Prospects for **LNG & Natural Gas** in Central America

An Institute of the Americas White Paper
by Roger Tissot & Jeremy Martin
All Rights Reserved © 2012
Prospects for **LNG & Natural Gas** in Central America

**Introduction**

Taken together, the six nations of Central America count a population of roughly 42 million inhabitants with a GDP per capita of US$3,500. The entire region has struggled to achieve a reliable and cost competitive supply of energy and is a net importer of hydrocarbons.

**Figure 1**

Across the six nations, the electric sector and market structure differ greatly from fully competitive wholesale markets to monopoly integrated utilities acting as single buyers. The region is divided into six sub-markets, each with different levels of economic development, energy infrastructure and energy preferences. But if evaluated as one single market, Central America has the potential to benefit from economies of scale derived from large power generation investments.

Incremental progress has been made from reforms in the 1990’s to an important regional energy interconnection project – the Central American Electrical Interconnection System or SIEPAC.

**Central America Energy Demand and Energy Balance**

Using as a reference Latin American Energy Organization (OLADE) data, Central America primary energy demand is relatively modest. Central America requires approximately 163,000 barrels of oil equivalent/day (boe/d) to cover its energy needs, which is 5% of the total Latin American energy demand.

Central American energy demand (Figure 2) is in fact slightly higher than Colombia (160,000 boe/d) or Chile (108,000 boe/d), but, of course, Central America is comprised of six independent nations each constituting a very small market. Moreover, demand by country
varies significantly depending on the countries’ population, size and economic development. Guatemala, with a primary energy demand of approximately 74,000 boe/d represents nearly half of total energy demand in the region. However, a simple forecast using population and economic growth data and 2011 total energy demand shows that energy demand in Central America could ascend to 200,000 boe/d by 2030. As a point of reference, primary energy demand in the United States is approximately 43 million barrels per day.

**Figure 2**

![Central America primary energy demand graph](image)

OLADE data underscores Central America’s energy balance and strong dependency on hydrocarbons. The region’s most important primary energy resources are biomass, oil and geothermal. As has been the focus of many studies and analyses, the high level of reliance on biomass is a reflection of the region’s levels of poverty. Biomass is used for cooking and heating purposes by rural and poor urban families.

**Figure 3**

![Central America primary energy supply graph](image)
Petroleum Dependency

Central America is particularly oil poor, resulting in challenging options for its electricity generation strategy. In recent years the region has experienced a collapse in its modest domestic oil production while imports, particularly of LPG, gasoline and diesel have greatly increased. As shown in Figure 4, Central America’s petroleum dependency has had a significant impact on the region’s imports bill, costing on average nearly $9.5 billion per year over the last 3 years, or approximately 6% of the region’s GDP.

Figure 4

![Central America cost of oil dependency](image)

The dependency of oil is in large measure due to its important role in the transportation sector, but also given its significant share of the electricity generation mix, as shown in Figure 5. Using data for 2010, diesel accounts for 32% of all of Central America’s power generation installed capacity.

Central America’s electric sector has seen a large expansion in thermoelectric generation capacity, exacerbating the region’s oil-import dependency and exposure to price fluctuations. In the last twenty years the share of hydroelectricity of the region’s total installed capacity has declined from 66% to 40% while diesel installed capacity share has increased from 5% to 32%. Despite an increase of 330% in the installed capacity of wind power generation in the last decade, the share of renewable in the region electricity matrix is still very modest.

In 2010 hydroelectricity accounted for 53% of all electricity generated in Central America followed by Diesel which totalized 27% of all power generated in that year. Since 2005 electricity generation has grown in average by 3.5%. The two fastest growing sources have been natural gas (23% grown per year) and wind power (20.6%).
Golden Era of Natural Gas

The International Energy Agency (IEA) in a recent publication refers to the golden era of natural gas. Gas is described as a “transition fuel” toward an energy future free of CO2 emissions. Unlike coal, when used as an electric generation fuel source, natural gas emits less Greenhouse Gases (GHG) gases. Therefore, it is seen as less harmful to the environment. For policy makers in today’s climate conscious environment, the crucial statistic is: Combined cycle gas fired power plants emit up to 50% less carbon dioxide than those from coal.

Until recently the natural gas “advantage” was based on these climate-related issues and a lower environmental impact as well as in the case of power generation, rapid pay out periods from cogeneration and small size gas thermoelectric plants. However, since the “shale gas revolution” in the United States, natural gas has become extremely cost competitive as a power generation source.

Figure 6

Gas prices HH US$/mbtu

Figure 5

electricity generation installed capacity by source 2010

- hydro: 40%
- diesel: 32%
- gas: 8%
- coal: 6%
- wind: 2%
- cog: 6%
- geo: 5%
- steam: 6%
Thermoelectric generation is attractive if it can benefit from economies of scale, requiring medium to large size power plants. Coal was often seen as an attractive alternative but one, as mentioned before, suffering from a negative environmental perspective.

Natural gas on the other hand provides for a much greater level of flexibility. Solutions can include small scale cogeneration plants and also large gas fired thermoelectric ones.

In addition to USA and Canada, Mexico and Argentina have very large shale gas reserves that can potentially be developed to feed their domestic needs and exports. Colombia is also actively pursuing the development of its own shale gas potential. However, in addition to shale gas, Central America can benefit from vast conventional gas resources from Venezuela, Peru and Bolivia.

**Global Natural Gas Scenarios**

In a recent study, the Baker Institute in cooperation with the University of Harvard developed a series of global scenarios for natural gas development. Two scenarios are perhaps the most relevant for Central American policy makers. The first one assumes that shale gas potential can be developed to its full economic potential globally, emulating North America experience, and that development would be made under a market oriented regulatory environment. The second scenario suggests that the shale gas revolution is unlikely to be exported beyond North America, and a global market of natural gas fail to materialize.

In the first scenario one can expect natural gas to converge into a global commodity. Gas producers in the United States would pursue new markets, including exports of LNG, a significant shift from a decade ago when USA was perceived to be a key importer of LNG. LNG competition would encourage an end to oil indexation contracts, and even shorter term agreements. In Latin America, encouraged by North American shale gas success, governments adopt policies encouraging investments in their “non-conventional” hydrocarbon resources. The key assumption in this case is the success of these policies at convincing private investors to risk capital in these projects.

Under this scenario, Central America would benefit from an abundant and reliable supply of low cost natural gas. In fact, Central America could be supplied from land by pipelines from North America and Mexico, and the south from Colombia. By sea, Central America would benefit from increasing LNG export projects from Peru, Colombia, Trinidad, Canada and perhaps Venezuela.

In the second scenario, on the other hand, a US industrialization boom and potential expansion of natural gas vehicles (NGV) could result in reduced pressure for LNG exports. Moreover, exports would focus on Asia's appealing market. Prices are unlikely to converge and thus LNG contracts will continue to be exposed to oil price volatility risks and long-term take or pay requirements. In this scenario resource nationalism continues to inhibit the full development of Latin America's vast resources of unconventional oil and gas. Central America is thus exposed to high prices of natural gas affecting the competitiveness of gas fired power projects.

**Natural Gas and SIEPAC**

The Central American Electrical Interconnection System (SIEPAC) is a roughly 1,800 kilometer electric transmission line project that will run from Panama to Guatemala and allow for capacity of 300MW in both directions. The project has been touted for many possible advances in Central America ranging from lower electricity costs for consumers in the region to improved security of supply the project has two specific goals: 1) Support the formation and consolidation of a Regional Electric Market (MER); and, 2) Establish the infrastructure for electric interconnection (transmission lines, substations, etc) that permit the exchanges of electric power among the participants of the MER. In fact, the SIEPAC market and infrastructure could serve as a critical piece for Central America to seize the opportunity presented by the “golden era of natural gas.”
Recommendations for Central America

Drawing from the foregoing analysis, Central American energy policy makers would appear to have different options in terms of market design depending on what scenario they believe is more likely to occur. In the first case, developing a regional integrated model where renewable energy supply is supported with a significant low-cost base load power generation from imported LNG emerges as an attractive option. Challenges in term of location and internal security of supply would have to be addressed. The appeal and viability for LNG projects would be enhanced if it were to be based on the more substantive regional demand, and not as the sum of six different markets.

On the other hand, in the second scenario the attractiveness of imported LNG would diminish due to potential high cost of imports. Coal would become more attractive as a source of supply, while renewable could continue to develop, reducing the need for imports.

In the last 20 years Central America has made significant efforts toward energy, and particularly electricity, integration through the SIEPAC project. Now, a new variable is challenging some of the assumptions made when the project was conceived. Technological developments resulted in the shale gas revolution. Cogeneration allowed for small scale power generation solutions. The combination of these two provides a new alternative for Central America in its design of a sustainable, competitive and reliable electricity generation strategy.

Conclusion

Central America has grown on average by 4.1% per year over the last decade. However, its long term economic growth will continue to be challenged by the high level of energy dependency that faces the region.

Figure 7
Having completed most of the SIEPAC infrastructure and corresponding market for cross border electric trade, Central America is now confronted with the challenge of deciding what model to implement in terms of electricity supply and demand.

The development of renewable sources in Central America, albeit more expensive than imported hydrocarbon ones, offers the advantage of import substitution costs. However, expansion of renewable power generation must include the added costs of connecting to the grid. Moreover, due to the intermittent nature of wind or solar generation, a strong fossil fuel and hydroelectricity source must be included in the energy mix.

Central America’s electric sector has a historical background of being developed under a highly centralized model often run by the state. In the 1990’s a process of liberalization and privatization aimed at increasing investments and improving efficiency resulted in the implementation of market oriented models through the region. In recent years the private sector model has been questioned in various countries due to insufficient investments. Emerging trends are also challenging the centralization approach as technological developments suggest the emergence of a decentralized electricity model, based on “smart grid” and micro generation units and consumer empowerment. These are at the center of the European Union electricity policy analysis. The complexity of market deregulation should not be taken lightly by Central American policymakers. In fact, the trend toward consumer empowerment requires costly meter readers, and complex regulatory frameworks.

Given Central America’s level of economic and technical development, the region may benefit from a model combining importation of LNG to feed large thermoelectric units. These would be complemented from small sources based on cogeneration, wind, hydro, geothermal and if viable, solar power. The key challenge, as usual, is for policymakers to agree on a common regulatory framework.
The Institute’s energy program is one of the oldest and most internationally respected efforts that focuses exclusively on energy issues in the Western Hemisphere.

The Energy Program works in a variety of ways to enhance public policy across the diverse roster of nations in the region. Through research, opinion essays, roundtables and conferences the Institute aims to shape and inform a deeper understanding of the most critical energy issues facing the hemisphere.

For over two decades, Latin America’s energy leaders have turned to the Institute as a key player and facilitator of informed and robust energy policy discussion. Energy events have been hosted in almost every country and market in the hemisphere.

The Institute’s ability to bring the worlds of business and government together for candid conversations is ever more critical for Latin America.

“The powerhouse among conference planners ... including the well-regarded Latin American Energy Conference” - Latin Trade

<table>
<thead>
<tr>
<th>UPCOMING EVENTS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospects for LNG &amp; Natural Gas in Central America</td>
<td>Panama City • September 27, 2012</td>
</tr>
<tr>
<td>Oil &amp; Gas Investment in Argentina</td>
<td>Buenos Aires • October 2012</td>
</tr>
<tr>
<td>Chile Energy Roundtable</td>
<td>Santiago • November 12, 2012</td>
</tr>
<tr>
<td>Energy &amp; the New Administration in the Dominican Republic</td>
<td>Santo Domingo • December 2012</td>
</tr>
</tbody>
</table>

PROGRAM STEERING GROUP

Energy Program Director
Jeremy Martin
Tel. 1/858-964-1715 • jeremy@iamericas.org

10111 NORTH TORREY PINES ROAD, LA JOLLA, CALIFORNIA 92037 U.S.A. • TEL: 1/858-453-5560 • FAX: 1/858-453-2165 • WWW.IAMERICAS.ORG