

# A Natural Gas Revolution in Colombia\*

Miguel Ramirez<sup>1</sup>

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<sup>1</sup>Retiree, ExxonMobil, consultant, Bogota, Colombia ([miralo781@gmail.com](mailto:miralo781@gmail.com))

## Introductory Comments

We all know the use of natural gas not only improves air quality by reducing smog, but also helps mitigate the impact of climate change by significantly reducing emissions. Natural gas has tangible positive effects on people's lives around the world.

Here is just one example from Colombia. One of the meanings of the word “revolution,” as defined by the Merriam- Webster dictionary, is “a sudden, extreme, or complete change in the way people live and work.” For Maria Giraldo ([Figure 1](#)), a poor woman living in a poor neighborhood of Medellín, Colombia's second largest city ([Figure 2](#)), the day she began cooking using natural gas was indeed revolutionary. For her, natural gas represented a sudden, extreme and complete change in the way she lived.

Prior to the introduction of natural gas to the domestic market, Maria, like millions of Colombian housewives, cooked using “Cocinol,” a notoriously flammable liquid, akin to gasoline, which caused innumerable tragedies. The front page of *El Tiempo*, Colombia's largest daily newspaper, published November 29, 1993, read, “Cocinol is the Fuel of Tragedy: Figures do not lie. In Bogotá alone, every four hours a patient (many times a child) is hospitalized due to burns or other injuries involving Cocinol.”

To cook using natural gas and not Cocinol was indeed a true revolution that produced a great improvement in the quality of life of millions. For many other poor Colombians living in rural areas and in small towns, the situation was even worse. Burning biomass and wood was the cheapest way to cook. Burning wood often was not only detrimental to the health of women and children exposed to smoke in kitchens, but also hurt the environment, as evidenced by increasing deforestation. Fortunately, now, all that is in the past.

## “We Do Not Have Oranges, but We Have Lemons!”

Maria's happy story is the culmination of a long saga, which describes how the implementation of the natural gas service significantly increased the well-being of many Colombian households and improved the competitiveness of industry and the electricity sector.

Like in other oil and gas producing countries, Colombia did not use its natural gas. For many years, gas was unwanted and, in most cases, was flared at the wellhead. It was not until the early 1970s that Colombia understood that natural gas was not an undesirable byproduct of oil production, but an asset with numerous industrial and environmental benefits.

It is worth recalling the now legendary expression of the disappointed Texaco Petroleum Company geologists, testing a large offshore prospect believed to contain oil in June 1973, when they reported to headquarters, “S... , it’s gas!” They were referring to the production tests that led to the discovery of the offshore Chuchupa gas field, Colombia’s largest, which along with the neighboring Ballena and Riohacha gas fields, had original reserves of approximately 7 trillion cubic feet (TCF). Chuchupa gas reserves provided Colombia a golden opportunity to increase the use of natural gas in the country.

Juan Francisco Villarreal is a former president of Ecopetrol and one of the drivers of the push for the wider utilization of natural gas. In 1976, he coined a phrase that captured the imagination of the industry: “We do not have oranges, but we have lemons!” He was referring to the meager oil reserves of the country as compared to the size of the gas discoveries in Guajira.

### **Current Status**

The gradual, though at times slow, penetration of gas usage in Colombia is a success story, considering that the gas reserves of the country are modest (5.9 TCF proven and probable reserves at year-end 2015) and total gas sales are in the order of 1150 MCFGD. Other countries in the region with larger gas reserves can take cues from how Colombia increased the use of natural gas with great benefits for the population.

Today, after a difficult and long process, more than 670 municipalities, out of a total 1123, are connected to the gas grid. Included in the 670 municipalities are Colombia’s largest cities: Bogotá (7.8 million people), Medellín (3 million), Cali (2.4 million) and Barranquilla (2.5 million). Thus, more than 8 million households use natural gas. This represents a whopping 81 percent of the total households in the country. The country’s government aims in 2016 were to connect another million households to the grid before 2018.

A total of more than 530,000 vehicles, 14 percent of the total vehicle fleet of the country, are powered by natural gas. Roughly 32 percent of the taxis in Bogotá run with natural gas ([Figure 3](#)), and service stations serving compressed natural gas (CNG) for vehicles are now a common sight throughout the country. In addition to environmental benefits, the use of CNG also brings considerable economic benefits. Mauricio Hernández, a Bogotá taxi driver, said he saves around 50 percent when using CNG as compared to the cost of gasoline.

All service stations with CNG are privately owned, including national and international operators. Colombia has the seventh largest fleet of gas-powered vehicles in the world. (Iran has the largest, with 3.5 million vehicles.)

Vehicle conversions to CNG increased at a rate of 12 percent per year on average from 2010 to 2014. The penetration of natural gas in the transportation sector continues to increase. For example, Medellín’s rapidly expanding bus rapid transit (BRT) system (currently more than 320 buses) runs on CNG. Recently, Medellín garbage trucks also began using CNG. Now the trucks not only emit fewer pollutants but also produce lower noise levels. Cartagena’s BRT system, which came online in early 2016, also uses CNG.

CNG brings multiple benefits to motorists and cities, which enjoy lower costs, compared to diesel- and gasoline-powered vehicles and lower gas emissions. The winners are the environment and consumers' wallets. Colombia's grid of more than 7200 kilometers of natural gas pipelines ([Figure 4](#)) serves not only domestic markets and the transportation sector, but also the power generation and chemical industries.

### **How Did All This Happen?**

Four factors led to the expansion of the common use of natural gas in Colombia. All of these actions are reasonable and logical, but are difficult to implement, particularly in third-world countries.

1. The creation of a legal and regulatory framework, which allowed private companies to participate in public utilities with clear and transparent rules, under the supervision of a single government watchdog.
2. A long-term energy policy that encouraged action in the entire value chain: an adequate supply of natural gas, the construction of the transportation and distribution infrastructure required to serve the markets, and clear government signals designed to create a culture of gas utilization.
3. Active involvement of the private sector in the value chain, from the upstream to the midstream to the final distribution of gas to the consumers: The two largest gas transportation companies are Promigas (a Colombian company) and Spain's Gas Natural Fenosa, and the final distribution local lines are owned by numerous companies, most of them Colombian. The largest producers of natural gas in Colombia are Chevron, Ecopetrol (the state oil company), Equion (a joint venture of Ecopetrol and Repsol) along with Pacific Exploration and Production.
4. Continuous support of mayors and governors to expand the distribution lines in their cities: These are key actors along the entire chain and, without their support and participation, the construction of the intracity distribution lines would be impossible.

### **What's Next?**

For the natural gas revolution to continue bringing benefits to industry, power plants and the people of Colombia, new gas reserves must be discovered and brought to the market. This is particularly true considering the country's small proved reserves. Recent deep-water gas discoveries in the Caribbean (Orca -1 by Petrobras, Ecopetrol, Repsol and Statoil as well as Kronos-1 by Anadarko and Ecopetrol) provide encouraging technical results, but it will take some 10 years for these fields to be on stream.

In the meantime, recent smaller gas fields are being developed, gas lines are being expanded and most recently a 400-MCFGD regasification plant was approved to be built in Cartagena on the Caribbean coast. All these actions will guarantee a flow of gas to a growing market of satisfied customers.

Colombia's natural gas revolution illustrates how proper political decisions can move a developing country from a culture of "no market, no exploration" to a virtuous cycle of creating demand that stimulates exploratory efforts. Time will tell whether other countries will follow Colombia's lead and benefit the many Marias and Mauricios living in their cities.

## **Author**

Miguel Ramirez ([Figure 5](#)) is a native of Colombia and a proud Member of AAPG since 1972. He holds a bachelor's degree in geology from the Universidad Nacional de Colombia and a master's in petroleum geology from the Colorado School of Mines. He worked for ExxonMobil affiliates in Latin America for 35 years, including E&P assignments in Colombia, Brazil, Venezuela, Peru, Bolivia, the United States and Mexico. He retired in 2008 and worked another four years as a contractor for ExxonMobil in Colombia. Afterward, he consulted for Avanti Energy. Ramirez currently lives in Bogota, Colombia.

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Figure 1. When Maria Giraldo, a poor woman in Medellín, started using natural gas to cook, her quality of life took a quantum leap for the better.



Figure 2. Medellín, Colombia's second largest city, is located in the Aburrá Valley of the Andes Mountains. The city is among more than 670 municipalities connected to the country's gas grid; that amounts to 81 percent of Colombia's total population



Figure 3. Miguel Ramirez, AAPG Member since 1972, meets Bogota cab driver Mauricio Hernandez, while his vehicle is being refueled with CNG. Mauricio said he refuels every day and saves about 50 percent as compared with the cost of gasoline.

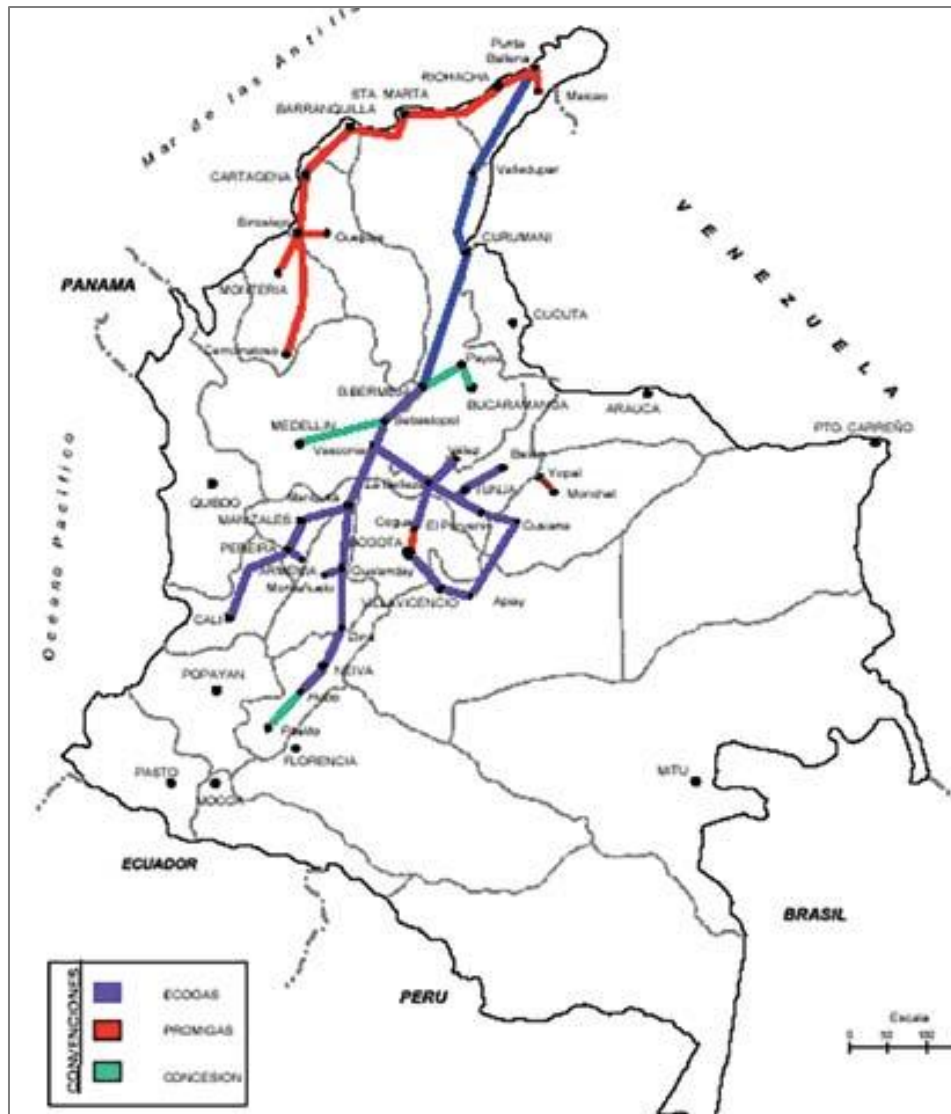


Figure 4. Map of Colombia showing major natural gas lines bringing natural gas to consumers in the country's main cities. Colombia has more than 7200 kilometers of gas lines.



Figure 5. Miguel Ramirez.