

Americas Business Dialogue

Energy Working Group White Paper

THE ROLE OF NATURAL GAS IN THE LATIN AMERICAN ENERGY TRANSITION

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Executive Summary

Many countries in Latin America and the Caribbean are turning to natural gas and renewables as new sources of energy. Both have a key role to play as countries work to establish the right balance for their energy mix going forward. This white paper focuses on the role and potential of Liquefied Natural Gas (LNG) for the region.

Access to natural gas has a positive effect on economic development. Success stories such as Argentina, Chile, Colombia, Jamaica and the Dominican Republic show that natural gas can have an impact on various sectors. It is therefore important that Latin American nations promote their use either through extraction or importation.

Currently 18 countries in the region do not have access to natural gas. These countries do however have a number of opportunities that could be leveraged in the near term, such as proximity to regional sources of LNG, abundant supply of gas to benefit buyers, and innovations in the supply chain that allow small and/or medium-scale options. This document presents a series of recommendations for countries to accelerate the adoption of natural gas:

- Enable bidding processes under international standards;
- Adapt LNG projects to existing conditions in each country;
- Stimulate the conversion of existing assets;
- Encourage use of globally recognized technical standards;
- Strengthen institutional commitment to accelerating access to natural gas; and
- Deepen the environmental agenda

Introduction

In 2018, global consumption of primary energy was 543,504.1 Tbtu¹. During that year, energy consumption grew 2.9%, more than 40% of which came from growth in natural gas consumption. The world's total natural gas reserve is 6,952,683.6 Tbtu. In the Americas, the countries with the largest reserves are the United States with 420,197.7 Tbtu, Venezuela with 222,457.6 Tbtu, and Brazil and Peru with 14,124.2 Tbtu each. Argentina, Bolivia, Colombia, Trinidad and Tobago and other

¹ Tbtu: Trillions of BTU; The following conversion is used: 1 million equivalent tons of petroleum = 39.2 trillion BTU

countries, have reserves less than 14,124.2 Tbtu.² In North America, natural gas is the most-used fuel in the generation of electricity, while in Latin America it is the second most-used, after water.

The net international gas exchange reached 34,357.3 Tbtu in 2018, with two thirds distributed by pipeline and the rest through LNG.³ The volume of Liquefied Natural Gas (LNG) in global trade has been increasing in recent years, reaching a record of 15,590.1 Tbtu. This increase was mainly due to the initiation of operations at new liquefaction plants in Australia, Russia and the United States. A total of 19 countries were gas exporters in 2018, Qatar leading with 3876.6 Tbtu and a 24.9% market share, followed by Australia with 3379 Tbtu (21.7% market share) and Malaysia with 1206.8 Tbtu (7.7% market share). A total of 37 countries were importers, Japan leading with 4098.2 Tbtu and 25.4% market share, followed by China and South Korea with 2699.3 Tbtu (16.7% market share) and 2192 Tbtu (13.6% market share), respectively.⁴

Natural Gas as a Driver of Sustainable Economic Development in the Americas

The development of natural gas is crucial to the diversification, resilience, and sustainability of the energy production in the Americas. Natural gas is a natural substitute for coal, generating half the carbon emissions and no particulate matter. It will continue to play key role in long-term energy planning, pairing well with renewable energy sources.

Economically, increased trade in natural gas in Latin America has been a primary driver of economic growth for countries with natural gas reserves such as the United States, Brazil, Peru, Bolivia, and Argentina. The production and export of LNG supports hundreds of thousands of jobs in the region, with significant increases projected in the coming years should the industry continue to develop as expected.

However, importing countries also benefit economically from natural gas development. Studies in countries with access to natural gas have shown that the consumption of this hydrocarbon has a positive effect. For example, a recent study⁵ analyzed 67 countries (including 9 Latin American countries⁶) over a period of 13 years and demonstrated that there is a direct link between economic growth and natural gas consumption. The study concluded that the consumption of natural gas has positive and significant impacts on investment and employment, in addition to the positive environmental impact of using this natural gas in place of other higher-emission fossil fuels.

It has been determined that the mechanism by which natural gas benefits the economy is the supply of the resource, regardless of price variation and method of access.⁷ This means that it is important for Latin American economies to promote access to natural gas, whether through support for its production or through importation.

Several Latin American countries are success stories of the introduction of natural gas into their energy matrices. Some, such as Argentina, Colombia, Peru, Trinidad and Tobago or Bolivia, are producers; while others, including Chile, Brazil, Mexico, Panama and the Dominican Republic, are net importers.

² BP Statistical Review of World Energy, 2019.

³ The Global Gas Market, Cedigaz, 2019.

⁴ World LNG Report, International Gas Union, 2019.

⁵ Nicholas Apergis, James Payne. Natural gas consumption and economic growth: A panel investigation of 67 countries. ELSEVIER, 2010.

⁶ Argentina, Bolivia, Brasil, Chile, Ecuador, México, Perú, Trinidad and Tobago, and Venezuela.

⁷ Vipin Arora, Jozef Lieskovsky. Natural Gas and U.S. Economic Activity, 2014

Expansion of Industry's Consumption of Natural Gas. Argentina has been one of the leading examples of the possibilities of penetration of natural gas in the economy⁸. In 1960, gas represented only 7.22% of the country's available primary energy, but its importance has grown in the intervening decades, and as of 2018 the figure has risen to 53%⁹. One of the main beneficiaries of this extraordinary growth has been Argentina's industrial sector, which has expanded its usage since the 1970s. In 2018, the petrochemical, steel, and food industries alone consumed 174.1 TBtu of gas in 2018, approximately 11% of the total gas in the country¹⁰ and equivalent to the total import of gas from Chile in the same year. Currently, the industrial sector industry represents 21% of Argentine GDP.

Effective Adoption of Liquid Natural Gas. In Chile the story is different: the country does not have significant reserves of hydrocarbons near consumption centers. The country has therefore had to resort to natural gas imports in order to maintain its accelerated pace of development. In 1996, the country began importing natural gas via 7 pipelines from Argentina, ultimately importing 180.1 Tbtu of gas per year by 2004. That year, however, production conditions in Argentina changed; imports declined 90% in 2009, and Chile then had to resort to other alternatives for its gas supply. In a period of 4 years, through a public-private initiative and a regulatory framework that facilitated private companies' access to storage capacity, 2 LNG terminals were built that successfully compensated for the drop in imports via pipeline. In 2017, Chile imported 163 TBtu of gas by sea.¹¹

Accelerated Diversification of the Energy Matrix. In 2003, an LNG terminal with a 160,000m³ tank was opened in the Dominican Republic to provide natural gas for a 319 MW combined cycle power plant. The previous year, the country's energy generation matrix depended on 85% of liquid fuels derived from petroleum (diesel and fuel oil No. 6).¹² From the first years of operation, the local natural gas market began expanding, first with a 34 km pipeline connecting to other generation plants in the west of the terminal (320 MW) and later with the construction of a truck filling terminal to provide LNG to customers beyond the pipeline. As a result of this effort, the country has saved more than 200 million dollars annually in energy bills and reduced atmospheric emissions by 1,100,000 tons of CO₂. There are currently more than 70 industries and more than 15,000 private vehicles using natural gas.

In 2019, contracts were signed for the construction of an additional storage tank and a new 50 km gas pipeline to the east, which will allow the replacement of current fuels from 5 generation plants with a total capacity of more than 900 MW. This was achieved thanks to the government's commitment to substituting liquid fuels in power generation, as it encouraged distribution companies to procure energy with natural gas. The official estimate is that by 2021 the Dominican Republic will no longer require petroleum-derived fuels for power generation.

Natural Gas in the Transportation Sector. The history of the adoption of vehicular natural gas (VNG) in Colombia is a success story. The penetration of VNG in Colombia began in the 1990s with initiatives in public transport. Nevertheless, by 1999 there were only 5,276 VNG vehicles, located mainly on the Atlantic coast. In the early years of the 2000s, fuel prices were liberalized, creating opportunity for VNG to compete. In the following decade the number of vehicles with VNG had grown by a multiple of 60. Service stations proliferated from 22 to 605 and were distributed throughout all regions of the country. By 2018, 13% (583,688) of private vehicles in the country used VNG and 808

⁸ Hansen J.P. and J. Percebois (2010). *Energy: Economics and Policies*, Brussels: Editions DeBoeck Université.

⁹ Energy Accounts. Ministry of Productive Development.

¹⁰ Report on Balances and Management 2018. Ente Nacional Regulador del Gas.

¹¹ National Energy Assessment.

¹² National Energy Information System (SIEN), National Energy Commission, Dominican Republic, 2018.

service stations had been installed.¹³ It is estimated that VNG users in cities such as Bogotá and Medellín save on average 45% compared to users of gasoline vehicles.

Leveraging New Technologies for Small-Scale LNG Distribution. Jamaica represents a case of success in adapting LNG infrastructure to the particular conditions of the country. The Caribbean country's energy matrix contains a very high proportion of oil derivatives; in 2015, 89% of its generation matrix depended on liquid fuels.¹⁴ That year, the Government promoted the conversion of a 145 MW plant in Montego Bay through the granting of an energy contract that financed the investments in the conversion. The volume of consumption and the location of the power plant made the construction of a traditional terminal very difficult. As a solution, a terminal with 7,000 m³ bullet-type storage tanks was built in 18 months to receive small-scale tankers. By 2017, natural gas represented 19% of the electricity generation matrix.

Given the advantages of access to natural gas, questions arise regarding the 18 countries that do not yet have it: what are the opportunities and what actions that should be taken in order to promote access to natural gas?

Opportunities

Geographic Location. All the countries that do not have access to natural gas are only a few days' trip away from a LNG source, either because of their proximity to a redistribution hub such as the Dominican Republic, Panama or Jamaica; or because they are close to the United States, Trinidad and Tobago or Peru, who are the main producers in the region. The cost of transporting LNG is relatively high due to its low energy density; therefore consumers who are closer to the sources of supply have a considerable competitive advantage. For example, the transport of an LNG ship that runs from the U.S. Gulf Coast to India could cost \$2.28/MMBtu; if that same ship were to go to Panama the cost could be \$.27/MMBtu.¹⁵ In a 400 MW power generation plant that consumes 25 TBtu per year this difference could mean more than \$50 million annually.

Buyers' Market. The shale gas revolution has exponentially increased the production of natural gas in the United States. This abundance has fundamentally changed the global market for LNG, as the United States has gone from being an energy importer to becoming the third biggest global exporter of LNG. It is estimated that by 2025 export capacity will grow 60%. The abundance of gas has also had a considerable impact on hydrocarbon prices. Since 2008, the price of gas in Henry Hub¹⁶ has fallen 7.2% annually, from \$8.86 to \$2.5 /mmbtu in 2019.¹⁷ The increased supply of LNG has allowed the creation of an increasingly more liquid "spot market" and has enabled long-term buyers to achieve more favorable conditions in LNG supply contracts. The rapid adoption of LNG in the world could reduce this window of opportunity in the coming years.

Innovations in Small- and Medium- Scale Technology. One of the main barriers to bringing LNG to Central America and the Caribbean has been the scale of demand in their countries. Traditionally, LNG was limited to countries with considerable demands that could justify the construction of terminals for reception, storage and regasification that involve very high investments. For example, the terminals of Chile and Panama cost more than \$1 billion each.¹⁸ This situation has radically

¹³ Reporto on the Natural Gas Sector 2019. Promigas.

¹⁴ Energy Division, Ministry of Science Energy and Technology. (2018). CARIFORUM Energy Report Card Input Data Jamaica

¹⁵ The cost of LNG transport depends on a number of variables that are not static over time. This estimate is based on average sizes, speeds and boil-off of ships. The estimated daily boat charter cost is based on the current market.

¹⁶ Henry Hub is a gas pipeline that is located in Erath, Louisiana. It is the formal delivery site for the future contracts of the New York Mercantile Exchange (NYMEX).

¹⁷ Energy Information Administration

¹⁸ Large size refers to terminals with storage capacity of more than 150,000 m³.

changed thanks to the technological advances of the last decade. The innovations have allowed the construction of small-scale ships that adapt to the conditions of countries with more modest demands. By 2018, there were more than 33 small-scale ships in operation with 1,100 to 31,000 cubic meters¹⁹ of storage capacity that could serve the demands of power plants between 50 to 400 MW. The construction of medium and small-scale LNG terminals has also become popular; they are built in less time and with a fraction of the investment that a traditional terminal would require.

In 2015, the Inter-American Development Bank sponsored a study for the introduction of natural gas in the Caribbean, which concluded that the best mechanism for accessing gas in the region was through LNG hubs.²⁰ At the time of the study, only the Dominican Republic had capacity for LNG. Now, there are several options from Colombia, Jamaica, Panama as well.

Actions to Boost Access to Natural Gas. The vast majority of expansion plans for the electricity sector in the countries of Central America and the Caribbean include the introduction of natural gas into their matrices in the coming years. To achieve this goal, the below actions can be identified. These actions fully align with the Americas Business Dialogue Recommendations #25²¹ and #27²² for enhancing sustainable use of natural gas:

Enable Bidding Processes under International Standards. LNG projects, regardless of their size, involve considerable monetary investments. The local financial systems of many of the countries in the region that aspire to access LNG usually do not have the financial capacity to finance these investments themselves or do not have the appropriate risk rating to support the commitments derived from the supply contract. Therefore, developers turn to major banks and / or international institutions, which require that the processes of granting contracts comply with international rules and standards. The difficulty in closing the financing has been one of the main factors in the delay or failure of many projects in the region. For example, the LNG terminal in Panama, the most recent one built in the region, was built as a result of an international bidding where 27 proposals were submitted with a variety of technologies. The transparency of the process and the solidity and experience of the developers allowed financing to be achieved with a pool of 8 financial institutions, including local banks, international banks, and multilateral organizations.

Adapt LNG Projects to Existing Conditions in Each Country. Different country conditions require different LNG projects. Many countries believe that only large-scale projects can bring competitive prices. To access large-scale markets, countries need large-scale reception terminals, which are not economically viable for electricity consumption of less than 500 MW. However, countries that do not have demand of that size can take advantage of new small and medium-scale technologies that already exist. They should also take advantage of distribution hubs nearby to advance gas projects adapted to their demands and geographical conditions. Many factors influence the design of LNG projects, including restrictions on development due to maritime conditions, scarce available land, and protected areas, among others. Deploying modular storage tanks and / or Floating Storage and Regasification Units (FSRU) allows LNG receiving systems to take advantage of existing port infrastructure in each country, reducing the amount of work and investment needed. In Central America and in most of the Caribbean islands, existing port infrastructure can be used for LNG

¹⁹ Small Scale LNG. International Gas Union. Appendix I, Examples of Small Scale Terminals, Operating and Planned, 2015

²⁰ Natural Gas in the Caribbean: Feasibility Studies. Castalia Strategic Advisors.

²¹ ABD recommendation #25: Facilitate improvements in the efficiency, cost, reliability and emissions of electricity production through the physical and regulatory integration of regional markets; enabling the efficient purchase and sale of electricity; and utilizing market-friendly regulations that improve access to renewable energy and natural gas.

²² ABD recommendation #27, Establish a transparent institutional framework process, incorporating private sector expertise, to facilitate long-term energy planning and the sustainable development of natural gas to improve the diversification and resilience of energy production.

terminals that would adapt perfectly to demand. With demands from 50 to 400 MW, small and medium-scale projects can be made that are financially sustainable, scalable over time, and have low environmental impact

Stimulate the Conversion of Existing Assets. In 2017, the diesel and fuel oil bill for the electricity sector in Central America reached \$1.2 billion, which were consumed in 5,634 MW of installed thermal generation.²³ As seen in the cases of the Dominican Republic and Jamaica, the conversion of existing plants is an effective way to create the necessary demand for the introduction of natural gas. Generally, in terms of investment, conversions are cheaper than installing new plants. The conversion to natural gas increases the efficiency of the plants and extends their useful life. However, the owners of the plants need certainty to be able to make these investments. Therefore, states that are interested in gaining access to natural gas should advance measures that are aimed at promoting the conversion of existing assets.

Encourage Use of Globally Recognized Technical Standards for Natural Gas Development. In order for the development of the natural gas industry to meet the requirements for safe, affordable, and sustainable energy, the equipment and processes used by LNG operators must provide high levels of safety, performance, and environmental protection. The global LNG industry, together with governments, non-governmental organizations (NGOs) and academic experts, has developed globally harmonized technical standards for the natural gas sector that can help operators and suppliers ensure they meet such requirements. Furthermore, since much of the LNG industry necessarily operates across borders, internationally accepted best practices and standards allow for seamless integration into cross-border labor and supply chains, reducing costs and frictions for participating in LNG development. Authorities can encourage use of standards through policy (incorporating references to global standards in regulation as appropriate) and collaboration with the private sector, in accordance with WTO and other multilateral trade rules, as well as the good regulatory practices (GRP) recommended by multilateral institutions such as the Americas Business Dialogue, World Bank and the Organization of Economic Cooperation and Development.

Commitment to the Introduction of Natural Gas. LNG terminal projects are very complex infrastructure projects. The development, construction, and operation of the project usually fall under the regulatory powers of multiple government entities with different levels of experience. When such a project is undertaken for the first time in a country, the authorities are in a complex situation, since they must respond quickly on novel regulatory issues. Therefore, government entities need to be willing to adapt their institutions to conditions required for development. This adaptation process must be supported by multilateral organizations, both public and private, that can accelerate the adoption of global standards and international best practices, as well as promote technical training of the authorities. For example, the LNG terminal in Panama involved more than a dozen government entities. The authorities' commitment accelerated the adoption of the new technical knowledge, which allowed the project to be put into operation in record time (27 months).

Deepen the Environmental Agenda. To reach various emission reduction goals, countries have to move towards an energy matrix that contemplates sustainable coexistence between intermittent renewable sources and firm energy sources, all to ensure society's growing energy needs are met. Natural gas can help achieve renewable energy development while maintaining the reliability of the electrical system. Natural gas plants have ideal characteristics to complement intermittent renewable energy. It is also the fossil fuel that produces the lowest emissions of greenhouse gases

²³ Central America and the Dominican Republic: Statistics on the hydrocarbon sector 2018. Economic Commission for Latin America and the Caribbean (ECLAC).

and pollutants. For example, compared to Heavy Fuel Oil (HFO), natural gas produces 30% less carbon dioxide (CO₂) emissions, between 80 to 90% less Nitrogen Oxides (NO_x), and does not produce sulfur oxides emissions.

Central America and the Caribbean are among the few regions in the world where high-sulfur HFO No. 6 is still used for the electricity sector. Until 2019, this residual derivative was mainly used in maritime transport. However, since January 1, 2020, the maritime authorities banned its use worldwide due to the volume and variety of pollutant emissions derived from its use. It would seem, then, an excellent opportunity for the authorities of the energy sector of the countries to start a broad discussion about the need to replace that fuel.

Conclusion

Access to natural gas has been shown to have a positive effect on economic development. In the countries of the region that have access to natural gas, its use has benefited industry (including the transport sector), reduced emissions, and provided diversification of the energy matrix. The versatility of LNG, in particular, has allowed countries without local production to access natural gas in a sustainable manner and in relatively short time. However, 18 countries in the region, located mainly in Central America and the Caribbean, still do not have access to that resource today.

This document identifies a series of actions that governments should take to accelerate access to natural gas. This includes carrying out bidding processes under international standards, which attract investors with proven experience in the sector and allows the financing of projects. In addition, planners must adapt the projects to the realities of the country, in order to make them really viable. Likewise, as in other cases of success, the authorities of the electricity sector should promote conversions with existing units, accelerating the adoption of natural gas while limiting the amount of necessary investments. It is also necessary that countries rely on global technical standards, continue to advance their environmental agenda, and achieve a unified effort by all institutions to accelerate natural gas projects.

Countries that do not have natural gas today are in an ideal geographical location to take advantage of the current situation, where there is an abundance of hydrocarbon. This improves contractual conditions for buyers and the availability of small and medium scale technology that allows advancing projects specifically designed for the needs and characteristics of each country.