EXECUTIVE SUMMARY

Background

In January 1996, an interdisciplinary team of faculty and students at the University of Houston led by the Energy Institute launched a two-year “thought experiment” on North American natural gas and electricity integration. The purpose for this investigation was to explore the consequences for energy with the North American Free Trade Agreement in place. Our study was funded through the Shell Interdisciplinary Scholars Program at UH with support also from Corporate Sponsors of the Energy Institute. Our team brought together several perspectives – business economics, historical, political, and legal – in an endeavor to conceptualize for energy what is generally perceived to be the most open market in the world for overall trade and commerce. We posed the following questions.

- What are the prospects for harmonizing policies and regulations affecting natural gas and electricity across the three North American Free Trade Agreement (NAFTA) countries?
- What are the implications of harmonization for seamless transactions?

These questions are important because of certain presumptions and attendant expectations that have arisen with the NAFTA, of which the following three ideas have achieved prominence.

1. “Canada and the U.S. maintain the most seamless border in the world; there are no real issues for Canada/U.S. integration.”
2. “In general, the NAFTA will lead to a balanced commercial trade regime despite differing levels of development among the countries because the new regime will help to ‘bring Mexico along.’”
3. “Even though energy was not a significant component of the NAFTA, market reforms elsewhere in Mexico’s system will create pressure for significant restructuring of Mexico’s energy sector.”

We targeted the North American natural gas and electricity industries because of the enormous change unfolding in two industries that have been dominated by public interest issues and public utility regulation and policy. Since the late 1970s, Canada and the U.S. have engaged in a massive restructuring of their natural gas sectors, in order to increase the opportunities for competition and market-based transactions and minimize monopoly power. Now, the situation in both countries is quite similar.

- The production of natural gas is competitive.
- Long-distance inter-jurisdictional (meaning across national, state or provincial boundaries) transmission of natural gas is “contract carriage,” what we term “open access” but which simply means that pipeline operators must provide comparable and nondiscriminatory service to any shipper, and strong third party marketing functions have evolved.
• Local distribution companies (LDCs or local gas utilities) are being pushed to adopt more competitive standards and allow contract carriage on their systems. This latter experiment is much more widespread and aggressively pursued in Canada; progress in the U.S. is much slower and resistance is high.

• The U.S., with Canada following, now is moving toward a similar, and clearly more wrenching, restructuring for electric utilities driven in large part by the growing influence of lower-cost natural gas-fired electricity generation and the increasing convergence of the natural gas and electricity industries.

Mexico also is enacting changes for natural gas and electricity that are historic. Mexico’s changes parallel those in Canada and the U.S. but also contrast in one important respect: federal control of Mexico’s energy sector is being preserved and, in a sense, strengthened.

• In 1993, Mexico adopted rules for private investment in electricity generation, but its national electric monopoly, Comisión Federal de Electricidad (CFE), retains control of purchases, transmission and distribution of electricity generated by private facilities. Like many developing countries, the electricity infrastructure in Mexico is more advanced than for natural gas.

• In 1996, Mexico elected to introduce competition into natural gas pipelines, distribution and storage, but its national oil monopoly, Petroleos Mexicanos (Pemex) retains control of natural gas production and processing and has considerable power in transportation, industrial and electric power generation markets. An interesting issue for Mexico and other countries is the degree to which “downstream” segments (like pipelines) can be subjected to market forces while natural gas production “upstream” is not. The consequences for end-use, like power generation, can be substantial.

• Also in 1996, Mexico adopted policies and a regulatory structure at the federal level (the Comisión Reguladora de Energía or CRE) that is similar to its NAFTA partners (the National Energy Board or NEB in Canada, Federal Energy Regulatory Commission or FERC in the U.S.). The CRE also has authority over local infrastructure projects and tariffs in addition to national infrastructure and tariffs. This compares to the U.S. and Canada, which have highly decentralized federalist systems with state and provincial regulatory commissions that have authority over local (intrastate and intraprovincial) infrastructure and tariffs and that were established well before the NEB and FERC.

• The CRE, which also is charged with the sale of certain assets to private interests, has proceeded with auctions for local distribution franchises and bids for power projects (a review of activity in Mexico is provided in the Appendix). A second issue for Mexico and other countries is whether the strategy of vesting newly created regulatory authorities with privatization responsibilities may raise conflict of interest possibilities or affect regulatory credibility.

• Fuel choices for power generation are increasingly market driven in the U.S. and Canada (save for specific issues with Canada’s Crown corporations, addressed later in this report). In Mexico, fuel choices for power generation are subject to national policy.

For the most part, the physical parameters of the North American gas and electricity systems are fairly well known, and there are any number of studies that attempt to forecast and predict supply/demand balances into the future. Our premise was much more basic. Through the evaluation of current information, in depth interviews and a well-thought-out scenario exercise we hoped to uncover barriers to the free trade of natural gas and electricity via the ultimate integration of physical networks and complementary policy and regulatory practices in the NAFTA zone. Once those barriers were revealed, recommendations could be made and acted upon. Our topic of study is a moving target –
nearly everyday or week events occur in North American gas and electricity markets that alter expectations, perceptions and potential future pathways. Our challenge was to attempt a longer term view and separate hype from sound strategies, isolate short term deviations from long term trends and identify and, hopefully, avoid the array of biases that infiltrate viewpoints about North American energy relationships.

Of interest to all actors in the new marketplace is how much time must pass before these expectations are realized, if indeed they are. We assume in our study that ultimately, over some time frame, we will witness the creation of and reliance on market institutions of some form in Mexico. We expect that a relatively open, three-way commercial trade flow for gas and electricity will evolve within the NAFTA zone that yields positive net benefits. Timing hinges on the various impediments that exist and the strength of those impediments. In general, transactions across the Canada/U.S. border appear to be relatively seamless. Regional gas markets in Canada and the U.S. are tightly bound together given our similar stages of development, infrastructure (including policy and regulatory institutions) and our reliance on market institutions. These conditions are less apparent for electricity and thus the outcomes are less clear. Furthermore, while Mexico has taken some important steps, which we acknowledge in our study, we also can see the rather profound difficulties and constraints that are in place to Mexico’s full integration.

In our study, we were concerned with non-tariff barriers, those practices, and rules, regulations and institutional arrangements that discourage free trade in energy. However, we did not explore the minutiae of policy and regulatory frameworks across the continent, nor was that our intention. More important to a functioning, integrated North American energy market are the more subtle signals that come from the differences within and among the three partner countries. These signals affect whether there truly can be a level playing field with consistent rules of the game within a reasonable time frame. We consider “energy integration” to mean both physical and institutional. Natural gas and electricity “convergence,” an idea whose time seems to have come, is part of our framework. The more closely these two industries grow together, the more inevitable continental integration may become.

While the physical dimensions of integration are apparent, institutional ones are less easily defined. In the policy and regulatory dimension, each sovereign nation (Canada, the U.S. and Mexico) maintains separate federal level jurisdictions and, in the case of Canada and the U.S., separate provincial and state jurisdictions for energy. There is no “continental authority” or coordinating body nor is there any attempt or, as far as we can tell, any desire to create one (nor do we make that recommendation in our study). There are, however, informal arrangements that exist in some important areas.

- Regulatory approaches to natural gas and electricity in Canada and the U.S. are strongly parallel. In both countries, organizations exist that coordinate across provincial and state regulatory commissions.
- National energy agencies in Canada (Natural Resources Canada or NRCan) and the U.S. (Department of Energy or DOE) have maintained communication and coordination through bilateral meetings. The strength of this relationship has varied over time, and is currently weak given the reduced role of federal policy making for energy in both countries.
- Mexico has been drawn into these informal networks, both through the CRE and Secretaría de Energía (SE).  

Our approach was simple. We launched our study with the North American Energy Roundtable on June 6, 1996, an invitational forum that allowed us to interact with industry and government experts from Canada, the U.S. and Mexico. Delegates to the roundtable were drawn from the extensive

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networks maintained by the Energy Institute. We followed the roundtable with interviews of key individuals and collection of data and information. We conducted baseline legal analysis of the NAFTA and political and technology considerations. Finally, we conducted a scenario exercise in December 1996 designed by the graduate students involved with our study. Our goal for the exercise was to explore all facets of our conceptual marketplace in light of everything we had learned and evaluated. In the months following the roundtable, we conducted supplemental interviews and monitored events in the North American energy marketplace to test our conclusions.

This report contains the results of our research. It is a frank assessment of the situation for North American natural gas and electricity, from perspectives that are often not considered or are treated only lightly. Throughout this document, we include information gleaned from the numerous interviews we conducted, as well as input gained during the June 1996 North American Energy Roundtable. We treat all interview information anonymously. All of our conclusions, their implications and the interpretation of information gathered to support our analysis are the product of our own thought and evaluation.

Analysis and Findings

Historical and Economic Considerations

Our study rests on two assumptions with respect to energy integration. The first suggests that the highest level of efficiency is reached with free market competition. We used the concept of “marketization” to capture the process of establishing rules and norms for properly functioning market transactions. The implication of our first assumption is that the most efficient trade flows will also be linked to the degree of competition. Our second assumption is that the ability to foster competition is influenced both by trade flows and by strength of state ownership and control. Successive policy actions (trade laws to regulation to open access, which facilitates competition associated with infrastructure) can lead to reduced monopoly power if they are not overwhelmed by the opposing strength of government ownership and control.

Energy integration might unfold in several different ways. Mexico is at a much different point developmentally than the U.S. and Canada. While we largely have our infrastructure in place, so that strategies revolve around maintenance and expansion, Mexico has substantial infrastructure needs particularly in impoverished and remote rural regions. Although the U.S. and Canada have experimented with government owned or controlled energy enterprises (to a much larger degree in Canada) and while these enterprises pose peculiar problems and constraints, neither country has relied solely on government owned enterprises for the provision of energy goods and services. Mexico contrasts directly in this regard. Finally, while provincial Crown government ownership of resources exists in Canada, resource extraction and supply are competitive endeavors. The starkest contrast between Mexico and its partners is the constitutional reservation of oil and gas to the state on behalf of the Mexican people (the patrimony). The available pathways for North American energy integration, therefore, are distinguished by the fundamental characteristics of how the respective energy sectors are organized.

When our process models for marketization and trade flows are combined with the context of North American energy integration and the NAFTA, several broad issue categories are raised.

- “Publicness” of the natural gas and electricity industries. This concept embraces the nature of “public interest” in its historical usage (ownership and operation of public companies and whether
this is the same concept as “monopoly.” Importantly, within any commercial trade regime, “privatization” does not necessarily lead to free trade.

- **Timing of restructuring.** The nature of restructuring and length of transition are crucial to understanding the future shape of the North American marketplace. Importantly, publicness is related to energy restructuring (the problem of getting around state monopolies) and thus to timing.
- **Governance.** Across North America there is variability in the nationalism/federalism dimension. This differentiates the NAFTA partners and has huge implications for publicness and timing.
- **Economic development.** We must accept that there is also variability in the comparative economic development of the NAFTA partners. This dimension affects publicness, timing and governance.

These four broad issue categories form the basis for our thinking, our scenario analysis and our interpretations of the results from our scenario analysis. They are derived from our review of historical and current conditions and our analysis of key legal, political and technology transfer considerations for North American energy development and trade.

**Legal Considerations**

Several conclusions can be drawn from our analysis of legal considerations.

- Energy trade among the major North American countries has had a turbulent history. Government control of export and import licenses in particular resulted in uncertain or complex regulations that regularly imposed delays and administrative costs and sometimes prevented culmination of the transaction. In some cases the latter was the result of government decisions. In others it was caused by government ineptitude or political maneuvering.
- As a primary industry, energy transactions will always invoke issues of public policy. The public interest is particularly affected with imports and exports, which have repeatedly raised issues related to price, need and security.
- Over time, through regulatory changes, statutory enactments, and international agreements, the U.S. and Canada have established complementary systems of trade regulation affecting natural gas. The stage has been set for nearly transparent trade activity that promises to allow an efficient distribution of energy resources between the two countries.
- Despite hopes that Mexico could be included in this energy market, potential barriers remain even under NAFTA. This results from the reservations and restrictions insisted upon by Mexico itself. While both the U.S. and Canada stand ready to include Mexico in an integrated energy market, Mexico has elected to take a more cautious approach. This hesitation was to be expected, given the historical and political significance of the energy industry in that country.
- As a result of Mexico's NAFTA rights, the eventual direction of energy trade with that country remains in its own control. While Canadian and American companies may be ready and anxious to enter the Mexico's market, the ultimate decision will rest with the Mexican government. The outcome awaits major political and economic decisions affecting the country's energy market and its state-owned monopolies.

**Political Considerations**
An overarching trend around the world is the meshing of commercial trade and energy trade networks. Apart from the NAFTA region, the European Union, Mercosur (which involves Argentina, Brazil, Bolivia, Uruguay and Paraguay with Chile as an associate member) and emerging regional trade networks in southeast Asia and the FSU-Asia-Middle East all present a compelling argument for setting physical infrastructure integration within a context of trade agreements. Europe is frequently regarded to be a model for or parallel to the NAFTA regime, although NAFTA is not intended to be a common market. In comparing Europe and North America, Europe's grids have been more easily integrated physically. A main difference between the two trade regions is that in the NAFTA, the more central and powerful countries support open access, and have used regulatory actions to restructure natural gas and are moving in similar fashion on electricity. In Europe, it is the peripheral countries that would like to open natural gas and electricity grids to market forces. Stronger countries, such as France and Germany, would like to maintain a government control. Part of the debate in Europe centers on the role of regulation in forcing market-based options, including whether that function should reside at the European Commission level or at the member country level (where the United Kingdom is the best example of aggressive, some say overly so, regulatory restructuring). The U.S. is an often-cited example of mistakes that should be avoided with respect to energy policy and regulation, Canada as a generally favorable example of successful regulatory restructuring and management.

Our analysis suggests that the effect of NAFTA has been minimal with respect to continental energy trade and regulatory integration. NAFTA is a much weaker institutional arrangement than the EU, cut this might not be an undesirable situation. While the economies of EU Member States are highly integrated, integration has had some undesirable consequences (a notable example being the rigorous standards imposed on weaker economies in order to achieve monetary union). This general experience has raised suspicions about energy integration, especially with regard to the issue of whether a European Commission-level regulatory body should exist that would supersede national interests. In addition, the jury is still out on the ability for strong and weak economies to successfully combine in effective trade regimes (again, the notable example in Europe is the struggle to embrace the Central and Eastern European countries). The purpose of regulation in Mexico is to reduce uncertainties and create a more favorable environment for direct foreign investment. Therefore, a “NAFTA energy regulatory code” might not be the answer, because not only would there be problems with the effectiveness of such a code, but also with whether it would be the right code for all three countries given their respective levels of development.

Our negative finding is softened by two forces presently taking place that are desirable and sufficiently similar, which demonstrates that the three countries may be more integrated than one might think if in other ways. One is movement in general toward greater reliance on markets in all three countries. Second are energy regulatory developments, specifically in Mexico, that could only have taken place as the institutional contexts became increasingly market friendly.

Not all changes on the horizon for North America are likely to be market-based. Though the vast majority of experts consulted for this study, within the industry and government circles, have shown a willingness to increase reliance on market solutions, there will always be a tendency to take care of the “what-ifs” with non-market solutions. Supply shortages and energy price volatility will always be a serious threat to initiatives in any of the three nations, in particular when mixed with long histories of exercising government control in times of perceived crisis. Historical precedent will make the transfer of responsibility from public to private domains a slow process, even slower where government control has been strongest. The most likely way to succeed in overcoming resistance to market-based solutions for energy and a consequent broadening of continental natural gas and electricity trade and market efficiencies is to begin slowly with pilot projects, or smaller experiments. The success of these projects
will likely help to convince the skeptical. Here, signs are encouraging not only with respect to the border regions and in particular Mexico’s, but with demonstrations that are opening doors to market-based solutions throughout Canada and the U.S.

**Technology Transfer Considerations**

Defining technology transfer – how it takes place, how the process can be improved and the notion that there is a technology associated with endeavors such as regulatory oversight – are more subtle but no less important features of the context for North American energy integration. Two important themes can be drawn from our analysis.

First, with respect to the transfer of hard energy technologies, one of the most important remaining questions that will work to further or inhibit integration is whether Mexico will generate incentives, in the form of sufficient commercial opportunities, for foreign companies to share their proprietary technologies. Oil and gas exploration and production technologies are problematic. The transfer of upstream technologies is inhibited by the inability for foreign private firms to participate in oil and gas production. Acquisition of “off the shelf” technology is slowed by remaining tariffs on energy products and services as a result of the NAFTA phase out. Downstream gas technologies, in particular for applications like pipeline system management, metering, repair and maintenance, should be more accessible to Mexican firms because of the CRE’s restructuring and ability of foreign firms to participate in those businesses. The same will be true for electricity if sufficient commercial incentives exist. In addition, however, Mexico’s national energy companies must provide incentives for their own managers to adopt and implement new technologies and knowledge.

Second, our analysis makes clear that regulatory technology transfer must be distinguished from overt policy coordination. Formulating a common regulatory code is a separate question requiring a difficult solution. What is apparent is that common practices are facilitated through informal channels. It is a relatively easy solution to increase the level and depth of contact among officials and their staffs charged with responsible and effective oversight of natural gas and electricity development and services. In either case, we caution again that adoption of common practices that inhibit competition and market-based solutions are not preferred. Such an outcome would serve to disrupt transactions and North American energy integration, creating potential lost benefits continent-wide.

**Overall Conclusions on the NAFTA**

Our first task was to evaluate the role of the NAFTA on the basis of these assumptions. We formed the following general observations.

- Overall, the NAFTA formalized a commercial trade regime for three countries already linked in a number of ways. However, it is important to acknowledge that the NAFTA is not, nor was it intended to create, a common market.
- What could not be achieved with the NAFTA is significant for the problem at hand. The NAFTA does not include a strong resolution toward competition, clear dispute mechanisms or, importantly, a level playing field for energy.

With respect to energy, the contributions of and omissions in the NAFTA are clear.
The NAFTA instituted specific concessions for petrochemicals, natural gas, electricity and energy services.

The NAFTA does not provide any resolution on government monopolies, formalize arrangements for energy regulatory harmonization (not that it should have) or extend the energy crisis provisions from the Canada-U.S. Free Trade Agreement to Mexico.

**Finding:** Given the treatment of energy in the NAFTA, the lack of clarity with respect to provisions that indirectly impact on energy and the historical, economic, political, legal and technology considerations associated with North American energy, the NAFTA provides only a weak framework for North American gas and electricity integration. Consequently, trends toward integration are and will be more heavily influenced by other factors – the historical, economic, legal, political and technology contexts for natural gas and electricity development and trade.

**Results from Our Scenario Analysis**

The alternative futures we analyzed were based on the two questions posed for our study.

- **Will the process for electricity restructuring parallel natural gas restructuring in Canada and the U.S.?** This question constitutes Alternative Future 1, “A CUS System for Electricity.” It suggests that a “single market” for electricity emerges between Canada and the U.S. that mimics the highly integrated natural gas system. Alternative Future 1 is considered to be the one we “know,” based on the history of Canada-U.S. natural gas trade relationships and industry and regulatory development. Alternative Future 1 also allows us to explore the first of the “conventional wisdoms:” “Canada and the U.S. maintain the most seamless border in the world; there are no real issues for Canada/U.S. integration.”

- **How does Mexico fit into the Canada-U.S. (CUS) market relationship and process?** This question constitutes Alternative Future 2, “Mexico Joins the CUS.” This future is considered to be the unknown, and captures the hypothesized integration of Mexico with its NAFTA partners as a result of the new trade regime itself and economic pressures, with a resulting opening in Mexico’s energy sector. Alternative Future 2 allows us to investigate the second and third of the conventional wisdoms: “In general, the NAFTA will lead to a balanced commercial trade regime despite differing levels of development among the countries because the new regime will help to ‘bring Mexico along,’” and “Even though energy was not a significant component of the NAFTA, market reforms elsewhere in Mexico’s system will create pressure for significant restructuring of Mexico’s energy sector.”

For both scenarios, we employed a ten-year time frame (to 2006) and used our issue categories of publicness, timing of restructuring, governance and economic development.

**Finding:** Our analysis of Alternative Future 1, A CUS System for Electricity, led to a qualified “yes,” within our ten-year time frame, electricity integration would proceed in a manner similar to that of natural gas. Alternative Future 2, Mexico Joins the CUS, failed under the criteria we established.

Our scenario analysis demonstrated that a number of uncertainties exist with respect to Alternative Future 1. These can be further delineated by examining the positions of key stakeholders. The
The following table summarizes our evaluation. A “+” or “-” is used to indicate relative direction, positive or negative, of influence of each group of stakeholders in each country. We found relatively few points of difference between Canada and the U.S. in direction of influence, but several instances in which influence, while in the same direction, might be stronger in one country than the other. Where this occurs, we use a “<” to signal less than or “>” to signal greater than, for Canada relative to the U.S. We also identified the key issues driving each group of stakeholders.

### Evaluation of Stakeholders’ Interests

<table>
<thead>
<tr>
<th>Stakeholders’ Interests</th>
<th>CANADA</th>
<th>U.S.</th>
<th>ISSUES</th>
</tr>
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<tbody>
<tr>
<td>Industrial Customers</td>
<td>+</td>
<td>+</td>
<td>Industrial customers in the CUS are positive forces for electricity restructuring. They benefit most from technology change that allows decentralized power purchases. They are also driven by historical pricing practices that favor other customer groups.</td>
</tr>
<tr>
<td>Ratepayers</td>
<td>+&gt;</td>
<td>+</td>
<td>As with natural gas, if the imperative for electricity restructuring grows customer choice in residential markets may occur more quickly in Canada because of the longer, more intense winter heating season.</td>
</tr>
<tr>
<td>Existing energy industries (gas and electric utilities)</td>
<td>-&gt;</td>
<td>-</td>
<td>Existing electric utilities are barriers to electricity restructuring, but more so in the case of Canada’s Crown corporations.</td>
</tr>
<tr>
<td>Potential new players (“energy entrepreneurs”)</td>
<td>+&lt;</td>
<td>+</td>
<td>Energy entrepreneurs, companies that will drive the direction and pace of restructuring, can play a more effective role in the U.S.</td>
</tr>
<tr>
<td>Federal vs. state/provincial regulators, policy makers</td>
<td>-&lt;</td>
<td>-</td>
<td>In the CUS, decentralization is both a strength and a weakness but Canada could reach consensus among federal and provincial officials more quickly than the U.S. may among federal and state officials.</td>
</tr>
<tr>
<td>Environmentalists</td>
<td>-&gt;</td>
<td>-</td>
<td>Strategies, focal issues (“the North”) and the level of conflict in Canada appear to be stronger negative influences. Many environmental groups in the U.S. view electricity restructuring to be a strike against policy-mandated alternative fuels and conservation programs long imposed on utilities. However, some groups see restructuring as essential for loosening the hold of public utilities that many view unfavorably (suggesting a possible positive direction of influence).</td>
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The preceding table merits further discussion.

- Industrial interests in both countries are striving to take advantage of power generation technologies that afford greater flexibility and cost advantages. This drive toward decentralized power creates an overall push for electricity restructuring among large users, the same force for change that led to open access for natural gas. Also like gas, industrial users have historically subsidized the cost of infrastructure and service for residential and small business customers. These subsidies have also been a strong incentive for industrial users to promote restructuring.
• Ratepayer interests in Canada and the U.S. are essentially the same – especially with regard to the costs of restructuring (cost of transition as well as the resolution of stranded costs associated with the decline in book value of assets that cannot compete in a restructured market). These issues are perhaps more sensitive in Canada and may require more political commitment for restructuring because of Canada’s colder winters.

• Existing gas and electric utilities vary in degree of support for restructuring and integration but, again, public ownership in Canada differentiates stakeholder interests.

• The entry of cogenerators, independent power producers and other energy entrepreneurs into the electric power industry in the U.S. in response to federal initiatives (the Public Utility Resource Policy Act of 1978 or PURPA and revisions and the Energy Policy Act of 1992 or EPAct) has had a significant impact on the drive toward restructuring. It will be more difficult for these entrepreneurs to flourish in Canada with Crown ownership in place. Indeed, many U.S.-based energy entrepreneurs face barriers to entry in Canada because of the status of the Crown utilities.

• In both countries, there is a high degree of regulatory fragmentation. While federal authorities may be committed to electricity restructuring, and some provinces and states may follow (some have actually led federal reforms), others may lag behind.

• Finally, environmental interests in Canada are differentiated by the strength of ideological appeal: Canada, the “pristine North,” should be protected from development, especially when development is to support energy exports to the U.S.

Why did the Mexico scenario fail? While Alternative Future 2 is not impossible, at least with respect to more efficient utilization of continental grids, it is, in our assessment, highly improbable within the ten-year time frame we selected for analysis. Indeed, in building our second scenario we could not identify a reasonable time frame for Mexico’s full integration with the CUS system. This is an important realization, because for many studies on North American energy and evaluations of Mexico’s initiatives, and for the investment decisions that rest on these studies, timing is a crucial assumption. With respect to key uncertainties for Alternative Future 2, we concluded the following.

• Technology is a constraint in every dimension. Lack of technological options and the time required to introduce and implement new technologies will prolong the existing arrangement. Mexico is simply not at a point, and it is unlikely to be so in our ten-year time frame, where it can engage in integrated free trade. A considerable transfer of knowledge with respect to policy and regulatory approaches has taken place, but implementation is key.

• Even with open access in place for the Pemex gas pipeline system or for new pipelines, the NAFTA is a problem. Mexico reserved enough rights so that it can “close” its border with respect to energy trade.

• Attitudes toward the national monopolies and natural resource endowments create untenable political constraints.

The key uncertainties in each of our four issue categories overlapped our historical, economic, legal, political and technology disciplinary perspectives.

I. “Publicness”

• State ownership of resources (the national patrimony) and national monopoly control of resource production. Mexico’s constitutional and related regulatory law protection, particularly of Pemex, is complex and difficult to unwind. There is little political support for privatization of either Pemex or CFE (or Luz y Fuerza, Mexico City’s huge electricity distribution company).

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While there are many efforts to improve operating performance of Mexico’s national energy companies, and many positive results, leaving the monopolies in place creates constraints that are likely to ultimately bear negative consequences. In the case of natural gas, with Pemex as the single supplier for the vast majority of the country, and with the favorable economics associated with production in Mexico as compared to the U.S. and Canada, development of downstream markets will be difficult. For electricity, the CFE’s position as monopsony buyer will constrain private investment in Mexico’s electric power sector.

II. “Governance”
- *Centralized control of investment and decisions relative to infrastructure and resources.* Although Mexico has taken major steps with establishment of the CRE and creation of a regulatory framework (although revisions to the electricity rules are needed), decisions on franchises and oversight remains at the federal level. This reduces flexibility and will slow the pace of development. “Political devolution” will ultimately increase tension between federal decision-makers and local interests.

III. “Timing”
- *Pace of change is slow enough that opposing coalitions are able to restructure themselves.* Mexico’s energy sector, government and political regime type are all closely intertwined. Revenues from oil production have traditionally provided the major source of general funding for Mexico’s federal government. The fuzzy line between the federal government and Mexico’s major political party, the PRI, has created a direct link between Mexico’s political elites and petroleum sector. Strong political opposition exists to changing the status of Mexico’s national energy monopolies, and even to the changes most recently put into place. Because the pace of change is slow, these opposition coalitions may be able to restructure and survive even though Mexico’s political system is also undergoing historic reforms and faces increasing pressure to democratize.

IV. Economic Development
- *Prevailing attitudes toward resource endowments and national monopolies.* The producer/consumer dimension, identified as a key uncertainty for the CUS in Alternative Future 1, also applies to Mexico, but even more strongly.
- *Regime type and overall economic growth.* Mexico is burdened with many of the same constraints to economic development and growth that other developing countries face as a consequence of centralization and control. While market reforms continue to progress, there is still suspicion of market-based economic policies.

We identified several stakeholder issues that have complex positive and negative effects for Mexico.

- **Political elites** are much more important in Mexico than Canada and the U.S. with respect to energy. A shift among elites toward market determination is essential for Mexico to integrate with the CUS model. This is happening, but slowly, and is generational change for the most part. A barrier to both general economic and energy reform, however, is the extent to which these strategies are debated at the elite level.
- **Industrial customers** play much the same role as in Canada and the U.S. in driving energy sector restructuring. However, there are strong relationships among Mexico’s largest industrial companies and the national energy monopolies which complicate analysis. Many industrial customers want better prices and service, but do not necessarily favor privatization of Mexico’s national energy companies.
• The external financial community may be a force for change. Worldwide competition is keen for private capital for energy infrastructure. Mexico is becoming much more alert to the views among international financial markets. However, typical of emerging markets, there is considerable resistance within Mexico to the idea that international investors might influence or even control internal policies.

• Elite influence from northern Mexico may be an interesting variable. Northern states are best positioned to integrate with and benefit from the CUS system, creating pressure for reform.

The role that northern Mexico might play in building pressure for integration leads to an aspect of our scenario analysis that is more probable – the growth of an active border “free trade zone” for energy. Certainly, the most vigorously sought after project opportunities are in the northern tier and it is likely that northwestern Mexico (Baja California) will integrate fully with the CUS system before the rest of the country. This possibility has been identified in previous work and is due largely to the lack of comparative advantages for Pemex in that region and the considerable relatively low cost supplies of natural gas and electricity available from California. For border electricity trade to take hold and flourish, however, the CFE will have to take a more favorable position toward wheeling.

Risks to Our Scenario Outcomes

The risks to our scenario outcomes are evident in our analysis. They can be summarized as follows.

Alternative Future 1: A CUS System for Electricity

Downside risks:
• Technological barriers associated with electricity restructuring in both countries are such that markets for power and CUS integration cannot be established within our time frame.
• Regulatory constraints and barriers, and the associated politics, are such that markets for power and CUS integration cannot be established within our time frame.
• Political disputes within Canada and the U.S. trigger a retrenchment in both natural gas and electricity marketization and integration.
• Political and/or trade disputes between Canada and the U.S. trigger a retrenchment in both natural gas and electricity marketization and integration.

Upside risks:
• Technological, regulatory, political or trade disputes are resolved (or do not emerge) such that electricity marketization and integration proceed unimpeded.
• Technological, regulatory, political or trade breakthroughs are achieved such that electricity marketization and integration proceed more rapidly than we have anticipated.

Alternative Future 2: Mexico Joins the CUS

Downside risks:
• Overall political and economic development in Mexico impedes or triggers a retrenchment against natural gas and electricity marketization and integration.
• Technological constraints impede marketization and integration.
• Marketization of gas and electricity takes hold, but trade disputes with the CUS impede integration.
Upside risks:
- Technological, regulatory, political or trade disputes are resolved (or do not emerge) such that natural gas and electricity marketization in Mexico and integration with the CUS proceed unimpeded.
- Technological, regulatory, political or trade breakthroughs are achieved such that gas and electricity marketization and integration proceed more rapidly than we have anticipated.

Barriers to Energy Integration in a Free Market Context

Our scenario experiment revealed that, while a CUS electricity restructuring that parallels natural gas is plausible within the ten-year time frame for our analysis, many potential roadblocks exist and some could easily disrupt the process. The inclusion of Mexico into the CUS system is much more problematic, and the flaws in conventional thinking about the NAFTA and its role in encouraging significant energy reform in Mexico are deeply apparent.

The following general considerations were drawn from our scenario analysis and evaluations.

- Regardless of outcomes and time frames specifically with regard to Mexico’s inclusion, possibilities for joint ventures with Pemex and/or CFE continue to exist. Many Canadian and U.S. firms are seeking these out as solutions to an otherwise difficult investment and operating environment. In addition, nothing in the NAFTA or other underlying conventions precludes joint ventures between Mexico’s national energy companies and Mexico’s industrial groups or other foreign investors. Nevertheless, successful joint venture programs could ease pressure to reform Mexico’s national monopolies, especially with regard to the difficult political solutions to their constitutional status.

- Natural gas deliverability issues in Canada and environmental opposition directed toward exports could change entirely the picture for North American gas. A political constraint associated with Canada’s role as energy supplier to the vast U.S. market, such as public opinion swaying against natural gas exports, or technical supply constraints in either Canada or the U.S. could alter Mexico’s position. Such an opening conceivably might allow Pemex to build a vigorous export program for gas and could bring Mexico’s interests much more in alliance with those of the CUS with respect to management of pipeline systems and, perhaps, upstream policies. Likewise, an opening for electricity wheeling in Mexico would create pressures for greater access throughout much of the North American grid.

- As we conclude this project, Mexico’s general economic situation appears to have improved from the situation in 1995-1996 following the most recent peso devaluation. However, until fundamental reforms take hold, Mexico will continue to face fiscal pressures. Given the size of Mexico’s energy sector, it is a logical place for policy reforms and therefore political conflict. Many threats exist on the horizon, from volatility in world oil prices to fiscal pressures as Mexico approaches presidential elections in 2000 that could hamper progress. In our view, it is only a deeper commitment to economic liberalization and “marketization” that will allow Mexico to successfully navigate these challenges.

Our scenario analysis suggests much about potential barriers to continental marketization and integration of natural gas and electricity systems. In combination with our baseline assessment, we
conclude that the following five conditions bear the most significant implications for North American natural gas and electricity integration as we have defined it in our study.

- **Regulatory harmony and regulatory technology transfer.** Regulatory harmonization is strongest between Canada and the U.S., through both formal and informal processes that facilitate diffusion of approaches. There is no overt policy or process driving harmonization, nor do we suggest there should be. The relationship between regulatory institutions and governance in each country has a significant effect. Policy harmonization is weaker as federal level institutions in Canada and the U.S. decline in importance relative to market-based solutions, and internal and external politics impact federal agencies in all three countries.

- **Regionalization.** The prospect of integration via interconnected regions is very strong. Local politics plays a strong role at the regional level with often negative implications. Regionalization may be most important in expanding opportunities along the U.S.-Mexico border.

- **International trade.** For each of our “conventional wisdoms,” we found the following. (1) “Canada and the U.S. maintain the most seamless border in the world; there are no real issues for Canada/U.S. integration.” We found this to be mostly true but with several current and potential sources of conflict related to views within each country regarding energy exports and imports. (2) “In general, the NAFTA will lead to a balanced commercial trade regime despite differing levels of development among the countries because the new regime will help to ‘bring Mexico along.’” Since the signing and implementation of NAFTA, the situation in Mexico has become more volatile and unpredictable rather than less. Overall, the NAFTA does appear to set reasonable ground rules for continued restructuring and increased efficiencies in Mexico’s economic sectors, including energy to some degree. What was not given adequate appraisal, perhaps, was the depth of the political upheaval that would accompany the taking apart of Mexico’s six-decade old dependency by its political system on national economic assets, especially in the energy sector. Democratic institutions are needed that can facilitate both the operation of market mechanisms as well as the orderly transfer of political power. (3) “Even though energy was not a significant component of the NAFTA, market reforms elsewhere in Mexico’s system will create pressure for significant restructuring of Mexico’s energy sector.” The new trade regime simply does not provide enough support for the truly tough steps that must be taken if Mexico’s goal is to have a market-based energy sector (and there is some doubt as to the nature of Mexico’s goals in this regard).

- **Investment, ownership and anti-trust controls.** All three countries have large public enterprises in their energy sectors, and private enterprises that can wield market power if not disciplined (preferably in a light-handed manner). The difference between the CUS and Mexico is that, in the former, the pendulum is swinging in favor of greater balance between consumer and producer interests, driven by consumer expectations that can be expressed freely in the political marketplace. Our evaluation of stakeholders’ interests fully demonstrates the gap between the CUS and Mexico in this regard.

- **Politics and economic development.** The relative positions of the three countries with respect to economic development and maturity of their energy sectors are clearly linked. However, we found a number of situations in which market mechanisms are emerging where before the only solution would have come from government. To us, this signifies that other solutions are available and that economic determination may do more to stimulate economic and political development in North America, even in our poorest neighborhoods, than we could continue to achieve from our existing arrangements.
Recommendations – Paths around Key Barriers

We identified both barriers and break-throughs that have occurred since the start of our study. Our analysis and results suggest several recommendations that could enhance the prospects for more market oriented and integrated North American natural gas and electricity systems that can support economic development and prosperity on the continent. Some of our recommendations are controversial, but we offer them in the spirit of our overall contribution and encourage debate and the exchange of ideas.

- Alter the status of Mexico’s Secretary of Energy.

As we publish this report, Mexico has in place the third Secretary of the current Zedillo Administration. Any individual holding this position in these times is subject to enormous pressures and political conflicts, most of which are unresolvable in the current climate. Nearly from the moment of appointment, however, the Secretary becomes compromised by his duties as chairman of Mexico’s national energy companies. This renders SE ineffective as an agency and removes neutrality from policy making. We recommend that the status of Secretary be altered to remove these responsibilities and to create a more effective, neutral office.

- Work to attain consistency in goals and objectives for energy policy and regulation.

The net benefits that may stem from harmonization of energy policies and regulatory frameworks cannot fully be achieved, even through informal channels, unless there is consistency in approaches within individual jurisdictions. This is difficult to attain because it requires resolution to fundamental differences of opinion within the three NAFTA countries, and their sub-jurisdictions, regarding reliance on markets and the role of government. At any point in time, commitment to either philosophy will be influenced by economic, political and social conditions outside of the control of policy makers, regulators, firms or consumers, and long-term patterns can revert or become cyclical. National policy institutions can play a role in educating consumers and lawmakers on the range of alternatives and encouraging balanced debate on all sides of these issues. The counterweight is that national energy policy institutions have a tendency to become too politicized to be effective, so that viable options should be created or supported.

Policy and regulatory consistency seem to have been weakest in Mexico. We suggest that a hard look be taken at the ultimate goals and objectives for energy sector reform. We cannot realistically recommend privatizing Pemex or the CFE. The political and social status of these companies makes such a suggestion meaningless, although a wealth of evidence suggests that private activity in Mexico’s energy sector would yield many more benefits than can be achieved if the core businesses remain reserved for Pemex and the CFE. However, it seems to us that exposing investors to a situation in which market strategies are constrained by the presence of national energy monopolies does not accomplish much either. It may be that the only achievements are diminished revenues for the national companies and underperforming private investments because of the efforts by the national companies to retain control of their best customers. If the status of the national energy companies is something that will be preserved, then Mexico’s policy and investment communities and their partners in the U.S. and Canada should be pragmatic about what can best be accomplished and strive for effective solutions.

Canada and the U.S. are not free of policy and regulatory inconsistency. The Crown corporations in Canada and the federal power authorities in the U.S. pose conflicts similar to those in Mexico. The savings and enhanced flexibility for customers achieved with greater competition must be weighed against the inevitable downward pressure on revenues as entrepreneurs chip away at markets formerly reserved for these government enterprises.
• Overcoming NAFTA deficiencies.

Many researchers by now have pointed to the many deficiencies in the NAFTA with respect to energy and the difficulties that these deficiencies lend to the new regime. In our view, the deficiencies within NAFTA lie not with specific terms for energy trade but with the failure to provide broad principles for continental energy marketization and integration. Opening NAFTA to re-negotiation on principles would likely yield little return since the relative positions of the three partners with respect to energy have not changed much, if any, and it was the failure to achieve agreement on principles for energy that nearly stalemated the negotiations. It also appears that attempts to re-negotiate specific terms, for example accelerated phase out of tariffs on gas imported by Mexico, have little chance of success. At the same time, sharp disputes related to energy matters could jeopardize other aspects of the new NAFTA regime. We recommend, therefore, that the NAFTA not be opened for re-negotiation, since the overall benefits would likely not exceed the costs of doing so, but that during the normal course of review and renewal efforts be made to build dialogue on principles for energy marketization and integration. In light of our previous recommendations regarding consistency in approaches, however, it is clear that much work has to be done before a fruitful exchange can take place.

• Emphasize regional solutions.

We concluded that regionalization offered some good news, and that was in the development of energy market regions that interconnect into continent-wide systems. To the extent that regional solutions can be encouraged, then the outlook for national or continental ones becomes more positive. For Mexico in particular, this approach may be a constructive way of circumventing barriers to marketization and integration. We also noted earlier that the U.S.-Mexico border has been termed a place for experimentation. Based on separate work undertaken by the Energy Institute, we recommend that pilot projects be undertaken to establish whether co-operatives and development bonds may provide useful tools for energy infrastructure development. An assortment of legal/institutional changes would be required, but all are achievable.

1. Constitutional provisions to allow decentralized financing in Mexico would be necessary. This is one of the biggest hurdles to a border region approach, but eventually decentralization must be achieved if Mexican businesses and communities are to flourish.

2. Regulations enabling the formation of co-operatives (Mexico’s 1993 regulations allowing private investment in electric power generation) should be strengthened and clarified and terms and conditions for the creation and performance of co-operatives established. Other countries, notably the U.S., have facilitated the development of co-operatives. The U.S. used the rural co-operative system effectively to electrify remote towns and farms. Insured low interest loans would allow for infrastructure improvements in areas that are far from the Pemex and CFE, or U.S., systems.

3. Municipal utility districts, heavily used in Texas to provide services for new residential areas and industries, could be adapted for the purpose of providing energy services. Strict rules and codes of conduct and enforcement would be essential in order to ensure that MUDs operated profitably with without opportunities for fraud.

4. Mexico should create a municipal bond market that would allow municipal jurisdictions some self-determination in funding infrastructure improvements, including municipal energy systems. This step will take time as all of the institutions that facilitate “muni” markets in other countries would have to be created in Mexico – bond underwriters, rating agencies, insurers, primary and secondary markets for trading, income tax provisions for interest free income to make munis attractive investments, and so on. Again, skills and experience from Canada and the U.S. could be easily shared with Mexico to build these institutional assets.
Any or all of these options could be experimented with among any of the rapidly growing cities and towns along the U.S.-Mexico border, borrowing heavily from Canadian and U.S. expertise and with a careful look at how other emerging markets (cases exist in India, the Philippines and Colombia) have deployed these strategies, successfully or not. These options would ease pressure on Mexico’s national companies and hasten development. We suggest that a ready source of lending exists with the North American Development Bank (NADBank). The NADBank has come under criticism for a low level of activity since its creation with the NAFTA. We recommend that the charter of the NADBank be revised to allow lending for pilot energy infrastructure projects within the U.S.-Mexico border region consistent with the Bank’s mission to encourage environmentally sound infrastructure improvements.

- **Regulatory/policy gap on reciprocity.**

We mentioned earlier the problems with reciprocity. Structures already exist for constructive dialogue on these issues (bilateral meetings between the national energy agencies, the NARUC and CAMPUT associations, and so on). We suggest that working groups within these structures be formed to evaluated the seriousness of reciprocity issues and workable dispute mechanisms before they become impediments to energy trade and integration.

- **Regulatory restructuring**

We have recognized in this report that the regulatory arena has not been immune to the forces of change that have impacted the natural gas and electricity industries. Not only are regulators and companies experimenting with more innovative approaches (market-based rates for transportation, incentive ratemaking, proactive technical conferences, etc.). Many regulatory bodies are also attempting to streamline their own operations, hear cases more judiciously, enable more efficient processes. These steps need to continue, but our survey of the North American energy situation suggests other necessary steps to be taken.

1. All regulators operate within the narrow confines of the case and decision at hand. We recommend that regulatory agencies need to reorganize staffs and processes so that they can be more “value chain” oriented, understanding the extent to which decisions in one portion of the gas and electricity businesses can impact supplier and consumer transactions in many other segments of these increasingly convergent industries.

2. We acknowledged that the federalist systems in Canada and the U.S. have both positive and negative ramifications for gas and electricity integration. Many levels and layers of regulatory control exist, particularly in the U.S. We recommend that a deeper regulatory restructuring should take place, perhaps even to rationalize institutions, like the public utility commissions, that in some cases have existed for about 100 years. In our view, with regional market development and the existence of regional reliability councils that entail Canadian and U.S. involvement, reorganization upward to regional-level institutions should be seriously evaluated to gain “political economies of scale.”4 We recommend that laws and regulatory approaches devised during the infancy of the gas and electricity industries be thoroughly reviewed and revised or repealed accordingly based on the current, high technology, high value-added and increasingly competitive nature of these industries.

3. In contrast to (2), Mexico should decentralize its regulatory apparatus or at least provide real outlets for sustained and meaningful input from state and municipal governments. An unwarranted risk is posed to investors should Mexico’s political devolution extend to a desire for local control...
over energy infrastructure projects when a greater effort could be made to accommodate local viewpoints and preferences.

- Education and technology exchange.

It is to the benefit of all stakeholders within the North American gas and electricity marketplace to be as well informed as possible of all options. Markets cannot function properly unless information is accessible. We suggested earlier that national energy policy bodies might have a role to play in this regard. Regulators as market facilitators play a role in reducing information asymmetries (recognizing, however, that information represents competitive advantage). Since the beginning of the deregulation movement in the U.S. in the 1960s and parallel trends in Canada, consumers in both countries have become much more astute with regard to what the market can offer them. Consumers in Mexico do not have this privilege unless they have had opportunities to travel or work outside of Mexico. In addition, Mexico’s elite, paternalistic institutions have stifled consumer preferences. Consumer education can be an effective agent of change and once consumers detect that choices exist it is difficult to return to the status quo. Our analysis suggests that this will be true throughout North America, but with variations in timing given where the starting points for the respective NAFTA partners. Our study also highlights the importance of technology to properly functioning natural gas and electricity markets in North America, and the barriers to Mexico’s full integration posed by technology deficiencies in that country. We also learned the limits to what private firms will share if they do not have profit incentives. Some years ago it was suggested that “technology dyads” between the U.S. and Mexico could go a long way toward resolving mutual suspicions and ensure long-term energy security for both. There is evidence that something like this filters through the relationships among the NRCan, U.S. DOE and SE. We recommend that these initiatives should extend more deeply into the NAFTA relationships, and that there may be a proper role for Canadian, U.S. and Mexican universities to play in this regard.

ENDNOTES

1 When Mexico began the process of opening its natural gas sector, a one-day workshop on natural gas regulation was held on May 31, 1995 at the University of Houston by the Energy Institute, at the request of the U.S. DOE. Attending were the newly appointed regulators from the CRE and their counterparts from NEB and the FERC; officials from U.S. DOE, NRCan and SE; and officials from provincial and state regulatory agencies in the U.S.


3 The concept of experimentation in the Mexico-U.S. border region is attributed to Dr. Jesus Reyes-Heroles, Secretary of Energy for Mexico during the time of this study.

4 We borrowed this concept from Leebron (1996), an intriguing way of considering regulatory institutions within the context of cross-jurisdictional trade.