

Natural Gas in Central America

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Summary

Central America's energy landscape presents complicated challenges. The region's dependence on imported oil has brought with it high and volatile energy costs. A recent boom in natural gas production offers an opportunity to reduce electricity prices and greenhouse gas emissions in the near term. Stakeholders in government, business, and civil society—while acknowledging the theoretical benefits of natural gas for electricity generation—have restricted its advance because of perceived political and economic risks. This paper reviews the status of natural gas projects in Central America and the challenges of natural gas use in the electricity sector.

An Uncertain Energy Future

Central America¹ must urgently address the high and rising energy costs that have increased the fiscal burden on business, governments and households over the past decade. Electricity rates range from an average US\$0.08/kilowatt hour (kWh) in Costa Rica and Honduras to US\$0.16/kWh in the rest of the region.² The region pays prices two to three times higher than

the US average and significantly greater than those in larger Latin American nations.

High costs are driven by rising demand, tight supply conditions, and countries' small market size. Energy consumption in Central America has grown between 4 and 5 percent annually over the past ten years and is now projected to increase at a yearly rate of 4.9 to 6 percent through 2030.³ To keep up, between 6,500 and 11,000 megawatts of new capacity must be installed in the coming period—nearly double the region's total installed capacity in 2010.⁴

It will be a challenge to bring additional supply online in the region that, with the exception of Guatemala, lacks proven reserves of oil and gas. Hydroelectric installations generate a significant share of electricity, operating from a high of 70 percent of capacity in Costa Rica to a low of 13 percent in Nicaragua.⁵ But this disposition toward hydropower leaves electricity supplies vulnerable to drought. And in recent years, hydropower has fallen out of political favor due to strong local and indigenous resistance to dam construction in many countries.

A growing portion of the region's electricity is produced using geothermal and other renewable sources. However, analysts forecast that these sources will remain a relatively

¹ This paper reviews the situation of natural gas in Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica and Panama. For a variety of reasons, Belize is usually considered a unique case and is not included in this analysis.

² Regional Power Integration: Structural and Regulatory Challenges, World Bank Report No. 58934-LAC, 2011.

³ Plan Indicativo Regional de Expansión de la Generación 2010–2025, CEAC.

⁴ Plan Indicativo Regional de Expansión de la Generación 2010–2025, CEAC.

⁵ Regional Power Integration: Structural and Regulatory Challenges, World Bank Report No. 58934-LAC, 2011, p. 25.

FOREWORD

I am pleased to present another working paper of the Inter-American Dialogue's Energy Policy Group. This paper was prepared by Paul Shortell, program assistant for energy policy at the Inter-American Dialogue, along with Kathryn Baragwanath, an independent analyst based in Santiago, Chile, and Carlos Sucre, a consultant in the energy division of the Inter-American Development Bank (IDB). The working paper is part of a series of studies carried out through the Dialogue's initiative on energy policy in the Americas.

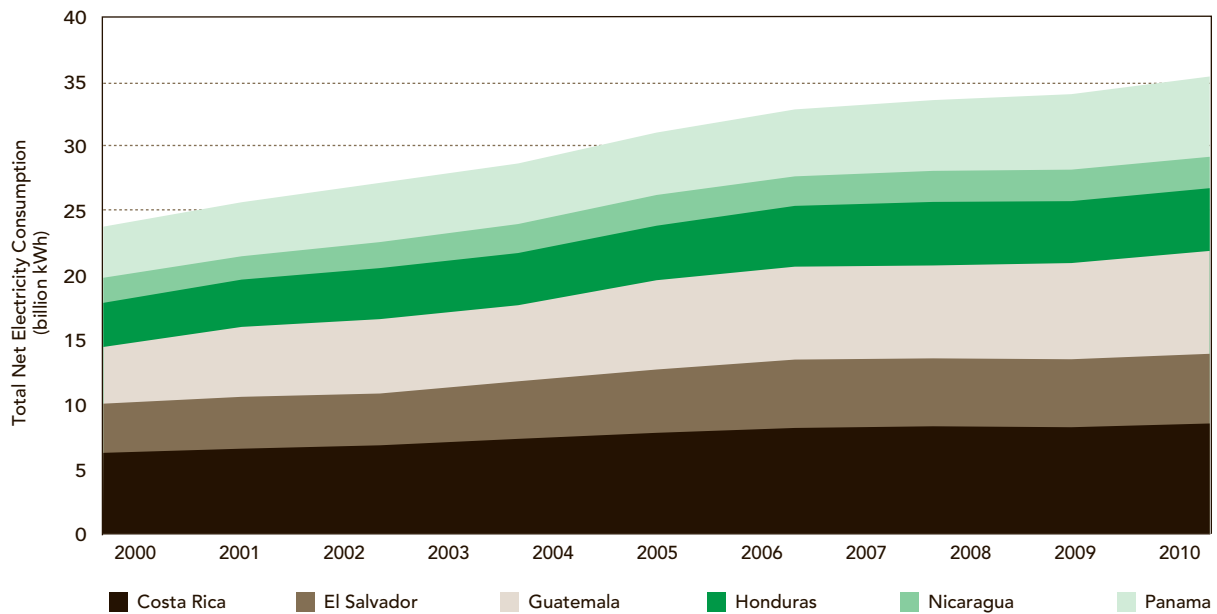
Established in 2009 with the generous support and cooperation of the IDB, the Inter-American Dialogue's Energy Policy Group is a professionally and politically diverse group of some 20 energy analysts, corporate leaders, and policymakers. The group is led by Inter-American Dialogue senior fellow Genaro Arriagada, a distinguished Chilean analyst and former minister of state. The views expressed in this working paper do not necessarily reflect those of Energy Working Group members or the Inter-American Dialogue.

In the working paper, the authors analyze the potential for natural gas development in Central America's electricity sector. Shortell, Baragwanath and Sucre review the region's pressing energy challenges and highlight the opportunities presented by the US shale gas revolution. They provide a panorama of natural gas policies and assess the obstacles that remain in the region's six countries. The authors conclude by addressing the diverse technical and institutional challenges that have delayed Central America's development of natural gas. These include: unaligned national policies and priorities; critical gaps in information; and a lack of collective action among governments on energy issues.

Previous papers in this series have dealt with a diverse set of energy policy issues, including the "energy triangle" between China, the US and Latin America, opportunities for shale gas in Latin America, social conflicts over energy development, and the management of Brazil's national oil company Petrobras. Our aim is to inform and shape national and regional policy debates on the energy challenges confronting the countries of Latin America, improve the quality of attention to those challenges, and encourage multilateral cooperation to address them.

Michael Shifter

President

Figure 1. Electricity Consumption in Central America (2000–2010)

Source: US Energy Information Administration, December 2013.

minor part of the energy matrix over the next twenty years.⁶ Central American governments have generally avoided coal because of its negative health and environmental impacts.

Central American nations increasingly depend on imported oil and related products for the rest of their electricity generation, ranging from less than 10 percent in Costa Rica to more than 60 percent in Nicaragua.⁷ The share of hydrocarbons in the region has increased from roughly 30 percent of total electricity generation in 1990 to over 50 percent today.⁸

Steep increases in the price of these fuels have impacted the Central American economies. Expenditures on oil imports accounted for around 7 percent of regional GDP in 2007, when the cost of crude oil was roughly \$60 per barrel.⁹ Just six years later, crude traded for approximately

\$100 per barrel. The rising price of energy pushes up production costs, reducing the competitiveness of Central America's export-oriented activities. The World Bank has estimated that for every 16 percent rise in oil prices, GDP growth in the region falls by 0.09 percent per year.¹⁰

Oil price volatility also presents cause for concern. Short-term fluctuations in oil prices put fiscal pressure on Central American governments, which maintain a formal and informal subsidy programs intended to shield consumers from rate hikes. The rapid upsurge of global energy prices in 2008, for example, increased energy subsidy costs in Panama and Honduras by 69 and 85 percent, respectively.¹¹ El Salvador's growth in energy subsidy outlays has been even more impressive, growing 2,412.5 percent from 2000 and totaling US\$201 million in 2012.¹²

⁶ BP Energy Outlook 2035.

⁷ Regional Power Integration: Structural and Regulatory Challenges, World Bank Report No. 58934-LAC, 2011.

⁸ See Centroamérica: Estadísticas del Subsector Eléctrico, UN ECLAC.

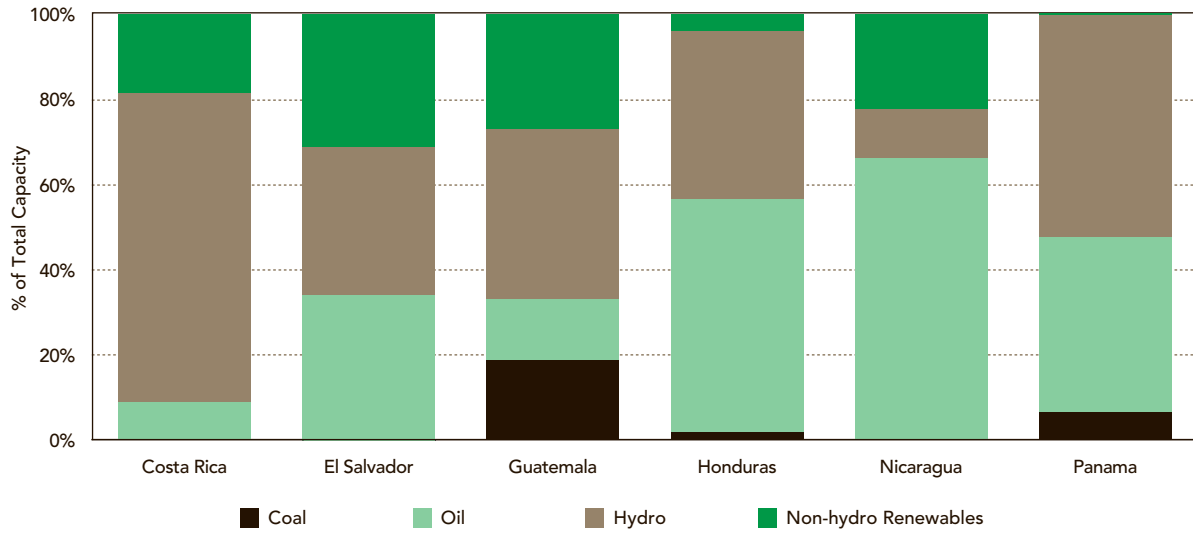
⁹ Jeremy Martin and Juan Carlos Posadas, "Central America's Electric Sector: The Path to Interconnection and a Regional Market," *IAGS Journal of Energy Security*, July 2012.

¹⁰ Rigoberto Ariel Yépez-García and Julia Dana, "Mitigating Vulnerability to High and Volatile Oil Prices: Power Sector Experience in Latin America and the Caribbean," World Bank, 2012, p. 4.

¹¹ Rigoberto Ariel Yépez-García and Julia Dana, "Mitigating Vulnerability to High and Volatile Oil Prices: Power Sector Experience in Latin America and the Caribbean," World Bank, 2012, p. 36.

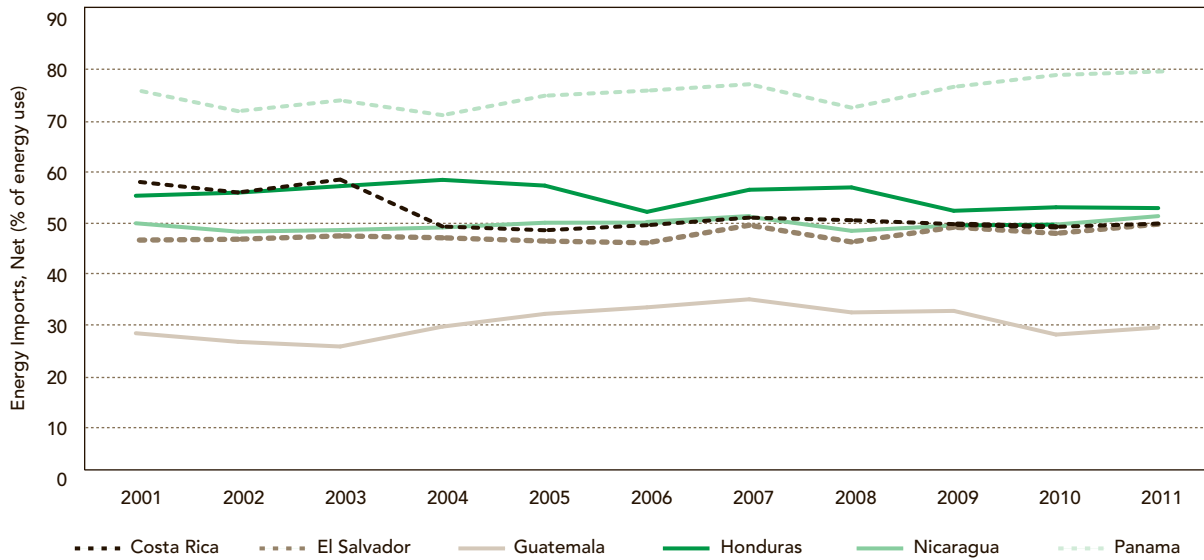
¹² "Subsidy Policy in El Salvador," *Central America Data*, July 3, 2013.

Figure 2. Composition of Electricity Matrix by Country (2011)



Source: World Bank Development Indicators, December 2013.

Figure 3. Energy Imports by Country (2001–2011)



Source: World Bank Development Indicators, December 2013.

The Promise of Natural Gas

While oil prices are projected to increase in the coming years, burgeoning production in North America has pushed US natural gas prices to new lows of roughly US\$3 per million btu.¹³ These prices are expected to remain relatively stable for several decades.

The US shale “revolution” not only has transformed global energy markets, but it presents Central America with an opportunity to stabilize and reduce electricity costs. A feasibility study conducted by the Inter-American Development Bank (IDB) and the Central American Bank for Economic Integration (CABEI) found that adding cheap natural gas into the region’s electricity matrix could lower prices as much as 23 to 30 percent, depending on the technology and market structures utilized.¹⁴ The most significant and immediate benefits from cheaper power would be lower production costs for industries and reductions in the fiscal burden on governments.

Natural gas boasts other benefits. It takes less time to develop than renewables, and it burns more cleanly and efficiently than coal and oil. A study by the IDB found that the use of natural gas could lower the consumption of oil products such as bunker, a particularly “dirty” fuel, by 75 to 90 percent and the use of diesel by 95 to 100 percent.¹⁵ Electricity generation is the ideal gateway for natural gas, which could also eventually replace oil use in industry and transportation.¹⁶

Since Central America does not produce its own gas, economical and efficient fuel importation and distribution systems are critical. The construction of a Central American gas pipeline has been proposed on multiple occasions, most recently by Mexico’s new administration.¹⁷ Yet the region has been slow to implement similar regional infrastructure

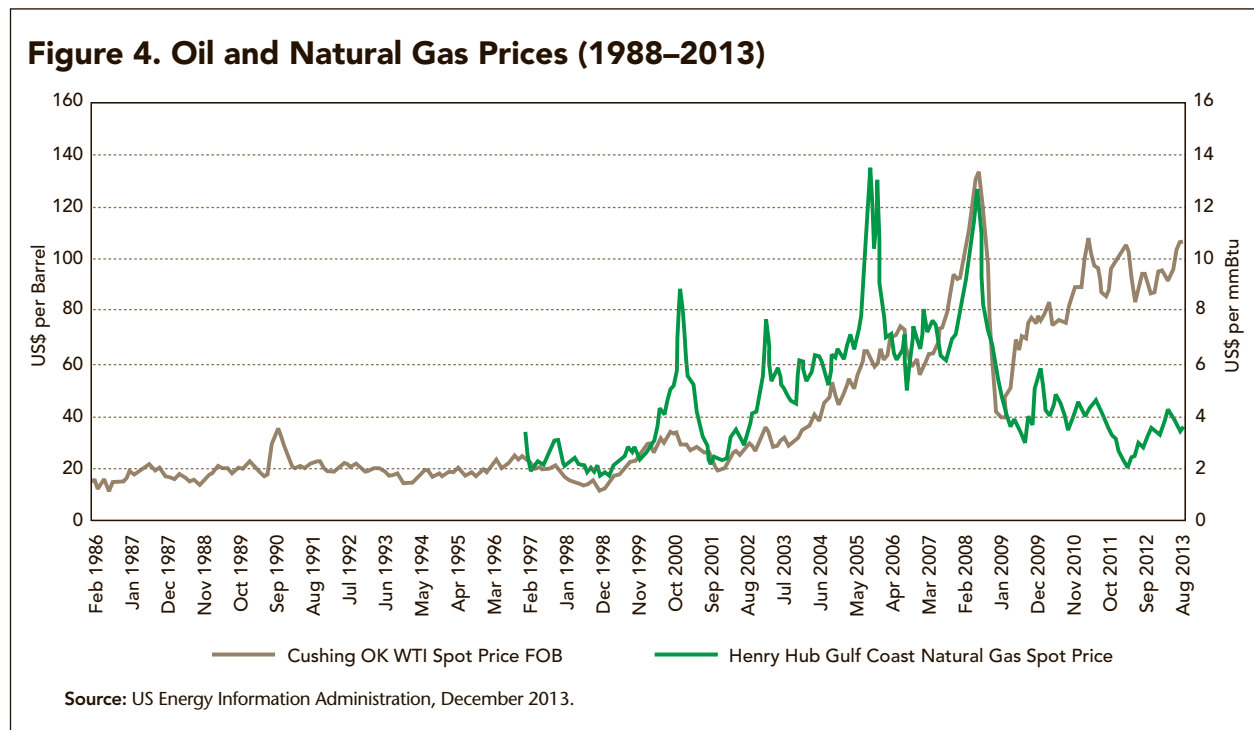
¹³ Natural Gas Prices, US Energy Information Administration.

¹⁴ Pre-Feasibility Study of the Potential Market for Natural Gas as a Fuel for Power Generation of Energy Intensive Industry in Central America, Inter-American Development Bank, 2013.

¹⁵ Pre-Feasibility Study of the Potential Market for Natural Gas as a Fuel for Power Generation for Energy Intensive Industry in Central America, Inter-American Development Bank, 2013.

¹⁶ The electricity subsector accounts for a modest percentage of total energy use in Central America. Statistics published by the Inter-American Development Bank estimate that less than 20 percent of imported oil is utilized for electricity generation. Confronting the challenges posed by oil dependence will require addressing uses of petroleum in other sectors.

¹⁷ “Central America Gas Pipeline Project Resurfaces,” *Central America Data*, January 15, 2014.



projects, which tend to encounter delays in the regulatory process. The regional electricity transmission line (SIEPAC), for example, remains unfinished nearly a decade after ground was broken.

A more feasible and likely near-term option is the construction of one to three liquid natural gas (LNG) terminals capable of generating gas-based electricity for export to the rest of the isthmus. LNG holds two major advantages over alternative schemes. First, a large regional hub for gas importation would overcome critical economic barriers of scale faced by Central America's small markets. Second, exporting energy throughout the region as electricity, rather than gas, would allow countries to utilize existing infrastructure and regulatory frameworks, thereby reducing time and costs of transportation.

Central America's Energy Paradox

LNG facilities are highly centralized nodes for electricity generation. They depend on distribution networks to deliver power from production centers to consumers. In Central America, electricity interconnections between the region's six countries provide the primary interface for energy exchanges. The viability of natural gas is therefore closely tied to the success of regional electricity integration.

Since 1996, Central America has gradually implemented institutional and regulatory frameworks necessary for the exchange of electricity among the region's six nations. The regional common market for electricity (MER) entered into full force in 2013. It is overseen by multiple regulatory and technical bodies including regional electricity interconnection commission (CRIE) and regional operations entity (EPR). The SIEPAC transmission line, which runs the length of the region, from Guatemala to Panama, will provide physical infrastructure capable of channeling 300 megawatts of electricity (approximately 20 to 60 percent of countries' total generating capacity). A final 60-mile section of the line in Costa Rica is scheduled for completion in early 2014.¹⁸

Government officials and private sector leaders have regularly and publicly recognized the advantages of integration. Still, domestic needs and political priorities take precedence over regional initiatives, and Central America continues to operate as six separate markets with distinct national energy

sector policies. Declining exchanges between countries accounted for less than 1 percent of total electricity generation in 2010.¹⁹ And while multiple national-scale natural gas projects have been proposed, none have been successful to date. It is doubtful that LNG can be efficiently developed without the guarantee of firm supply contracts in a functioning regional market.

This paper explores the disconnect between Central America's energy ambitions and its current realities. Transforming and integrating of the electricity matrix are technically complex and politically sensitive processes under the best of circumstances, requiring collective action by multiple stakeholders in government, business, and civil society. In Central America, three factors amplify these challenges:

- 1. Diverse market and political conditions** have facilitated natural gas development in some areas and impeded it in others. The political and economic landscapes vary widely across the six countries, presenting officials with different opportunities and limitations. The result is a regional patchwork of unaligned priorities and policies.
- 2. Scarcity and inaccessibility of information** have generated uncertainty about the logistics and impacts of natural gas development. Resistance by certain officials, businesses, and communities is fueled by concern that the risks of investment in natural gas outweigh the rewards.
- 3. Chronic distrust between governments** remains a major obstacle to collective action. Governments' lack of confidence in their neighbors and in the regional institutions has led to pessimism over the possibility of expediently reaching a mutually desirable outcome.

¹⁸ "Avances en el Sistema de Interconexión Eléctrica de los Países de América Central (SIEPAC)," Proyecto Mesoamérica.

¹⁹ Elaborated based on statistics in Plan Indicativo Regional 2012–2027, CEAC; original statistics from ECLAC, Estadísticas del Subsector Eléctrico, 2010.

Six Countries, Six Natural Gas Policies

Regional coordination of energy policies is complicated by the diverse political, economic, and social conditions across the isthmus. The compositions of electricity matrices in the six countries vary widely, as do the structures of their energy sector institutions, the content and enforcement of their regulatory frameworks, and the overall governance of the macro economy. Political cycles, public opinion and vested interests in each country present additional constraints.

Progress towards integrating natural gas in the electricity sector—and the obstacles that remain to doing so—vary widely between Central America's six nations. Governments in Panama, El Salvador, and Guatemala stand out as proactive, while gas importation efforts have been limited in Honduras, Nicaragua, and Costa Rica.

Costa Rica

When it comes to natural gas, Costa Rica has lagged behind for reasons that are more political than technical. Movement has been hampered by powerful environmental interests, and sidelined by the country's highly politicized debate over energy sector reforms.

Extractive industries are unpopular with Costa Rica's environmentally-minded citizens. The government banned open-pit mining in 2010²⁰ and renewed a moratorium on oil extraction in 2011²¹ in response to pressure from civil society. Restrictions are less stringent for natural gas. Yet any move toward developing hydrocarbons in Costa Rica is likely to trigger increased scrutiny, particularly in light of the government's commitment to carbon neutrality. At present, the Ministry of Energy considers natural gas importation a 'Plan B.'²²

This contest also plays out in the nation's cumbersome judicial and regulatory processes. The unfinished 60-kilometer segment of the SIEPAC regional transmission line

in Costa Rica, for example, has been set back repeatedly by conflicts over property rights, environmental impact, and a lack of effective communication across agencies.

Proposals for natural gas and electricity integration have also been overshadowed by highly contentious debates over the future of Costa Rica's power. Unlike most of its neighbors, which unbundled and privatized their electricity utilities beginning in the 1990's, Costa Rica maintains a vertically integrated electricity sector. Legal provisions prohibit private

Adding natural gas into the region's electricity matrix could lower the price of power by as much as 23 to 30 percent relative to oil. Cheaper electricity would reduce production costs for industries and fiscal burdens on Central American governments.

generators from producing more than 30 percent of the country's power²³ and confers sole authority over price setting to government agencies.²⁴ Harmonizing these frameworks with the more market-oriented practices of Guatemala, El Salvador, Nicaragua and Panama has proved difficult.

Rising electricity prices and the Costa Rican electricity institute's (ICE) mounting debts²⁵ have provided some impetus for change. Costa Rican business associations asked the government to declare a national energy emergency because of rising electricity prices in March 2013,²⁶ and proposed legislation that would increase private participation in electricity generation by some 10 percent.²⁷ These same interests have voiced support for cheaper, gas-based electricity. Because of how Costa Rica handled past privatizations of other sectors, however, any energy reform has become highly politicized.

²³ Steve Mack, "A renewable power generation primer," *The Tico Times*, September 6, 2013.

²⁴ Notas sectoriales: El sector eléctrico en Costa Rica. Instituto Español de Comercio Exterior. November 2011.

²⁵ Marcel Evans, "Debt Forces ICE to Seek Partners for Costa Rican Hydroelectric Projects," *Business News*, July 3, 2012.

²⁶ "Energy Emergency in Costa Rica," *Central America Data*, March 20, 2013.

²⁷ Gerardo Ruiz Ramón, "Diputados reanudan trámite para proyecto de Ley de contingencia eléctrica," *El Financiero*, March 13, 2013.

²⁰ Zach Dyer and Tania Lara, "3 years after Costa Rica kicked out gold-mining company, legal battle continues," *The Tico Times*, November 21, 2013.

²¹ Karla Arias Alvarado, "New moratorium for oil drilling on Castro's first day in MINAET," *The Tico Times*, July 31, 2011.

²² Institute of the Americas. 2nd Annual Forum on Prospects For LNG And Natural Gas In Central America. San José, Costa Rica. October 2, 2013.

Successful opposition has been spearheaded by the left-leaning Partido Acción Ciudadana (PAC) and energy sector unions. Citizens are concerned that greater private involvement will bring higher electricity prices and lower quality of services. If approved by the national legislature, a bill proposed in 2013 would put natural gas activities under the control of RECOPE, the state monopoly charged with overseeing all oil extraction and production activities.²⁸

The future of natural gas in Costa Rica revolves around the country's ability to address critical internal questions. Much will depend on the outcome of upcoming national elections. Outgoing President Laura Chinchilla has publicly supported natural gas and broader energy reform,²⁹ but she leaves office with the lowest popularity of any leader in

some hurdles, making great strides in reforming its regulatory and investment frameworks since passing a landmark natural gas bill in 2003.

Still, localized resistance has frustrated the government's repeated attempts to contract a large-scale gas plant. Demonstrations over health and pollution concerns stymied plans by Cutuco Energy and Fonseca Energy to develop an LNG terminal at the Pacific port of La Unión. Initially scheduled to come online in 2016, the plant would have been the region's first. Then-mayor of La Unión Osmar Cruz sided with protestors, however, banning thermoelectric facilities within the municipality.³² His replacement has hinted he may overturn the regulation, but political uncertainty at the local level persists.

The first round of bidding for a more recent contract was declared null after no company was able to best the government's price ceiling. In a second round, however, El Salvador awarded a contract to a consortium made up of Quantum and GLU. The agreement calls for the companies to construct and operate a 355-megawatt natural gas plant in the port city of Acajutla. If the endeavor is successful, El Salvador

could boast the region's first natural gas plant by 2018.³³

Challenges remain for the new project. Quantum and GLU could face resistance from the same organizations that coordinated grassroots protests in La Unión and Cortés, Honduras. The project's feasibility will also hinge on the company's ability to sell its electricity at a profit under uncertain market conditions. More than a quarter of planned generating capacity is non-contracted, and will need to be sold on the spot market.³⁴

Guatemala

Guatemala's energy outlook is among the brightest in Central America. The country has utilized its domestic oil and coal resources to diversify its energy matrix, taking advantage

Efforts to harmonize Costa Rica's legal and regulatory frameworks with others in the region have been complicated by domestic provisions that prohibit private generators from producing more than 30 percent of the country's power.

the region.³⁰ Her likely successor has declared that further opening of the electricity market "is not under discussion."³¹ With the PAC leading both presidential and legislative races after a first round of voting, it seems unlikely that the incoming administration will embrace major changes to Costa Rica's energy matrix.

El Salvador

Despite political support and promising reforms at the national level, well-organized local opposition and technical debacles have repeatedly delayed the integration of natural gas in El Salvador. The country has already overcome

²⁸ Diego O. Arguedas, "Proyecto de ley daría a Recope control de gas natural licuado," *La Nación*, July 11, 2013.

²⁹ Leticia Vindas Quirós, "Gobierno declara de interés public importar y distribuir gas natural," *El Financiero*, November 26, 2012.

³⁰ Marcel Evans, "Laura Chinchilla: No Corruption or Censorship in Costa Rican Government," *Costa Rica Star*, September 27, 2013.

³¹ Mercedes R. Agüero, "Luis Guillermo Solís, PAC: 'La apertura eléctrica es un tema cerrado,'" *La Nación*, September 10, 2013.

³² Anatoly Krumanav, "Outgoing official torpedoes El Salvador's LNG plans," *Interfax*, March 30, 2012.

³³ Juan José Morales, "Quantum-GLU vendería energía producida con gas a \$120 el megavatio," *ElSalvador.com*, December 20, 2013.

³⁴ Karen Molina Patricia García, "Construirán una planta de gas de \$1,000 Mlls. en Acajutla," *ElSalvador.com*, November 3, 2013.

of an electricity link with Mexico, expanding its generating capacity, and reducing average electricity costs. Since the entry into force of the regional electricity market (MER) in July 2013, Guatemala’s net exports of electricity have jumped more than eightfold, from 5.5 gigawatt hours in December 2012 to 47.7 gigawatt hours in December 2013.³⁵

Prospects for natural gas have also improved. In September 2013, Guatemala announced the discovery of approximately 2 million cubic feet of natural gas reserves in the northern department of Petén, marking the first find large enough to be exploited for electricity generation.³⁶ The development could displace a proposed US\$380 million, 200-megawatt gas-fired plant announced in 2012.³⁷ No decision will be made on either project until the government completes a feasibility study of the discovery in Petén.

Even if the new reserves are commercially viable, additional factors could derail natural gas development in Guatemala. The poor security environment in Petén is one major concern. The country’s plans to export electricity

to its neighbors have also been frustrated by complications with the SIEPAC line. Honduras failed to connect its portion of the regional transmission system with that of Guatemala by the 2013 deadline.³⁸ Technical liabilities discovered by El Salvador’s regulatory agency also prompted the regional regulator to limit the two countries’ exchanges via the regional electricity market.³⁹

Honduras

The Honduran government and private generators have publicly expressed interest in transitioning to natural gas for electricity generation.⁴⁰ Yet numerous internal obstacles are likely to impede natural gas development in the near term, among them local resistance, weak institutions, and poor infrastructure.

The only LNG facility proposed in Honduras to date, which would have been developed in the port city of Puerto Cortés by AES Corporation, came under fire from unions and community groups. Workers associated with national electric company (ENEE) staged public protests, objecting to

³⁵ Rosa Ma. Bolaños, “Crece exportación de energía de Guatemala,” *Prensa Libre*, January 22, 2014. Original statistics published by Comisión Regional de Interconexión Eléctrica (CRIE).

³⁶ “Potential Guatemalan gas opportunities in Petén mitigated by ongoing security concerns,” *IHS Jane’s 360*, September 12, 2013.

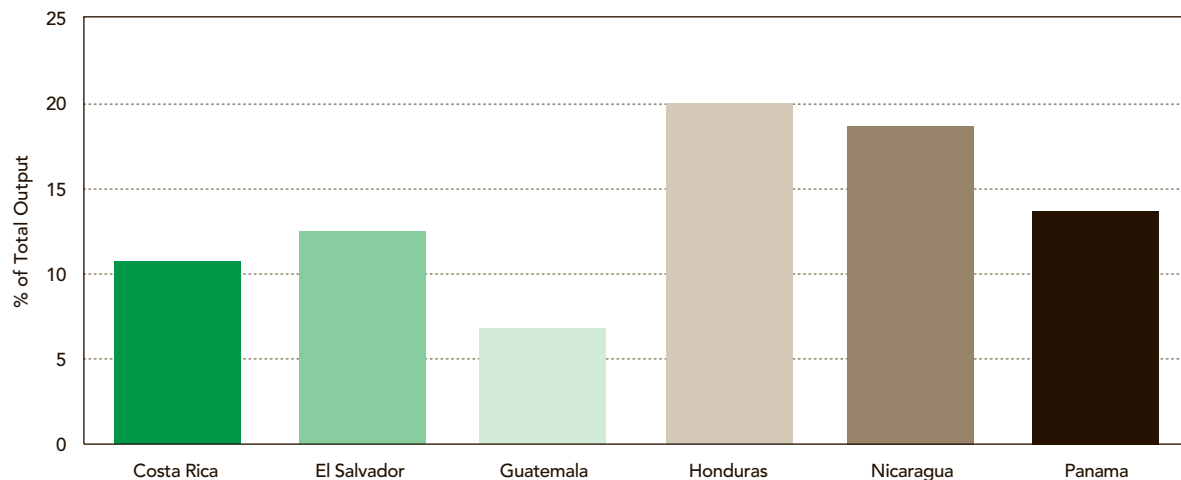
³⁷ “Guatemala: Natural Gas Power Plant,” *Central America Data*, August 23, 2013.

³⁸ Iris Ibeth Pérez, “Aplazan venta de remanentes de energía eléctrica,” *siglo21.com.gt*, December 12, 2013.

³⁹ “Limitan a Guatemala exportación de energía a El Salvador,” *El Economista*, November 22, 2013.

⁴⁰ Ministerial Statement on Electricity Integration in Mesoamerica, Inter-American Development Bank, June 28, 2013.

Figure 5. Electric Power Transmission and Distribution Losses (2011)



Source: World Bank Development Indicators, December 2013.

the use of foreign technology and the expatriation of profits to the United States.⁴¹ Environmental organizations have also organized against energy projects in Cortés and nearby Omoa. Challenges focused on allegations of corruption and the dubious safety record of operating companies.⁴²

In Omoa (where the targeted facility was a LPG storage and distribution center unrelated to electricity generation), opposition delayed the licensing process of Gas del Caribe for years and ultimately prompted the company to relocate to Costa Rica.⁴³ LNG plans in Puerto Cortés were also ultimately shelved, though it remains unclear whether the decision to pull back came in response to local concerns or more technical factors.

New efforts to develop an LNG terminal at Puerto Cortés have attracted attention from multiple transnational firms. Still, the Honduran government remains wary of technical uncertainties with switching to a new fuel, and the most recent contract signed by ENEE leaves open the possibility of constructing a more traditional oil-based plant in Cortés.⁴⁴

LNG facilities are highly centralized nodes for electricity generation that depend on efficient and reliable distribution networks. The viability of natural gas in Central America's electricity sector is therefore closely tied to the success of regional electricity integration.

Weak legal and regulatory frameworks, as well as a history of poor management in Honduras' energy sector, also present challenges to new natural gas projects. Like Costa Rica, Honduras's integration into the regional electricity market has been complicated by public control over the electricity sector. The country's commercial code also dates to the 1950s. A lack of guidelines and resources restricts the

permitting process at multiple points.⁴⁵ The lengthy environmental licensing process is cited as a "principal obstacle" by developers.⁴⁶

The country struggles to maintain the basic infrastructure necessary for electricity integration. Low investment has left Honduras' electricity grid in unusually poor shape. Power shortages occur with regularity, many rural areas have no electricity, and approximately 20 percent of total generation is lost in transmission due to poor infrastructure and theft.⁴⁷ After diverting a portion of the SIEPAC line to compensate for lacking domestic capacity, the government signed a deal with the IDB for US\$22.9 million in financing. The bank expects these funds will upgrade the matrix and dramatically improve Honduras' ability to participate in the regional electricity market.⁴⁸

Nicaragua

Nicaragua could benefit considerably by adding natural gas to its electricity matrix. The country's electricity rates are among the steepest in the region,⁴⁹ partly as a result of high oil dependence and significant losses in the transmission network. Rising electricity rates have sparked citizen protests in rural communities.⁵⁰

The national government seems most interested in discovering and exploiting domestic natural gas reserves. Like Honduras and Panama, Nicaragua has granted concessions for offshore oil and gas exploration along its coast. These prospecting ventures have not yielded significant finds to date. Most other efforts by Nicaragua's government have focused on encouraging investment in renewable energies.

⁴¹ "Unions protest AES' Puerto Cortes Project," *BNAmericas*, May 3, 2011.

⁴² Gregory J. Sobetski, "Gas del Caribe's Liquefied Petroleum gas Installation in Omoa, Honduras: An Assessment of Impacts and Progress Toward Resolution."

⁴³ "Gas del Caribe Moves Operations to Costa Rica" *Central America Data*, August 25, 2009.

⁴⁴ "Gobierno deberá intervenir 1,900 millones en terminal de gas natural licuado," *El Heraldo*, November 11, 2011.

⁴⁵ 2013 Investment Climate Statement—Honduras, US Department of State, February 2013.

⁴⁶ "Gobierno deberá intervenir 1,900 millones en terminal de gas natural licuado," *El Heraldo*, November 11, 2011.

⁴⁷ "Pérdidas técnicas de la ENEE alcanzan 22.9%," *El Heraldo*, September 9, 2010.

⁴⁸ Inter-American Development Bank, "Honduras to join regional electricity market," News release, December 19, 2013.

⁴⁹ Inter-American Development Bank, "IDB loan to strengthen electricity sector in Nicaragua," News release, November 19, 2013.

⁵⁰ "20 injured in Nicaragua protests over rising power costs levied by state, private company," Fox News, November 16, 2012.

The business community has proposed pipelines that would carry gas to the country from the United States or Venezuela⁵¹ although this is unlikely to gain traction so long as Nicaragua receives oil from the latter. Private sources estimate that as much as 90 percent of the country's oil imports are sourced to Venezuela through the Petrocaribe agreement, as are US\$1.6 billion in investment over the past five years and an even greater amount in public financing from the Venezuela-led Bolivarian Alliance (ALBA).⁵² Barring the dissolution of these institutions, Nicaragua's leadership will have strong incentives to continue importing Venezuelan oil rather than investing in new natural gas infrastructure.

Nicaragua's propensity to intervene in the electricity sector makes long-term natural gas investments a risky venture for private firms. After the government declared a national emergency in the energy sector in 2008, the Nicaragua Institute of Energy (INE) took over the country's privately operated gas import and distribution facilities for a period of six months.⁵³ Spanish company Gas Natural Fenosa also recently abandoned a large-scale investment in electricity distribution after being unable to turn a profit.⁵⁴

Panama

Among Central American countries, Panama is best situated to import natural gas. The ongoing expansion of the Panama Canal to accommodate large-scale gas shipments is expected to anchor the nation as a major transport hub for LNG traveling from the United States to Pacific markets. The country's relatively high investment grade makes it better able to attract capital than El Salvador or Guatemala.

The Panamanian government has been proactive in pursuing the opportunities offered by natural gas. It has launched feasibility studies to identify potential on a wide

range of activities, including LNG shipments, a gas pipeline from Colombia,⁵⁵ and even domestic gas exploration.⁵⁶ A series of reforms have primed national legal, regulatory, and investment frameworks for the incorporation of gas. President Ricardo Martinelli's administration has also advocated for natural gas through diplomatic channels, initiating discussions with potential energy supplier Trinidad and Tobago as well as the United States.⁵⁷

Approved natural gas projects under development by Panama NG Power in Panama and Quantum-GLU in El Salvador could yield the first LNG facilities in the region by as early as 2017 or 2018.

As a result, Panama vies with El Salvador to become the first Central American nation with an electricity plant fed by natural gas. The country recently awarded its first long-term contract for natural gas-based electricity generation, although the deal took much longer than expected and attracted only one bid, from Panama NG Power.⁵⁸ The installation is scheduled to go on line in March 2017. As in El Salvador, cautious industry insiders note that the project's scale could present technical challenges.

Critical Questions Remain

Unlike oil, which dominated world markets for decades before becoming a major fuel for Central America in the 1990s, natural gas only recently emerged as a major source of energy. The isthmus' distinctive geography, economy, and politics have further limited the application of US knowledge about the sector. This leaves available relatively little technical information appropriate to a Central American context.

⁵¹ 2013 Investment Climate Statement—Nicaragua, US Department of State, February 2013.

⁵² Maria Teresa Romero, "Nicaragua: Surviving without the Venezuelan Slush Fund," *Panamapost*, October 31, 2013.

⁵³ "Nicaragua intervenes in Tropigas distributor," *Central America Data*, September 25, 2008.

⁵⁴ D. Page, "Gas Natural Fenosa vende su negocio en Nicaragua por 43 millones," *Expansión.com*, February 12, 2013.

⁵⁵ "Venezuela, Panama, and Colombia Inaugurate Gas Pipeline Construction," *Venezuela Analysis*, July 6, 2010.

⁵⁶ "Concesiones para explorar gas y petróleo en Panamá," *Central America Data*, August 9, 2013.

⁵⁷ "Martinelli calls for US-Panama natural gas deal," *Newroompanama.com*, May 4, 2013.

⁵⁸ "Panama NG Power gana licitación para generación a gas," *Central America Data*, June 6, 2013.

Table 1: Potential Suppliers of Natural Gas (2011)

Country	Proven Reserves (Tcf)	Production (Bcf)	Ratio Reserves/Production	Consumption (Bcf)	Net Exports (Bcf)
United States	135.9	134.6	155.9	198.3	215.9
Venezuela	18.7	15.1	24.9	37.1	51.4
Trinidad and Tobago	13.9	15.8	21.2	26.3	30.5
Mexico	7.0	5.6	7.3	9.3	13.1
Peru	3.6	3.1	3.3	3.8	3.9
Colombia	2.2	2.1	4.3	7.1	9.1
Chile	3.2	3.8	4.7	9.6	8.2

Source: Pre-Feasibility Study of the Potential Market for Natural Gas as a Fuel for Power Generation or Energy Intensive Industry in Central America, Inter-American Development Bank, 2013.

The few studies conducted to date yield conflicting results and gaps remain in existing analysis. Lack of consensus around basic technical and economic fundamentals has left both governments and firms hesitant about investing in gas as a source of electricity generation. Concerns over the impacts of natural gas have also provoked opposition from government agencies, workers' unions, environmental groups, and local communities.

At best, a dearth of information complicates efforts adapt natural gas importation technologies to the unique capabilities and constraints of Central American nations. At worst, inconclusive data can be used strategically to justify political inaction. Information gaps must be filled and current knowledge must be reinforced if natural gas is to be credibly pursued as an option in the region. Key uncertainties include:

Who will supply Central America with natural gas?

With few proven reserves of natural gas, Central American countries will need to import natural gas from one of several existing producers. The region's most likely provider is the United States, where the ongoing shale gas bonanza has pushed supply to record highs. US gas is an attractive option for other reasons, as well. Existing free trade agreements between the United States and Central America should streamline the licensing process for all countries in the region but Costa Rica.⁵⁹ Another potential supplier

⁵⁹ Unlike the free-trade agreements signed between the United States and other Central American governments, the US-Costa Rica free trade agreement does not stipulate national treatment for natural gas trade between the two countries.

is Trinidad and Tobago, which exported a net 685 billion cubic feet of LNG to the United States, Europe, and Latin America over the past year.⁶⁰

Securing gas supplies from these countries, however, may prove challenging given the region's geography. LNG export facilities in the United States and Trinidad and Tobago border the Caribbean, but the majority of Central America's population—and the only ports of Guatemala and El Salvador—is concentrated along the opposite coast. Colombia and Peru operate LNG facilities on the Pacific Coast but neither ships large quantities of gas and both have other markets for their exports. The expansion of the Panama Canal to allow large-scale LNG shipments could be a game-changer for the Pacific region, but only provided that the costs of traversing the canal do not dramatically increase the end price of the gas.

There is also concern that gas-producing nations will restrict trade, such Peru did for a time when it ruled out large-scale exports from its Camisea gas field.⁶¹ Central American leaders stressed this point during a meeting with President Barack Obama in 2013.⁶² But the White House has been slow to approve export licenses, in large part to keep energy prices low for US companies during the critical

⁶⁰ Pre-Feasibility Study of the Potential Market for Natural Gas as a Fuel for Power Generation in the Caribbean, Inter-American Development Bank, December 2013.

⁶¹ "Aclaración: Perú no exportará gas natural a Chile en el corto plazo," *Ener News*, October 1, 2013.

⁶² Pre-Feasibility Study of the Potential Market for Natural Gas as a Fuel for Power Generation in the Caribbean, Inter-American Development Bank, December 2013.

Figure 6. Potential Ports for LNG Export to Central America

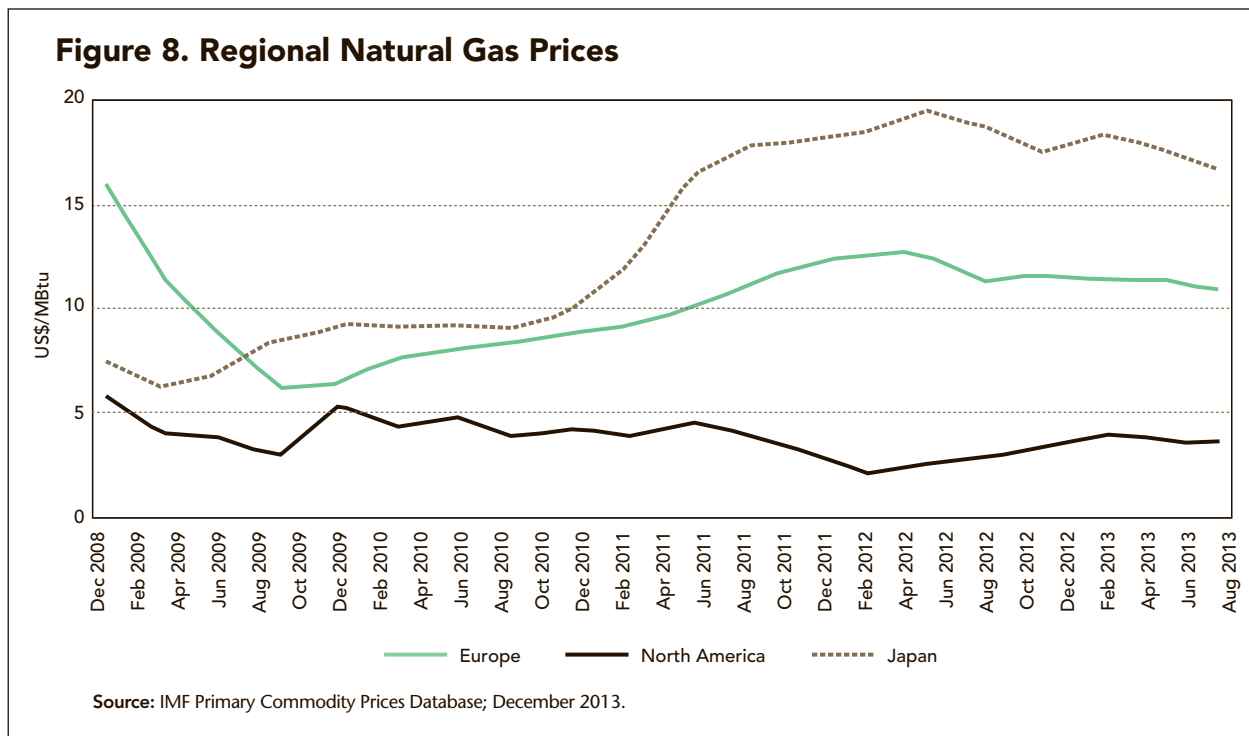


Source: Pre-Feasibility Study of the Potential Market for Natural Gas as a Fuel for Power Generation or Energy Intensive Industry in Central America; Inter-American Development Bank, 2013.

Figure 7. Potential Ports for LNG Import to Central America



Source: Pre-Feasibility Study of the Potential Market for Natural Gas as a Fuel for Power Generation or Energy Intensive Industry in Central America; Inter-American Development Bank, 2013.



early years of economic recovery. The green light for a third US port in late 2013 brought the total volume of gas approved for export to 5.6 billion cubic feet per day, or just 8 percent of total production.⁶³

Central America also faces stiff competition from other nations interested in purchasing US gas. Without tapping some form of preferential trading arrangement with the United States, the isthmus lacks the market size to compete with Japan or Europe—importers that consume greater volumes and pay higher prices than Central American economies can likely support.

How much will it cost to import natural gas?

For natural gas to penetrate Central American energy markets, it must improve upon the price of the oil and related fuels it is intended to displace. Few studies provide any measure of the final costs of natural gas. One of the most widely cited studies predicts price reductions of up to 30 percent

compared with oil.⁶⁴ Yet estimates can vary widely based on assumptions about regional and global market conditions.

Central America's small market size puts it at a disadvantage. Shipping companies that transport LNG benefit considerably from economies of scale. The aggregate demand of the entire isthmus pales in comparison to large consumers like Japan. If Central American countries must pay a premium to obtain LNG otherwise bound for bigger markets, costs savings relative to oil might be erased. Although small-scale technologies utilized elsewhere have been touted as a potential solution, there is no indication that these can be feasibly implemented in Central America.⁶⁵

Cost will depend greatly on other factors, including the extent of globalization in natural gas markets. US gas prices (approximately US\$3 per million btu) remain extraordinarily low thanks to rapidly increasing domestic production and tight restrictions on exports. If further liberalization introduces more US gas to global markets, arbitrage in

⁶³ "Order Conditionally Granting Long-term Multi-contract Authorization to Export Liquefied Natural Gas by Vessel from the Freeport LNG Terminal on Quintana Island, Texas, to Non Free Trade Agreement Nations," US Department of Energy Office of Fossil Energy, May 17, 2013.

⁶⁴ *Perspectivas sobre uso de LNG en Costa Rica*, SNC Lavalin, report compiled for RECOPE, 2012.

⁶⁵ Proponents of small-scale solutions generally point to the success of AES Corporation in the Dominican Republic. However, the favorable pricing terms obtained by AES Dominicana for natural gas are no longer available given market shifts, precluding Central American countries from taking advantage of similar premiums.

international prices could drive US rates closer to those of Europe (about US\$12 per million btu) or Japan (about US\$16 per million btu). Recent calculations by the US Energy Information Administration estimated that Henry Hub gas prices, the pricing point for natural gas futures contracts, will climb to approximately US\$8 per million btu by 2040.⁶⁶

A third major factor will be the tariffs levied by natural gas transporters. The costs of traversing the Panama Canal could be cost prohibitive for proposed LNG plants on the Pacific Coast. Charges imposed by the canal authority for LNG shipments would probably push prices for natural gas up to the same levels as oil and bunker in the region, according to some experts.

Who will finance natural gas projects?

An IDB workgroup estimated in 2008 that a feasible scenario for gas importation to Central America would require approximately 1.5 billion dollars in financing—an amount roughly equivalent to 4 percent (Guatemala) to 18 percent (Nicaragua) of countries' GDP in that year.⁶⁷ Projects of this magnitude will likely exceed the financing capacity of Central America's public sector, particularly at a time when growing budget deficits are a concern for several countries and state-owned energy companies face mounting debts. External funding is relatively scarce given most countries' poor credit ratings.

Private firms have expressed interest in funding and constructing LNG terminals and other gas-related facilities. Many, however, remain reluctant to invest in Central America until two critical issues are resolved. One is the question of regional integration. The second revolves around long-term supply contracts, which are critical to ensuring profitability of large-scale natural gas investments. Several countries have been slow to put these agreements into place.

⁶⁶ See Michael Ratner et al., "U.S. Natural Gas Exports: New Opportunities, Uncertain Outcomes" Congressional Research Service, September 17, 2013.

⁶⁷ David Casallas, "Central American natural gas alternative pegged at US\$ 1.55bn," *BNAmericas*, September 12, 2008. GDP estimates elaborated based on World Bank data.

Multilaterals are another possible source of financing. The IDB, for example, extended the region more than US\$240 million in loans for the construction of the shared SIEPAC transmission line. It subsequently approved addi-

The United States has been slow to approve natural gas export licenses, in large part to keep energy prices low for US companies. In late 2013 the total volume of gas approved for export was 5.6 billion cubic feet per day, or just 8 percent of total production.

tional financing and related research.⁶⁸ The World Bank also plans to provide increased funding for natural gas and hydropower projects in the coming years.

Who will be the winners and losers in the new energy matrix?

The region's private energy producers, many of which generate oil- or bunker-based electricity, may lose the most from natural gas integration. Competition from cheaper, gas-based power would likely force such facilities into costly conversions.⁶⁹ They might also have to accept lower profit margins per unit of energy sold. The adjustment will be most immediate and challenging for agents selling on the open market—the group likely to oppose natural gas integration efforts in the near term. The impact will be limited for producers already in contracted supply arrangements.

Natural gas is not likely to adversely affect other groups to a similar extent. Lingering uncertainties and scarce information, however, have fueled the perception among distributors, regulators, consumers, and local communities that energy reforms come with major risks. To ease gridlock on natural gas and electricity integration issues, key issues must be clarified and damaging misperceptions corrected.

One challenge comes in the form of resistance by local communities and environmental groups to the construction of natural gas facilities and other electricity infrastructure.

⁶⁸ Regional Power Integration: Structural and Regulatory Challenges, World Bank Report, January 2011.

⁶⁹ "Cepal: no es económico reconvertir térmicas a gas natural" *El Heraldo*, December 5, 2011.

Opposition of this nature is generally rooted in safety and health issues although, in certain cases, environmental interests have been the overriding factor. Local representatives have also complained that officials and companies do not adequately address communities' concerns. Protests have put pressure on local regulators and courts to intervene in certain jurisdictions, resulting in the delay or abandonment of energy projects.

For other, the logistics of electricity integration present risks. Electricity distributors, for example, remain divided because of fears that cross-border transactions will increase their operating costs. Concerns have also been raised about integration's impact on the cost of power for businesses and consumers. Electricity prices vary substantially among Central American countries based on the composition of the matrix. Countries with a large percentage of cheap hydro-based power, as well as those with highly diversified matrices, generally enjoy lower-than-average costs.

Protests by community groups over the safety, environmental impacts, and economic benefits of natural gas installations have put pressure on courts and regulators to intervene in certain jurisdictions, resulting in the delay or abandonment of projects.

In countries with relatively low rates, such as Costa Rica, officials worry that increased demand for cheap electricity in a common market will render energy more expensive for consumers and industry alike. This is a particularly sensitive issue for national regulators, who face pressure from high levels of government to keep energy prices low. Not only does the competitiveness of export-oriented manufacturers depend on affordable electricity costs, but price hikes will require greater fiscal outlays if politically sensitive energy subsidies to consumers are retained.

All for One and None for All?

More efficient outcomes in the energy sector could be achieved through closer collaboration between the region's governments. Gas-based electricity generation will likely be concentrated in one or two Central American countries. Power surpluses from these nations could replace more costly forms of generation in others, establishing a co-dependent and mutually beneficial relationship between energy exporters and energy importers.

Yet dependence is perceived as a significant political risk by most governments. According to Juan Miguel Cayo, "the problem [in Central America] is that politicians equate *energy security* with having *domestic generation capacity*" and that "countries remain unwilling to surrender sovereignty to regional bodies or depend on other countries."⁷⁰

The region's legal provisions, history, and political dynamics reinforce governments' sensitivity to risk in the energy sector. Laws in all six countries require producers to prioritize internal demand over external commitments in times of shortage; this makes it next to impossible for firms to enter dependable supply commitments over the long term.⁷¹ Even absent such measures, governments generally feel a political and economic imperative to respond first to national needs when external commitments conflict with internal necessities. After Argentina's energy sector failed to meet internal energy demand, the country cut gas supplies to Chile in violation of its legal commitments. Russia has been even more pernicious, threatening to discontinue the provision of gas on multiple occasions to block political developments opposed by Moscow.

Central American leaders have not been shy about intervening in the market to protect commercial interests: The region leads the world in the number of non-tariff barriers

⁷⁰ Juan Miguel Cayo, "Power Integration in Central America: From Hope to Mirage?" in World Bank, *Getting the Most Out of Free Trade Agreements in Central America*, June 2011, p. 123–149.

⁷¹ Análisis del mercado eléctrico regional de Centroamérica y acciones para impulsar proyectos de generación regional, UN ECLAC, February 2013, p. 31–42.

against trade in goods.⁷² The impacts of such measures are especially high in the energy sector. Since electricity cannot be stored after it is generated, producers usually sustain heavy losses if demand is interrupted.

There is additional concern that energy dependence could be used strategically to give energy exporters political leverage over their regional rivals. Long-standing quarrels—from territorial conflicts to trade disputes—regularly spark diplomatic rows between Central American countries. In some cases, the extent and level of regional cooperation is directly affected. The incumbent presidents of Nicaragua and Costa Rica, for example, are notorious for boycotting Central American Integration System (SICA) conferences in order to avoid each other.⁷³

These vulnerabilities notwithstanding, several Central America nations have begun exploring options for limited imports of electricity from their neighbors. Recent auctions in Guatemala, El Salvador, and Panama all allowed for a small percentage of contracted power to be imported from other Central American countries, as well as Mexico and Colombia. And cross-border electricity transactions have noticeably increased since the entry into force of the regional electricity market in the summer of 2013, though most purchases still occur on the spot market.

MER and CRIE can play a greater role in building confidence among Central America's six governments, but they possess little financial and political capital with which to pursue a more ambitious agenda. Both institutions lack the technology and manpower that would allow them to efficiently fulfill their multiple responsibilities. CRIE, which performs regulatory functions in the regional market, has neither the specialized technicians nor the computer software available in countries like the United States.⁷⁴ Its

members, moreover, have only convened four times per year since its formation.⁷⁵

Capacity building must also occur at the national level. Regional bodies rely on national agencies that are too often underfunded and overextended.

A push to upgrade the physical infrastructure necessary for electricity integration and natural gas development is also crucial. After remaining stalled for years by legal complications in Costa Rica, the last section of the SIEPAC transmission line is nearing completion. Yet in Honduras

The critical question for Central America is not whether natural gas can eventually be implemented—it is whether countries can do so in time to address growing liabilities in the energy sector.

and Nicaragua, where poorly maintained grids mean poor coverage in many areas and sizeable losses during distribution, the SIEPAC infrastructure is being utilized for alternative, in-country functions. The installation of the commercial measurement system (SIMEC) at every node in the regional transmission network has not been completed in every country.⁷⁶

Re-energizing the Region

Energy challenges in Central America will only become more acute in the coming years, putting additional pressures on governments and industry. Given the region's unique characteristics and the shifting global environment, effective policies will increasingly need to be determined and coordinated the regional, rather than national, level. The recalibration needed to make that happen will not be easy given diverse political and technical impediments to collective action.

The critical question for the region is not whether natural gas can eventually be implemented—it is whether countries

⁷² Perspectivas sobre uso de LNG en Costa Rica, SNC Lavalin, report compiled for RECOPE, 2012.

⁷³ "Costa Rica invites Nicaragua's Daniel Ortega to SICA meeting with Barack Obama," *Inside Costa Rica*, April 3, 2013.

⁷⁴ Regional Power Integration: Structural and Regulatory Challenges, World Bank Report No. 58934-LAC, 2011.

⁷⁵ Regional Power Integration: Structural and Regulatory Challenges, World Bank Report No. 58934-LAC, 2011.

⁷⁶ Análisis del mercado eléctrico regional de Centroamérica y acciones para impulsar proyectos de generación regional, 2013, UN ECLAC.

can do so in time to address growing liabilities in the energy sector. Regional coordination often occurs at a creeping pace. In this case, however, the isthmus cannot afford to wait for change. Natural gas is not a panacea for Central America's energy issues,⁷⁷ but it can greatly improve the efficiency and sustainability of the electricity matrix.

Accelerating the transformation of the grid will require mitigating perceived risks to diverse stakeholders throughout the region. Both businesses and civil society lack adequate information on the economic and social costs and rewards of natural gas implementation. Measures should also be taken to reduce the political risks of regional cooperation and energy dependence, including the convening of

more frequent and high-level meetings, and to increase the strength of regional institutions charged with overseeing the electricity sector.

Central America's situation is challenging, yet not unprecedented. The region collectively constructed the Pan-American Highway and negotiated the Central America Free Trade Agreement (CAFTA) with the United States. A transformation of the energy matrix presents new and unique challenges, but earlier successes can lend lessons. Much needed leadership on regional energy issues can be provided by technical bodies, such as the IDB, and by national governments that have already identified natural gas as a priority.

⁷⁷ Factors reinforcing Central America's high energy costs extend well beyond the electricity sector. Even assuming a best case scenario for electricity generation, displacing the lion's share of imported oil (more than 80 percent of which goes to the transport and industrial sectors) will be a long-term process. Although it will gas will remain competitive relative to oil, steady price increases forecasted for the next thirty years will gradually make the fuel more expensive.



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