

Natural-gas-powered thermoelectricity as a reliability factor in the Brazilian electric sector

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Abstract

The introduction of natural-gas-powered thermoelectricity into the Brazilian generation sector can be considered as a very complex energy, economic, regulatory and institutional revision. Brazil is a country with very specific characteristics in electricity generation, as approximately 80% of the generating capacity is based on hydroelectricity, showing strong dependency on rain and management of water reservoirs. A low rate of investment in the Brazilian Electricity Industry in the period of 1995–2000, associated with periods of low rainfall, led to a dramatic lowering of the water stocks in the reservoirs. With this scenario and the growing supply of natural gas, both from within Brazil and imported, natural gas thermal electric plants became a good option to diversify the electrical supply system. In spite of the Brazilian Government's efforts to install such plants, the country was faced with severe electricity rationing in 2001. The objective of this work is to show the need to continue with the implementation of natural gas thermal electricity projects, in a manner that allows flexibility and guarantees greater working reliability for the entire Brazilian electricity sector. Taking into account the world trend towards renewable energy, the perspectives of usage of biofuels in the Brazilian Energy Matrix and in electrical energy generation are also analyzed. The very issue of electrical power efficiency in Brazil and its challenges and strategic proposals from the standpoint of Government Programs and results provided so far are presented. The technological constraints in order to put on stream the thermal electric plants are also analyzed. The article concludes with a positive perspective of the usage of natural gas as to be the third pillar in the Brazilian Energy Matrix for the years to come.

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1. Introduction

During the last 5 years, the large companies in the oil and natural gas industry throughout the world have developed studies of scenarios that point out the important

role reserved for other energy sources, as an alternative for the expected exhaustion of oil supplies in the period 2030–2050. In the case of Brazil, studies carried out by the planning bodies of the Ministry of Mines and Energy (MME), in relation to the most probable Brazilian industry growth scenarios for the period 1998–2010 (de Além, 1997), clearly show the important role reserved for natural gas, as a rapid response to the increasing demand for energy, which will be necessary for making sustainable development viable in the country. This subject, of great relevance from the geopolitical and strategic viewpoints, has deservedly been receiving growing attention from successive governments, not only because of the availability of the fuel in our production fields and the initiatives

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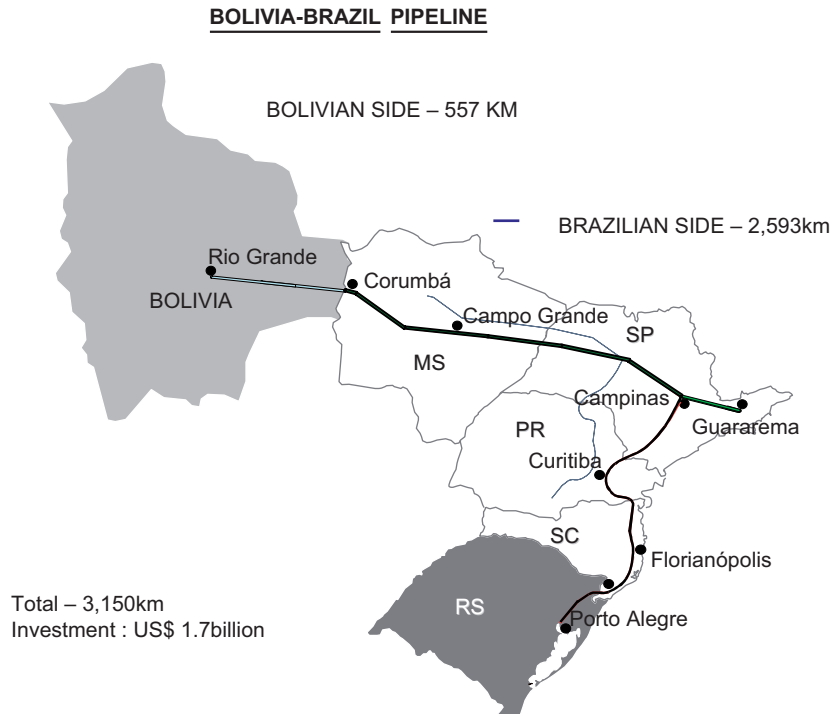


Fig. 1. Overall view of the Bolivia-Brazil gas pipeline. *Source:* TBG—Transportadora Brasileira do Gasoduto Bolívia Brasil.

to increase supply by importing (Fantine, 1995), but also for the appeal of using a superior fuel, which fits in as the best compromise solution between the alternatives of increasing the energy supply and the need to modernize the Brazilian industrial sector (Foss, 2005).

Thus, an important event occurred in the 90s, which continues to have wide repercussions on questions of energy supply for Brazil and, in particular, for the oil and gas industry; this was the decision, taken in 1992, by the Gas and Energy Commission of the MME (Cogas/MME) (Ministério das Minas e Energia (MME), 1992) to increase the participation of natural gas in the Brazilian Energy Matrix, then at 2.5%, to 12% by 2010. This decision became an institutional target of the Ministry, and was later endorsed, in 2000, by the National Energy Policy Council (CNPE), the body responsible for establishing policies and guidelines for subjects related to energy in Brazil.

The government's strategic objective, already accounted for in the tactical planning of Petrobras and Eletrobras,⁴ led to important, concrete initiatives in enterprises, of which can be highlighted the 3150 km Bolivia–Brazil gas pipeline, whose commercial operation to São Paulo began in June 1999. At its maximum capacity, the gas pipeline will make 30 million Nm^3/day^5 of gas available, the

equivalent of the daily production of all Brazilian wells in operation in 2006. Fig. 1 shows the size of the project.

The investments predicted for the period 2006–2011 in natural gas projects rank to US\$22.1 billion, of which 80% will be performed by Petrobras. Of these enterprises, two large gas pipelines being built in the Northeast Region are the highlights: Gasene, an integrating gas pipeline between the country's Southeast and Northeast networks, and Nordeste 2, which will take natural gas to the interior of the country. In the Amazon region there is building work for the Coari-Manaus and Urucu-Porto Velho gas pipelines. These projects will substantially increase the supply of natural gas for the country. Fig. 2 shows the trunk gas pipeline network that exists today in Brazil.

The exploration effort in its turn extended the Brazilian natural gas reserves to the level of 11.2 trillion cubic feet (317 billion Nm^3), with significant discoveries in the Santos and Espírito Santo basins. The evolution of natural gas discoveries in Brazil can be seen in Fig. 3.

Taking into account the 2004 proven reserves in Brazil, Argentina and Bolivia and the current consumption of the principal countries of the region (Brazil, Argentina and Chile), there will be a guaranteed supply of natural gas for a period of 28 years (not accounting for the reserves in Chile and the consumption of Bolivia). Fig. 4 illustrates these data.

In respect to environmental issues, the search for ecologically correct industrial products is more than a worry for the world's large companies; it is a necessity, a commitment to the environment. The improvement of environmental standards is among the main reasons for the

⁴Petrobras is a Brazilian mixed economy company principally working in the oil and natural gas segment. Eletrobras is a state-owned company in the electricity supply segment. It is responsible for coordinating the expansion plans for electricity supply in Brazil.

⁵ Nm^3 means a cubic meter of gas under standard measurement conditions, i.e. 1 atm of pressure at a temperature of 60 °F.

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