



NAEWG/SPP



The North American Energy Working Group / Security & Prosperity Partnership

NATURAL GAS WORKSHOP REPORT

La Jolla, June 28, 2006



INSTITUTE OF THE AMERICAS

*Promoting public policies for development,
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Workshop Report¹

Nelson Altamirano

The North American Energy Working Group (NAEWG) asked the Institute of the Americas to host a one day Natural Gas Workshop that congregated 36 experts from the public and private sectors of Canada, Mexico and the U.S. The objective was to exchange perspectives on the challenges facing future natural gas supply and delivery, focusing specifically on the supply picture for North America, liquefied natural gas (LNG) and pipeline infrastructure. Demand and market interactions were left aside explicitly for potential future workshops. It is expected that the outcomes of this one-day workshop will form the foundation for writing the North American Natural Gas Vision II report to be released in 2007.

¹This document incorporates some of the comments, ideas and editing efforts made by 3 great reviewers to a preliminary draft: Dan Cowan (Natural Resources Canada), Andrea Lockwood (U.S. Department of Energy) and Virginia Doniz (SENER).

Workshop Presentations Can Be Downloaded from:
<http://www.iamericas.org/pdfs/Presentations/Energy/2006NaturalGasWorkshop/>

List of Participants – See Annex I



Natural Gas Flow in North America

The governments of Canada, Mexico and the U.S. recognize that a sustainable energy supply is essential for the prosperity of North America, and that natural gas supply, in particular, is a key element of the North American Energy Security Initiative, mandated by the leaders of the three countries in 2006. To understand why natural gas supply is at the center of both economic prosperity and energy security in the region we have to recognize key industry characteristics. On the supply side, the U.S. and Canada are the 2nd and 3rd largest natural gas producers in the world. However, while Canada will continue to be a net exporter over the long term, market forecasts and projections for 2010-2020 emphasize that Mexico and the U.S. will increasingly rely on overseas natural gas supply (LNG) to meet their respective growing natural gas demands. Canada is also expected to import LNG, both to serve East Coast Canadian markets remote from Western Canada supply sources, as well as for export to the U.S.

Natural gas demand growth in North America is largely driven by electricity demand and, as we know, electricity is vital for economic prosperity. North American economic development may become increasingly dependent on overseas natural gas imports for a growing share of natural gas needs rather than the previous overwhelming reliance on internal North American gas resources. Given this new trend, the three governments are committed to developing sustainable and secure energy supplies, and are interested in gaining the input of the private sector to ensure that optimal development and access to supplies occurs.

Four key issues were set forth at the outset of the workshop to guide the discussion sessions. The first issue was whether or not the picture concerning local North American supply was correct for the near future. The second was assuring additional supply: Where will supplies come from? What needs to happen to ensure optimal development? The third issue focused on LNG

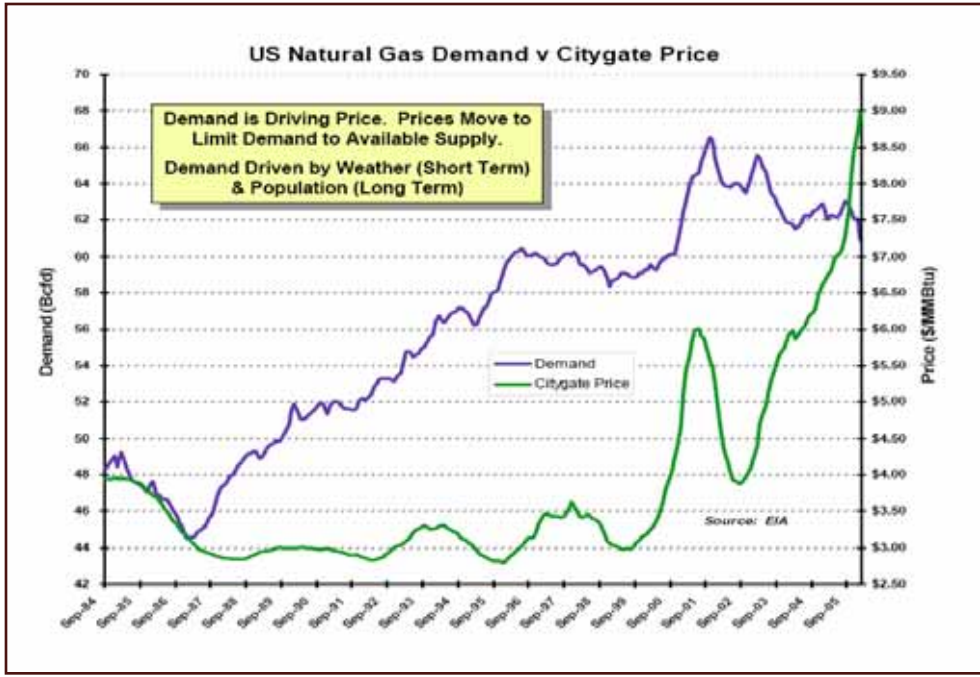
and how both supply and new facilities would ensure optimal access and competitive prices. The last issue was about infrastructure: What are the permitting and licensing issues that need to be addressed to assure optimal development of infrastructure? Where are the bottlenecks in existing infrastructure?

The workshop's structure allowed participants to more or less separate these questions among the three sessions. The questions and issues about supply and demand were addressed in the first session. LNG topics and infrastructure were discussed in the second and third sessions respectively. Given this format, this report organizes the main ideas discussed per session centered on the key questions, and at the end of each section a brief response to the questions posed. This report concludes with a summary of the wrap-up session, and some points for possible inclusion in future workshops.

FIRST SESSION – NORTH AMERICAN DOMESTIC NATURAL GAS SUPPLY

Canadian natural gas production is around 6 trillion cubic feet (TCF) per year and remaining natural gas resources (discovered and undiscovered) total 447 TCF. These resources include conventional gas, unconventional (80 TCF) and Mackenzie/Beaufort (61 TCF). If we consider that conventional gas produced so far is 150 TCF, there is abundant natural gas left to produce. At actual rates of production, around 18 billion cubic feet per day (BCFD), there is enough natural gas for the next 57 years. Positive prospects include the development of non-conventional gas. Public projections assume that natural gas from coal production will grow from 0.65 BCFD in 2006 to 3.4 BCFD by 2020 and, that the Mackenzie project will start up with 1.2 BCFD by 2012 and grow to 1.8 BCFD by 2018. Given these non-conventional developments and schedules, Canadian natural gas production by 2020 would be the same as 2005, around 6 TCF per year.

The U.S., on the other hand, is facing the continuous decline of natural gas production in spite of the impressive increase in the number of wells drilled in the last few years. While production declined from 53.7 BCFD in Jan 2002 to 50 BCFD in Jan 2006, the number of wells drilled increased from 370,000 to 435,000 for the same period. Drilling is happening at traditional basins in the form of "more straws into the same cup," so the result is lower productivity per well. Furthermore, since 2003, the huge increment in drilling activity has not stopped natural gas output from dipping. The likelihood of a change in this picture in the near future is almost zero. There are no new basins to be drilled and most participants stated that Alaska is not going to be developed in the near future. So, contrary to the Canadian supply, the U.S. natural gas domestic supply is expected to continue declining in a



Demand keeps rising even with higher natural gas prices.

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Slide from Laird Dyer's "Natural Gas Supply Demand Fundamentals"

context where demand seems to continue growing. It is expected that U.S. imports will increase from its current 12 BCFD (10 BCFD from Canada and 2 BCFD from non-North American sources (as LNG), mainly from Trinidad & Tobago and Algeria).

While the NAEWG had agreed that the demand profile would be better taken up in a separate workshop, some ideas about price behavior and LNG attractiveness were explained. In the short term, natural gas prices adjust demand to available supply, and demand drives price movements. It was suggested that oil prices directly impact natural gas prices, and one speaker posited that the demand for natural gas is inelastic. The participant showed data evidencing that price increases have not caused demand to decrease. Demand keeps rising even with higher natural gas prices. In today's market, demand is only limited by supply and LNG does not affect prices, volumes are too small. However, price increments could cause consumers to substitute and switch among fuel alternatives. Natural gas, for instance, competes with fuel oil and residual fuel oil — for this reason, the price of natural gas tends to move within the price band set by these two competing fuels. It was also mentioned that the increment of U.S. natural gas prices have not attracted more LNG cargoes into this country. There has been a spike of natural gas prices in the last three years in a range from \$6/MMBTU to \$11/MMBTU with no visible demand reduction. However, these

prices are still lower with respect to other markets in Asia and Europe, and LNG cargoes are not attracted to the U.S. market. Furthermore, some participants felt that LNG would not come to North America in winter because Europe and Asia would outbid us for supply. Most LNG deliveries were expected in the summer, to fill storage or satisfy power generation requirements. It appears that relatively low prices, lack of diversified natural gas storage facilities, and seasonal world demand are the main reasons explaining the inability of U.S. markets to attract LNG and increase natural gas supply.

Mexico's natural gas supply outlook is closer to that of the U.S. than of Canada. Supply is declining at a quick pace in traditional basins of associated gas and there are insufficient efforts to offset this reduction with exploration in non-traditional areas. Current levels of domestic production and imports for 2006 are 5.3 BCFD and 0.4 BCFD respectively. While current proved reserves of 20 TCF could last only 10 years at actual production rates, total gas resources (proved, probable and possible reserves) of 62.4 TCF would last 30 years. Mexico's challenge is to explore and certify natural gas reserves in the Northern region to secure medium term supply stability. PEMEX officials predict production levels should be between 6 and 7 BCFD from 2006 to 2020. To achieve these levels most of the output has to come from new reserves starting in 2009. By 2020, 75% of natural gas

output has to come from new fields. Given that Mexico's Energy Secretariat (SENER) mandates PEMEX to prioritize oil exploration, PEMEX has primarily focused on associated gas. However, it needs to develop new reserves and much more investment is needed for non-associated gas. The new elected government has the chance to allow PEMEX or private investors to invest in non-associated gas exploration. Without significant policy changes, Mexico may suffer a growing shortfall of domestic natural gas in the near future.

Given all these points, herewith are some brief responses to questions expressed at the beginning of the workshop.

1. *Is the picture of current and projected demand right?*

Yes. It is accurate for the U.S. and Mexico, and it is correct when looking at the entire North American region. The regional picture is one where demand exceeds supply and imports from overseas are increasing. The U.S. and Mexico face significant challenges including, to varying degrees, environmental issues, political willingness, political support and governmental policies to ensure the development of their own natural gas deposits. Canada appears to face fewer challenges in developing its non-conventional resources.

2. *Where will supplies come from?* Natural gas supplies will come from a broad range of LNG suppliers outside of North America. In the short term, Mexico does not have easy alternatives to satisfy its increasing natural gas for power generation demand. However, the U.S. may increasingly turn to clean coal and nuclear alternatives.

3. *What needs to happen to ensure optimal development?* In the case of the U.S. the market would benefit from increased pipeline infrastructure, a simpler permitting process, more storage capacity, and less regulatory uncertainties. For instance, 80% of leases have been protested in the Rockies. In the case of Mexico, the government has to give PEMEX more investment resources and freedom to explore and exploit non-associated gas fields or increase private involvement in this industry. Canada faces fewer obstacles to ensure developing new supply reserves. However, arctic gas development is more challenging given the requirements of First Nations groups.

SECOND SESSION - LIQUEFIED NATURAL GAS (LNG)

The North American LNG market is supply driven and the leading demand factor is power generation. Global LNG supply was 19 BCFD in 2005 and it is expected to be 48 BCFD by 2020. Profound changes in the business model for world gas transactions are also expected. In fact, markets are already evolving from a model based on value chain and long-term contracts to one characterized by multiple linkages and

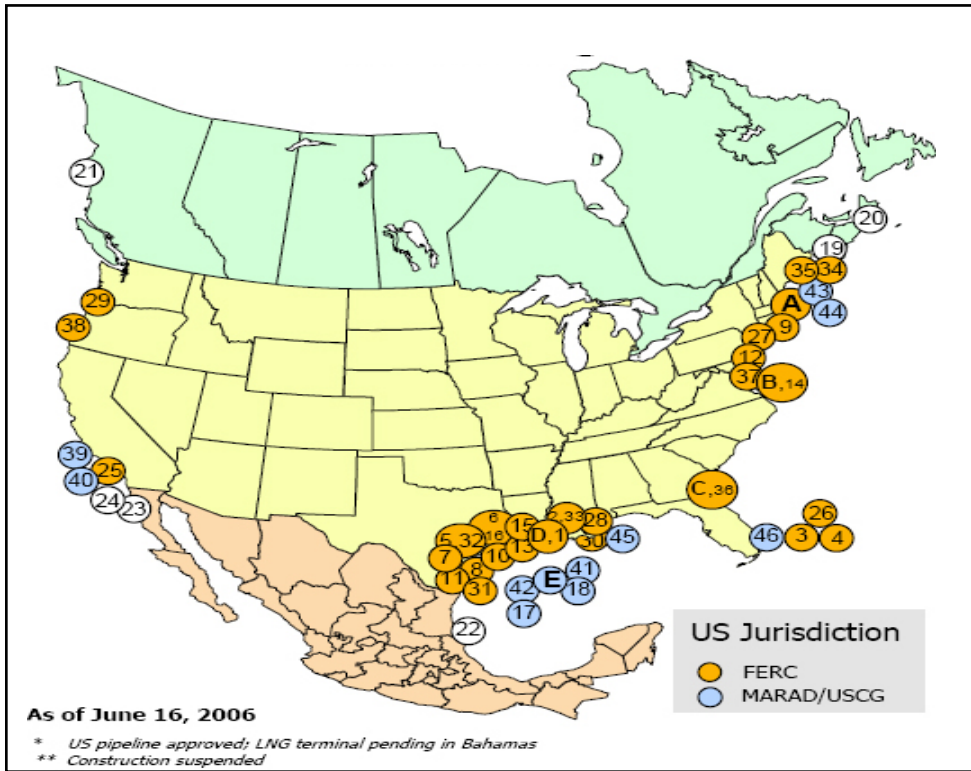


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spot transactions. LNG is in a process of becoming a global commodity, and producers, buyers and customers are all adapting to keep pace with this transition. The current Regasification/ Liquefaction ratio of 2:1 highlights the global shortage of LNG supply and suggests the emergence of a strong spot market for LNG cargoes will not occur anytime soon.

North America is a relative newcomer to the LNG game and it competes against Japan, Korea, Europe and China to attract LNG supply. Japan currently attracts 40% of global LNG supply and the U.S., as the only LNG consumer in North America at this time, just 13%. However, it is estimated these shares will be 18% and 29% respectively by 2020. In this context of U.S. LNG expansion, workshop participants focused on prices, LNG storage capacity, and terminal locations. Some argued that as long as the excess regasification capacity exists, LNG supply will be on the margins and set the market price of natural gas. Others argued that LNG was not expected to be a price-setter in North America, but rather would be a price-taker, with LNG being delivered to North America only when North American prices were right. These participants felt LNG deliveries might tend to dampen North American natural gas prices. Natural gas prices have been



Existing, Proposed, and Potential North American LNG Terminals

LNG terminals should be dispersed rather than concentrated in the US Gulf Coast.

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Costa Azul shows that more coordination between federal and local agencies is needed.

Slide from Jeff Wright's presentation in Session 1 "Natural Gas Supply Demand Fundamentals"

very volatile lately and the Winter/Summer spread has been high. Both of these characteristics suggest that current storage has not been used efficiently and/or more storage capacity is needed to moderate natural gas price volatility. Some participants also suggested that LNG terminals should be dispersed rather than concentrated in the US Gulf Coast. Additional storage and dispersed terminals could reduce volatility of natural gas prices domestically, increase the correlation between the U.S. and European markets, and may help to attract additional LNG cargoes into the U.S. market.

The difference in natural gas prices between the U.S. and Asian and European markets was related to regasification capacity ownership. While in the U.S. only LNG suppliers are allowed to develop such capacity, local distribution companies (LDC's) in Asia and Europe use their large customer base and buying power to sign long term supply contracts, support new LNG infrastructure and attract LNG cargoes. This important positioning oftentimes allows them to offer netbacks that suppliers find more attractive than those of the U.S. prices. A question was subsequently raised whether North American LDC's should be allowed by their state/provincial regulators to own regasification plants. The responses were far from a consensus and underscored the complexity of the interplay between regulators and LDC's in North America.

The Mexican case was analyzed from the perspective of a project in Baja California, Energia Costa Azul. This is a unique project because Baja California is not integrated into the main Mexican electrical system controlled by Comisión Federal de Electricidad (CFE), or the natural gas pipeline system owned by PEMEX. Costa Azul is interconnected into the U.S. West Coast system and will supply LNG to Baja California and Southern California starting in January 2008. Although Costa Azul is a special case in the Mexican context, there are some lessons to be learned. Costa Azul shows that more coordination between federal and local agencies is needed. Cities do not understand country significance of LNG projects. The current Mexican natural gas netback price structure reflects net costs but not opportunity costs, and this price structure does not help to expand LNG in Baja California. In general, federal/local agencies coordination, market based pricing and pipeline open access are three lessons that could greatly aid LNG development in Mexico. Without these elements, further LNG development will be very difficult.

Canada is looking at LNG but in a small way to service coastal and export markets, rather than broad domestic Canadian use. Energy projections suggest that Canada does not need to develop LNG in order to meet its future electricity demand. The name of the game for Canada is supply diversification. Canada has diverse and abundant energy resources that



Transparent, reliable and trusted information should be used to change NIMBY attitudes.

includes oil, coal, hydro, nuclear and natural gas. LNG is an important element to service demand that is remote from the producing regions and to offset increasing demand from oil sands production. It is also important to support Canada’s export volumes and increase export energy supply diversification. However, the big issues that slow development of LNG supply in Canada are contradictory public opinions with strong NIMBY attitudes.

In terms of regulation and NIMBY problems in North America, some participants mentioned that there is sufficient effort to coordinate regulation among Canada, the U.S. and Mexico. Regulators usually have three meetings per year. However, it was also recognized that governments need to take the lead fighting NIMBY attitudes along with the private sector. Transparent, reliable and trusted information should be used to change NIMBY attitudes.

The main question for LNG centered on the key factors for ensuring optimal access and competitive prices. These issues were partially answered within the presentations and discussions,

but need more exploration. The high U.S. prices are not enough to attract more LNG supplies due to the Regasification/ Liquefaction ratio of 2:1, high Asian and European netbacks, and centralized regasification infrastructure in the Gulf Coast. In the case of Mexico, LNG expansion in Baja California is difficult because prices do not reflect opportunity cost and a better agency coordination is needed. In the case of Canada, LNG expansion is mainly limited by NIMBY attitudes. These attitudes can also slow down neighboring proposals in the U.S. NIMBY attitudes are in fact common to all three countries. Unfortunately, having mentioned these constraints per country, the discussion did not have answers on how to resolve such constraints and how to minimize their effects.

THIRD SESSION - PIPELINE INFRASTRUCTURE

Following the same format of the previous sessions, speakers from Mexico, Canada and the U.S. presented their country’s perspectives on their country. The key question for this component of the workshop was how to assure optimal development of infrastructure. While the discussion strayed from this focus, several rich ideas were expressed about pipeline infrastructure.

Oil and natural gas must be considered together in the Canadian context. Not only are the oil sands and natural gas complementary resources in geological and economic terms, but both industries also compete for resources to build their own pipelines. Pipeline costs are going up and there is shortage of labor and materials to expand Canadian natural gas transmission infrastructure. Construction delays and increasing costs affect the natural gas price consumers have to pay in Canada and more broadly in North America. For instance, one study suggested that a 2 year construction delay could increase natural gas prices paid by Canadians by CDN\$ 57.7 billion from 2006 to 2025 (millions of constant 2005 CDN\$). Given this cost, it is critical to identify the factors that may delay pipeline construction.

Environmental regulation, inefficient agency coordination and the lack of measures to reduce costs directly were the constraints identified causing pipeline construction delay in North America. Moreover, environmental regulations challenge infrastructure expansion and increase the possibility for delays. To avoid these costly delays in Canada participants suggested to delegate environmental assessments case by case, substitute panel reviews to the National Energy Board and ensure adequate agency capacity. They also suggested that regulatory efficiency should go beyond environmental issues. Some participants suggested a ‘Major Projects Office’ should be created to provide timely project review and to coordinate and manage all regulations including aboriginal relations. Finally, to help to reduce increasing



Across North America, efforts are required to reduce construction delays

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pipeline costs, some participants felt regional and federal governments should invest in human resources and training for this industry and eliminate barriers to the free movement of material and equipment.

The U.S. pipeline outlook seemed to mirror the Canadian prospect in terms of increasing pipeline costs due to shortages of materials and labor. However, the point was made that it is radically different in terms of efficient regulation. The current cost of a 36 inch pipeline is \$2.5 million per mile. This nominal cost exceeds the \$1 million nominal average cost from 1999 to 2004. Steel prices have doubled and dozens of projects are competing for the same staff. This is the context produced by a boom of construction in 2003-2005 that exceeded all expectations. An additional investment of \$60 billion is needed, and governmental workshop participants were optimistic about its realization. In their opinion, the new U.S. regulatory framework is the best to enhance investment because it includes exclusive federal authority, eminent domain and EPAAct enhancements to deal with other permitting issues. They were also optimistic about the natural gas rate and tariff restructuring. However, other participants pointed out that regulation, pipeline construction and costs of labor and materials are all related. Participants agreed that there does need to be some efforts undertaken to reduce the increasing pipeline costs in the U.S.

In Mexico, the 5,603 mile natural gas pipeline grid connects all Eastern industrial regions while the West remains isolated and

not connected to the main grid. PEMEX owns the entire grid and the challenge is to increase transmission capacity from 5.1 BCFD in 2006 to 6.1 BCFD by 2010. At the same time, PEMEX wishes to continue with the policies of “zero accidents” and “zero kilometers under preventive risk.” Siting and construction regulation differs in Mexico in comparison to the U.S. and Canada. Since FERC has a pre-filing process and there is no eminent domain, negotiations can still be underway during construction. However, participants offered no concrete opinions regarding regulatory reforms or improvements to address these concerns.

From the discussion it seemed that, in order to tackle the question regarding how to assure optimal development of infrastructure with the ideas expressed in the workshop, a generalization of the Canadian case is useful. Across North America, efforts are required to reduce construction delays because of environmental regulation and lack of efficient agency coordination. This was explicitly mentioned for the case of Canada, but also applies to the U.S. and Mexican cases. Given that pipeline costs are going up across the whole of North America, it is important that all three governments establish relevant education and training programs to increase the human resources needed in this industry. The idea of free tariffs for materials used in pipelines, for instance steel, should be analyzed regionally rather than nationally.

WRAP UP DISCUSSION

The last session was devoted to a summary of the three sessions and the workshop closing. The following are the main ideas of that discussion as well as ideas that should be included in future workshops.

In terms of North American domestic supply, it is clear that conventional production will continue to fall in all three countries. This is a prediction stated in the first North American Natural Gas Vision and remains unchanged. The new elements are that there is not much faith in Alaska's production entering the market, and there are serious doubts about developments in the Mackenzie Delta. Thus, perhaps, the second vision for the U.S. and Canada will be less optimistic than the first in terms of availability of unconventional gas basins. The key concern for Mexico is the lack of sufficient investment levels, primarily due to political and reasons.

Several points were raised for future discussion of indigenous supply development including: regulation, macro context, technology and demand. However, a consensus was not reached during the workshop concerning the appropriateness of regulatory frameworks to ensure the development of domestic supply. Some participants expressed that their own regulatory systems were fine, but others mentioned the opposite, and there was little discussion to clarify and expand these positions. Macroeconomic contexts, technological innovations in gas and other energy sources that can substitute natural gas as well as demand issues were only taken up tangentially in this workshop. However, these are certainly key elements that should be included in the Second Vision Report.

In terms of LNG, there was the agreement that LNG will continue to be critical to balance the U.S. natural gas market; it is the most likely solution for the growing Mexican demand; and it is an important source of diversification for the Canadian energy base. Some problems already mentioned in the First Vision remain valid for the Second Vision. These are for instance, safety concerns, siting problems and NIMBY attitudes. Governments can - and it was suggested should - take a leading role to deal with NIMBY attitudes towards LNG with readily available, reliable and trusted information. The new issues for the Second Vision are, for instance, the evolution of the LNG business model, the competition to attract LNG cargoes, and the problems of storage capacity in the U.S.

The points related to LNG that would benefit from further discussion are those focused on regulatory frameworks and pricing issues. Specific recommendations regarding improvements to Mexico's regulatory framework need to be worked through as well as how North American nations could facilitate the



LNG should continue be discussed in future workshops.

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construction of LNG regasification plants. The “destruction of demand,” “inelasticity of demand,” “high prices but inability to attract LNG cargoes,” “LDC’s possibility to own LNG regasification capacity,” “price seasonal differentials” and “price volatility” were concepts mentioned during the workshop but which require much more detailed analysis and greater consideration in a global context. All these issues deal with prices and the changing business models, and should be incorporated in the agenda for potential future workshops.

In terms of pipeline infrastructure the consensus seemed to be that many of the conclusions that apply for LNG also pertain to pipeline infrastructure. However, the new elements that need to be incorporated in the Second Vision are about reducing pipeline construction costs. This is a challenge faced by all three countries and delays are costly across the board. Therefore, further discussion about the effects of delays in all three countries and potential solutions to reduce delays and construction costs would be important and useful discussion topics for future workshops.

ANNEX 1



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