

Global Energy Game Changers

Focus on the Americas
Spring 2016

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The Dentons' Global Energy team is excited to present the newest edition of its Global Energy Game Changers series, a compendium of insightful analysis delving into the most important issues facing the energy industry. Our April 2016 issue is focused specifically on the Americas where the industry is undergoing dramatic transformation.

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Trends and Projections for the Energy Industry

Our last Quantum Viewpoints discussion met with such overwhelmingly positive response from our clients and colleagues that our editorial staff decided it should become a primary feature in all future volumes of Game Changers. In keeping with the focus on the Americas theme of this edition, we asked the key thought leaders in our North American Energy practice to share their views on what they believe are the most significant trends, issues and challenges facing the energy sector in our hemisphere today.



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Introduction

The Dentons' Global Energy team is excited to present the newest edition of its Global Energy Game Changers series, a compendium of insightful analysis delving into the most important issues facing the energy industry. Our April 2016 issue is focused specifically on the Americas where the industry is undergoing dramatic transformation.

Opportunities abound, notwithstanding a broad range of challenges, from disruptive technologies to volatility in both price and demand, from new regulatory schemes to evolving consumer expectations, from new and rapidly changing risks to new business models. Our team takes a look at cross-border renewable programs between the US and Canada, what the Paris climate agreement means for the oil and gas industry and how Mexico's energy production sector is being reshaped and what these changes mean to investors.

Moreover, as the US finds itself in the throws of one of the more contentious, unusual election cycles in recent history, we take a closer look at national policy and examine proposed legislation reforming the government's approach to resource development on tribal lands in the US. And finally, we include a follow-up to an article we published in the past calling for a multi-faceted approach to infrastructure security.

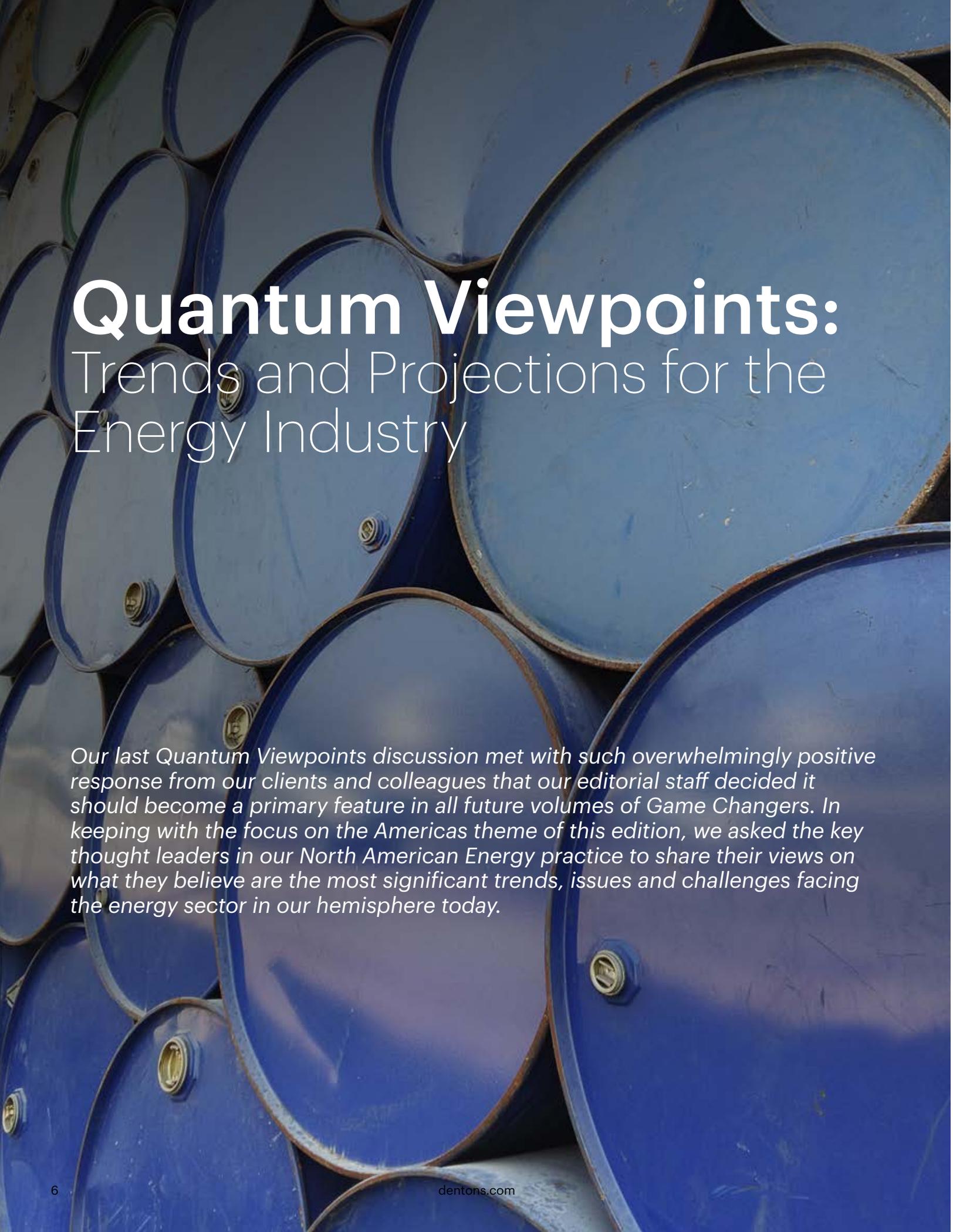
Taking advantage of opportunities while navigating the ever-changing challenges requires creative thinking and innovative approaches to the emerging new global energy landscape. With a Global Energy team that has expanded in headcount across multiple regions over the past year, we now offer more top-flight experience in more places where you do business.

Yours sincerely,

Jennifer Morrissey, Editor



Dentons was named the
“Energy Firm of the Year” for
the second straight year by
Who's Who Legal Awards 2016



Quantum Viewpoints:

Trends and Projections for the Energy Industry

Our last Quantum Viewpoints discussion met with such overwhelmingly positive response from our clients and colleagues that our editorial staff decided it should become a primary feature in all future volumes of Game Changers. In keeping with the focus on the Americas theme of this edition, we asked the key thought leaders in our North American Energy practice to share their views on what they believe are the most significant trends, issues and challenges facing the energy sector in our hemisphere today.

Q : Are there opportunities for energy companies in Canada, the United States, Mexico, Colombia, and/or the Caribbean to cooperate to address the most pressing issues facing the global energy sector? What, if any, are the political, regulatory, or other barriers to cooperation that could be changed to benefit the region as a whole?

HOYOS (Colombia): Colombia has recently enacted important laws and regulations aimed at boosting the country's fledgling renewable energy resources, including new and revised tax regulations. The ongoing El Niño weather pattern has revealed that the country's generation capacity needs additional investment, including investment in renewable energy resources. During El Niño years, rainfall is far below historical levels; this puts a strain on hydroelectric generation and results in very low hydro output. There is abundant coal in Colombia, but no significant reserves of natural gas. The gap caused by a lack of hydropower needs to be filled, preferably with another relatively low-emitting resource. As a result, we expect new projects—both traditional (e.g., coal-fired) and renewable—to be developed in Colombia in the coming years. Local financiers and regulators, as well as project owners and developers, could benefit by analyzing and discussing regional successes (and failures) in energy development not only in Colombia, but in neighboring jurisdictions as well, with particular focus on financing and construction risks.

LOPEZ-VELARDE (Mexico): While the recent opening of the Mexican energy sector to private investment—both in the oil and gas and the electricity industries—continues to unfold, North American energy companies are finding in Mexico a counter-cyclical market. Despite the slowdown within the energy sector due to the drastic decrease in international prices of crude oil, Mexico is in the midst of a major overhaul. Mexican companies are positioning themselves to become relevant players in all areas within the energy sector, where in the past there was only the state monopoly. The development, for example, of the wholesale electricity market in Mexico will greatly benefit from the experience and lessons learned in the different US regional electricity markets. So, too, will much needed midstream infrastructure be developed to maximize market efficiency and to operate seamlessly as part of a North American energy market. In Mexico, political and regulatory hurdles have been addressed to minimize obstacles to regional cooperation and to allow the market to operate efficiently. But we must closely monitor whether such steps to a broader regional integration of the energy market will face political challenges in the US in the near future.



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O'REILLY (Canada): I do not think I see any one particular unifying issue.

The current state of the union in energy seems to be Canada needs access to markets, the US needs lower-cost services, including for their multi-stage fracs, Mexico needs a more well thought out royalty regime and the Caribbean need incentives to explore. While the Mexican regulator's (CNH) recent first onshore hydrocarbon bid round had a strong Canadian presence and established a positive precedent for future business opportunities before the CNH and in the oil and gas industry in Mexico in general, its royalty regime is fraught with complications. In regards to barriers, excessively high royalties (for example, those that were recently bid and won contracts in the Mexican regulator's (CNH) first onshore hydrocarbon bid round) won't lead to increased production and recovery of hydrocarbons, or to more drilling. The high additional royalties bid to win (more than half of the contracts awarded had additional royalties bid of more than 50 percent, many with an aggregate government take of more than 80 percent—attributable to unsophisticated companies) means the long-term viability and sustainability of the contracts awarded, and thus onshore hydrocarbon development in Mexico in general, remains questionable. However, a fixed or prescribed royalty could lead to more clarity on future investment revenues, leading to a more cooperative environment.

MORRISSEY (US): It is perhaps a bit trite to say that there already is a tremendous degree of cooperation on many aspects of the energy industry among the US, Canada and Mexico. In many respects, we are one another's most significant markets, and our proximity and interconnectedness make working together almost a necessity, and of course, there are a number of agreements in place that require cooperation and coordination on certain issues. That said, politics are often an impediment to deeper cooperation that would be economically beneficial for all of North America. In the US, the nearly decade-long lack of a cohesive and comprehensive national energy policy injects great uncertainty into even the most positive developments. Our on-again off-again regulatory battles moving from executive agencies to the courts and back again, with Congress circling on the outskirts, each party continuously threatening to undo what the other has initiated, have come to resemble Lewis Carroll's famous caucus race. In order to address the most pressing national, hemispheric and global energy issues, we need to step away from the unproductive circular course we are currently following and run in a new direction.

ITURREGUI (US/Caribbean): The energy sector in North America and the Caribbean Basin is in the midst of major positive tectonic shifts. Mexico, a dominant player as a producer and consumer, has put into motion radical restructuring of its oil and gas resources, along with the restructuring of state-owned giant Pemex. Notwithstanding the depression in prices of oil and gas, Mexico has opened to private investment and exploration its significant untapped or underutilized resources, an unprecedented move since the era of nationalization many decades ago. In tandem, the country is shifting and upgrading its vast electricity grid, diversifying the generating fuels matrix and incorporating thousands of MW in new generation via renewable sources, including wind, biogas, solar and geothermal.

At an equal scale, in the aggregate of the many countries and island that comprise the region, the fuels matrix and transmission networks are experiencing major investments and transformations. In Central America, several countries are finally interconnecting previously isolated national grids and coordinating dispatch and technical operations. With the collapse of the Venezuelan economy and its adverse effect on the “Petro-Caribe” strategy (i.e., cheap credit for PEDEVESA’s oil), Caribbean and Central American nations seek other options to satisfy growing energy demands. This includes the adoption of significant new generation via renewable energies (grid-tied and distributed systems). In the Caribbean, island-nations and territories are flipping from oil-fuel based grids to hybrid ones. In 2014, US Vice President Biden launched an “Energy Security Strategy” for the region. This multi-faceted initiative includes significant technical assistance and optimization of resources by all stakeholders, including financing tools via bi-lateral and multi-lateral entities such as the IDB and World Bank Groups, OPIC and others. The goal is to leverage available private sector and public resources as part of a broad modernization and climate change security effort.

Regulatory and political barriers remain in place in some countries. But enhanced cooperation by some, in addition to upgraded legal and investment frameworks (both domestic ones and through free-trade agreements such as the DR-CAFTA) are bringing very significant changes and new projects to a region that is home to some 280 million people south of the US border.



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Q : What is the greatest challenge for the energy sector in your region in the immediate future?



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CAIN (US): The availability of capital is the greatest challenge for the North American oil and gas sector. However, if the flow of capital continues, then the production surplus and lower oil prices will also continue, assuming that OPEC is able to maintain higher production levels and that demand growth remains relatively low. Oil prices rose with a weak US dollar and interest rates near zero in 2009. As prices passed US\$80 per barrel in late 2009, unconventional oil production began in earnest. Low interest rates forced investors to look for yields better than they could find in the US Treasury bonds or conventional savings instruments. Money flowed to E&P companies through high-yield corporate bonds, loans, joint ventures and share offerings. Prolonged low oil prices may restore growth to the global economy, accomplishing what central banks have failed to do since 2008. If successful, interest rates should rise and this may restrict the flow of capital to E&P companies engaged in unconventional oil production. If interest rates increase with a stronger economy, capital may flow to alternative investments that offer yields that are more competitive with higher risk associated with unconventional oil production. Therefore, interest rates and the availability of credit are crucial for E&P companies and their stakeholders. As corollary, that means the most important decisions for future oil supply could be made, not with OPEC, but with the Federal Reserve in Washington, DC.

HURST (Canada): From the Canadian perspective, there are at least three.

The first is the upstream oil and gas sector's response to low prices for oil and gas. Making long-term predictions about where the prices of these commodities are going might be said to be a fool's errand, but it is reasonable to assume gradual increases. However, it is likely that in the future it will be more difficult for small cap and possibly mid cap players in the sector to be sufficiently capitalized to stay in the game. This is a particular problem for the Canadian industry because the success of such companies over the past few decades has been a very big part of the industry's vitality. Some assets may become stranded (more on which assets below), talent may leave the industry and the ripple effect through the economy that is created by a robust upstream sector may not return, or at least not in full measure. Advances in technologies, both cost and carbon reducing, can be expected to partially offset the effects of the challenges.

The second relates to constraints on market access for Canadian oil and gas. The recent rejection of the Keystone XL Pipeline by the US administration and increasing opposition from NGOs and First Nations groups to oil export pipelines and LNG projects, raise serious concerns concerning the future growth of the Canadian oil industry.

Canadian gas producers have lost significant market share in the United States as a result of the development of US shale plays, such as the Marcellus and Utica shales. LNG export projects could ameliorate the situation considerably but are for the most part on “hold” and are faced with some market resistance as well as the outright opposition noted below.

The third is how all of the players in industry and all levels of government are going to react to the undertakings given by the Government of Canada at the COP 21 conference in Paris.

Recently, leaders of Federal and Provincial Governments signed the “Vancouver Declaration” which recites the commitments made by Canada in the Paris Agreement and promises ambitious joint efforts across the waterfront of de-carbonization and clean energy activities. It is the nature of such documents that they are aspirational, high toned and lacking in detail. What is clear is that the Canadian energy industry is about to undergo a significant change and there will, inevitably, be winners and losers. For every increase in activity in sectors such as solar and wind, there may be decreased activity in upstream oil and gas. Indeed, even if commodity prices rebound, access to market, carbon caps, cap and trade and carbon taxes may see the stranding of resource assets that, not so long ago, were economic.

Most of Canada’s oil production is bitumen from Alberta’s oil sands. Diluted bitumen regularly trades at a discount to the WTI benchmark. It suffers a reputation of being “the dirtiest oil in the world.” It is not, but its production does have a significant carbon footprint. The oil sands are the third largest deposition of oil in the world. Yet, there are many who would like to see further development of this resource stopped. It likely will not be, but it will face significant challenges.

Natural gas will, in some jurisdictions, partially replace coal in the generation of electricity, and renewables will be a significant area of growth.



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LOPEZ-VELARDE (Mexico): With respect to Mexico, the greatest challenge may be the actual materialization of significant investments and capital projects needed across the entire Mexican energy industry to facilitate the opening of that sector. Pemex has ceased to be the monopoly in the midstream products market and is no longer the predominant player in the gas market. With regulations compelling Pemex to limit its participation in the market, considerable investments are needed (and certainly interesting business opportunities have arisen) in all areas: from gasoline retail, where private investors will begin installing service stations, to liquids terminals and pipelines, refining configuration capabilities, and certainly upstream projects that can handle the needed increased production. Because Mexico's energy market faces short-term cash challenges, the energy sector needs to attract investment and provide appropriate business conditions for development. We are beginning to see changes under the new legal and regulatory framework. The challenge is to convert new and increasing opportunities into successful projects through proper legal, financial, and commercial changes.

THIEMAN (US): One of the greatest near-term challenges for power producers in North America will be the low natural gas prices that are expected to continue for the next several years. The depressed natural gas prices, coupled with lower than expected demand growth, create a market situation that depresses market electricity prices, spark spreads, and revenues. Although equity capital is available and commercial debt is cheap (given low interest rates), gas-fired power companies will find it difficult to justify new builds. Two positive areas within this challenging power generation landscape, however, are the increased investment in and continued proliferation of renewable power in North America and the need to retire and replace coal-fired power plants given the climate change policies, RPS requirements, and the capacity needs of the markets. Interestingly, the simultaneous convergence of these two positive developments might just convert the low gas price challenge into a nearer-term opportunity than expected.

VESGA (Colombia): Coping with low international prices, and the effects on exploration and production, is the most important immediate challenge for the energy industry. In Colombia in particular, companies also deal with a high government take that makes our market less attractive than others in times of crisis. Colombia does not have a significant renewable energy industry; the most important challenge for the coming years is for the country to enact a comprehensive and investor-friendly set of laws and regulations in order to enhance project development and provide attractive investment signals to foreign investors. Also, the recent El Niño weather pattern has highlighted certain structural issues in Colombian electricity regulation. How the regulator will adjust to the country's changing generation needs will be its most important challenge for the next several months.



Q: To what extent are emerging mega-trends such as big data, proactive consumers, and the entrance of non-traditional competitors impacting the energy landscape in your region? Are there any unexpected trends you see developing in your region that will likely have a major impact on the energy sector?



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CROWTHER (Canada): We have heard quite a lot lately about “big data” and other such trends emerging in the US. Most new things that appear south of the Canada/US border—whether they be in fashion, entertainment or business—eventually appear here as well. Sometimes a little slower and most often on a slightly smaller scale. I expect that it will be the same with these particular trends. In fact, there is no denying that access to “big data” has already arrived and that Canadian consumers are as proactive as any. Indeed, they are now routinely and aggressively demanding choice and competitive service offerings. The entry of non-traditional competitors is the inevitable result. Whether unexpectedly or not, Canadians are increasingly aware of the climate change consequences of their energy consumption. Not only are they more careful about their own choices but also more demanding of both their governments and their energy suppliers to become “greener.” The ultimate impacts on the energy industry in Canada could be profound.

HOYOS (Colombia): The most important non-traditional competitors in the Colombian electricity sector during the coming years will be renewable energy facilities. However, the development of coal-fired plants, which had stalled for some time, is now back on regulatory and project development agendas. We also expect increased investment in self-generation and co-generation facilities by large industrial end-users, such as factories and oil drilling and production sites. Of course, international oil prices (and the investment associated therewith) will be a key driver of the development of this industry.



JIMENEZ (Mexico): The Mexican energy landscape is undergoing a complete reshaping. In addition to the conversion from a monopolized energy sector to one opened to private players, the sector is evolving and coping with international trends and challenges not unique to Mexico. These include the integrity of networks and cyber security issues, as well as an organized and proactive consumer base and participation of new players. On the security front, the separation of the Mexican power utility and the creation of a transmission organization—an independent system operator that will manage the wholesale electricity market and the structuring of transmission lines expansion projects through long-term BOT schemes—will demand strong reliability and security developments. On the consumer side, in oil and gas, the breaking up of the monopoly will require more sophisticated consumers who demand service reliability and ranges of quality of products, and who will play a more active role with regulators. Industrial consumers of power also are being asked to change their market behavior, such as by securing clean energy sources, buying power directly in the market rather than from the utility, and many other initiatives. The entire sector is being reshaped, so there will be significant developments that we need to follow closely and participate in actively in the coming months and years.

MORRISSEY (US): Big data analytics, empowered and proactive consumers, and the rise of non-traditional players in the energy business are all triggering transformations in the US energy and utility industry. Big data makes utility operations more efficient, allowing for real-time adjustment to changes in demand, more economic management of energy markets, self-repair of the grid, and so forth. But the more significant impact is the tremendous increase in demand for energy that cloud computing represents. According to the Energy Information Administration, last year data centers represented 2 percent of total demand for electricity in the US. This figure is expected to rise exponentially in the next few years. Traditionally, industries with such large power consumption tended to locate where power is cheap (e.g., where it is produced by coal). However, we now see prominent companies electing to install large renewable energy facilities on site (or nearby) to power their data centers. These same companies are supplying consumers both with smarter and smarter devices to actively manage their energy use, and with social media platforms on which they may communicate their views to energy providers, regulators and one another. And some of these companies, whose primary focus is not the utility industry, are nevertheless becoming involved in the energy business and changing the market in ways that leave traditional utilities scrambling to remain relevant. The influence of these developments is already being felt in parts of the energy sector, but the full scope of their impact is still greatly underestimated. A smooth transition in the energy, and especially electric utility, industry will require massive consumer education. Consumer expectations are rapidly changing, but the expectations are not based on



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full information. For example, costs associated with power production are not transparent to consumers. This is evident in the discussions taking place about rooftop solar and net metering, as well as in conversations about the relative merits (feasibility, costs, reliability, and life-cycle environmental impact, among others) of natural gas versus renewable energy sources. Another hugely underestimated development that is looming on the horizon is the imminent retirement of a significant percentage of the skilled workforce across the energy sector and the shortage of qualified replacement personnel. Whether in the traditional energy space or in new energy technologies, as the skilled workforce reaches retirement age, there will be a loss in important institutional knowledge. Here, too, a broad education effort will be required to ensure a seamless transition to whatever our energy future will be.

Q : To what extent does climate change impact your clients' businesses or decisions?



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VALDEZ (Mexico): Mexico is deeply committed to combatting climate change issues. It was the first developing country to establish COP 21 emissions reduction commitments and it did so aggressively. For more than a decade, government incentives and a more conscious approach to energy consumption have led to a number of energy efficiency initiatives as well as the development of clean energy projects, particularly cogeneration facilities and wind farms (which are often anchored by private off-takers). Moreover, a series of policy decisions and regulations, particularly related to the energy sector, have impacted the way large energy consumers manage their energy needs. Laws, regulations, and other governmental actions specifically addressing climate change include a Law on Climate Change and an Energy Transition Law, the establishment of a carbon tax and a National Climate Change Strategy, and the implementation of a national Emissions and Emissions Reductions Registry. More importantly, following the 2013 energy reform, the Mexican government recently enacted regulations requiring large power consumers and utility suppliers to acquire clean energy certificates for a percentage of their power consumption. A mechanism to develop a certificates market is also underway. This new requirement and the proposed market to manage it are cornerstones of the new design of the Mexican electricity industry, which is already turning the focus of energy-intensive industries to renewable sources of power.

VESGA (Mexico): Climate change, and especially the anticipation of more frequent extreme weather, will play a key role in future capacity expansion in Colombia, which will, in turn, impact our clients' future business development. We have witnessed increased traditional and social media coverage of environmental issues affecting communities that are impacted by ongoing and potential energy projects. Communities are more empowered now, and have required project owners and developers to meet higher standards of compliance with environmental and social obligations. Also, national and local governmental authorities are under increased pressure to act, investigate and impose fines on noncompliant parties. One benefit of this change has been that project owners now implement improved communication systems with affected communities.

THIEMAN (US): Climate change issues are having a profound impact on generation investment in the US. Recently, we have had a number of clients whose generation portfolios are almost 50 percent composed of coal-fired assets, and many who have substantial investments in pending new coal projects. Millions in investment dollars are at stake. Almost across the board, management at these companies finds itself at a crossroads, trying to determine how best to optimize these assets in light of pending EPA regulations and administration policy regarding coal. The legal challenges to EPA's Clean Power Plan have injected some uncertainty into decision-making. However, there is a general belief that, regardless of who is in the White House come next January, the EPA rules will ultimately be implemented in some measure. EPA may be required to revise certain aspects of the regulations, but they are almost certain to move ahead with the plan. At the same time, new state initiatives and changing market dynamics related to other generation sources are also impacting investment decisions. Importantly, there remains a need for companies to add generation, so projects will move ahead. The question is when, and in what form?



Q : What changes do you foresee in the energy sector in your region over the next decade or so? What will be the key drivers of these changes?

CROWTHER (Canada): It is impossible to know what changes will take place, but things are bound to look a lot different than they do today. The already extraordinary pace of change in the energy sector is rapidly accelerating, and I sense that this is making it more and more difficult for our clients to accurately predict what is to come. Those that do the best job at that will thrive. The rest may founder. We can certainly expect that the energy mix will be much different a decade out, especially as efforts at “decarbonization” become more serious and more urgent—which seems inevitable. On the other hand, it’s hard to know whether, for instance, petroleum-based transportation fuels will be replaced to a substantial degree within the near term. If, as some observers suggest, oil and gas prices remain close to their current low levels for the foreseeable future, then the transition may be prolonged. Of course, this will also depend on how our federal and provincial governments choose to price, or tax, carbon emissions. Those decisions could easily affect the economics of the situation. From the Canadian perspective, we can only hope that within the next 10 years we will have constructed the necessary pipeline infrastructure to get our oil and gas to tidewater and the markets beyond. Indeed I would suggest that this is a national imperative.

HOYOS (Colombia): The portfolio of installed power capacity of Colombia may change dramatically during the next decade. We expect an increase in renewable resources, and fewer gas-fired facilities. New coal-fired plants will be installed, and improvements in transmission and distribution systems are necessary. Development of self-generation and co-generation facilities is expected to increase, and here, too, we expect renewable energy to play an important role. Key drivers are likely to include oil prices and national economic growth. Also, new reliability regulations are being drafted and are expected to be enacted in the near future. These new rules will be crucial for the future development of the Colombian energy sector.

JIMENEZ (Mexico): Despite Mexico being a significant producer of oil and gas, its market has been largely insular for decades. The year 2016 has marked the opening of foreign trade of petroleum products. We believe that this is the starting point of a path to a commercially integrated energy block, particularly with Mexico’s NAFTA partners. We anticipate that the existing domestic gasoline market opportunities (Pemex only produces 47 percent of the gasoline consumed in Mexico), the growing need for other fuels and products, the potential revival of the Mexican petrochemical industry, and the start of production operations by new E&P operators in the coming years will create relevant infrastructure that in the mid-term can operate in a relatively seamless fashion with Mexico’s trading partners.

CARTER PETERSON (US): Over the next decade, I foresee a crucial need for energy efficiency, conservation and sustainability for cities in the Americas and around the world. The key drivers of these changes will be the increased demand on infrastructure and the environment as the world's population continues to grow and the majority of its population is centered in megacities. Our team at Dentons has unique experience to tackle the energy efficiency, conservation and sustainability issues cities are facing. We can assist municipalities with lowering utility rates, addressing reliability and storm hardening issues, and creating or improving upon energy efficiency/demand response/conservation programs; increasing the amount of renewable sources through coordination with municipal utility providers; financing and regulatory measures needed to convert existing streetlights to LED street lights; and replacing existing utility poles with composite poles that are more durable and have certain telecom applications. The next decade will be a dynamic shift in how cities plan, develop and implement their energy resources and infrastructure.

VALDEZ (Mexico): The Mexican energy sector is now undergoing dramatic changes that are redefining the industry as a whole. Mexico has finally opened its energy sector to private investment and competition, where the government-owned players are no longer monopolies but are competitive companies interacting with private companies. This is expected to raise tens of billions of dollars in investment over the next decade. For a country whose oil, gas, and power sectors have remained mostly closed and controlled by the state, this is a game-changing transformation. Private operators in the upstream oil and gas sector, competition in midstream infrastructure, diversification of energy supply options, reduction of Pemex's market share to allow in other market participants, a wholesale electricity market, private power utilities, and clean energy requirements—these are only some of the most significant changes we are seeing in Mexico, and this is only the beginning.



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A US perspective on the global energy landscape— game changers for 2016 and beyond

By Clint Vince and Jennifer Morrissey

Over the past several months, geopolitical, economic, technological and policy changes within and external to the US have been extraordinary, and have profound implications for the entire global energy sector. The past year has witnessed tremendous geopolitical disruptions and changes. There have been sudden and unexpected power shifts in the Middle East. Russia's movement into Crimea has shaken Europe. Germany has shut down its nuclear fleet for political reasons, while opposition to natural gas production has spread to many European states, leaving the continent to face an uncertain energy future. Simultaneously, a weakening ruble will push Russia to exert its military strength both as a driver for its economy and to distract from decline.

On the economic front, the crash of global oil markets has left the industry reeling, and the slowdown of the Chinese economy is only beginning to be felt. Changes in US monetary policy will also have a significant impact on the world markets.

In terms of policy, the entire planet is focused for the moment on climate. And while world leaders congratulate themselves and one another on the historic pact that was reached last December, this month the real work lies in implementation. In the US, the Clean Power Plan (CPP) is expected to be the key component to meet national commitments (although much uncertainty has now been injected into the dialogue since the Supreme Court stayed implementation of that rule until pending litigation is resolved); and Brazil's last-minute switch to the "High Ambition" group of countries at COP 21 may signal a willingness to address deforestation, which is estimated to account for nearly 25 percent of global climate change.

On the technological side, rapid advances are affecting everything from resource extraction and production (especially related to shale gas and oil) to the potential for big data, battery and energy storage, infrastructure security and a host of other areas.

Following is a brief overview of what we view are the dozen most significant issues facing the global energy industry as we head into the new year.



1. The global oil price collapse

The global oil price collapse is a tremendous game changer. Prices have fallen to around US\$30 per barrel and predictions are that they may drop even lower. With continued output by Saudi Arabia, the US and Libya, and with Iran coming on line next year, there is the expectation that abundant supply will be the norm for the immediate future.

The imminent entrance of Iran into global oil markets in particular is already triggering oil producing nations to revisit their strategies. Some countries that would normally prefer to keep supply tight and prices high are finding it in their strategic interest to allow the economics of abundant supply play out on the global marketplace. And in the US, supporters of terminating the ban on oil exports have found the potential of Iranian exports to be a powerful argument in favor of their cause.

Within the industry, nearly all oil companies are cutting workforce, cutting expenses, and slowing new exploration. A number of players have announced the intention to pull out of certain arctic projects, and the US veto of the Keystone XL pipeline, while disappointing from the perspective of North American relations, is not likely to have a significant effect on markets, as production had already slowed substantially in the Canadian oil sands and the crude that is produced is already finding its way to refineries via other routes. Furthermore, the story is not all doom and gloom for the industry. Current market conditions may present buying opportunities for those with adequate capital.

US crude exports

The debate over crude exports from the US has been a roller coaster ride through Capitol Hill. The issue has been put on and taken off the table more times in recent months than just about any other issue. As recently at the first week of December, it was thought that proposals to lift the decades-old ban were futile. Republicans were worried that lifting the ban would lead to higher prices at the pump, while Democrats expressed concern that lifting the ban would put too much emphasis on fossil fuels, to the detriment of renewable resources. But then, a last-minute, surprise compromise among lawmakers at the end of the year completely changed the energy landscape in this country for the foreseeable future when Congress was able to strike a tax deal that included language to allow oil exports in exchange for extension of renewable tax credits for wind and solar projects. This is a huge game changer for the US energy sector.

Venezuela could prove to be another significant game changer for the US if it ceases exporting its oil. A large percentage of US imports come from Venezuela, as US refineries are designed to handle the heavy crude that comes from that region. (US-produced light, sweet crude has a difficult time finding refinery capacity in the US.)

2. The natural gas boom continues

Natural gas is abundant, with the lowest prices the US has seen in 12 years. No longer a new development, this is expected to continue to be the norm for many years. The US Energy Information Administration's (EIA) estimates of US reserves continue to increase as technologies advance and as the Utica and other plays are explored.

Combined cycle gas turbines (CCGTs) are the transition generating source for baseload in the US. Low natural gas prices have sideswiped coal and nuclear in the US and have impeded competition with renewables to some extent, though costs of renewables are dropping rapidly.

Meanwhile, global liquefied natural gas (LNG) dynamics have changed suddenly and dramatically. The oil price collapse (significant because of the link between LNG and oil prices outside the US) has coincided with the softening of the world LNG market due to oversupply and reduced demand from the slowing economies in Europe and Asia. Comparatively, high costs associated with US LNG production mean that the US will likely play a role as a "swing" producer in the current world market. The US is presently priced out of the market, there could be some demand if oil prices increase significantly, particularly because shale production can shift more rapidly than other traditional fuel production and US production has not declined as previously predicted (in scale or volume). And new US projects will not likely get built unless they have long-term commitments from creditworthy off-takers for tolling services.

US LNG exports

FERC and the Department of Energy (DOE) continue to move forward with their review of applications for authorization to construct LNG export facilities and to export LNG to Free Trade Agreement (FTA) and non-FTA destinations alike. DOE has recently released its follow-on economic study of exports in the 12-20 Bcf/d range. Similar to the earlier reports, these studies generally conclude that increased exports will generally be beneficial to the US economy, or that they do not have a net negative effect on the US. The report is subject to public comment, but DOE is highly likely to make the finding that exports in this range would be consistent with the public interest. As in previous analyses, there likely will be at least some high export volume scenarios examined that would result in somewhat higher US prices or other impacts on US industry, but increasing estimates of supply ease the concern that this would in fact materialize. The gas glut, in fact, has affected approval of export applications in an unexpected manner. FERC recently denied an application to construct a terminal on the west coast of the US on the basis, in part, that the project developer had not demonstrated a need for the facility, although the agency left open the door to re-apply if circumstances change and a need can be shown.

3. Disruption in the BRIC country super-cycle

The BRIC country super-cycle has experienced sudden disruption, which will dramatically change the role these nations have in the global energy story over the next year or so. Brazil is facing serious economic and social challenges, and appears to be making efforts to disassociate itself from the BRIC group in favor of inclusion among wealthier economies.

Russia faces a plummeting ruble, among other problems. This country is likely to experience renewed emphasis on military strategy both in an effort to spur its economy and to deflect international attention away from domestic economic decline.

China has recently experienced a major economic hiccup. Changes in China are especially significant as this country has been instrumental in shaping global energy markets for past decade or so. Sudden disruption will cause shock waves throughout the global economy, such as we have already witnessed in falling commodity prices for metals and other materials. Also causing dramatic policy shifts, recent media attention and public outrage regarding pollution in Beijing and Shanghai (dubbed the 'airpocalypse') will push China to make aggressive changes internally that will have an impact outside its borders.

And India? It is unclear where India is headed. India tried to be the leader for the developing nations at COP 21, but that coalition proved to be somewhat more disjunctive than initially expected. Brazil's last-minute shift to the "high-ambition" group of developed nations caught the coalition somewhat off-guard. Speculation is that India will sign onto the international agreement, but will struggle to implement or enforce it due to gaps in internal structures necessary to enforce the commitments.

4. Climate as the dominant driver for energy policy

The world let out a collective cheer last December at the conclusion of COP 21 when 190 nations were able to reach an agreement on measures to address the planet's changing climate. The real work, however, has yet to begin, as nations begin to grapple with how to implement their commitments. It may be that businesses in the energy space will figure this out faster than the governments that put forth the commitments. If the sheer number of companies that sent representatives to Paris during the talks is any estimate, the opportunities for the energy sector are indeed vast. The agreement would not take effect for five years, but companies are expected to move much faster.

Focus in the US now is on the CPP. The CPP is the US' primary means of achieving its commitments, although it faces an uncertain future at the moment given the pending litigation and recent decision of the Supreme Court to stay implementation of the rule. Aside from the CPP, there is discussion that emphasis in the US and elsewhere may shift to deforestation, which accounts for 25 percent of global climate change. Avoided deforestation came through in the Paris Climate Agreement with key "results based" payments. This means that the private sector can have a role, and that governments may need to justify the results for payments received.

Some climate scientists say the climate goals cannot be achieved without a more prominent role played by nuclear energy. This will be very challenging in the US in the near term, as gas has pushed out nuclear generation on a cost basis. A significant portion of the US nuclear portfolio cannot meet operating costs today, and if a solution is not devised that appropriately compensates those plants, they will be lost. Even a carbon price might not solve the problem. Carbon pricing typically focuses on only one of many attributes of nuclear generation, and proposals on energy price formation that reflect true costs are repeatedly shot down by supporters of other energy sources with significant externalities or generous subsidies.

Goals for COP 22

Countries went into COP 21 with a sense of urgency and genuine, wide-spread support for achieving a meaningful agreement, with particular emphasis on renewables and de-carbonization. The final agreement surprisingly included the goal of keeping temperature rise to no more than 1.5°C above pre-industrial levels. Not surprisingly, there are no legally binding emission reduction targets, but there are requirements to report progress made toward achieving commitments and flexibility for developing nations in the early years.

COP 22 offers the opportunity for the international community to address several important implementation issues associated with the Paris Agreement. In addition to discussion of national progress in meeting Intended Nationally Determined Contributions (INDCs), there is strong interest among many stakeholders for enhanced clarity and commitments around climate finance provisions as well as transparency processes to raise mitigation ambition over time. Capacity building for developing countries to effectively participate in climate action is another issue that will gain prominence. COP 22 could also provide greater detail on potential financial instruments that could compensate the risk of loss and damage stemming from the adverse impacts associated with climate change.

The parties to the agreement might also begin to give some thought to carbon pricing—there is no agreement on a price on carbon, but the groundwork has been laid for more emissions trading. Also, countries are expected to share renewable energy and emissions reductions technologies—this will count toward fulfilling financing commitments. However, how this will happen, or how quickly, is unclear. We note that there is already skepticism that the next World Trade Organization (WTO) round of trade talks will include further liberalization of these products under that agreement. This may have more to do with the binding nature of the WTO Agreements than with a willingness to carry out commitments under the Paris Agreement, but a lack of harmony between the two regimes could complicate the exchange of technologies.

Between now and COP 22 several important international events will occur, including the April Signing Ceremony of the Paris Agreement, the 2016 Climate Action Summit in Washington in May, the Clean Energy Ministerial in June, the G7 and G20, and critical decision-points in the Montreal Protocol and the International Civil Aviation Organization. Any or all of these may impact what takes place in COP 22.

Politics must be considered when evaluating the future of nuclear power in the US. The fact is that most of the clean energy advocacy community does not support nuclear power. They view it as competition for less expensive renewable energy resources and energy efficiency alternatives. There is also a strong and influential contingent of Northeast politicians vehemently opposed to nuclear. It is surprising that the industry has not been more active in talking to key environmental and clean energy advocacy groups, although this still could change. Additionally, the waste issue remains to be resolved, but there is little will on Capitol Hill to take this issue on in any grand measure. In sum, if nuclear power is to play a role in the US—whether in meeting greenhouse gas reduction goals or in providing reliable, dispatchable power—the focus may have to be on finding a way to support and extend the lives of existing plants.

5. Renewable energy resources

Renewables are surging in developed countries and will become the dominant force in developing countries that are short on existing infrastructure and capital. In the US, it is expected that there will be another surge of renewables, helped in part by the recent extensions of the Production Tax Credit and Investment Tax. But in the US, as elsewhere, renewables have now achieved mainstream status. In 2014, 30 percent of all installations around the world were renewable energy. Renewables have grown tenfold in a decade, due largely to scale, technology and cost improvements. The ability of renewables to compete on more even footing with traditional energy sources brings them within reach of more consumers, and, together with energy efficiency, make economic sense to a much broader public than even just a few years ago.



6. Energy storage

Energy storage, including battery technology, is moving inexorably toward greater commercial feasibility and is attracting huge investment. These technologies will likely come to scale within the next decade. Tesla's Power Wall, introduced to the world this past year, is only the tip of the iceberg. And once the storage problem is solved, the entire energy industry will be revolutionized in ways we can't even imagine at present.

7. Distributed energy resources

Distributed energy resources are the hot new focus of the electric industry and represent a major investment opportunity. More broadly, enhanced transmission and now micro-grids are major areas for infrastructure investment. The growth of emerging markets is driving distributed power, with 85 percent of new energy demand coming from emerging markets. Emerging markets have different customer criteria than in developed countries with mature energy markets. In developed countries, the markets are more about replacement, although security and reliability needs are expected to help drive the market for distributed resources.

8. Brilliant machines

So called "brilliant machines" and advanced data analytics are game changers. With the increased role played by rooftop solar, in-home storage systems, advanced energy efficiency technologies, smart appliances, improved time of use technologies, widespread electric vehicles—the world is on the verge of a whole new energy paradigm. In addition to running energy systems, these machines will have the ability to analyze shape and aggregate consumer behavior on a real-time basis. As this occurs, the US energy industry—and eventually the global industry—will be challenged by "asymmetrical competitors". These new types of competitors will arise across the industry, but will be prominent in the technology field. Similar to what occurred more than a decade ago in the telecom industry, companies such as Google or other entities that are not traditionally thought of as energy players will become household names in the energy space.

9. Empowered consumers

We are just beginning to see the potential disruptive change that will be caused by a movement described as "empowered consumers". The energy and technology worlds are tectonic plates that are moving at different speeds but that have a direct relationship with each other in terms of market transformation and customer behavior. The needs, desires, and characteristics of utilities' customers are changing. Consumers are far more environmentally concerned and aware, more vocal and more tech-savvy than many industry leaders appreciate. Some like to be in control, to have choices, and to be self-reliant in their energy choices and use. This group is also known as "pro-sumers". For others, electricity is a low-engagement product (*i.e.*, only noticed when it is not available). Customers increasingly expect personalized service and convenience and have very low tolerance for reliability issues. The changing relationship with consumers will force utility companies to rethink business models in the same way that other industries (witness telecom) have had to re-invent operations to accommodate changing consumer preferences and new involvement of consumers at all stages of production.

10. Cyber and physical security issues

Cyber and physical security issues are at a critical juncture—this is a major issue for every player in the energy space. Most industry experts believe that the next "black swan" event that will strike the energy industry will be a cyber event, or a combined physical and cyber attack. Utility companies report that they detect cyber intrusions on a daily basis, and the recent power grid shutdown in the Ukraine in January has served as an abrupt wake-up call to evaluate the preparedness of infrastructure systems to respond to cyber attack. The Ukraine attack was composed of multiple elements which included introduction of malware, widespread denial of service overwhelming the capacity of emergency customer call lines, and a wiping of system files to obscure attack details. The attack was sophisticated and demonstrated planning, coordination and the ability to use malware and possible direct remote access to blind system dispatchers. The same malware used to initiate the Ukraine attack reportedly has been introduced into some US industrial



control systems used to operate critical infrastructure, causing national security officials to issue warnings that multiple layers of defense are needed to protect critical systems.

This past November, the US energy industry, together with a host of government agencies, conducted a third massive drill simulating widespread, coordinated, sustained physical and cyber attacks on critical US infrastructure. Coincidentally, the drill took place just days after the terrorist attacks in Paris, so many of the participating entities were already in a state of heightened readiness to respond to threats. Nevertheless, the drill revealed that a number of important vulnerabilities persist, even after investments have been made to mitigate the consequences of a significant breach. New in the simulation this year, entities in Canada and Mexico were invited to participate, broadening the scale of the drill to the entire North American continent. With the increased interdependence of our energy sectors in this hemisphere, a joint approach to protecting infrastructure is not only desirable but essential.

11. Water scarcity and turbulent weather

Water scarcity and turbulent weather continue to be wild cards in predictions about the energy industry. With more than 20 percent of the world's aquifers depleted, and the tremendously water-intensive nature of many alternative fuel sources on top of water demand associated with production of energy from traditional sources, water availability could be the single most defining game changer facing the energy industry. Desalination plants are not proving to be the ideal solution because they are very energy-intensive, creating something of vicious circle between water and energy.

As for changing weather patterns, the "once in a hundred years" storm is a thing of the past. Violent storms, drought, floods, extreme heat and cold are all occurring with increasing frequency, and in unusual locations. Changing and unpredictable weather patterns threaten energy system reliability when storms hit, but also present planning and cost challenges to energy companies and regulatory authorities.

12. US policy

US energy policy continues to be a huge question mark. As a general rule, Congressional gridlock continues. Occasionally, a small energy measure manages to pass, but with each small step forward that is accomplished, it seems that some other issue pushes the legislature to even further polarization, and the upcoming current election cycle is doing nothing to relieve this situation.

What does the rest of 2016 hold in store?

A vacancy on the Supreme Court, election year politics, and a ticking clock on the President's remaining opportunities to promote his agenda through regulatory powers means that the remainder of 2016 will witness either a perfect storm of policy volatility or total government paralysis. The leading candidates are all over the map in terms of what they say their energy positions will be, and any actions taken by this Administration risk being unwound by the next. Congress is a quagmire of partisan rhetoric, with little hope of energy bills gaining any significant traction. The media devotes far less ink to energy matters than it does to icons of popular culture. Physical and cyber attacks abroad are pulling the focus away from all other issues. And almost no one is paying any attention to the few energy-related initiatives that are being taken by federal or state agencies. It is like a closed game of blindfold chess that looks like it will continue through the end of the year, which then may lead inevitably to a dead draw.

It has been nearly a decade since a comprehensive energy policy has made it all the way through the legislative process and been approved by the White House. This lack of a broad and cohesive national energy policy has prompted many state and local governments to fill the void, often innovatively and aggressively. At the national level, we have instead seen regulation move to the fore, with the Executive branch, not the Legislative branch, in the driver's seat. This in turn has given the judiciary an outsized role in shaping energy policy as rules are challenged by opponents in court at the back end rather than sensibly debated in Congress on the front end. As a result, major national policy is determined, if not by the least qualified, certainly by the least accountable branch of government. This dynamic has a tremendous impact on investment decisions made in the energy sector, creating uncertainty and risk that pushes investment dollars to more certain, even if smaller, returns.

* * *

The common theme of all of the above trends is change and volatility in the energy sector. Some of these issues have felt their impact for a number of years now, but in varying measures over time; others arose somewhat unexpectedly. These key drivers will both challenge and shape the global energy sector over the coming years.



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The background of the page features a close-up, low-angle shot of the United States and Canadian flags waving against a clear blue sky. The American flag is on the left, showing its stars and stripes, while the Canadian flag with its red maple leaf is on the right. The flags are slightly out of focus, creating a sense of movement and depth.

Opportunities for climate and energy cooperation between the US and Canada

By Jon Sohn and Andrew Shaw

It is clear that President Obama and Prime Minister Trudeau share a deep personal commitment to combatting climate change. Canada/US cooperation on climate issues, which began in earnest during the Kyoto talks in the 1990s, stalled in the first decade of the 2000s, and is now front and center for the countries coming out of the Paris COP-21 agreement last December. A major focus of the March 10th official visit between President Obama and Prime Minister Trudeau included the unveiling of a US-Canada Joint Statement on Climate and Energy that builds upon recent cooperation between the two countries on climate change, such as recognition by the EPA's Clean Power Plan of Canadian renewable imports.

The centerpiece of the US-Canada climate change pact is a commitment by both the US and Canada to reduce methane emissions from the oil and gas sector 40-45 percent below 2012 levels by 2025. As part of the pact, EPA will begin immediately developing Clean Air Act regulations on methane emissions from existing oil and gas sources, a sharp break from the agency's previous plan of merely pursuing voluntary incentives to reduce methane emissions from existing sources. Environment and Climate Change Canada (ECCC), the Canadian Ministry principally responsible for developing and implementing climate change policy, will also develop regulations on new and existing oil and gas sources with the goal of issuing a draft rule in early 2017. These regulations will be developed in collaboration with provinces/territories, indigenous peoples and other stakeholders.

Methane regulations in both countries face an uncertain path. With less than 10 months left in office, it is unlikely that the Obama administration can finalize methane regulations for existing oil and gas sources, so the job will be left to his successor. As to the next administration, both Secretary Hillary Clinton and Senator Bernie Sanders would likely finalize these regulations, but a Republican president would be expected to abandon this rulemaking. The oil and gas industry has also signaled that it will sue EPA over methane regulations, which could potentially tie the rule up in litigation for years. ECCC will also have to work to coordinate the federal rules with Alberta's own efforts to develop methane regulations for the oil and gas sector.

Canada and the US also committed to take additional domestic action on climate change. The two countries pledged to continue collaboration on post-2018 model year greenhouse gas (GHG) standards on heavy-duty vehicles and to update their respective public procurement processes to reduce use of hydrofluorocarbons (HFCs). The pact also calls for "an alignment of analytical methods for assessing and communicating the impact of direct and indirect GHG emissions of major projects." This provision follows a recent briefing paper by Sierra Club, National Resources Defense Council and Pembina Institute in which they urged Canada and US to adopt a "credible, robust climate test" in assessing the impacts associated with potential energy projects. The US-Canada Joint Statement on Climate and Energy could lead to further refinement of environmental review processes to analyze projects' direct and indirect climate impacts, including cross-border energy projects.

On the international front, the US-Canada Joint Statement on Climate and Energy pledged the following actions: adoption of a Montreal Protocol HFC phasedown amendment in 2016, and upon adoption, provide increased financial support to the Protocol's Multilateral Fund to help developing countries implement a HFC phase-down; working with the International Civil Aviation Organization to promulgate a new CO₂ standard for airplanes; and encouraging G-20 commitments to reduce emissions from heavy-duty vehicles and the oil and gas sector.

Finally, the US-Canada Joint Statement on Climate and Energy states that the two federal governments "will encourage" collaboration between sub-national governments on best practices for carbon markets. Going forward, the federal governments could serve to convene state and provincial officials in order to further integration in North American carbon markets. Notably, California and Quebec already share a common carbon market, and Ontario and Manitoba are set to join this market in the coming years. In addition, New York Governor Andrew Cuomo (D) has directed state officials to study options for the Regional Greenhouse Gas Initiative to link up with California's and Quebec's carbon market.

While not mentioned in the US-Canada Joint Statement on Climate and Energy, discussions are likely to continue this year on how EPA's Clean Power Plan will account for Canadian renewables. In the final Clean Power Plan rule, EPA enables an important step in cross-border collaboration by allowing states to credit Canadian renewable energy imports toward meeting their compliance obligations. While the US Supreme Court has issued a stay on the Clean Power Plan, EPA is expected to continue engaging with states, industry and other stakeholders on compliance strategies for the rule. With respect to Canadian renewable imports, EPA may provide further clarification on how states can account for Canadian renewable energy imports under the Clean Power Plan if they pursue a rate-based standard.

In building upon the action from the official visit, there may also be additional progress in building upon the Memorandum of Understanding (MOU) reached by US Secretary of Energy Ernie Moniz, Canadian Natural Resources Minister Jim Carr and Mexican Secretary of Energy Pedro Joaquin Coldwell at the recent North American Energy Ministers Meeting. Under the MOU, the energy ministers pledged to focus on the following six areas:

- Identifying trilateral activities to further climate change adaptation and resilience;
- Sharing best practices and seeking methods to reduce emissions from the oil and gas sector, including methane and black carbon;

- Sharing experience and knowledge in the development of reliable, resilient and low-carbon electricity grids;
- Modeling, deploying and accelerating innovation of clean energy technologies, including renewables;
- Exchanging information in order to improve energy efficiency for equipment, appliances, industries and buildings, including energy management systems; and
- Exchanging information and promoting joint action to advance the deployment of carbon capture, use and storage.

Further, the "Tres Amigos" North American Leader Summit in June could provide agreement on additional energy and climate change coordination between the US, Canada and Mexico.



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The Paris puzzle of oil & gas after COP21

By Jonathan Cahn and Jeffrey Fort



Following the recent United Nations Climate Change Negotiations in Paris, there are now a number precedent setting agreements and partnerships that will affect development, operations and closure of oil and gas activities around the world. Below, the Dentons Climate Change Group shares its perspective on these opportunities for 2016.

The United Nations climate negotiations in Paris: Big Oil needs to pivot

In December, over 190 countries reached a sweeping, new global climate change agreement in Paris (Paris Agreement). The Paris Agreement is remarkable in many ways: each word of the agreement was negotiated; confirming the existing consensus for 2C as the maximum increase over pre-industrialized levels with a goal to keep the increase to 1.5C; every country is expected to do its part; and periodic reviews will occur. This agreement impacts all industrial sectors and supply chains of the global economy and requires careful analysis for investors to understand the risks and opportunities ahead.

The impact on big oil is potentially dramatic. Barclays Capital published research immediately before the COP21 negotiations, reported on by the Petroleum Economist which concludes that “if global energy policies consistent with a 2C trajectory were adopted, the fossil fuel industry would stand to lose revenues of some \$34 trillion between 2014 and 2040 compared to those under the IEA’s base-case New Policies scenario. Of that total loss, the oil industry would account for \$22.4 trillion, gas for \$5.5 trillion, and coal for \$5.8 trillion.” These figures plainly illustrate the importance of climate change issues to our oil and gas clients.

At the core of the Paris Agreement are “intended nationally determined contributions” (INDCs). The process for INDCs pairs national policy-setting—in which countries determine their emission reduction contributions in the context of their national priorities, circumstances and capabilities—with a global

framework that drives collective action toward a low-carbon, climate-resilient future. INDCs reflect a new model of international climate governance blending a more “bottom-up” approach of ambition setting for greenhouse gas emission reduction but placing those approaches within an international framework for reviewing adherence to projected goals.

The “Paris Puzzle”

A consensus view of the 190+ countries at the Paris COP was to affirm the 2C increase in temperature over pre-industrialized levels, but to have a goal of limiting the increase to 1.5C. A coalition of island nations led that advocacy arguing that mitigation was not enough, that those countries were dealing with adaptation to significant sea level rises and more severe weather events. Given that the INDCs submitted before the COP were estimated to only result in about half of the necessary reductions, to the 2C level, the 1.5C goal is daunting, if achievable at all.

The challenge oil companies confront is that the Paris agreement resulted in a patchwork of INDCs in countries where they have operations, and the risks from jurisdiction to jurisdiction will vary widely depending on the corresponding INDC and the country’s existing environmental regulations and governance culture. Because environmental regulations frequently are not “stabilized” in upstream oil and gas agreements with host governments, there are both short- and long-term implications for these clients in each country where they are doing business.

To illustrate this point, a side event in the IETA “Open for Business” Pavilion in the COP Blue Zone was organized and conducted by the oil and gas industry’s IPIECA (created at the request of UNEP, as the “global oil and gas industry association for environmental and social issues”). The event used the title “The Paris Puzzle: the Pathway to a Low Emission Future.” Panelists included BP, Shell, Statoil and Total. Topics included the unique role of Oil & Gas, the need for effective policy, use of energy conservation and more to manage emissions, the use of natural gas to replace coal, and that CCS is a key technology. An overview statement is not surprising: “Most energy sources have issues to varying degrees around public acceptability and environmental impact. For fossil fuels, their use can be combined with carbon capture and storage (CCS) to mitigate CO2 emissions, although significant barriers remain. Renewable resources and technologies have long-term potential and are growing fast - but suffer from cost, intermittency and other barriers and are starting from, a very low baseline of energy delivered.” Shell and Statoil were particularly disappointed in the UK government decision to stop funding the CCS projects there. With respect to future energy options, Total stressed its solar development activities and BP its involvement in bio-fuels. The panel tended to associate the 1.5C goal as equivalent to the “decarbonization” of the energy sector by 2050.

Since the COP, there has been little comment from the oil majors about the COP decisions. On January 18, IPIECA issued a press release repeating the principal elements of its program, including “The Paris Puzzle.”

A few observations

Many oil and gas companies have been preparing themselves for a global carbon price for some time, and have made significant investments in renewables (e.g., solar and wind), alternative fuels and low carbon technologies to enhance efficiency. Many have also positioned themselves to benefit from higher demand for natural gas as a “bridge” to a lower carbon environment. Nevertheless, companies require thoughtful strategic guidance, and a team that can track both obvious and non-obvious implications of the emergent climate change environment.

Arguably, one of the most difficult challenges posed by the Paris Agreement is that it offers little clarity with respect to future policy or certainty with respect to costs. This is therefore an area where strategic advice drawing on a multi-disciplinary team can offer substantial value to our oil and gas clients in the many jurisdictions where they operate. We believe that a first step in developing a multi-disciplinary approach will be a review the INDCs of the major producing countries where our clients operating to evaluate the types of legal issues on which we may assist.

In general, the best approach may be a highly granular focus on the legal dimensions that are implicated with each INDC:

- Fiscal regime stabilization—how do climate change obligations of individual states figure into and disrupt the economic stability of existing upstream agreements;
- Carbon tax implications—what are the comparative advantages and disadvantages (compared with cap and trade) and how does this play out in various jurisdictions;
- Renewable energy offsets—the use of oil company investment in renewable energy as an element of upstream oil and gas negotiations for balancing upstream investment objectives with country-specific renewable energy targets (e.g., Total’s investment in Sunpower and its investment in two African-focused solar power startups Off Grid Electric and Powerhive through its \$150 million Total Energy Ventures capital fund);
- Carbon capture and sequestration (CCS) technology—investment in CCS and cost recovery issues, coupled with analysis of local environmental requirements and practices will dictate the adoption of CCS, and needs to be factored into future planning and negotiations;
- Environmental compliance and monitoring constraints on oil and gas developments with particular attention to CO2, methane, etc. where INDC progress will be based on rigorous measurement;

- Political risk, social licensing, and local community impact mitigation (e.g., REDD+)— using climate change response as part of a broader social licensing initiative to secure local community support;
- Local content (supply chain management) integrating with commitments around decarbonisation (e.g., REDD+).

As the January Petroleum Economist underscored: “What Paris has shown is that there is now political will to set out a trajectory towards decarbonisation. The pace of progress will vary around the globe, but fossil fuel producers need to stay ahead of the climate squeeze and develop a pivot strategy to embrace a low-carbon future.” <http://www.petroleum-economist.com/Article/3520374/Paris-climate-deal-highlights-long-term-risk-for-oil-and-gas-as-coal-staggers.html#ixzz3yqszAaHa>. That strategy will invariably involve a mosaic of responses depending on the jurisdiction involved, the INDC commitments that have been made, and the substance of current agreements with the respective host government.

Novel solutions to address local concerns

We see opportunities for creative use of carbon finance tools to assist mining enterprises in meeting their objectives and the expectations of local law.

One such tool is known as avoided deforestation, known by its acronym REDD+ (for Reduced Emissions for Degradation and Deforestation). The “plus” denotes the use of community based activities for education and capacity building. By preventing such actions, carbon credits can be earned. These credits are typically sold to support the ongoing education, training and enforcement of the avoided deforestation project. Such projects can be a substantial give=back to the host community or country and advance INDCs. Over 60 countries (mostly tropical) expressly included these “REDD+” activities in their INDCs. Dentons has substantial experience in these projects and was awarded Global Citizen of the Year by the American Lawyer for the Oddar Meanchy project in Cambodia.

REDD+ projects can also become part of emission trading systems, a powerful policy instrument for managing industrial greenhouse gas (GHG) emissions. The Paris Agreement includes a specific section for countries to exchange “extra reductions” with other countries, and many countries have expressed interest in such an arrangement. Of course, such a system encourages cost-effective measures to be taken. Given that the INDCs which have been submitted to date do not appear sufficient to meet the 2C, we expect this to become a greater opportunity in the coming decade.

Dentons has extensive experience in creating, aggregating and trading carbon commodities, in Europe, Asia, Africa, China, Canada and California.



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Mexico's oil and gas industry: open for all

By Rogelio López-Velarde and Jorge Jiménez

For decades, doing business in Mexico's oil and gas industry could only mean one thing: providing oilfield services to the national oil company, Petroleos Mexicanos (Pemex). This changed slightly in 1995, when liberalization of midstream natural gas (storage, transportation, and distribution) opened a very limited window of investment opportunity to investors other than Pemex. Several midstream gas companies entered the Mexican market, but Pemex continued to play a dominant role.

In 2014, however, Mexico implemented new rules and the entire energy landscape changed for good. What for many was unthinkable then materialized, and Mexico lifted the "iron wall" on energy. Private players—domestic and foreign—were allowed to actively participate in all the stages of the oil and gas value chain, from exploration and production operators, to midstream companies now not only in natural gas but in oil and related products, to marketing, to refiners, to service stations, and to traders of all products.

It is perhaps paradoxical that after taking so long to open its energy markets, Mexico finally made the move at a time when the world's oil and gas sector tumbled into a cycle of instability. But the self-evident needs of the Mexican industry remain clear, and are drawing interest and the participation of players seeking new opportunity.

Despite the downturn, projects continue to be developed. Over the past year, the Mexican regulatory framework also continued to evolve, filling gaps in areas where the original statutory framework had only set out the basic rules. At the same time, the old fiscal regime for Pemex and a structurally outdated system left the national oil company in financial difficulties, made all the more serious by plummeting crude oil prices. This situation—unexpected at the time that reforms were initiated—has made the role of private developers even more important, as Pemex plans for a limited ability to grow both in the upstream and midstream sectors.

Upstream

Last summer, the first auction for offshore oil leases was held. Turnout was lower than hoped (not entirely unexpected given falling prices and a worldwide oil glut), but it was a positive step towards reversing a longstanding decline in Mexican crude output and improving Mexico's economic growth. The National Hydrocarbon's Commission (Comision Nacional de Hidrocarburos) (CNH) awarded shallow-water blocks both for exploration and production, as well as a number of small onshore blocks in the southern Mexico region. At the end of 2016, CNH will award a number of deep water blocks in the Gulf of Mexico—the next frontier of Mexican oil production. It is anticipated that several major players in the global oil industry will bid on these blocks.

Pemex announced in 2015 that it intends to "farm-out" a number of the blocks it kept under the so-called "Round Zero," including areas in shallow and deep water as well as onshore. These farm-out projects, as per the regulatory design, will be structured through a competitive bidding process under which CNH will select a joint-venture partner for Pemex. There will be blocks where Pemex will take a non-operator seat, while in other cases it will try to maintain a key operational role. The farm-outs present various challenges, but are certainly expected to attract many players to the table. As Pemex seeks to resolve its financial woes, there are likely to be additional farm-out opportunities for new entrants in the future.

Contemporaneously, a number of companies have recently engaged in exploration activities, including seismic shooting and surface recognition. They also are reprocessing data belonging to the National Center for Hydrocarbons Information. This may unveil new interests and areas for exploration and development in the near future.

Midstream

The opening of the market for imports of products (including gasoline and diesel) spurs a considerable range of opportunities in an underdeveloped market for storage and transportation of these important supplies. Mexico imports more than 50 percent of its gasoline, and has very limited facilities for transport and storage. Projects for maritime storage terminals, pipelines for multiple products, and marketing companies focused on regional market development (including service stations grouping together to gain market stature) are all experiencing steady growth.

The midstream regulator—the Energy Regulatory Commission (Comision Reguladora de Energia) (CRE) (best known for its role in regulating the natural gas industry) has taken its expanded regulatory role very seriously. CRE has tried to develop a number of regulatory instruments to provide investment certainty. It also has implemented measures and rules to govern terms of service, regulated rates, and open seasons to allocate pipeline capacity. It also has created “common carrier” rules and capacity release rules, among others. With respect to storage terminals for products, CRE has opted for a lighter regulation. For example, it has exempted terminals from certain burdensome restrictions such as mandatory capacity allocation through open seasons, some rules governing development or expansion, and certain procedures for the approval of rates. Terminals continue to be required to provide service on open access principles and unduly discriminatory treatment of shippers is prohibited. However, lighter regulation will apply as long as a developer does not seek to exercise market power. A separate set of rules applies to Pemex. Pemex terminals will be subject to open seasons and approved rates from the outset. Pemex will soon be launching its open season to allocate the capacity available in its more than 50 facilities around the country. At a later stage, these facilities are set to be spun-off and operated on a joint venture basis.

As to natural gas, the mandatory spin-off of the transportation business (into a separate entity—CENAGAS) is now accompanied by a mandatory phase-down under which Pemex will be required to divest a majority of its currently controlled natural gas sales market. It will be allowed to retain only 30 percent of the market share over the next four years. CRE has yet to approve the terms of this divestiture, but it is seen as a clear signal for other marketing companies to participate in the Mexican natural gas markets.



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Mexico's green energy puzzle

By Rogelio López-Velarde and Amanda Valdez



Mexico is highly committed to addressing climate change. Over the last few years, the country has made a series of policy decisions resulting in the implementation of several mitigation and adaptation measures supported mainly with governmental resources. At the international level, Mexico has been an active participant in nearly all international climate change conferences and conventions, and was the first developing country to establish emissions reduction commitments in the context of COP21. There, Mexico set an ambitious target of a 22 percent reduction of greenhouse gas emissions by 2026.

Mexico's renewable energy sector, which has grown rapidly over the last decade, is attracting significant investments. Last year, 18 percent of the electric power generated in Mexico was produced from renewable energy sources. However, Mexico is not stopping there. Mexico's ability to achieve its ambitious goals to combat climate change depends highly on its ability to continue expanding its renewable energy sector.

So what does the future of green power look like in Mexico? The constitutional reforms of December 2013 and subsequent legal developments have redesigned the structure and legal framework for the Mexican energy sector as a whole, including the electricity industry. The electric power sector now includes a multiplicity of generation resources, a wholesale electricity market with open competition for power marketing companies, and an independent system operator (ISO) in charge of system dispatch and administration of the power market. This represents a dramatic paradigm shift for the entire industry. Implementing these changes is no minor task considering the importance of the energy sector for the Mexican economy, its role as the largest contributor to the federal budget and the prominence of the two State-owned companies, Pemex and Comisión Federal de Electricidad (CFE), which operated as vertically

integrated monopolies over the oil, gas and electricity business for decades. Now, finding the right place for renewables in the new Mexican electricity sector presents additional challenges, as there are many pieces to fit into an evolving puzzle.

Some of the incentives for renewables that the Mexican government had already implemented under the previous legal framework (including accelerated tax depreciation rates and financing programs) are still in play, but not all of them have been retained in the new regime. Instead, new statutes provide for different incentives, mostly intended to:

- Promote open access to transmission and distribution infrastructure, and allow adequate interaction of firm and intermittent power resources on the grid;
- Support the development of new generation capacity through clean energy auctions resulting in long-term and mid-term agreements ("clean energy" includes renewable energy, nuclear and efficient cogeneration);
- Increase the involvement of off-takers in supporting clean energy projects, through the imposition of clean energy requirements reflected in a number of clean energy certificates that suppliers and off-takers will have to obtain on an annual basis.

The Mexican government has accomplished much in a relatively short time by issuing many of the necessary rules to implement these incentives, but there is still much work to do and numerous other pieces to fit into the energy puzzle. Gas availability, low prices and the promotion of the oil and gas industry (also recently opened to private investment) are prompting the development of large gas pipelines across the country. This could make it harder for renewable

energy sources to compete, particularly against gas-fired generation. Moreover, the steel industry and other large power consumers have openly shown their reluctance to pay higher energy costs associated with clean energy (whether in the form of certificates or otherwise). They argue that the incentives to promote clean energy should not be at the expense of the industrial sector, which is already struggling to overcome financial difficulties caused by the slowdown in global economic growth. In fact, the pressure exerted by industrials resulted in changes to the recently enacted Energy Transition Law, which includes saving provisions that somewhat ease the clean energy requirements that the Mexican government had originally contemplated. In addition, the role of CFE—the vertically integrated national utility company—as a competitor with tremendous market power in the new energy markets, is still an unresolved question.

Clearly, the pieces in Mexico’s green energy puzzle are still moving, and some of them are even missing, so the final picture is yet to be seen. But the pieces will eventually come together, and many players seem to be betting on that. (Sixty-nine bidders submitted 227 sale offers in Mexico’s first clean energy auction this year, and developers are already preparing for a second auction scheduled for the end of this year). There is no doubt about Mexico’s huge renewable energy potential, which, supported by the country’s macroeconomic and political stability, continues to attract domestic and foreign investors. Many of those investors believe this is precisely the moment to position themselves and actively participate in adding and rearranging the puzzle pieces to define the new face of Mexico’s renewable energy industry.



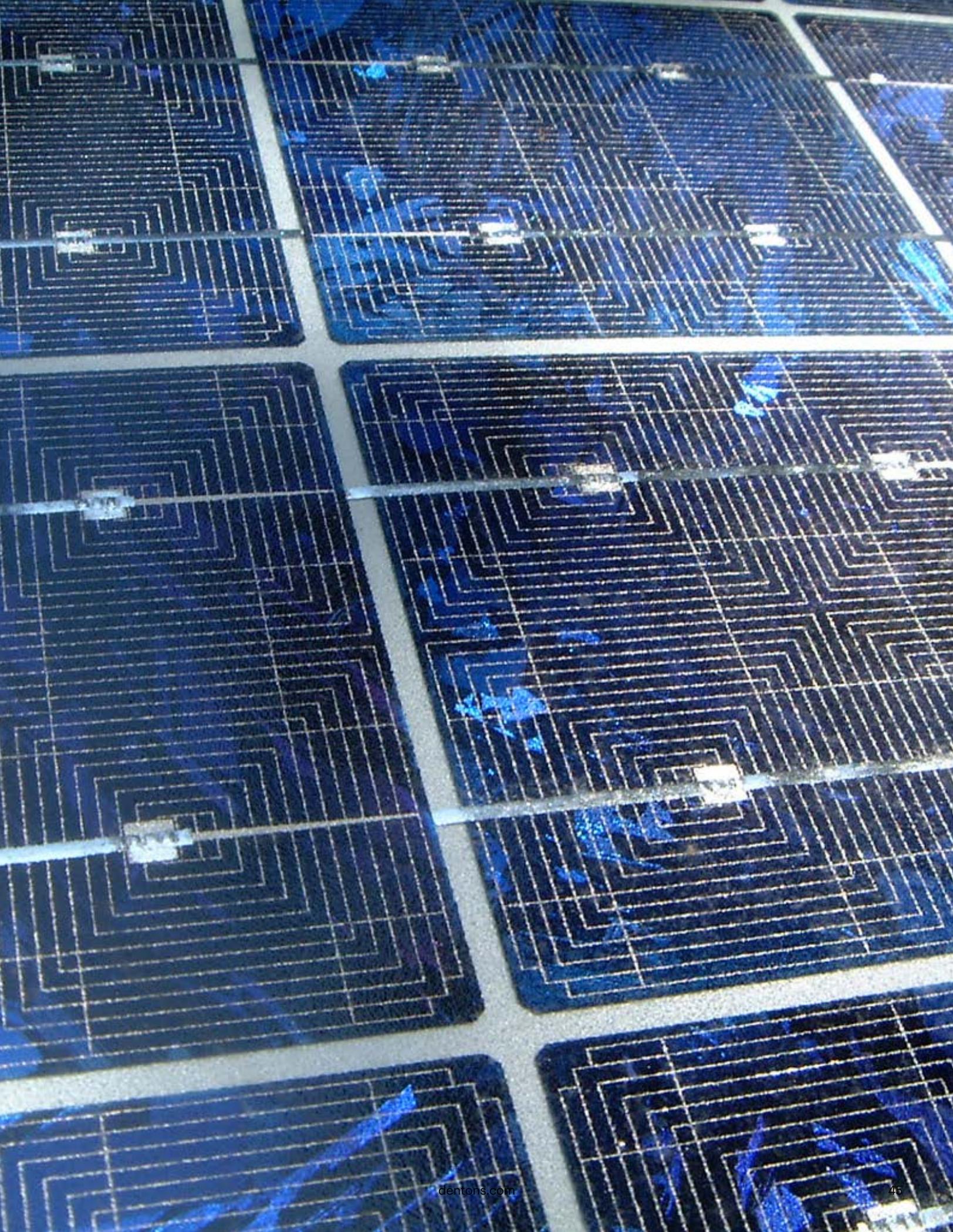
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US energy and environmental policy: wait and see in 2016?

By Jeff Lane



The Supreme Court's recent decision to suspend implementation of the Environmental Protection Agency's Clean Power Plan (CPP) by granting opponents' request for a stay reflects a broader truth about US federal energy and environmental policy in 2016: it is essentially frozen.

This is not exactly news, as others both within and outside government have remarked. Last November, freshman US Senator Ben Sasse, a Republican from Nebraska, made his first speech on the Senate floor, nearly one year after his election. Senator Sasse, a former university president, said he wanted to take time to observe the Senate and learn from his colleagues before sharing his perspective on the current state of US politics and the legislative process. His speech was widely noted and praised as a thoughtful and balanced analysis of congressional dysfunction. Among Senator Sasse's critiques was that Congress has ceded too much power in policy-making to the executive branch. Citing "the historic growth of the administrative state," he decried "executive overreach" that has "come about partly because of a symbiotic legislative underreach." He wondered how Congress has gotten "to the place where so much legislating now happens inside the executive branch?"

Early in President Obama's first term in 2009, the Democratic-led House of Representatives narrowly passed a comprehensive "cap and trade" bill aimed at limiting US greenhouse gas (GHG) emissions and combating climate change. The Senate, despite having 60 Democrats at the time, did not debate the House bill or consider its own version of comprehensive energy legislation. Since then, Republicans with an energy and environmental agenda largely at odds with President Obama's have assumed control of both the House and Senate. Predictably, legislative gridlock has intensified. Indeed, the only significant energy policy change that has been enacted in recent years was last December's

repeal of the US ban on crude oil exports, made possible by a deal to couple the change with five-year extensions of the Production Tax Credit for wind energy and the Investment Tax Credit for solar energy projects. That agreement won approval as part of an extraordinary omnibus budget and tax bill that bypassed the committee process and was scarcely debated on the floor of the House and Senate in the face of a looming government shutdown.

In the absence of any realistic prospect for major legislative action consistent with his energy and environmental priorities, President Obama has aggressively exercised his administrative authority. One example was his decision last fall, after years of delay, to deny approval of the Keystone XL pipeline project. Earlier in the year, he had vetoed a bill that would have effectively granted approval of the pipeline. Allowing the project to go forward, he argued, would have "undercut" the US' role as a global leader in fighting climate change.

Even when the administration may not be anxious to take the lead, congressional inaction has ceded influence on important energy issues, such as the controversial Renewable Fuel Standard (RFS), to an executive branch agency. The required volumes of ethanol, advanced biofuels, biodiesel, and cellulosic biofuels to be blended in the nation's transportation fuels have been criticized by both the biofuels industry and the oil industry, but Congress has been unable to pass any sort of reform of the RFS, leaving the Environmental Protection Agency (EPA) with the responsibility of trying to balance those competing interests.

In an action more impactful than the largely symbolic disapproval of the Keystone project, the president moved forward last year with the EPA's CPP, a rule designed to reduce GHG emissions from existing power plants by 32 percent below 2005 levels by 2030. And



more recent steps taken by the Interior Department underscore the president's ambitions by, as he stated in this year's State of the Union address, seeking "to change the way we manage our oil and coal resources so that they reflect the costs they impose on taxpayers and our planet." As with the Keystone XL Pipeline, President Obama preserved his executive prerogatives by vetoing a congressional resolution that would have blocked implementation of the CPP. Now, with the CPP stay in place, the federal appellate court is considering whether EPA has the legal authority to implement this signature initiative of President Obama's climate agenda, but it is highly improbable that a final decision will be handed down before the next president takes office in January 2017.

In any event, the central role taken by the executive branch in driving energy policies for the past several years may be nearing an end, or at least a pause. With elections looming, Congress has pronounced many of the president's climate-centered budget proposals as dead on arrival. Even the Senate's effort to pass a limited, bipartisan energy bill focused on energy efficiency and infrastructure has faltered in the face of procedural objections and the competing priority of funding to address the Flint water crisis.

Meanwhile, presidential election politics reflect the growing polarization of the two parties on energy and environmental policy. The leading Republican candidates have attacked environmental and energy regulations as overly burdensome and support policies that promote greater oil and gas production. Donald Trump has called for essentially dismantling the EPA. Ted Cruz opposes tax incentives for renewable energy and the Renewable Fuel Standard. On the Democrat side, Hillary Clinton pledges to reduce US GHGs emissions by 30 percent below 2005 levels by 2025, set a national goal to install 500 million solar panels, generate enough renewable energy to power every home in America, reduce US oil consumption by a third, and consider additional limits on fossil fuel production by means of hydraulic fracturing. Bernie Sanders supports a carbon tax and favors a ban on hydraulic fracturing, new offshore and Arctic drilling, mountaintop coal mining, and exports of oil and natural gas.

President Obama is sure to continue to exercise what regulatory powers he has to promote his environmental and energy agenda in the months remaining in his term. Earlier this year, the Department of Interior announced a moratorium on coal leasing on federal lands. And, in recent weeks, the president joined Canadian Prime Minister Justin Trudeau in pledging to reduce methane emissions from the oil and gas sector 40 to 45 percent below 2012 levels by 2025. Also in March, the president reversed policy and eliminated offshore leasing to drill for oil in the Atlantic off the East Coast.



Congress is limited in its ability to block such regulatory efforts in the near-term, but if Americans elect a Republican to office in November, that person would almost certainly seek to undo most of these actions. A Republican chief executive would also explore options for limiting or eliminating the CPP, even if the rule survives its current legal challenge. That process would not be easy or straightforward. A new rulemaking would be required, and in all likelihood it would be subject to its own legal challenge. On the other hand, if a Democrat is chosen but the composition of Congress remains similar to what it is now, we may continue for quite a while on the course of legislative stagnation that has become so familiar, with action coming from the executive branch, and the Supreme Court as the ultimate policymaker. Or, if a new justice is not soon confirmed to the high court, the power to make policy may (temporarily) be shifted to the DC Circuit, as four-four decisions would leave in place the decisions of the appellate court.

All of this leaves the US energy industry in a state of tremendous uncertainty. Investment, whether in traditional fossil fuels or in renewables, becomes more costly because of increased risk, which impacts economic growth. State and local regulators can step in to fill some of the legislative and policy void, as they have in many instances over the past several years. But this, too, comes at a cost as businesses then face a veritable patchwork of inconsistent, or even incompatible, compliance obligations. For the moment, energy policy and environmental policy are circling in a “wait and see” holding pattern, but sooner or later, this plane will need to land or change its course.



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A boost for energy development on tribal lands is on hold with the broad energy policy reform in Congress

by David Shaffer

Congress is considering comprehensive energy legislation for the first time since the Energy Policy Act of 2005. In the Senate, the Energy Policy Modernization Act of 2015 (S. 2012) is intended to bring about a broad overhaul of federal energy policy to bring it in line with changes to the energy industry over the past decade. The legislation includes a number of amendments. Of particular interest is a “non-controversial” amendment directed to reducing the administrative hurdles for Native American tribes to develop oil, gas, solar, and other energy resources on tribal lands.

Background

Native American tribes face an extra layer of bureaucracy when they seek to develop energy projects because they are located on trust lands that need additional federal approvals for how the land is used. In 2011, Senate Committee on Indian Affairs Chairman John Barrasso (R-WY) first introduced the Indian Tribal Energy Development and Self-Determination Act. The legislation helps cut the red tape of the approval process for energy projects on tribal lands. Primarily, it streamlines the Department of Interior's approval of Tribal Energy Resource Agreements (TERA) and reduces delays associated with the leasing and providing rights-of-way for energy projects. The legislation also includes greater technical assistance and access to loan programs to develop all types of energy projects, including renewable resources. In addition, it establishes a biomass demonstration project to promote energy production from the forest and ranges on federal lands. Last year, with bipartisan support, the Senate passed the bill by unanimous consent.

By simplifying the approval of tribal energy projects, the legislation should enhance Native American tribes' ability to exercise more self-determination over the development of energy resources on tribal lands and spur greater economic development. Currently, delays in the approval process for energy projects on tribal lands has led to missed development opportunities. It has also led to increased project costs and the loss of revenues for the tribes. Therefore, Senator Barrasso has stated that "[o]ne of the best ways to facilitate economic opportunities in Indian Country is to give tribes more control over the development of their natural resources," and recognized this bill "will help create good-paying jobs across Indian Country while increasing our nation's energy security."

Next steps

The energy bill and a majority of the amendments to the legislation have broad bipartisan support, but Senate action is currently blocked by two legislative holds. One hold is related to a separate bill to provide assistance to address the drinking water crisis in Flint, Michigan. Originally, the assistance for Flint was an amendment to the energy bill, but a bipartisan deal to introduce a separate bill for Flint was struck to allow the energy bill to move on a parallel path. The second hold is related to an amendment to the energy bill for greater sharing of revenue from offshore oil production in the Gulf of Mexico. Both holds are preventing a unanimous consent agreement to allow a vote on the energy bill and the aid package for Flint.

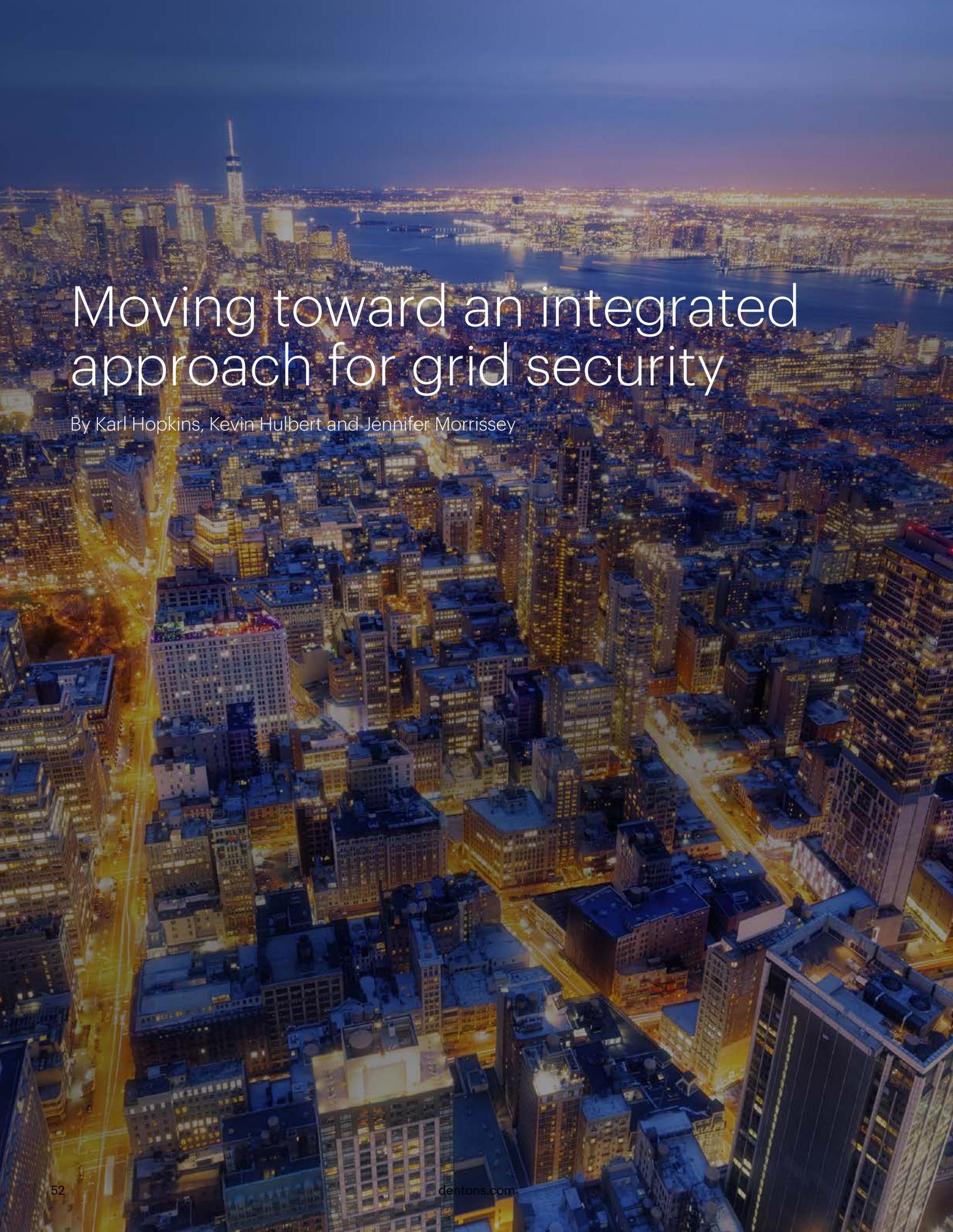
As noted in an accompanying article on US Energy and Environmental policy, the current Congress has had a difficult time passing major energy and environmental legislation. The energy bill offers a perfect example. If the energy bill is brought to a vote and adopted by the Senate, then it would need to be reconciled with the House's own broad energy policy bill, the North American Energy Security and Infrastructure Act. The House energy bill faced nearly unanimous opposition by Democrats and a veto threat from the White House. In contrast, the White House has not issued a veto threat for the Senate energy bill, but stated it had concerns with some aspects of the legislation, while supporting others.

The hurdles to a Senate vote on the energy bill do not appear unsurmountable. There is general optimism that a deal can be reached to resolve the legislative holds and allow a vote on the energy bill. Even so, there is no assurance that any energy bill that comes out of conference will be acceptable to President Obama. Therefore, Senator Barrasso's legislation to give Indian tribes more tools to develop their energy resources and to remove unnecessary barriers to economic development on tribal lands is tied to the fate of broader energy reform being signed into law.



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Moving toward an integrated approach for grid security

By Karl Hopkins, Kevin Hulbert and Jennifer Morrissey

In our first volume of Game Changers several years ago, we included a thought piece highlighting our view that there is an urgent need for regulators to develop a multi-faceted approach to critical infrastructure security that includes preparedness for both cyber and physical attacks on the power grid. In that piece, we cautioned that the national conversation about critical infrastructure security may have been too heavily weighted toward cyber concerns, fueled in part by a growing sense among the general public that advances in the technology that has become essential to our increasingly computerized lives is being outpaced by our ability to secure it. Without discounting this concern, we argued that critical infrastructure is equally vulnerable to low-tech, low concept, physical assault, and that both the cyber and physical sides of the problem must be accorded equal weight in devising adequate protections.

It turns out we were not alone in our thinking. At about the same time that we authored our article, the Department of Energy (DOE), the North American Electric Reliability Corp (NERC), and a host of government agencies and utility companies were conducting a drill designed to test emergency responses to a widespread physical and cyber crisis affecting the power grid. And just weeks ago, the Department of Homeland Security (DHS) submitted a plan to Congress to create and fund an organizational structure within the government to address growing and changing risks to critical infrastructure. Among the key messages that DHS representatives communicated to legislators was an urgent need to include a comprehensive integration of both cyber and physical aspects into any national risk management and response structure. The close interplay of these elements in critical infrastructure requires a coordinated, “non-fragmented” approach, regardless of whether a threat comes from a human initiated operation or natural disaster. Further, while law enforcement has become more skilled at detecting large-scale threats

to major infrastructure, insufficient attention is directed toward “increasingly localized” threats. It is imperative that both government and the private sector be involved in managing the risks, because in this country the majority of targets—including more than 90 percent of energy infrastructure—are private assets. In other words, federal government oversight is a good start, but it is not nearly enough. Protecting the nation’s infrastructure requires cooperation and coordination at many levels.

Lessons learned from three rounds of GridEx “war games”

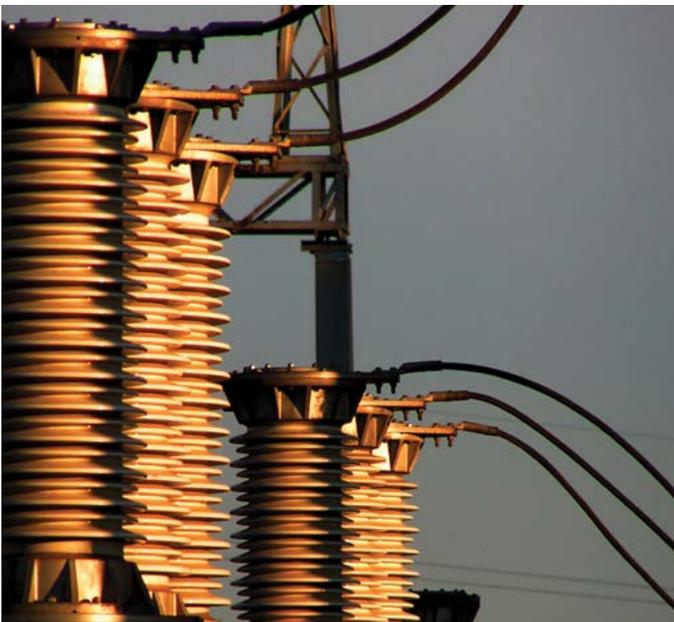
DOE and NERC, along with 10,000 individuals from 315 public and private organizations in the US, Canada and Mexico—including the FBI, the DHS, Department of Defense, utility industry executives and operators, electric generators, transmission and other infrastructure companies, law enforcement, and a host of local, state and federal government agencies—all joined forces for two days in November to participate in the third biennial “Grid Security Exercise” or “GridEx III” war games. The drill involves a massive simulated attack on the US power grid, with multiple black swan disaster events all striking simultaneously to test response and restoration preparedness in the energy and utility sector. The exercise is intended to strain systems in order to test vulnerabilities in prevention, communications, response, and restoration, and is based on the notion that if energy and communications systems are disrupted or fail for an extended period of time, the entire country is at risk. The non-public training exercise is conducted in a secured cyber environment, but also involves physical movements of spare transformers and other components around the country to replace infrastructure that is hypothetically destroyed in the simulated attacks. A group of observers monitor the events as they unfold, and a high level executive roundtable is conducted to discuss regulatory and policy challenges that arise as operators seek to respond to the crisis.

This year's exercise was expanded to include portions of Canada and Mexico in addition to US infrastructure, and reflected much larger participation than the two previous exercises. The last simulation in 2013 contemplated a series of events that left 30 million people without power for more than a month. This year's exercise pushed the envelope even further, recognizing that if the events being simulated were to occur, there probably would not be a return to "normal."

Industry operators were faced with coordinated cyber intrusions and physical assaults on grid installations by heavily armed terrorist squads and rogue drones; cyber-attacks on corporate computers and systems; physical and cyber-attacks on communications systems; infiltration of control systems, relays, and controls in substations and power plants; copycat attacks following the initial events; and a panicking public responding to misinformation spread on social media, among other crises. While some participants commented that the likelihood of an event on the scale of the simulation is extremely remote, the value of the exercise lies in the ability to identify strengths and weaknesses in US response and restoration efforts, including computer systems, physical equipment management, and communications and teamwork between industry participants, regulators, emergency responders, and the public.

NERC issues a report after each simulation, only part of which is released to the public. The participants in the exercise, however, have the opportunity to work closely with NERC and DOE to discuss the lessons learned, and to sift through the policy and legal challenges encountered during the drill, such as information and resource sharing, regulatory barriers, and integration of public and private efforts going forward.

By pure coincidence, GridEx III took place just days after the terrorist attacks in Paris. This meant that a number of drill participants were already operating in a state of highest alert, which, reports indicate, was noticeable in responses (timing and actions taken) to certain of the simulated events. Participants also reported that the communication between agencies, operators, and responders was relatively smooth, cooperative, and transparent. Other results were disappointing. For example, participants identified a number of areas where significant investment in prevention and detection of intrusion had been made after the 2011 and 2013 exercises, yet vulnerabilities still were apparent. Based on the information gathered in this year's drill, a worst-case attack could leave parts or all of some cities temporarily uninhabitable, even where tremendous dollars have been invested in grid security measures.



Among other lessons, we learned that: (1) the extensive legal and regulatory requirements that govern the design and day-to-day operations of the bulk power system may in fact be an impediment to restoration during a large-scale crisis; (2) the highly sophisticated North American grid can be operated more simply following a significant disruption to the systems that forecast load, monitor flows, dispatch generation, remotely operate equipment, and administer markets, but only at higher costs and reduced reliability; (3) restoration efforts following a major event that even approaches the scale of the scenarios tested in the drill will require unprecedented levels of financial resources to be made available to utilities; and (4) a clear order of priority of service is necessary following a large-scale outage to ensure that electricity needed to start generation and energize transmission and distribution lines is made available first, followed by “lifeline” customers such as communications, water supply and treatment, and hospitals, and it is helpful if the public at large (including elected officials) understands these priorities.

Implications of the cyber-attack on the Ukrainian power grid

In late December, barely a month after the GridEx III simulation in the US, western Ukraine lost power for six hours in what was attributed to a cyber-attack on the power grid.¹ An investigation of the event is ongoing, but initial conclusions have set alarm bells ringing for cyber security experts. Until this event, a number of commentators had remarked that the chance that a cyber-attack on the grid would result in physical damage is very remote. The Ukraine SCADA (Supervisory Control and Data Acquisition) attack appears to be the first known cyber-attack on civil infrastructure resulting in physical damage. The risk of this kind of attack is not isolated to the energy sector, but extends to all industries with operating control systems networked into the Internet. Experts warn that almost any system can be breached by a determined attacker. The risk of breach increases when the attacker is state-sponsored, as is suspected in a number of

recent cyber events worldwide (one federal power marketing agency recently reported that it had been the target of over 600,000 cyber-attacks from a single foreign entity over the course of one month).

The resulting power outage in western Ukraine left over 700,000 residents in the dark. One of the power distributors affected reported that 27 of its substations went dead, with 103 cities completely in the dark and another 186 cities with partial blackouts. A second power distributor reported 30 substations disconnected. At the same time, customers were unable to report the blackout because call centers were blocked. Rapid response by field operators manning substations, switching from automatic to manual mode, and manually reclosing breakers, enabled the restoration of power within three to six hours.

The attack involved multiple elements working together including the introduction of malware, a denial of service attack to overwhelm the capacity of emergency customer call lines, and the wiping of system files to obscure attack details. The attack was sophisticated and demonstrated planning and coordination. Investigators discovered malware BlackEnergy 3 had infected the operating system. There was an additional component discovered, KillDisk, whose precise function remains disputed. BlackEnergy and KillDisk were introduced into the network by “spear phishing” via a malicious Microsoft Office (MS Word) attachment, exploiting social engineering tactics that tricked the recipient into ignoring the built-in Microsoft Office security warnings. The malware spread from the infected workstation into the SCADA system, the control system that enables remote access and system operation, “blinding” the dispatchers to the unfolding damage. The blocking of customers’ ability to access call centers further obscured that an attack was in progress. This gave time for the third element to come into play, the wiping of files which made any restoration of service more difficult.

Reports indicate that similar malware has likely infected many industrial control systems used to run American critical infrastructure, with targets ranging from military systems to airports to energy and telecommunications firms. This malware also may have reached a host of other industrial control systems used in a variety

¹ This portion of this article is based on sources and information deemed to be true and reliable; however Dentons makes no representations to same.



of sectors, including health care, manufacturing, and transportation, among others. Many systems now connected to the Internet were designed in the pre-Internet era, and the underlying protocols and components take no account of modern Internet threats. With the Internet of Things transforming how we live, critical industries are at risk of becoming even less secure.

DHS advises that critical infrastructure asset owners should not assume their control systems are deployed securely, or that they are not operating with an Internet accessible configuration. Instead, asset owners should routinely and thoroughly audit their networks for Internet-facing devices, weak authentication methods, and component vulnerabilities. DHS warns that control systems often have Internet-accessible devices installed without the owner's knowledge, putting those systems at increased risk of attack. In the Ukrainian attack, the initial access to the system was gained through a complex and multifaceted spear phishing campaign, yet most companies do little to no training to prevent spear phishing (or any other type of social hacking, for that matter).

Almost any system can be breached by a determined and well-resourced hacker. As a result, companies need to invest in a multi-layered cyber defense plan for risk

mitigation, which should include security products, employee training, and education, and a ready-to-execute incident response plan to identify a breach and respond effectively. This is particularly important in connection with large-scale systems and processes that cannot be manually operated.

Changing sources of threats to infrastructure security and growing appreciation for the need for a different approach

Until recently, physical security risks have generally been managed independently from cyber risks. In the case of electric utility infrastructure, cyber security requirements have been in place for some time, but surprisingly, with the exception of nuclear facilities and certain other facilities, physical security standards are a relatively recent phenomenon. A large portion of grid infrastructure is unprotected. Security efforts for these structures have focused on issues such as access across private lands to trim trees and restoration efforts following severe weather. Less attention had been paid to the protection of facilities from attack.

Then, in April of 2013, a carefully planned and executed sniper attack on a California electrical substation near Silicon Valley prompted utility executives and regulators to assess the physical security of electric

utility assets that previously had been largely ignored. In that incident, the perpetrators cut underground communication cables connected to a relatively remote electrical substation, and then, under cover of darkness, opened fire on the substation equipment with automatic weapons. Over the course of approximately 20 minutes, they damaged 17 large transformers before police were able to respond. It took the utility a month to repair the equipment. The attackers were never caught.

The facility was not without security devices. The substation was fenced in, and there were security cameras, but they apparently were on the lookout for a threat of a different nature—one coming from within the fence, such as a substation fire. The region did not experience any power outages as a result of the attack. The facility was not deemed a “critical interconnect,” and operators—once they became aware of what had happened—were able to re-route some power around the damaged facility. Nevertheless, law enforcement officials speculate that the incident may have been a dress rehearsal for a more significant operation still to come.

The heretofore fragmented approach to infrastructure security is something DHS hopes to change with its new cyber and infrastructure protection structures. The agency specifically cited a “growing cyber threat, including potential for significant physical consequences,” a “heightened terrorist threat that is increasingly local,” and “more extreme weather events that impact critical infrastructure” as all pointing to a need for an entirely new mindset in addressing the problem. All aspects of the world we live in are increasingly interconnected, and cyber and physical functions should be considered in tandem. Current methods of managing risk tend to be siloed, often too heavily weighted toward responding to individual incidents as they occur. The risks are changing quickly. Only a few years ago, actions to prevent physical attacks were focused on terrorist activities by individuals and

organizations outside the US, aimed at preventing their members from entering this country. Now, these groups are turning to “homegrown” and “lone wolf” extremists to carry out their plots. In this country, we witnessed this in the 2013 Boston Marathon and in the 2015 San Bernardino attacks. Over the past several months, we have seen this also in Paris, Brussels, Turkey, and elsewhere. In the US, we have seen increased risks posed by a variety of other sources including private international and domestic hackers, anarchists, and state sponsored cyber-attacks. As DHS has recognized, and as the GridEx drills are demonstrating, because of the changing nature and source of threats, a broader perspective is essential. Everything must be considered together if prevention and response to disruptions are to be effective when disruptions occur.



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