: Capital is now plentiful, but attractive investment opportunities are scarce, with demand remaining strong for equity issuances, investment-grade bond offerings, and long-term contracted projects within the power and utilities sector. Meanwhile, in the North American natural gas sector, soaring shale gas production has created an enormous need for new pipelines, storage facilities, and export terminals to transport supplies to demand centers. Here there is little lack of investment opportunity and returns are often very good. Thus, capital is presently widely available. But will this access continue? Speakers diverged on how long the favorable funding conditions will last, but they concurred on one

fundamental tenet: Capital access will be instrumental in determining whether or not the industry can meet the requirements of the shale gas revolution, which is poised to reorganize virtually the entire natural gas infrastructure in North America.

Emerging Technologies—What's Next

Technological diversity goes hand-in-hand with fuel diversity. Speakers stressed that technological advances have not only led to new sources of supply but also to cleaner ways to use existing ones. And there are many emerging technologies on the horizon that could have evolutionary, if not revolutionary, implications. Among them are a number of carbon capture and sequestration technologies being developed by the U.S. National Energy Technology Laboratory (NETL). These include carbon separation membranes and CO₂ removal sorbent systems. Much work is also underway within the NETL and the Gas Technology Institute (GTI) to reduce the carbon footprint of natural gas as well as to advance its use as a transportation fuel. Speakers also emphasized that despite the economic conditions of the past few years, clean-tech investment has rebounded with "smart water," energy storage, water treatment, and energy efficiency all being areas to watch. Finally, speakers observed that no one is ahead of the U.S. in terms of technological innovation; however, deployment is a different story. Here China and India lead the way. Moving ahead, speakers maintained that technology markets and policies will need to work together to drive energy technologies into the U.S. economy more rapidly.



Global Wildcard—The Impact of China

Over the last couple of decades, China has moved more than 500 million people from rural areas into cities. As Dr. Michael Economides, Editor-in-Chief, *Energy Tribune*, and Professor of Chemical and Biomolecular Engineering, University of Houston, pointed out, this equates to moving more than the entire population of the United States within 25 years. And much more is expected to come. The nation's urbanization plan has resulted in a nearly insatiable appetite for energy, which Economides asserted will be "China's choke point." The Chinese government, however, is taking aggressive steps to circumvent this impending bottleneck. According to him, Chinese national oil companies have acquired \$60 billion in energy assets in Latin America as of 2010. The implications of this energy grab will likely include higher world oil prices, especially since OPEC already has little excess capacity behind the valve. While China's aggressive quest for energy may seem threatening to some, it does have a flip side. Economides asserted that the incremental demand for natural gas in China will increase greatly in the next few years, potentially creating new opportunities for exporters of Liquefied Natural Gas (LNG).

How Clean Energy Fits in the Equation

Many of the governmental support programs for clean energy are coming to an end. So what's next? Richard Kauffman, Senior Advisor to the Secretary of Energy, U.S. Department of Energy, asserted that clean energy will remain an important part of America's energy equation, but moving ahead, development models and financing methods will need to change in order to spur continuous innovation and encourage deployment. Kauffman noted that our approach to developing renewables in the U.S. has been to first innovate, then achieve cost parity, and ultimately deploy. This model hasn't worked well because

renewables do not have the benefit of decades of scale that traditional fossil fuels do. He further pointed out that Europe's model, which has been relatively successful in getting renewable technologies into the marketplace, takes the opposite approach of deploying first, then achieving cost parity, and ultimately encouraging continuous innovation. Like other speakers, Kauffman also emphasized the need for the renewables sector to migrate from private sources of capital to the public capital markets. This, he contended, will be critical to achieving cost parity with or without subsidies.

The Environmental Policy Agenda

At the beginning of the Obama Administration, federal carbon legislation appeared to be a strong likelihood. Now those prospects have faded, forcing the Administration to take a different approach in pursuing its goal of curbing greenhouse gas emissions. As William Brownell, Chairman, Hunton & Williams, succinctly stated: "Environmental policy in this Administration is thinly veiled energy policy." Accordingly, there has been much enforcement activity directed at the energy industry along with several new proposed regulations under the auspices of the U.S. Environmental Protection Agency (EPA). Most of these, he explained, will impose additional costs on coal-fired generation if promulgated. As a result, coal is presently shifting to become an export fuel while utilities and power generators move more toward natural gas, renewables, and to a lesser extent, nuclear. Brownell, however, stressed that many road bumps lie ahead in making these shifts, including the possibility of a brand new Administration taking office in January, and low natural gas prices, which are making it difficult for renewables to compete.

Solving the Energy Equation



"Infrastructure investments ultimately support or thwart the economics of the energy equation by linking supply and demand."

– John McCue, Vice Chairman –
U.S. Energy & Resources
Industry Leader, Deloitte LLP

The forces of population growth and a rising middle class in developing countries are exerting an unremitting pull on energy demand. Simultaneously, most forecasts expect demand in developed nations to remain flat over the next few years as population growth slows, and energy efficiency and conservation initiatives trim consumption. Speakers pointed out that imbalances in these forces are tipping the global scales toward significant energy demand growth, with the IEA projecting world energy demand to increase between 30-40 percent between now and 2035.⁴

The balance of supply is also shifting—often in a direction that is countercurrent to demand. Ironically, while Asia, the Middle East and North Africa are driving demand, the Americas are becoming critical sources of additional supply. For instance, horizontal drilling combined with hydraulic fracturing and stimulation techniques, is unlocking shale gas and shale oil across North America, with the potential for these production techniques to spread elsewhere. In addition, prolific, deepwater discoveries of oil and gas in the Gulf of Mexico, the salt and pre-salt basins of Brazil, and in many other areas throughout the world are supplementing conventional supplies from the Middle East. These developments are happening concurrently with the increasing penetration of renewables and split decisions concerning nuclear as a low-carbon energy source. For instance, even as new nuclear plants are under construction in the U.S., China and India, nuclear as a fuel choice is leaving the portfolio in Japan and in Europe. Coal too remains abundant both in the U.S. and abroad, but air quality concerns and economic questions are constraining its growth and will likely continue to do so without technology breakthroughs.

Underlying these shifts, particularly in North America, is the potential economic impact of an abundance of low-priced natural gas. Speakers explained that the shale gas boom is creating a new normal in terms of the marginal cost per kilowatt hour as natural gas penetrates the power production portfolio and industrial processes. This is causing the energy industry, along with some of its largest customers, to rethink the economics of coal, nuclear and renewables.

What will it take to solve this complex supply and demand equation for the given economic, geopolitical, and policy variables? Speakers asserted that infrastructure is the answer. Infrastructure, in its broadest sense, is the element that links these demand currents with the new sources of supply. In this context, they explained, infrastructure encompasses regulatory frameworks as well as physical components, such as pipelines and distribution facilities, exploration and production equipment, new power plants, wind turbines and solar panels, LNG import and export facilities, and energy efficiency and smart grid technologies.

Of these infrastructure investments, speakers further asserted that technology will be critical. Although technology has always been important to the energy industry, it has now become "the next frontier." As Dr. Joseph A. Stanislaw, Independent Senior Advisor, Energy & Sustainability, Deloitte LLP, explained, technology has been the key to developing new supplies of energy and to making existing ones cleaner and more efficient. And now, technology has come to the point where it can enable individuals, companies and governments to manage energy consciously every single day.

The rapid advance of technology has put a new twist on "the great game." According to Dr. Stanislaw, this game has historically been about controlling the territory underneath which the resources sit. While that's still true, the new game is also about controlling the technology needed to extract and use those resources more efficiently and more economically. As he concluded: "In the new version of the great game, every energy company is now a technology company—and equally, every company is now an energy company."



"Technology allows every single user, whether it's an individual, a governmental agency, or a company, to be an energy company."

– Dr. Joseph A. Stanislaw,
Independent Senior Advisor,
Energy & Sustainability,
Deloitte LLP

⁴ World Energy Outlook 2011, International Energy Agency

Global Energy Landscape

Developing energy technologies and infrastructure takes time, money and talent—but it also takes attention on the part of policymakers. Here, explained Richard Jones, Executive Director, International Energy Agency (IEA), the energy industry has recently encountered a roadblock. Persistent economic concerns have diverted the attention of governments away from energy, limiting their policy options. Simultaneously, natural disasters and geopolitical turmoil have created additional distractions and accompanying challenges. For instance, the fate of the nuclear industry remains uncertain in the aftermath of the Fukushima accident and turmoil in the Middle East and North Africa has raised questions about the region's plans for infrastructure investment, which could potentially constrain future world oil supplies and put upward pressure on prices. These challenges, Jones asserted, are adding to already worrisome trends. According to the IEA, CO₂ emissions have rebounded to a record high; energy efficiency of the global economy worsened for the second straight year, and spending on oil imports is near its historic peak. Simultaneously, emerging economies continue to drive global energy demand, which the IEA predicts will increase by one-third from 2010 to 2035. Emerging economies, led by China and India, will likely account for more than 50 percent of this anticipated demand growth.

Despite the uncertainty, energy companies understand that they cannot afford to stand still. Jones explained that the industry has already cut several progressive paths through the thickets of the global energy landscape. The shale gas boom is one of them. Production of unconventional gas—and now of light, tight oil—in the U.S. is rising to rates that were virtually inconceivable only a few years ago. This boom is having several effects, both domestically and on world oil and gas markets. U.S. oil imports are now on the decline due to rising domestic production and tighter fuel efficiency standards. Opportunities are also opening up not only for exporting abundant U.S. gas but also for transferring the technologies that made the boom possible to other areas of the world. Jones stressed, however, that “Golden Rules” specifying standards for safe and responsible operations will be required to support a potential “Golden Age of Gas” in the U.S. and abroad.

Renewables too are forging a new path, despite the relative absence of policy guidance and competitive pressures from natural gas. The IEA predicts that low-carbon power technologies will come of age between 2010 and 2035, with renewables and nuclear power accounting for more than half of all the new capacity added worldwide. While renewables are making strides toward cost parity, Jones stressed that investments in power generation will become increasingly capital intensive in the near term as the share of renewables rises. Nuclear, as the no-carbon option, may be the biggest wildcard in the mix. Jones pointed out that new construction started on more new nuclear reactors in 2010 than in any year since 1980. While it remains to be seen if and how governments will adjust their nuclear policies post-Fukushima, nuclear is still largely perceived as a critical sector, particularly for nations relying on imports or with growing power demand. And the new paths don't end there. Even the international coal trade, which has received a black eye from the media for its environmental challenges, could find a resurgence in China—especially if China's domestic production falters and advances are made in clean-coal technologies.



“In a world of uncertainty, one thing is sure: Rising incomes and population growth will push energy needs higher.”

— Ambassador Richard H. Jones, Deputy Executive Director, International Energy Agency

⁵ *World Energy Outlook 2011*, International Energy Agency

In response to these shifts and to the increasing complexity of the energy landscape, individual companies are beginning to examine their own energy equations. BASF, one of the world's leading chemical companies, provides an example. Dr. Hans-Ulrich Engel, CEO, BASF Corporation, explained that his company spends \$30 billion a year on raw materials, two-thirds of which are hydrocarbons. If this amount is reduced even by a small percentage, it could translate into higher profits, lower carbon emissions, and ultimately a competitive advantage. That's why Engel says executives in his company think day and night on how to decrease input and increase output through technology and innovation.

At BASF, energy efficiency is primarily pursued through the "Verbund," which stands for integration and networking, and it is one of the company's core strengths. Within the Verbund, production facilities, energy flow, logistics and infrastructure are intelligently networked with each other in order to increase production yields, save resources and energy, and reduce logistics costs. According to Engel, BASF saves more than 18 million megawatt hours each year due to the Verbund, which corresponds to the avoidance of 3.7 million metric tons of carbon emissions annually. Also of note, BASF produces products such as insulation materials, fuel additives and N₂O decomposition catalysts, which help its customers to save energy and avoid greenhouse gas emissions. Thus, the effects of its efficiency initiatives reverberate further than most and are felt throughout many parts of the energy equation.



“The world’s consumption patterns are clearly not sustainable and they must be addressed—that’s where energy efficiency plays a very, very important role.”

– Dr. Hans-Ulrich Engel, CEO, BASF Corporation



The Domestic Energy Landscape



The U.S. Energy Information Administration (EIA) forecasts that electricity demand in the United States will grow by just shy of one percent per year through 2035.⁶ Meanwhile, natural gas prices were hovering around \$2.50 per million British thermal units (MMBtu) at the time of the conference—all while solar had moved closer to grid parity in the last year, with the U.S. Department of Energy setting the aspirational goal of reducing the cost of solar power by 75 percent to \$1.00 per watt by the end of the decade.⁷ Bert Valdman, Senior Vice President, Strategic Planning, Edison International, asserted that when these numbers are plugged into the energy equation, they do not add up to business as usual for utilities.

Valdman explained that the old formula of balancing higher operating costs with load growth no longer works. The situation is even more challenging since this formula is breaking down at a time when operating costs and

capital investments are increasing because of the need to replace aging infrastructure and to comply with new regulatory requirements. Considering these developments, the question is not if the industry will transform, but how fast can it change.

Moving ahead, Valdman contended that utilities will need to counter higher operating costs, and the accompanying pressure they put on electricity prices, with operational excellence, supply diversity, and technological innovation. They will also need to prepare for a fundamental shift in the traditional transmission and distribution model. While the central-station electric system won't disappear overnight, utilities need to prepare for a system of distributed generation and microgrids. This model, explained Valdman, is more consistent with today's service-based economy, which is relentlessly focused on mass-customization. New technologies, such as Siri Voice, Facebook, 4G, and Google, are enabling personalization to a scale that has never been seen and they are fundamentally changing the ways in which information is disseminated and products are marketed.

As these technologies give consumers more options, utilities must do the same, and this includes adopting a retail mindset. This mindset involves not only setting out to meet the needs of today's customers but also educating them about new possibilities on how to use energy and understanding their individual preferences. It also includes delivering new products that consumers "can't imagine today but can't live without tomorrow." And it emphasizes competing for business instead of taking it for granted. Valdman concluded by noting that utilities will need to balance their move toward mass customization with their core obligation of safety and reliability. One element of the new formula will be to install systems that are useful and workable while deploying new technologies that push the frontier a little bit farther.

⁶ "2012 Early Release Overview," *Annual Energy Outlook*, U.S. Energy Information Administration

⁷ <http://www.cleaneconomy.com/solar-energy-news/doe-aims-to-reduce-cost-of-solar-by-75-percent-020711/>

Valdman and other speakers throughout the day stressed that regulatory policy will play a role in how fast the electric industry can transform. The Honorable Jon Wellinghoff, Chairman, Federal Energy Regulatory Commission (FERC), concurred, explaining that his organization is focused on making wholesale electricity markets robust and efficient, and building the transmission infrastructure to support them. The ultimate objective, he explained, is to structure these markets in ways that reduce costs, maintain reliability, and ensure throughput of reliable energy services. To this end, the FERC has issued a number of final rules. One of these is Order No. 743, which revises the North American Electric Reliability Corporation's (NERC) definition of the bulk power system to make sure it encompasses all facilities necessary for operating the interconnected electric transmission network.

Another is Order No. 1000 on transmission planning and cost allocation. This order deals with the two large areas of transmission that the FERC has jurisdiction over—planning and cost allocation. In the planning area, the rule mandates that transmission owner/operators form into regions for the purpose of doing regional planning. The planning processes within those regions must address reliability; consider economics in terms of minimizing costs and reducing congestion; and demonstrate that public policies, such as state renewable portfolio standards and the U.S. Environmental Protection Agency's (EPA's) emissions standards, have been taken into account. On the cost-allocation side, Order 1000 mandates that each transmission region must develop a cost-allocation methodology in which costs are commensurate with anticipated benefits; costs are only allocated to those who benefit and the beneficiaries must be transparent; and the region must coordinate with neighboring regions and establish ways to allocate costs across multiple regions. Additionally, under the Order, no longer will an incumbent distribution utility have the right of first refusal in a region

to build an interstate transmission line. Wellinghoff explained that those rights were previously included in some tariffs in some instances, but opening up the markets is essential for attracting the maximum amount of investment capital as well as the greatest number of competent, qualified participants.

As the industry transforms, Wellinghoff asserted that the FERC will continue to work to accelerate these shifts as well as to examine the implications of them. For instance, in the future the FERC will be looking at the implications of integrating large amounts of gas-fired generation into the electricity portfolio, particularly with an eye toward ensuring the reliability of supply to these facilities.



“We shouldn’t be afraid of disruptive innovation in the electric sector; we should embrace it because it is our future.”

– Bertrand Valdman, Senior Vice President,
Strategic Planning, Edison International



“We can build all of the supply resources we want to, but if we don’t have the transmission to deliver them, it really doesn’t matter.”

– The Honorable Jon Wellinghoff, Chairman,
Federal Energy Regulatory Commission

Natural Gas Supply — Reshaping the Energy Portfolio



“With shale gas, the U.S. has been given a golden ticket—a gift unlike any that has ever been given to a nation.”

— Greg P. Leveille, Manager, Unconventional Reservoirs Technology Development, ConocoPhillips

The shale gas boom in the United States has been characterized as “revolutionary,” “transformational,” and “unprecedented.” These types of adjectives are rare in any industry, but they carry even more weight in a sector such as oil and gas that is accustomed to planning decades ahead. But why is this dramatic shift occurring now? And why has it been centered mainly in the United States?

Greg Leveille, Manager, Unconventional Reservoirs Technology Development, ConocoPhillips, explained that the shale gas boom is largely the result of a perfect storm where technology and innovation collided with economics and opportunity. At the time, natural gas prices were strong, due in part to tight supplies from declining conventional production, and geoscientists recognized that large volumes of hydrocarbons existed within rocks that the industry typically didn’t go after. This combination of need and opportunity compelled the industry to take a new look at old rocks and existing production techniques. This resulted in the innovative marriage of two established technologies, horizontal drilling and hydraulic fracturing and stimulation—and the shale gas revolution had begun.



“The industry needs to drill these wells well, but equally it has to get information out to the public and make sure they fully understand the costs and benefits.”

— Peter Robertson, Independent Senior Advisor, Oil & Gas, Deloitte LLP

Leveille pointed out that the industry has gone from zero billion cubic feet (Bcf) of production from shale 10 years ago to 24 billion Bcf in 2011. However, he contends that what the industry has seen so far as growth is nowhere near what is possible from “these rocks.” Amid an environment of weak demand and excess supply, the price signal simply isn’t there for oil and gas companies to produce more. Should demand become stronger, Leveille asserted that shale gas production in the U.S. could be tens of Bcfs higher than it is today. The question, it appears, is

not if the shale gas opportunity will exhaust itself in the U.S. anytime soon, but instead, if it will spread elsewhere throughout the world.

As Leveille explained, robust shale gas deposits are known to exist in many places across the globe. While the U.S. doesn’t have special rocks, it does have a special set of characteristics, such as private ownership of mineral rights, the practice of sharing data within the industry, rapid technological innovation, and experienced human resources. This mix makes it easier to exploit the shale gas—and now shale oil—opportunity within the U.S. than in many other countries.

As a result of these factors, the U.S. has a head start in reaping the benefits of the rapidly developing shale movement. Leveille characterized these benefits as nothing short of “an industrial renaissance.” He asserted that America’s abundance of low-priced natural gas is opening up export opportunities, catalyzing a rebirth of the petrochemical industry where natural gas is used as a feedstock, laying the foundation upon which to revitalize the American manufacturing industry, and increasingly reducing CO₂ emissions as more and more power and utility companies replace aging coal-fired plants with those fueled by cleaner burning natural gas.

But as in any major shift, the shale gas revolution does face challenges. Among them are concerns about the environmental impacts of horizontal drilling and hydraulic fracturing and stimulation, particularly relating to water quality and seismicity. Another challenge is economic, with some chemical and industrial customers fearing that U.S. LNG exports could significantly raise domestic prices, although Leveille and many others throughout the conference contended they would have negligible impact. Both Leveille and Peter Robertson, Independent Senior Advisor, Oil & Gas, Deloitte LLP, who moderated the discussion, concurred that the future success of the shale gas revolution, like any major transformation, will largely hinge upon gaining and maintaining public support. As Robertson concluded, “The industry needs to drill these wells well, but equally it has to get information out to the public and make sure they fully understand the costs and benefits.”

A Competitive Response to Natural Gas Supply



"A recent explanation of the Obama Administration's 'all-of-the-above' energy strategy left out coal, which is like leaving the mother-in-law off the wedding invitation."

– Luke Popovich, Vice President, External Communications, National Mining Association



"The renewables sector is immature in the way it finances itself, which hinders it from becoming more cost-competitive."

– Ethan Zindler, Head of Policy Analysis, Bloomberg New Energy Finance



"Nuclear still makes sense economically in terms of fuel diversity and no emissions."

– Kimberly S. Greene, Executive Vice President and Chief Generation Officer, Tennessee Valley Authority

Natural gas is clean, lean and efficient—not to mention currently abundant and cheap in the U.S. With so much going for it, natural gas is emerging as a tough competitor to other fuels. This has led some to question whether or not renewables, coal and nuclear can successfully compete against this rising star to land future roles in America's power-generation fleet. With a few caveats, speakers largely asserted that the answer is "yes."

One reason for their optimism is that many power and utility companies value supply diversity. As Kimberly Greene, Executive Vice President and Chief Generation Officer of the Tennessee Valley Authority (TVA), explained, low-priced, abundant natural gas supplies have given her organization an opportunity to rebalance its generation portfolio. Originally, a hydro and coal-heavy utility, TVA is now decreasing its dependency on coal and shifting toward a mix of natural gas, nuclear and cost-competitive renewables. Interestingly, Greene noted that natural gas has not become the automatic default choice for new generation build within her organization, which is also pressing ahead with a nuclear plant. When assessed in the context of fuel diversity and no emissions, she explained, nuclear and certain renewables remain economically viable options despite historically low natural gas prices.

Another reason that natural gas will not likely deal a fatal blow to other fuel choices is the broad realization that prices will not stay low forever. Ethan Zindler, Head of Policy Analysis, Bloomberg New Energy Finance, explained that even though new capital continues to pour into clean energy, the solar and wind sectors are presently oversupplied, margins are shrinking, and renewable energy companies do not have as much negotiating power with utilities. With natural gas prices declining even further than the price of renewable power, the short-term situation is tenuous for weaker players. However, Zindler contended that many clean-energy projects have a long-term advantage: Since the capital costs are amortized within a power purchase agreement, utilities benefit by

paying a steady, predictable price for power where the marginal cost is zero for 20 years or more. In an era of fuel price volatility, he argued, this can be a very attractive proposition for utilities seeking to balance their portfolios and hedge against rising natural gas prices over the long-term. Moving ahead, Zindler, like other speakers during the conference, stressed that the renewables sector must find ways to become more cost-competitive without subsidies. One such option involves lowering the cost of capital, which may potentially be accomplished by accessing the public capital markets as opposed to relying on old-fashioned project finance.

Although renewables are facing their fair share of competitive challenges, it is coal that appears to be feeling the most heat from natural gas. This comes even as the U.S. has the deepest coal reserves in the world and is one of the largest suppliers of metallurgical coal for steelmaking. America also has what many believe to be the best mine-to-market infrastructure in the world. However, the coal industry has recently experienced steep declines in market share due to the collapse in natural gas prices and a hostile domestic regulatory environment. Luke Popovich, Vice President, External Communications, National Mining Association, asserted that these conditions are forcing the American coal industry to seek opportunities abroad. Absent significant advances in carbon capture and storage technologies, Popovich foresees growth in his sector coming mainly from exports, particularly to China and India, which primarily rely on coal for their energy needs today and will likely do so in the foreseeable future. Although exporting coal will help to preserve American jobs and improve the nation's balance of trade, Popovich acknowledged that it will not help to address global concerns about carbon. "We need to make coal cleaner and a more responsible choice," observed Popovich. To do so, he concluded, the coal sector will need supportive policy as well as more skilled people who are dedicated to developing the new technologies needed for catalyzing the massive transformation that lays ahead.

Linking Supply and Demand — Financing Infrastructure

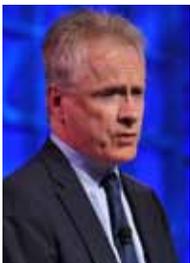
Infrastructure is largely seen as the variable that needs to be solved in order to balance the energy equation. From pipelines to generating stations, the energy industry at its core is a vast network of plant and equipment enabled and controlled by technology. And this network continuously needs capital to adapt and grow. As Daniel More, Managing Director, Global Energy Group, Morgan Stanley, explained, the topic of infrastructure naturally raises many questions in today's rapidly transforming marketplace: Where's all the capital going to come from? Is it out there? What does it cost? Who will supply it? And how can we move it from here to there to make sure that everything we've talked about gets done?

In attempting to answer these questions, More began by describing the North American power and utilities sector as a "voracious user of capital in the hundreds of millions" for new builds, re-builds and safety adaptations. He further noted that over the past 10 years, equity investors have been generally pleased with the sector as it has produced returns that by and large have outperformed the S&P 500. Amid continuing market volatility, investors are now looking for more of the stable returns that utilities typically provide. As More observed, "the stock market is wide open for equity issuance of utilities." The challenge from an investor's perspective is that utilities don't need as much equity as they used to,

since they're experiencing a slow-down in the build cycle due to flat electricity demand growth. The constraint then isn't a dearth of capital; instead it's a scarcity of attractive investment opportunities, with investor appetite remaining strong for equity issuances, investment-grade bond offerings, and long-term contracted projects within the power and utilities sector.

More further noted that utilities are moving swiftly to take advantage of these favorable funding conditions, particularly by tapping the robust market for debt issuance. He observed that many utilities are trying to borrow as much money as they can to prefund bonds that might be due in a year or two or to shore up pension obligations. M&A funding too is quite feasible—if good deals can be found. More observed that with today's conditions, utilities are readily able to access the markets for these types of transactions, and conversely, infrastructure funds are readily able to borrow money to buy utilities. More and other speakers throughout the conference concurred that the leading challenge for utility executives is how to grow earnings. Consequently, he asserted that this challenge, along with industry fragmentation and present financial-market conditions, equates to a "recipe for continued consolidation."

While the North American utility sector is experiencing a slowdown in its generation-build cycle, the North American natural gas sector is trending in the opposite direction. The shale gas boom, which has been characterized by some as the biggest thing that's happened in the energy industry in decades, is stimulating the need for new pipelines, storage facilities, and export terminals to transport supplies to demand centers. Curt Launer, Managing Director, National Resources Corporate Finance Coverage Group, Deutsche Bank, explained that the financing challenges here are related to magnitude. He estimates that reorganizing the natural gas infrastructure to accommodate the new shale plays will require \$10-\$20B in capital expenditures annually for the next 5-7 years. Thus, he sees access to capital as the biggest risk facing the industry. Nonetheless, investor interest is ample at present. Launer explained that the weighted average



“An important issue for utility executives is how to continue to grow earnings year after year”

— Daniel B. More, Managing Director,
Global Energy Group, Morgan Stanley

cost of capital for the companies that are building this infrastructure is just under 8 percent, while average project returns are in excess of 12 percent. This represents an attractive delta, which is where dividend growth comes from—and this growth is exactly what investors are seeking from the industry.

Will these favorable conditions last? In terms of infrastructure finance, Launer and others explained that investors tend to worry about extremes, such as situations where oil prices are so high that they destroy demand or natural gas prices drop so low that they destroy supply. The industry thus far, however, has proven to be rather resilient to price swings, recently withstanding a dip to \$2.00 MMBtu for natural gas with little impact. Thus, Launer observed, “the environment for the industry continues to look very good.” Alex Urquhart, President and CEO, GE Energy Financial Services, concurred with this assessment, stating his view that there absolutely will be capital available to build the new assets. His main concern, however, relates to the impact of the shale gas boom on the economics of existing assets. For instance, abundant, low-priced natural gas is affecting the viability of coal plants and renewable assets that are in operation or under construction. The economic profiles of pipelines too are being affected as operators switch them back and forth to accommodate different types of fuel or as new ones come online to transport gas from rapidly developing shale basins, thus lowering the utilization rates on existing conventional routes, such as those running northward from the Gulf of Mexico. Nonetheless, Urquhart and others emphatically agreed that the infrastructure variable in the energy equation will ultimately be solved since the benefits of the shale plays—in terms of national security, competitiveness, low carbon footprint and economic growth—are hefty enough to outweigh any drawbacks.



“The biggest risk to this industry is no longer interest rates; it’s access to capital since so much has to be built to reorganize the North American infrastructure for the shale plays.”

– Curt N. Launer, Managing Director, National Resources Corporate Finance Coverage Group, Deutsche Bank



“Will there be the capital to invest in the new assets? There absolutely will be.”

– Alex Urquhart, President and CEO, GE Energy Financial Services



Emerging Technologies — What's Next?



"We've moved very rapidly from a country that is worried about its energy security to one that almost overnight has a real opportunity to control its own energy destiny."

– Dr. Anthony Cugini, Director, National Energy Technology Laboratory, U.S. Department of Energy



"If we can prove that we can keep natural gas supply available and prices moderate for more than a few years at a time, the market will take care of itself."

– David C. Carroll, President and CEO, Gas Technology Institute



"The intersections of the Web with energy efficiency, energy storage, and water are all emerging areas to watch."

– Sheeraz Haji, CEO, Cleantech Group LLC

Hydrogen fusion...utility-scale solid oxide fuel cells...cellulosic biofuels...solar power from space: In pondering the subject of emerging energy technologies, most people automatically think of brand new energy sources such as these, which are under development but most likely are decades away from being deployed at any type of scale. Although the concept of futuristic, disruptive technologies is exciting, speakers noted it is often not where the day-to-day action is.

As Dr. Anthony Cugini, Director, National Energy Technology Laboratory (NETL), U.S. Department of Energy, explained, his research organization, like many others, is focusing on developing technologies that will support and expand America's newfound energy security, which has largely been brought about by the shale gas revolution. Among the technologies being developed at the NETL are a number of carbon capture, utilization and storage (CCUS) mechanisms that aim to reduce the carbon footprints of both natural gas and coal. These include carbon separation membranes and phase-change sorbent systems, which have been demonstrated at a very small scale. The NETL is now engaging in seven regional partnerships to scale these technologies and to explore ways to lower their costs. Cugini, who sees CCUS as critical to the future energy security of the U.S. as well as to nations around the world, observed that the U.S. government often falls short in touting its successes and that "no one is ahead of America in the development and demonstration of CO₂ control technologies." He also stressed that his laboratory is looking at ways to expand the fossil-fuel resources available in the U.S. This includes producing natural gas from methane hydrates, which if successful, could potentially be a bigger development than shale gas has been.

The Gas Technology Institute (GTI) is a not-for-profit research organization that has been quietly working to reduce the environmental impact of fossil fuels, improve energy efficiency, and help to lessen U.S. dependency on foreign crude oil. According to David Carroll, President and CEO, on any given day GTI engineers are working on 300 different technology development projects throughout the natural gas value chain. These efforts include technologies designed to expand low-cost energy supplies, ensure a safe, reliable and efficient delivery system, and create novel

ways to use energy efficiently and wisely. Carroll explained that if one takes a holistic look at the nation's energy grid, as much as two-thirds of the energy produced at a central station is wasted. He asserted that the industry can do a better job by combining heat and power systems, exploring distributed generation, and promoting direct use of natural gas in homes, businesses and transportation. To these ends, the GTI has been involved in developing smart control technologies for natural gas distribution, a heavy-duty natural gas engine, and a full-scale methane separation facility with carbon capture and sequestration. The Institute is also exploring enhanced hydraulic fracturing technologies, which would release more gas from each well.

In addition to public-sector R&D, speakers also emphasized that private-sector investment in clean technology is far from dead. Sheeraz Haji, CEO of the Cleantech Group, explained that after a stark decline in 2009, global venture capital (VC) investment in clean technology has rebounded. In 2011, clean-tech venture funding reached \$9.2 billion, an increase of 15% over 2010. Despite the recent spate of solar bankruptcies and exits, solar emerged as one of the leading VC sectors, along with energy efficiency and transportation. Haji further sees several trends on the horizon that will likely drive continued investment in many types of clean technologies. These trends include the growing recognition that smart water must be included as a critical component of smart-city initiatives; the need for better water management and recycling capabilities in unconventional energy exploration; and the imperative to meet the basic needs of an expanding global population through more efficient use of water and energy in the agricultural sector.

Speakers concluded by stressing that developing new technologies is just half the battle since the competition is ultimately won or lost in the deployment phase. Despite its leadership in innovation, the U.S. lags other countries such as China and India in driving energy technologies into the economy. Moving ahead, speakers concurred that technologies, markets and policies will all need to work together more cohesively in the U.S. to shepherd fledgling innovations through the "Valley of Death," which was described as the perilous period between invention and commercialization.

Global Wildcard — The Impact of China



“The future of oil and gas is still oil and gas.”

— Dr. Michael J. Economides,
Editor-in-Chief, *Energy Tribune*,
Professor of Chemical and
Biomolecular Engineering,
University of Houston

China has often been referred to as a “sleeping giant.” As Dr. Michael J. Economides, Editor-in-Chief, *Energy Tribune*, and Professor of Chemical and Biomolecular Engineering, University of Houston, sees it, this giant has not only awakened but it has “gone berserk.” As he pointed out, China increased its oil consumption by 20 percent per year for three consecutive years from 2004 to 2007, demonstrating a ravenous energy appetite unlike any experienced before in the history of human kind. This appetite is largely being stoked by the Chinese government’s urbanization strategy, which has already moved about one-third of the population, or 500 million people, from rural areas into cities. Along with this shift, comes the need for massive amounts of raw materials along with the energy to transform them into roads, buildings, hospitals, schools, transportation systems, and other elements that constitute modern urban life—all of which also require energy to operate. At the same time, a large portion of China’s population is transitioning into the middle class, with the nation recently surpassing one billion vehicles on the road.

Economides and other speakers throughout the day speculated on the impact of China’s growth on world energy markets. One of the potential ramifications is higher oil prices. Economides asserted that \$100 per barrel is the new norm, and in his view, \$150 per barrel may not be far away either. One of the reasons is that economically viable substitutes for oil and gas have yet to be found. According to him, 85 percent of world energy consumption will still come from fossil fuels by 2035 because renewable energy cannot economically compete with fossil fuels if the laws of thermodynamics are taken into account. Another factor that will likely tighten world oil markets is the precarious geopolitical landscape. In characterizing many major oil and gas producing countries, Economides described them as often corrupt, dysfunctional and militant. Even the more stable OPEC producers, such as Qatar and Saudi Arabia, have little excess capacity behind the valve. When China’s growing energy appetite is thrown into the mix, he contended that one must question where the incremental supply is going to come from.

China itself is asking this question, and is acting swiftly to find an answer. According to Economides, Chinese national oil companies spent \$200 billion acquiring energy assets around the world in 2010, \$60 billion of which were in Latin America. China is also interested in using more natural gas as a source of incremental energy supply and as a means of alleviating some of its air-pollution concerns.

Based on recent goals set by the Chinese government, Economides asserted that the Chinese incremental demand for natural gas could be 7-to-9 trillion cubic feet (Tcf) per year by 2020. When an incremental demand from post-Fukushima Japan of 1.5 Tcf/year is also factored in, the total becomes at least 3.5 times the amount of natural gas that Australia is planning to export next year—an amount that he says is “almost inconceivable to the industry right now.” To help fill this gap, China is also keen on developing shale gas. The nation claims it has shale reserves equal to those in the U.S., but that is probably overstated, according to Economides. Based on his experience working in the region, “their shale gas is probably more difficult to extract than they anticipate, and the volume of gas is probably less than they assume.”

Keeping pace with the inexorable pull of energy toward the East will be challenging for China’s domestic producers as well as for their suppliers. This leads Economides to contend “energy will be China’s choke point.” The advantage they have in managing the severity of this bottleneck, or perhaps avoiding it altogether, are qualities that ironically they share with the U.S.—family values, a strong work ethic, belief in education, and a can-do attitude. The problem, he suggests, is that America has lost its ability to translate these qualities into action quickly. To illustrate his point, he divided the room into two sections, one representing China and the other the U.S. and hypothetically tasked each with constructing a pipeline. He noted that despite having the same directives, the Chinese side of the room would have its pipeline built and flowing prior to the American side finalizing its plans.

How Clean Energy Fits in the Equation

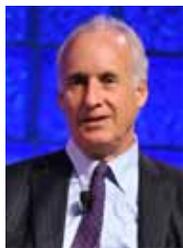
“Seventy-five percent of the support programs for renewable energy, including the 1603 program and the Production Tax Credit, are coming to an end or have already ended,” noted Richard Kauffman, Senior Advisor to the Secretary of Energy, U.S. Department of Energy. Accordingly, the question for policymakers and for the industry has become, “What’s next?”

One possibility is a fundamental restructuring of the way in which financing is done in the renewable sector. On one hand, Kauffman explained that traditional methods, such as venture capital financing, don’t work so well in the energy industry because of the time and enormous investments it takes to bring emerging technologies to scale. This, he contended, presents an opportunity for the Federal Government to assist in guiding new technologies through the “Valley of Death,” or the time between invention and commercialization. He further explained that the need to bridge this gap was the motivation behind the Federal Loan Guarantee programs, and it is now providing the impetus for the proposed Clean Energy Deployment Administration (CEDA).

On the other hand, more mature renewable technologies, such as wind and solar, also have an opportunity to revamp the way in which they are financed, and thus to lower their cost of capital. Kauffman asserted that wind and solar are financed in an anachronistic way, using non-capital-market sources of funding such as banks, tax equity and private investors. “There is no bond market to speak of in renewables despite the fact assets have

20-year lives,” noted Kauffman. He further explained that this is “really extraordinary” because corporations in other industries don’t go to banks in search of 20-year funding; instead, they turn to public debt markets and other capital-market structures such as Master Limited Partnerships and Real Estate Investment Trusts. Developing public capital markets for proven renewable technologies, he asserted, will be critical to facilitating cost parity with other fuels and to providing an off ramp for subsidies. To create these markets, he explained, projects will need to be aggregated in order to reach the size necessary for securitization. Additionally, standardized power purchase agreements and more robust performance data will also be required.

Kauffman stressed that renewable technologies will be an important part of the energy equation moving ahead and that the main variable is how quickly they can be deployed. He explained that until recently our approach to developing renewables in the U.S. has been to first innovate, then achieve cost parity, and ultimately deploy. This approach often creates an unlevel playing field for inventors since the energy market isn’t entirely pure. Differential subsidies and externalities (e.g., the Defense Budget and climate change) often tilt the field one way or another. Also, the inventor is challenged to achieve cost parity without the benefit of several decades of scale, which traditional fossil fuels have. Kauffman noted that countries in Asia and Europe have been successful in driving renewables into the economy and in enabling them to make significant progress towards cost parity. This model, he explained, establishes a market for “good enough” technology through a variety of finance mechanisms. This facilitates deployment first, which encourages more innovation and helps to build scale, thus creating a positive cycle of ongoing improvement and decreasing costs. “While our model in the U.S. has historically relied on an antiquated form of financing, we are working to expand capital markets financing for innovative renewable energy projects,” concluded Kauffman. This is something that he and other speakers concurred will need to evolve further if the U.S. is to become as adept at reaping the economic benefits of clean technologies as it is at inventing them.



“It’s through establishing markets for renewable energy technologies that real innovation and cost reductions take place.”

– Richard Kauffman, Senior Advisor to the Secretary of Energy, U.S. Department of Energy

The Environmental Policy Agenda



"We need to be transparent in the benefits and the reasons for subsidizing renewables, which go beyond economic growth and job creation to include diversification of energy resources."

— F. William Brownell, Chairman, Hunton & Williams

"It was all about carbon," when the Obama Administration came into office, observed William Brownell, Chairman, Hunton & Williams. But what a difference four years make. Today, with the prospects of federal carbon legislation all but extinguished, the Administration has turned to environmental policy as the main mechanism for pursuing its goal of curbing greenhouse gas emissions. "Environmental policy in this Administration is really energy policy," observed Brownell. He further noted that the environmental regulations that have been effected or enforced over the last four years all compensate for the Administration's "inability to legislate around climate change."

These regulations and enforcement activities have taken many guises. Brownell noted that under the purview of the U.S. Environmental Protection Agency (EPA), the energy industry now has Mercury and Air Toxics Standards (MATS), National Ambient Air-quality Standards, and a New Source Review Permitting Program for Greenhouse Gas Emissions to contend with. MATS, with compliance required as early as 2015, is one of the most significant environmental regulations for existing coal-fired power plants. The rule places stringent limits on the emissions of heavy metals, arsenic, chromium, mercury and nickel, as well as acid gases including hydrochloric acid and hydrofluoric acid. Under MATS, existing generation sources generally will have up to four years to comply.⁸ However, as a result of stakeholder input, the EPA announced on July 20, 2012 that it will stay the current emissions requirements for new power plants while the rule is reconsidered. If the three-month stay is not sufficient, the EPA has stated that it would not oppose extending the period until it issues new standards in the final rule. The reconsideration process is expected to conclude by March 2013.⁹

Meanwhile, many other regulations under the Clean Air Act have been proposed or are pending judicial review, such as the Cross-State Air Pollution Rule, New Source Review Permitting Program for Condensable Particulate Matter, and the Greenhouse Gas New Source Performance Standard for Electric Generating Units. The emissions levels detailed in the latter, noted Brownell, are below what is technologically feasible for coal-burning plants. If the rule is promulgated, this effectively means that no new coal power plant can be constructed until new emissions-control

technology is developed and economically feasible, which some industry participants believe is about 10 years away.

According to Brownell, the impact of this regulatory activity is being seen in the energy markets today. Some estimates suggest that the industry will be retiring up to 80 gigawatts of coal-fired generation as a result of the additional costs of these regulations. Also affecting the markets—and in some ways overshadowing the regulatory activity—is low-priced natural gas. Brownell noted that "cheap" gas is increasingly displacing renewables as well as coal, making it even more difficult for alternative energy technologies to compete against traditional fossil fuels considering the substantial price differential.

In a presidential election year, however, the big question is, "What will happen come November?" Contrary to what one might expect, Brownell contended that there will not be a major reversal in policy direction should a Republican Administration take office in 2013. Instead, he believes the nation will see "some tweaking around the edges" of regulations put in place for coal-fired generation and of those being developed for natural gas, "unless we hear things from the courts that require a different direction." On the other hand, if the Obama Administration gets reelected, Brownell thinks there will be a "push to finish unfinished business," with respect to tightening air quality standards even further and to defending challenges to proposed regulations.

In either scenario, he concluded, coal is being pushed towards becoming an export fuel. Although the sentiment in the current Administration has trended toward moving the nation "beyond coal," Brownell observed that some environmental policymakers are now suggesting that America should also start looking "beyond natural gas." While it is cheap and abundant now, they believe that an over-reliance on shale gas could displace renewables and discourage the infrastructure development needed to accommodate them, which could be detrimental to the energy industry and the domestic economy over the long-term. Diversification, concluded Brownell, is an important benefit of renewables and we need to articulate that too.

⁸ www.snl.com, July 20, 2012

⁹ <http://www.epa.gov/mats/pdfs/20120720letter.pdf>

Summary of Breakout Sessions



Dr. Charles K. Ebinger, Senior Fellow and Director, Energy Security Initiative, Brookings Institution

Oil & Gas Sector

While nearly inconceivable a decade ago, the U.S. is now poised to become an exporter of natural gas. But will liquefied natural gas (LNG) exports ultimately hurt domestic natural gas consumers by raising prices? Speakers asserted that the price impact of LNG exports will most likely be modest, and that the economic benefits overwhelmingly outweigh the negatives. They drew this conclusion based on several mitigating factors, including the large domestic resource base and highly interconnected energy market that exists in North America. Furthermore, the price impact is expected to dissipate with distance away from the Gulf of Mexico.



Andrew Ware, Director, Corporate Affairs and Communications, Cheniere Energy, Inc.

Recently, Deloitte MarketPoint applied its integrated North American Power, Coal, and World Gas Model to analyze the price and quantity impacts of LNG exports on the U.S. gas market. The objections raised by opponents of LNG exports were largely inconsistent with the findings of this analysis. Given the model's assumptions, the World Gas Model projects a weighted-average price impact of \$0.12/MMBtu on U.S. prices from 2016 to 2035 as a result of 6 Bcf/day of LNG exports. More detailed findings can be found in the full report, *Made in America: The economic impact of LNG exports from the United States*, a report by the Deloitte Center for Energy Solutions and Deloitte MarketPoint LLC.



John Shelk, President and CEO, Electric Power Supply Association

Power Sector

John Shelk, President and CEO, Electric Power Supply Association, opened the Power breakout session by noting, "It's dangerous to use the term 'breakout' around power generators because these days it often means 'breaking out' into a cold sweat." Despite the foundational and transformational nature of electricity, Shelk explained that there is much uncertainty and anxiety among power generators today due to questions around future fuel choices and challenges within the capacity market system. Despite the many pluses associated with natural gas, some power producers are wary about the stability of supply and likelihood of low prices over the long run. Thus, fuel diversity is still critical. The question is, "What type of



Cynthia J. Marple, Director, Rates and Regulatory Affairs, American Gas Association



Lillian A. Federico, President, Regulatory Research Associates

new generation build is needed?" Shelk explained that this question becomes tough to answer since states are encouraging energy efficiency and demand response and using loopholes in the system to subsidize new generation build in congested areas, mainly through deals with incumbent utilities.

The impacts of these types of actions were reflected in the results of the May 2012 PJM capacity market auction. Shelk pointed out that of the 5,000 megawatts of new generation build that cleared in the auction, a little over half was uneconomic and was coming into the market because of politically motivated subsidies. Critics maintain that this affects the overall market price and creates an unfair playing field. Shelk asserted that capacity markets are now coming to the point where difficult questions, such as whether to allow state-subsidized generation and how to value demand response, will need to be addressed if the industry wants to preserve a deregulated wholesale market structure.

Regulated Utilities Sector

Navigating the complex world of utilities is an evolving challenge that requires ongoing consideration of the current economy, regulators and increasing costs. Speakers explained that finding a still point among these cross-currents is becoming even more difficult due to the convergence of several factors, including the need to implement advanced technologies, revitalize aging infrastructure and replace coal-fired generation units. While all of these factors significantly affect returns, in many instances rate increases aren't the answer since regulators are more averse than ever to raising costs for the consumer in these difficult economic times. Consequently, speakers stressed that "collaboration is the name of the game." Since costs are increasing at a higher rate than sales, engaging customers and understanding their perspectives are vitally important for obtaining buy-in for investment strategies as well as for identifying unmet needs, which could lead to new sources of revenue. Speakers also suggested that developing multi-year rate strategies could also help electric utilities to better manage rate mechanisms and rebalance risk.



Eric Ackerman, Director, Alternative Regulation, Edison Electric Institute

On the regulated natural gas side, speakers cited safety as a top advocacy issue as well as exploring new uses for natural gas. While rates have been less of a sticking point lately due to low natural gas prices, some states have approved new rate mechanisms that are generally beneficial to all parties, such as weather normalization adjustments and decoupling, where a utility’s ability to earn a fair return is divorced from the amount of gas it delivers.



Donna Bell, Manager, Electric Vehicle Infrastructure and Smart Grid Technology, Ford Motor Company

The Last Mile — Electric Vehicle Infrastructure

The remaining effort to prepare for as many as one million electric vehicles (EVs) on U.S. roads by 2015 is not really about the last mile, speakers remarked, “it’s about the last 50 feet.” By and large, utilities are ready for this shift, but to get the final elements in place they are collaborating with multiple stakeholders, including auto manufacturers, municipalities, retailers, and suppliers of charging equipment.



Sandra Pinto de Bader, Environmental Sustainability Coordinator, Seattle Office of Sustainability and Environment, City of Seattle

Notably, generation and transmission capacity are not expected to be a problem. Utility industry efforts are presently focused at the distribution level to prepare for the possible clustering of electric vehicles in neighborhoods. Southern California Edison offered an example: It presently has about 10 percent of all EVs sold in the U.S. within its service territory and the vehicles have thus far connected seamlessly to the grid. The smoothness of this process may be partly due to the extensive preliminary research the utility conducted to predict where vehicles might be clustered and prepare for them. Speakers predicted that while challenges may come up, the grid will adapt similarly to the way in which it adapted to the introduction of air conditioning and plasma TVs. Like any new technology, EVs will not go from zero percent to 100 percent penetration overnight, thus giving stakeholders the luxury of time to prepare for the change. However, they must not dawdle either. Speakers stressed that EV readiness requires coordination among multiple stakeholders and the lines between each stakeholder’s piece of the value chain are blurring. Auto manufacturers and utilities are now sharing the same customers, with the nexus being the plug. Ironically, one of the biggest obstacles to integrating EVs doesn’t involve communication with consumers, but instead between



Edward T. Kjaer, Director, Electric Vehicle Readiness, Southern California Edison

industries. For instance, auto manufacturers are dealing with 3,200 utilities in the U.S. and the two industries have spent months trying to understand each other.

The picture is just as complex for municipalities, which must collaborate across departments and deal with complex issues such as how “garage orphans” (i.e., people who live in dense urban neighborhoods without garages) will charge electric vehicles. Cities like Seattle are trying to figure out whether it makes sense to install chargers in public rights of way for these types of EV owners. Some have suggested this is “like asking to put your hot tub in front of your building because you don’t have enough room for it inside.” Despite the challenges, however, the stakeholders are learning from their experiences and making steady progress toward integrating EVs.

To learn more on about this topic, read [Charging Ahead: The Last Mile](#), where Deloitte explores the infrastructure owned by electric utilities, specifically focusing on the last mile to the outlet.





Andrew Good, Senior Vice President and CFO, Exelon Generation

Changing Face of Energy Consumers

Information is a powerful tool, especially when it comes to building relationships with energy customers. The [Deloitte reSources 2012 Study](#) revealed that consumer resourcefulness has become entrenched. According to the study, 94 percent of consumers say that even if the economy improves, they will remain cautious and keep their spending at its current levels, virtually the same percentage (95 percent) that said so last year in the 2011 reSources study. And, this resourcefulness has spilled over into energy consumption, with 83 percent of consumers taking steps to reduce their electric bills over the past year, compared to 68 percent in the 2011 Study.



Nicole Poindexter, Director, Global Business Development, Opower

Based on these findings and other observations, speakers concurred that consumer attitudes and behaviors are changing. Moving ahead, they asserted that utilities will need to do a better job of aligning with these changes. One way to do this is by harnessing the power of data and information to build a stronger relationship with the consumer.



David McAndrew, Project Manager, Federal Energy Management Program, U.S. Department of Energy

Speakers further explained that the average energy customer does not understand the complexities of their monthly utility bills. They just want to know how they can reduce their out-of-pocket expenses. Further, utilities now have an opportunity to inform and influence consumer behaviors by using data to provide meaningful insights, such as informing of them of how much they could save through certain energy efficiency tactics and exposing them to tools and technologies that make it easier for them to understand their energy consumption patterns. One innovative suggestion for engaging customers is to make a game out of it by creating a mobile “app” that allows customers to compete against their friends at conserving.



Kevin Lauckner, Director, Business Development, Honeywell Building Solutions

Impacts of Smart Technologies on Infrastructure Requirements

While many electricity customers have yet to receive a “smart meter,” the integration of smart technology into the electric grid is happening—and in a very big way. Speakers stressed that utilities, vendors, customers and policymakers are all coming together to do more to make the “smart grid” a reality than ever before. This movement is largely being driven by the need to upgrade aging infrastructure and the realization among utilities that energy efficiency and demand-response are valuable resources that must be carefully managed like any other.

Speakers further explained that the concept of “smart grid” is vast, spanning everything from voltage optimization to building control systems, and everything in between, including data models and analytics to make use of the enormous amount of data available through smart technologies. Describing the scale of deployment as “unprecedented,” speakers noted that the industry is pushing the limits of vendors and that many competing technologies are evolving in parallel. They further acknowledged that some utilities are having to make “big bets at a very early stage.” Comparing the situation to the “Sony VHS versus Betamax” decision, they emphasized the need for industry cooperation in developing technology standards, risk management programs, and guidelines for safety and control.

Energy Accounting, Financial Reporting and SEC Update

Deloitte specialists addressed recent developments in financial accounting and reporting and SEC comment letters for energy companies and regulated utilities. Speakers provided an update on the big 3 convergence projects:



Mark McGranaghan, Vice President of Power Delivery and Utilization, Electric Power Research Institute



Ronald Y. Kim, Vice President and Head of IT for Exelon Utilities, Exelon Corporation



Linda Jackman, Group Vice President of Industry Strategy, Utilities Global Business Unit, Oracle Utilities

accounting for financial instruments, revenue recognition and lease accounting. Speakers gave their perspectives on the accounting implications associated with current industry matters such as natural gas, new environmental regulations and the rate setting environment. Additionally, Deloitte specialists addressed the SEC current environment and rulemaking, review process and disclosure considerations.

The Dodd Frank Act and the Impact on Energy

In the 20+ months since the Dodd Frank Act was signed into law in July 2010, energy companies have been trying to ready themselves for this sweeping financial regulatory reform, which impacts businesses that participate in hedging, risk management and derivatives transacting activities. But determining what needs to be done to prepare has been tricky since some of the rules and deadlines are not yet final, there are interpretive issues with many of them, and the Commodities and Futures Trading Commission, which is responsible for enforcing the Act, has been slow in providing guidance. "I have learned the value of patience," noted one speaker. "And, I've learned the value of data."

Since energy companies will likely be subject to many requirements within the Act, speakers noted that data availability has become very important. In preparing for implementation, many companies are having discussions with regulators and authorities in an attempt to understand what aspects of the Act they'll need to address and to determine the types of information they'll need to provide. Speakers cautioned, however, that companies should be doing more than just talking about the possible implications of the Act. They further suggested that energy companies take action immediately to get on top of their record keeping and their transaction portfolios. This is important because "when definitions are finally in place, the deadlines will come along at the speed of light."

No Water, No Energy. No Energy, No Water.

Water is a finite resource, and competition for water is increasing around the world, according to Will Sarni, Director and Practice Leader, Enterprise Water Strategy,

Deloitte Consulting LLP. He further explained that only about 0.5 percent of the water in the world is fresh and accessible. Since the 1970s, competition for water resources has intensified as a result of a growing global population, economic globalization, the rise of the middle class in developing nations, and China's phenomenal growth. The competition for water, also poses challenges for energy production, since it takes vast amounts of water to produce most forms of energy and it takes vast amount of energy to access, treat and transport water.

Due to the critical implications of this water/energy nexus, speakers underscored the need for dramatic changes in water stewardship. The good news is that even though the public sector is not investing in water as it should, the private sector is coming up with creative ideas to tackle these issues, and "there are great technologies being developed that could change the game overnight," says Sarni. Partly because watersheds are a local issue in the U.S., change has been slow. However, countries such as Australia, Singapore and Israel are successfully managing water risk through technology applications, partnerships and tiered pricing and allocation schemes.

Joe Stanislav, Senior Independent Advisor, Energy & Sustainability, Deloitte LLP, noted that when it comes to energy access, water often drives the conversation. He said we have to get a handle on water because it is a critical factor in the stabilization of energy producing regions such as the Middle East. Also, in the U.S., water access and treatment are becoming key concerns in the production of shale oil and shale gas; however, industry innovations are helping to reduce the amount of water these processes require. In his view, water rights will become increasingly important and pricing holds the key to encouraging better stewardship.



Will Sarni, Practice Leader, Enterprise Water Strategy/Sustainability and Climate Change, Deloitte Consulting LLP



Dr. Joseph A. Stanislav, Independent Senior Advisor, Energy & Sustainability, Deloitte LLP



Bob Reilley, Vice President, Regulatory Affairs, Shell Energy North America (U.S.), LLP



Paul J. Pantano, Jr., Partner, Cadwalader, Wickersham & Taft LLP



Badar Khan, President, Upstream and Trading, Direct Energy

Election 2012: Two Views



“Those interested in alternative energy may find themselves in league with people who produce oil and gas because there are people on both sides who want to get rid of all tax breaks for everybody, including those for alternative energy and traditional sources.”

– The Honorable Martin Frost
Shareholder, Polsinelli Shughart
Former Congressman, Texas (D)

Closing the 2012 Deloitte Energy Conference in Washington, DC, two former U.S. Congressmen—one a Democrat and the other a Republican—both agreed that the 2012 Presidential race will be extremely tight. Speaking from his experiences as a former Congressman (D) in Texas, Martin Frost thinks Obama will win but the race will be close. Thomas Davis, former Congressman (R) in Virginia and current Director of Federal Government Affairs at Deloitte, agreed the race would be tight, saying that Obama is facing several challenges, which will make the campaign much more difficult for him this time. For instance, in his first election, Obama won a significant number of electoral votes, but now many of those states are in play. Also, student voter turnout is not expected to be as great as in the last election, since enthusiasm is generally down due to high unemployment and other economic factors.



“While divided government is the norm, the American public doesn’t really trust either party,”

– The Honorable Thomas M. Davis
Director of Federal Government
Affairs, Deloitte & Touche LLP
Former Congressman, Virginia (R)

Frost further pointed out that the election will likely turn on the Industrial Midwest, particularly Ohio, Iowa, and Wisconsin. Here, the gay marriage issue will likely hurt Obama with white, blue-collar workers, but in other places, it will likely help him with fundraising and in bolstering interest in his candidacy. He further contended that white seniors in this region and others will also play a big role because they are concerned about an issue that is affecting many people but that has not been widely discussed—low interest rates. While expansionary monetary policy is generally seen as a boon for business, it is hurting seniors who rely on yields from money market accounts, treasury bonds, and CDs for a portion of their retirement income. Frost concluded his assessment of President Obama’s prospects for reelection by noting that the news isn’t all bad: “Republicans have given him a gift in appealing to Hispanics since Romney went so far to the right in issues that pertain to this large voting block during the primary that he is not likely to win back their support.”



– Susan Eisenhower, President,
Eisenhower Group, Inc.

Tom Davis generally concurred with Frost in these assessments, as he elaborated on a phenomenon that is affecting both candidates. “While divided government is the norm, the American public doesn’t really trust either party,” noted Davis. Thus, Independents are the fastest growing voter registration group in the country. He further explained that in 2010, “voters didn’t elect Republicans;

they unelected Democrats.” Politicians on both sides of the aisle should take note of this trend, cautioned Davis, because “if voters don’t get the type of choices they want, they’ll make their own kind of corrections.”

Moderating the panel, Susan Eisenhower, President, Eisenhower Group, asked about the importance of energy issues in this election. Frost believes that energy is “not going to do much in the election,” but Davis felt it will play a role as an “undercurrent.” He further observed that Obama has lost some key states due to energy policy, including West Virginia and Oklahoma, with the latter being specifically tied to the Keystone pipeline debate. While Frost didn’t see energy issues as being dominant in the election, he did predict “there will be a major fight over energy when tax reform comes up.” He further explained, “Those interested in alternative energy may find themselves in league with people who produce oil and gas because there are people on both sides who want to get rid of all tax breaks for everybody, including those for alternative energy and traditional sources.”

Both Davis and Frost ultimately agreed that regardless of where energy falls in terms of influencing the upcoming election, energy security and independence are important long-term goals for the nation.



Save These Dates!

September 19-21, 2012

Deloitte Alternative Energy Seminar – Phoenix, AZ

For more information, please contact AlternativeEnergy@deloitte.com

November 13, 2012

Deloitte Oil & Gas Conference – Houston, TX

For more information, please contact OilandGasConference@deloitte.com

November 28, 2012

Deloitte Energy Accounting, Financial Reporting and Tax Update – Chicago, IL

For more information, please contact USEnergyFallSeminars@deloitte.com

November 29, 2012

Deloitte Energy Transacting Accounting – Chicago, IL

For more information, please contact USEnergyFallSeminars@deloitte.com

May 21-22, 2013

Deloitte Energy Conference – Washington, D.C.

For more information, please contact EnergyConference@deloitte.com



Center for Energy Solutions

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