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Integrating North America's Energy Markets: A Call for Action

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Executive Summary

As the energy and natural resources ministers of the three North American nations meet in Washington, DC in December 2014, there is a compelling case to be made for a new era in regional energy cooperation. Six issues should define this agenda:

- 1. Creating a mechanism that institutionalizes and adds stability to policy coordination efforts;*
- 2. Working with industry across the region to map out future supply and demand needs, both at the level of the region and for specific economic areas;*
- 3. Building infrastructure must respond to these supply and demand needs, and the three governments must work together with the private sector to meet them;*
- 4. Protecting critical infrastructure will require a concerted effort on the part of the North American governments, involving energy and security agencies;*
- 5. The most effective way to confront the human capital crunch and skills gap facing the energy industry in North America is for the three governments to work together and with the private sector to design curricula and programs that will train the next generations of workers required by the energy industry;*
- 6. Regulatory cooperation must be directed towards ensuring compatibility between standards and rules so that both public and private entities in the energy sector can operate seamlessly across borders.*

Introduction

In February 2014, the leaders of the three North American nations met in Toluca, Mexico, and determined a range of measures to enhance regional competitiveness, including new initiatives on transportation infrastructure, borders and research cooperation. Furthermore, the leaders agreed that, before the end of 2014, a North American Energy Ministers Meeting should take place to “define areas for strong trilateral cooperation on energy.” What these areas might be is still unannounced, but with the successful passage of energy reform legislation through Mexico’s Congress in December 2013, and secondary legislation in August 2014, many of the previously existing barriers to cooperation on oil and gas markets have now disappeared.

The prospects for an energy abundant North America are compelling. Combined, the three countries’ oil production compares favorably with those of the Middle East. As the United States surpasses Saudi Arabia as the world’s largest producer, and with

both Mexico and Canada on the verge of significant increases in production, North America's long-standing position as a hydrocarbons importer will then be reversed. Already, the dependency of the United States on imported oil has been greatly diminished by the combination of higher production and greater fuel efficiency standards in the United States, which has resulted in downward pressure on international oil prices.

The outlook for North American energy is therefore bright, and the transformation in the regional energy paradigm has been dramatic. From an obsession with energy security, the conversation has been transformed to a focus on energy abundance. This newfound abundance is commonly referred to as one of the major underpinnings of present and future regional competitiveness and it is indeed a crucial factor in the equation.

The outlook for North American energy is therefore bright, and the transformation in the regional energy paradigm has been dramatic. From an obsession with energy security, the conversation has transformed to a focus on energy abundance.

However, to achieve the full potential of this newly discovered regional energy wealth, it will be necessary to more fully integrate the three countries' energy markets. To date that integration has been haphazard at best, and it is far from being truly regional in nature. While there are interconnections between pipeline systems and electricity

grids, there has never been a sustained effort to plan across borders to maximize the efficiency of regional energy systems. Whereas private enterprise has long considered the potential for integrating electricity and oil and gas systems, national governments have done little to facilitate such a process. It is intriguing to note that state and provincial governments have been far ahead of their federal counterparts by recognizing and advocating for cross-border energy infrastructure projects and policy discussions.

There is more to the equation, however, than simply building pipelines and holding meetings between policymakers. This paper argues that, in order to make North American energy independence a reality, there are six main areas that require attention from the three governments, working together, to make the transition to an integrated North American energy system. These areas are:

1. Effective policy coordination
2. Mapping out future supply and demand
3. Building infrastructure to ensure that supply and demand needs are met
4. Critical energy infrastructure security cooperation, including cyber security
5. Preparing for the human capital crunch in the energy sector
6. Regulatory and standards cooperation.

Effective policy coordination

In December 2014, the energy ministers of the three NAFTA nations met for the first time since 2007. The fact that they had not met for seven years reflects both the traditionally closed nature of the Mexican energy sector and the tendency of Canada and the United States to manage relations bilaterally, rather than trilaterally. This is not, however, the first time that the three countries have attempted energy policy cooperation and coordination. In 2001, the North American Energy Working Group (NAEWG) was organized at the request of the three leaders, comprised of energy experts from the three countries and coordinated by the three Energy Ministries (the Ministry of Natural Resources Canada, the Secretariat of Energy of Mexico, and the U.S. Department of Energy). Its goal was to plan for the energy future of North America, conducting studies and proposing policy options to the three governments. In time, the NAEWG focused its efforts on regional regulatory cooperation and the exchange of energy market data, information and technology, all the while respecting the different legal frameworks and policy drivers of each country.

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Organized into nine Experts Groups, the NAEWG studied the issues of:

- regulatory frameworks;
- hydrocarbons;
- oil sands development;
- electricity;
- nuclear power;
- energy efficiency;
- science and technology;
- natural gas interconnections; and,
- energy data exchange.

In June 2002, the NAEWG published *The North American Energy Picture*, an overview of the oil, gas, electricity and coal sectors in each of the regional partners, providing an important analysis of the trends and challenges facing the NAFTA countries. Further publications followed in each of the nine issue areas, and the group came to be seen as an integral part of the North American cooperation architecture.

With the creation of the Security and Prosperity Partnership (SPP) in March 2005, the NAEWG took on the role of providing the intellectual capital for the SPP's Energy Working Group, with particular emphasis on implementing the North American Energy Security Initiative announced by the leaders of Canada, the United States, and Mexico in Cancun in May 2006. Energy security became the dominant paradigm of the day, with much credence lent to the notion of "peak oil," and the challenges of finding friendly suppliers (such as Canada and Mexico) for the United States. In this effort, stated priorities included:

1. Opportunities for collaboration on energy science and technology;
2. Energy efficiency standards; and
3. Identifying and overcoming barriers to deploying clean energy technologies in North America.

Other discussions involved energy regulation, nuclear energy and energy forecasts for North America. In 2006, the NAEWG published *The North American Energy Picture II*, a follow up to the 2002 edition, providing further evidence that there was ample statistical support and logic for coordinated policy planning.

However, with the demise of the SPP at the end of the second George W. Bush administration, the NAEWG ceased to exist as a functioning group. Starved of resources by governments, and given no support by the private sector, the NAEWG became just another part of the abortive institutional history of North America. The death of the SPP Energy Working Group and the NAEWG removed a mechanism that had allowed Canada, the United States and Mexico to explore and discuss the shared energy policy challenges in North America.

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The irony is that the NAEWG was extinguished as North America's energy industry was being revitalized. At the end of 2008, the shale revolution was picking up speed in the United States, Alberta's oil sand production was increasing impressively and Mexico had just passed through a stifled energy reform process that would nonetheless act as the precursor to the comprehensive energy reforms of 2013/14.

Given that the three countries have lacked any joint mechanism for studying the transformation, they were unable to produce a coordinated response to the change. Now, after a hiatus from collective analysis and discussion of the North American energy system on the part of the governments, they return to a world transformed. Mexico has its reform, the United States is producing in excess of 3 million barrels of oil more than in 2008, and Canada has seen its production increase by almost a million barrels in the same period. The major challenge facing the region in 2008 was one of meeting demand for oil; by 2014, policy makers and analysts had

switched their paradigm from scarcity to abundance. With oil production projected to increase still further, and with fuel efficiency standards and energy efficiency efforts holding consumption steady at the regional level, policy makers are now more concerned with the possibility of North America becoming a net exporter of oil.

However, the NAFTA partners are now in a unique position to provide such a mechanism. The coming together of a number of factors, including the Mexican energy reform that now allows for private participation in oil and gas exploration and production, and the dramatically altered energy security situation of the United States, proves there have never been more propitious circumstances for regional cooperation in the area of energy policy. Furthermore, there are very real and pressing issues to be discussed, including the thorny question of the Keystone XL pipeline and the highly politicized issue of aging and inadequate refining capacity and crude exports from the United States.

In light of the Trilateral Ministerial Energy Summit in December 2014, it is worth noting that the U.S. Department of Energy (DOE) is currently conducting its first Quadrennial Energy Review, and it is adopting a regional approach to the report. During the first year, the Review will focus on infrastructure issues, and the Energy Information Administration (EIA) is working on an infrastructure map that will include both Canada and Mexico for the first time. This resurgence of a regional perspective in the United States is highly encouraging and could provide the basis for a more institutionalized approach to trilateral energy relations in the future.

Following on from the energy ministers' meeting, there is therefore an opportunity to set in motion a process whereby increased communication and closer coordination of energy markets becomes the norm for the region. First, the ministers should institutionalize their meeting, committing to repeat it annually. Only with sustained cabinet-level attention can the ministries effectively implement strategies of continental coordination and collaboration. To add continuity to the process, the ministers should then dedicate "sherpas" from each country who would carry the trilateral agenda forward during the year.

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Ideally, however, the process of energy policy coordination would benefit from the creation of something akin to the experience of the NAEWG. With the developments in Mexico, as well as the tide of optimism over the oil production outlook in the United States and Canada, there is certainly an appetite in the three countries for an expert group, drawn from business, academia and think tanks, to come together to map out North America's energy present and future. Of course, for all the excellent analysis it had produced, the ideas generated in the energy working

group never reached the level of implementation. Clearly ministerial level leadership is needed to move from ideas to action.

It is vital to emphasize here that this is NOT a proposal for a supranational body. Unlike the coordination of energy policies in the European Union, a North American process would not pretend to set rules and regulations for the three sovereign governments, but rather work out ways in which their respective systems can become more compatible. The research dimension of the process would be of enormous use for both policymakers and for the private sector. It would be, in essence, an EIA for North America. Indeed, a standard feature of the most effective international institutions is their capacity for producing reliable information that can be used by all members.

Finally, it is important that the process of cooperation between the three NAFTA partners includes the private sector and academia, as well as sub-national governments, in an explicit and open way. The current climate of cooperation in the region is one that benefits greatly from the perspectives and involvement of these non-federal government actors, and it will allow for healthy cross-pollination with the broader regional competitiveness agenda.

The future of North America's energy demand and supply¹

For geographical reasons, energy trade in the region is dominated by the bilateral relationships between Canada and the United States, and between the United States and Mexico, with a negligible trade between Canada and Mexico. Although the Canada-U.S. relationship is by far the more developed of the two, with over \$140bn dollars of trade (out of a total commercial relationship of around \$700bn). This reflects rising oil exports from Canada, with a transnational oil and gas pipeline network that runs North-South as opposed to East-West. Just as importantly, the electricity transmission network between the two countries is so highly integrated that it makes sense to think of the two countries as sharing a single transmission system. By contrast, Mexico's oil trade with the United States has been declining in recent years as Pemex production has stagnated and fallen, and U.S. gas exports to Mexico have not been able to grow due to a lack of excess capacity in the limited cross-border gas pipeline connections. Electricity trade has similarly been limited due to a lack of cross-border connections, with only a handful of bi-directional links scattered across the breadth of the border.

U.S.-Canada energy trade:

Canada depends almost entirely on the United States as an export market for energy. In 2013, Canada sent 97 percent of its oil exports to the United States, cementing its position as the number one supplier of crude oil. Canada exported 2.6 million bbl/d of crude oil, showing an increase of 59 percent in the past decade, and providing one-third of all oil imports. While western Canada, especially Alberta, is

¹ All figures taken from the Energy Information Administration www.eia.gov

the main source of crude exports to the United States, eastern Canada imports crude oil from the United States. This reflects both the higher oil consumption and lower production of eastern Canada, as well as the fact that the pipeline network is oriented North-South as opposed to East-West. Canada imported 133,000 bbl/d of crude oil in 2013, the only country to import crude from the U.S. However, Canada

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also imported a total of 415,000 bpd of petroleum products from the United States.

A major challenge for Canada in the coming years is the question of how to get its growing oil production to market. Alberta expects to double its current oil production within the next

15 years, meaning that total Canadian oil production would rise to 6.4 million barrels per day in 2030, compared with 3.5 million bpd in 2013. This will mean almost 3 million bbl/d more that need to find their way to refineries and then to regional or global consumers. With limited pipeline and refining capacity, and with rising production in the United States, Canada needs to look for alternatives to get its product to tidewater.

The natural gas relationship between the two countries shows some similarities to oil. Although Canada has traditionally been the most important source country for U.S. gas imports (again, around 97 percent of the total), this is changing as American national production from shale has risen so prodigiously in recent years, and the total amount of Canadian gas imported by the United States has fallen from 3.8 Tcf in 2007 to 2.8 Tcf in 2013. At the same time, Canadian gas production has been rising, and Canada, like the United States, is now considering exporting LNG to global markets. This is a dramatic shift from only a few years ago when both the United States and Canada were planning to import LNG gas from global suppliers. As with oil, the gas pipeline network is (with the obvious exception of the TransCanada pipeline) structured in a North-South alignment, with gas flowing from western Canada to the western and Midwestern United States and eastern Canada supplying much of the northeastern United States.

As noted above, the electricity systems of the United States and Canada are so highly integrated that it makes more sense to think of them as one system. Canada exports an enormous amount of power south, totaling 58bn kWh in 2012, whereas the United State exported 11.4bn kWh northwards. Both Manitoba and eastern Canada (especially Quebec) are major sources of power for the Midwest and Northeast, whereas the Pacific Northwest exports large amounts of hydroelectric power to British Columbia during periods of high water in rivers in the spring and early summer.

U.S.-Mexico energy trade

Mexico and the United States have a similarly interdependent relationship to that between the United States and Canada. The United States has traditionally relied on Mexico as one of its major suppliers of crude oil, while Mexico depends on U.S. markets for its exports. Given the fact that Mexican oil, to date, has been produced either in the Gulf of Mexico or from onshore fields around the edges of the Gulf, oil has been moved primarily by oil tanker to Houston and Galveston refineries, where it is refined and then either sold in the United States or re-exported back to Mexico.

Mexico has typically been one of the top three exporters of oil to the United States, with 850,000 bbl/d of crude oil exported to the United States in 2013, behind Canada and sometimes Saudi Arabia. Mexican oil exports have been in steady decline since 2004, when Pemex reached its peak production of 3.4 million bbl/d, with exports to the United States at 1.6 million bbl/d, but that drop off in production has been more than compensated by rising U.S. national production. Of course, the

The refinery deficit has also meant, of course, that Mexico has been a major importer of refined product from the United States, with a particular dependency on gasoline imports.

crude that is being produced in the United States is of a very different quality than Mexican Maya blend; whereas the new oil production from shale and tight oil fields in the

United States has been predominantly light, sweet crude, Mexican exports have traditionally been heavy and sour. This means that new production in the United States has not been able to directly substitute for declining Mexican production in Gulf coast refineries, the majority of which are equipped for heavy crude. Mexico depends on U.S. refineries to process its crude, given the lack of new refinery capacity in Mexico over the past 2-3 decades. The refinery deficit has also meant, of course, that Mexico has been a major importer of refined product from the United States, with a particular dependency on gasoline imports.

Looking ahead, it is likely that the recent reforms in Mexico will enable the growth of production there to 3.75 million bbl/d by 2040, according to EIA estimates. Most of that production will continue to occur in or around the Gulf of Mexico, meaning that the majority will continue to be heavier crude. However, there is cause to believe that Mexican shale production will begin to pick up after 2020, which will likely mean an increase in production of lighter crude. This may help Mexico to satisfy its national demand for lighter crude, which it needs in its refinery mix to be able to handle the heavier crude generally produced. At the present time, Mexico does this through its Olmec and Isthmus crude streams.

The natural gas story between Mexico and the United States is radically different to that of oil. With declining prices in recent years, Pemex reduced production of gas and focused more heavily on trying to shore up its production of crude. This meant

that the country has experienced repeated shortages of natural gas, especially for generation purposes, which has led to calls to increase pipeline capacity to bring in more gas from the United States. Already, the United States is the most important source of Mexican gas imports, with 620 Bcf (out of a total of 720 Bcf) coming into Mexico via pipelines in 2012. With the construction of the major new gas pipeline projects, which will be operational by 2017, the capacity for bringing cheap U.S. gas to Mexico will be dramatically increased. Of course, this is only part of the gas transportation infrastructure challenge faced by Mexico. Its national coverage is also woefully underdeveloped. A simple comparison between Mexico and Texas serves to highlight the scale of the challenge. Whereas Texas has over 94,000 km of gas pipelines, Mexico's total is only a little over 11,000 km. Even with the completion of an ambitious national pipeline strategy that is currently underway, Mexico will only reach 16,000 km by 2018.

Infrastructure limitations have also impacted the electricity trade between Mexico and the United States. Although there is a small trade in electricity between Baja California and California (primarily from the Cerro Prieto geothermal plant to the City of Los Angeles) and limited imports into northern Mexico from Texas, the presence of only 1,271 MW of cross-border transmission capacity means that the opportunities for building that trade are minimal. Over the past decade, Mexico has been a modest net exporter of electricity to the United States,

Infrastructure limitations have also impacted the electricity trade between Mexico and the United States.

exporting a net 683,000 kWh to the United States in 2012. Sempra's privately owned and operated 230,000-volt transmission line across the U.S.-Mexico border near La Rumorosa, in Baja California, will

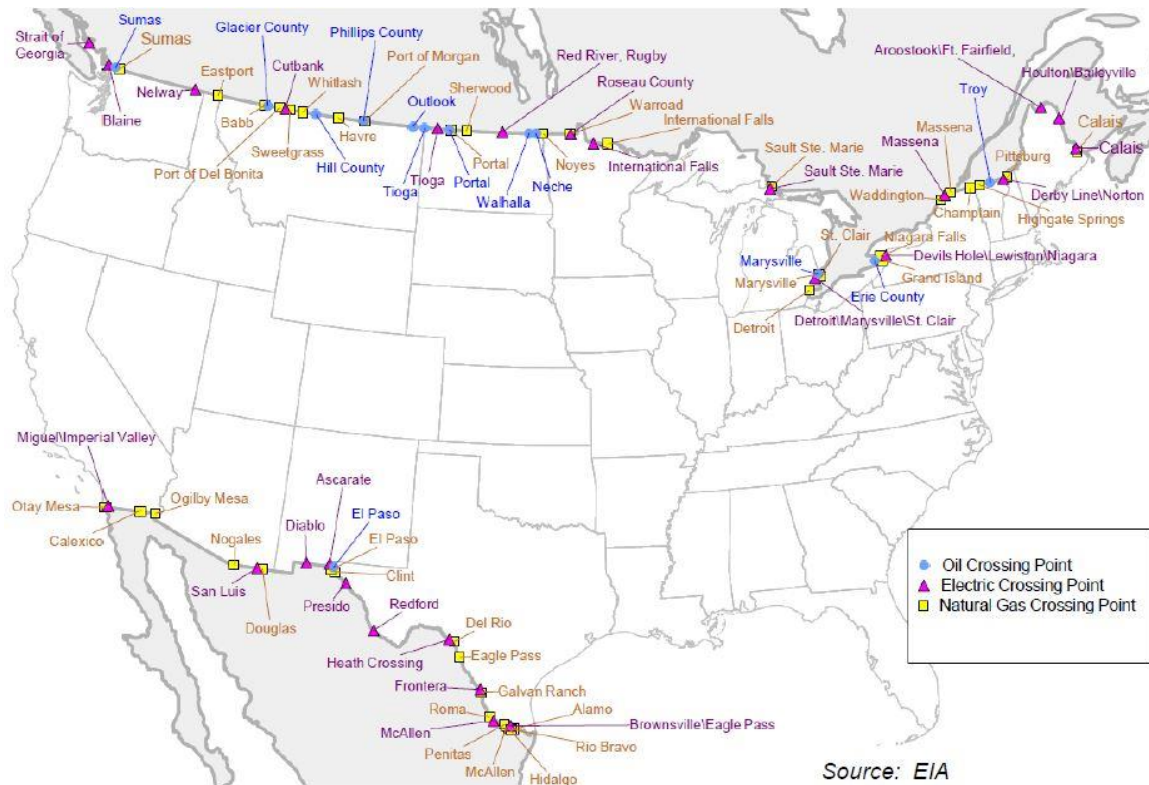
increase that trade. However, it is an isolated case and there is no general vision for increasing ties between the two electricity systems, despite the fact that there have been talks between the two governments since 2010 over the need for improved transmission between the two countries. There is clearly an urgent need for a new injection of vigor into the process of approving and obtaining presidential permits for cross-border transmission lines.

The future of energy trade in North America and the need for infrastructure investment

While it is easy to predict that energy trade between the North American partners will increase, it would be useful to identify which areas of the region are likely to see higher flows of molecules and electrons moving back and forth. First, given the rising production from Alberta's oil sands, it is reasonable to expect that there will be higher levels of crude flowing south to the United States in the near future. At the current time, the debate over Albertan synthetic crude has been focused on the travails of the Keystone XL pipeline and the drawn-out process of securing permits.

But regardless of the pipeline expansion, the oil is already being exported to the United States, and in particular to Gulf Coast refineries, by rail. This has raised a host of public safety issues, particularly after high-profile tragedies such as the accident that took place at Lac-Mégantic, Quebec, where 47 died in July 2013. Although this case was of U.S. crude moving north, the implications for Albertan exports are clear, especially as Canadian production increases to over 6 million bbl/d.

Map 1: North America Border Energy Infrastructure (source: EIA)



Second, if and when Mexican shale oil production picks up, there will be a need to move significant quantities of crude from inland fields in Chihuahua, Coahuila and Tamaulipas. This crude could move to refineries in Mexico, across the border to Texas-based refineries, or to the coast for export. Depending on the scale of the production from Mexican shale, pipelines are probably the most logical, economical and safest option.

Third, if we combine rising production from both Canada and Mexico, there may be a need for infrastructure to move more than 4 million additional bbl/d by 2040, as well as new refinery capacity to handle this new production. This does not take into consideration rising U.S. domestic production, which may add another 3 million bbl/d in the next decade. Of course there is the choice to either refine this crude in the region, or to export it to countries which will consume it and have the required refinery capacity in situ. Either way, the crude will need to move across the region to find either refineries or ports from where it can be exported.

If we consider the export potential of the region, there is clearly a need for pipelines that can move Canadian crude to tidal waters, on either the Atlantic or Pacific coasts. The option of exporting to Asia, where the most impressive growth in demand has occurred in recent years, is one that must be seriously considered by policy planners. Although the construction of a pipeline to carry Albertan crude to the Pacific coast for export to China has been used largely as an implicit threat by Canadian authorities in their declarations concerning the Keystone XL pipeline, at some point rising regional production will make such infrastructure a necessity.

In addition to the challenge of getting crude to tidal waters, exporting crude or refined product from North America will require port infrastructure investments. At the present time, there is infrastructure in place to allow for massive imports of crude into the United States. Adjusting to an export scenario should not be a major problem, but the logistics will need to be taken care of. For Mexico, rising production may necessitate looking for new markets in Europe and China if the United States cannot absorb all of the new crude.

On the gas front, there are impressive infrastructure projects underway to increase the linkages between the United States and Mexico. The Los Ramones, San Isidro-Samalayuca and Ojinaga-El Encino pipelines will dramatically change trade in gas between the two countries, allowing the Mexican economy to take advantage of the cheaper fuel source and convert existing fuel-oil generation plants. One of the main benefits of this process will be cheaper electricity for Mexican consumers, and there is also now an opportunity to grow the natural gas economy in Mexico. The government has recently announced an ambitious plan to build a gas pipeline network that will cover national territory, enabling the installation of natural gas distribution networks in cities and industrial areas.

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Thinking far ahead, the abundance of cheap gas in North America has raised the prospect of converting some of the automobile and truck fleet from gasoline and diesel to natural gas. Such a project would require massive investments by the private sector to build the sales network, either through existing gasoline stations and truck stops, or through green field projects. Governments may want to consider tax incentives for encouraging this development, given the potential economic and environmental benefits.

The three governments also need to consider the potential for exporting LNG from the region. In 2014, this acquired a new geo-political significance with the annexation of Crimea by Russia and the threat of interrupting natural gas supplies to Europe. Some existing LNG re-gasification plants may be converted to

liquefaction plants for export, but it is likely that this will not suffice. Planning LNG export capacity on a regional basis would allow for optimal site location and would help to eliminate duplication of efforts.

Canada has been leading the way in this regard, with a total of 20 companies applying for LNG export licenses (11 of which have already been approved). The majority of these export terminals are planned to be built on the West coast, to serve the Asian LNG trade. Japan is likely to be a leading consumer of North American gas in the short term, with China rapidly catching up and then surpassing it. Of course, both Mexico and the United States are also considering re-engineering

LNG import plants, which would provide an impressive export capacity.

When it comes to cross-border transmission lines, the issue has been a topic of discussion between Mexico and the United States since at least 2010, but little progress has been made.

For electricity markets, the potential to develop both traditional and renewable electricity sources will depend on major investments in electricity transmission. When it comes to cross-border transmission lines, the issue has

been a topic of discussion between Mexico and the United States since at least 2010, but little progress has been made. As mentioned above, there is enormous potential for cross-border trade between the United States and Mexico, both to satisfy demand in each country and to export cheap electricity from Texas to Mexico and then re-export to Central America. The problems posed by permitting, siting issues, and NIMBY-ism will continue to plague the process of building new transmission capacity, but establishing common guidelines and compatible standards for the planning and building process would be welcome.

Critical infrastructure security

With a focus on building new infrastructure and linking energy markets in the region, the three North American governments must also consider the physical and cybersecurity of the regional energy sector. Critical infrastructure security and resilience (CISR) has been a priority for regional security collaboration since 9/11, but despite extensive consultation between the three NAFTA partners and some progress on questions of cross-border emergency response, information sharing and joint exercises, there has been little achieved in terms of preventing attacks on critical infrastructure. A renewed political commitment to regional long-range consultation, planning and spending is needed to strengthen the agenda and to mitigate the risk from both natural and man-made threats.

The energy sector is particularly vulnerable to these threats, especially in light of ongoing pipeline theft and threats from organized crime and terrorist groups to

pipelines, refineries and generation facilities, and increasingly violent weather in North America. As a recent Wilson Center paper by Brian Bow has argued,

“If CISR efforts are not properly aligned among North American partners, disruptions may not be effectively contained, emergency responses may be slowed or rendered ineffective, and uncertainty about policy compatibility may undermine confidence in infrastructure services.”²

Bow goes on to argue that there needs to be a cross-government effort made to prevent attacks on critical infrastructure. In the energy sector, intelligence agencies must work alongside energy ministries. The Department of Homeland Security, Public Safety Canada, and Mexico’s intelligence service CISEN “should therefore create a trilateral expert panel to develop a strategic framework for long-term CISR planning in North America, mapping out a set of goals, timetables, and spending commitments.” Bow suggests that the expert panel be charged with “working out a three-year strategy to get past the current impasse, with particular attention to “re-booting” the working relationship between public- and private-sector players.”

A renewed political commitment to regional consultation, planning and spending is needed to strengthen the CISR agenda and to mitigate risk from both natural and man-made threats.

The human capital challenge

The energy sector is one of the most innovative and dynamic sectors of the economy, which in recent years has shown an impressive capacity to adapt to changing conditions, and to completely revolutionize both its mode of production and its level of performance. Technological advance has of course been a central element in this revolution in recent years, but spending on technology without concurrent human capital investment would mean a lack of a workforce trained adequately to be able to use the new technological advances.

Human capital investment is crucial for the energy sector in the following dimensions:

- a) Individuals: a greater investment in training and education leads to higher quality employment, higher salaries, and the creation of a career-track

² Brian Bow, “Now for the Hard Part: Renewing Regional Cooperation on Critical Infrastructure Security and Resilience”, Woodrow Wilson International Center for Scholars, 2014, <http://www.wilsoncenter.org/publication/now-for-the-hard-part-renewing-regional-cooperation-critical-infrastructure>

employment trajectory. More and better training, therefore, leads to higher professional satisfaction.

- b) The industry: through investment in better training, the industry benefits by gaining access to the skills base it requires to increase production, lower costs, and remain competitive. Providing more and better-trained workers will ensure competition for valued jobs and help to keep salary costs down. Most importantly, firms will see higher levels of innovation through investing in human capital development. This innovation will not only involve the development of new technologies, but also new procedures and workplace practices.
- c) The regional economy: human capital development for the energy sector will likely see a positive spillover into other sectors of the economy, as many of the skills and much of the knowledge base is transferable to other industries. Similarly, a more efficient and effective energy sector should lead to lower energy costs, providing an important boost to manufacturing and, therefore, to national competitiveness, as witnessed in the United States in recent years. Lastly, the region as a whole will benefit through a rising GDP.

During a 20-year downturn in the oil and gas sector in the 1980s and 1990s, the industry failed to adopt a long-term, strategic view in the human capital arena, failing to recognize that finding the right talent today may not be enough to face the needs of tomorrow. Another significant factor is the negative image that the hydrocarbons sector has acquired since its heyday in the 1970s. Commonly cast as a dirty, outdated and primitive industry, big oil has failed to demonstrate to the public, especially younger segments of the population, that it offers an exciting, international, modern, well-paid and technology-rich career path. The connection between major hydrocarbons companies and climate change is just the latest in a series of negative connotations. Earlier generations struggled with the link between those same companies and oil spills; throughout, the industry has suffered from an image that is connected with geopolitics, corruption and graft. This has happened at the same time as other firms in other areas, most notably the high technology and internet sectors, have portrayed themselves as “cool” and progressive employers, and have offered highly competitive compensation packages.

Energy firms have been slow to absorb the full implications of the shift from baby-boomers to Generation X, to Generation Y, to Millennials. Numerous studies have shown that today’s youth is less interested in financial reward and more concerned with issues such as career satisfaction, flexible work-hours and schedules, and the opportunity to travel. A fourth element, namely the social and environmental responsibility of the employer, has traditionally been an Achilles Heel of the energy sector, so often involved in environmental disputes and political scandals.

Around the world, national education systems have not been able to develop sufficient human capital resources to satisfy demand from the energy sector. In the rich countries, this has been seen in the long-term decline of engineering degrees, and their education systems have failed to persuade enough students to choose

educational career paths that focus on the STEM (science, technology, engineering and mathematics) subjects.

In order to effectively address these challenges, a range of solutions must be sought at the regional level, employing a range of different organizations. The involvement

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of both public and private actors will be essential, and both governments and firms should consider partnering with academic institutions and civil society organizations to ensure a more comprehensive implementation of their programs. Incentives must be evaluated for the short-,

medium- and long-terms, and should focus on more than simply monetary compensation. The three energy ministers should look to existing mechanisms such as university exchanges, internship programs, and industry associations to develop a joint approach to the skills gap in the energy sector.

Regulatory Compatibility

One area that would provide immediate benefits both in terms of efficiency for the private sector, and environmental protection and industrial safety, is regulatory dialogue between agencies from the three nations. There are a number of good reasons to promote this dialogue. First, in the case of trans-border infrastructure, such as pipelines or transmission lines, it makes no sense whatsoever for standards to differ. A pipeline that crosses the U.S.-Mexico border, for example, will by necessity be the same gauge, and it should meet identical safety standards on both sides of the border.

A second issue involves the so-called “social license”, that is the need to secure community approval before breaking ground on major projects. The energy industry as a whole faces serious challenges in gaining public consent for big projects. As a recent Op-ed argued,

“Projects regularly take years to approve; Keystone is not unique. Everyone wants to use energy, but no one wants it transported across their back yard. And it does not make much of a difference if the energy is produced from fossil fuels or renewable sources.”³

³ Rachel Bronson and Duncan Wood, “Confronting Challenges to North America's Energy Future”, Forbes.com, 12/12/2014, <http://www.forbes.com/sites/themexicoinstitute/2014/12/12/confronting-challenges-to-north-americas-energy-future/>

Similar standards for safety, environmental protection and the establishment of accepted industry best practices would not eliminate public antagonism to energy infrastructure projects, but it would provide an opportunity for learning between regulators. Canada's Ministry of Natural Resources successful experience in negotiating with First Nations communities and involving their people in energy projects is being studied by the United States and provides one example of how governments and industry can benefit from shared experiences.

Third, there are a number of areas in the region where shared resources require compatible regulations. The forthcoming wave of E&P activities in Mexican deep waters in the Gulf of Mexico has raised concerns about the quality of regulatory standards there. Post-Macondo, the United States imposed a new regime in which

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offshore operators in the Gulf must now have a Safety and Environmental Management System (SEMS) in place. The two main actors in this new offshore regime are the Bureau of Safety and Environmental Enforcement (BSEE), the new offshore regulator, and the Center for Offshore Safety (COS), created under the

technical standards unit of the American Petroleum Institute, the industry's trade association. The Mexican industrial safety and environmental protection regulatory agency, the Energy, Safety and Environment Agency (ASEA, formerly ANSIPA) should adopt standards that are compatible with those of the SEMS to avoid a potential tragedy of the commons. Furthermore, it is imperative that agencies from both governments continue to engage in a conversation over regulations to ensure that the highest safety and environmental standards are maintained without overburdening the industry. The conversation will be of particular importance over the next few years as the ASEA begins its existence and seeks to bring itself up to speed with regulatory international best practice.

Fourth, the determination of energy efficiency and emissions standards makes far more sense at the regional rather than the national level. Given the shared economic space, and the high level of integration between both markets and production systems, it is logical for all three countries to adopt similar standards in these areas. Already, we have seen some convergence in energy efficiency standards, with Mexico adopting variations of both Energy Star and U.S. fuel efficiency standards. However, on the question of emissions, the three NAFTA countries exhibit significant differences. Whereas Mexico is adopting a clean energy certificate and carbon tax system, the U.S. federal government has focused on regulating emissions through the Environmental Protection Agency (EPA), alongside State-level government renewable energy and climate change standards. In Canada, recent Federal government approaches have focused on investing in carbon capture

technologies, and energy efficiency and clean air legislation. Current environmental and market realities should now push the three governments to work together on a common approach to emissions, so as to both improve the impact of these standards, and to avoid any unnecessary market distortion at the regional level.

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In these areas the regulatory conversation should focus on ensuring compatibility between standards and rules so that both public and private entities in the energy sector can operate seamlessly across borders at the same time as high environmental standards are respected. A simple place to start would be a

conversation between the three governments over a common set of principles that should guide regulation, including transparency, public consultation and stakeholder engagement, and a commitment to employing international best practices, including a reliance on hard science and evidence-based approaches.

Conclusions

As North America begins to appreciate the significance of a new era of energy abundance, the time is right for increased collaboration. The former paradigms of energy nationalism, energy security and high prices are, for the time being at least, being replaced by market-based approaches, new supplies and low prices. The common challenge of improving infrastructure to allow energy to get to market, both within the region and globally, should drive the three governments to closer collaboration with each other. The creation of a unified energy marketplace in North America, will not only help to improve energy supply, but also drive economic competitiveness.

A first step towards this reality would be for governments and regulators to develop a regional planning mechanism that allows them to interact more regularly and to exchange information. The historical example of the NAEWG demonstrates that this coordination is not only possible, but can be highly productive. It is time for the three governments to create something similar that can drive the collaborative process forward.

Building new infrastructure and linking energy markets more completely will also necessitate a more collaborative approach to critical energy infrastructure security. As Brian Bow has argued, to date, the regional conversation on this issue has been rather stunted, and it is time to coordinate national approaches.

Governments will also need to cooperate to meet the urgent challenge of the skills gap in the energy sector. Developing regional schemes for both university and technical qualifications, and facilitating internship arrangements across the North

American space, would go a long way towards improving the human capital pool for the industry.

Lastly, to ensure that integrated regional energy markets function smoothly, regulators must work together to jointly develop rules, standards, norms and procedures. Avoiding a tragedy of the commons is only one, albeit the most critical, reason why this must be a priority for the three North American partners.

North America's energy future is bright. With improved cooperation and a commitment to an ongoing conversation between governments, regulators, stakeholders and the private sector, there is good reason to predict that this can be sustained, and can continue to drive competitiveness and prosperity long into the future.

About the Author

Duncan Wood is the director of the Mexico Institute at the Wilson Center. Prior to this, Wood was a professor and the director of the International Relations Program at the Instituto Tecnológico Autónomo de México (ITAM) in Mexico City for 17 years. He is a member of the Mexican National Research System (level 2), a member of the editorial board of *Foreign Affairs Latinoamérica*, and has been an editorial advisor to both *Reforma* and *El Universal* newspapers. In 2007, he was a non-resident Fulbright Fellow and, between 2007 and 2009, he was technical secretary of the Red Mexicana de Energía, a group of experts in the area of energy policy in Mexico. He has been a Senior Associate with the Simon Chair and the Americas Program at the Center for Strategic and International Studies (CSIS) in Washington, D.C. His research focuses on Mexican energy policy, including renewable energy, and North American relations. He studied in the UK and Canada, receiving his PhD in political studies from Queen's University, Canada, and is a recipient of the Canadian Governor General's Visit Award for contributions to the Mexico-Canada relationship.