

# Opportunities and challenges for the use of Brazilian natural gas in the context of a low carbon energy transition

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## Overview

Currently, humankind seems to have reached a consensus on the need to accelerate efforts to decarbonize the world energy mix to avoid an increase in earth temperatures by 1.5 degrees compared to pre-industrial levels. The signing of the Paris agreement in 2015 was the first trace of this trend that today shows signs of no return (IEA, 2021). In this context, technological advances and gains in competitiveness have allowed a faster diffusion of new renewable sources, especially wind and solar energy (IRENA, 2021). However, the transition to low carbon economies presents significant challenges to be overcome. Among the main reasons, more than 80 % of primary energy consumption in the world comes from fossil sources (BP, 2020). In addition to the dimensions of the effort, the available technological options are still insufficient to replace fossil sources safely and at affordable in all sectors. Under these conditions, the option of electrification powered by new renewable sources still faces challenges to be overcome due to the intermittence of wind and solar sources and the need to have backup sources that are also safe and competitive to manage this variability. Recently, due to the need to have flexible backup sources to allow the diffusion of new renewables, energy policymakers in different parts of the world have resumed their interest in natural gas while other technological options reach levels of development sufficient to meet with that role. This is due to its high energy value, the installed capacity for processing and transport, its possibilities of wide application at low cost, and its greater purity in the combustion process - lower emissions compared to coal and oil (RADOVA, 2020).

In Brazil, initially without significant reservoirs of natural gas, the development of this industry was linked to the energy policy decisions taken by the federal government in the early 2000s, aiming to use this source to feed a thermoelectric park that would serve as a backup in a system dominated by hydroelectric generation (BICALHO, 2014). For this, the implementation of the thermoelectric park in the country was designed to deal with a residual demand that could not be satisfied by the hydroelectric park during periods of unfavorable hydrology and demand peaks, supplied from the importation of LNG. To this end, a remuneration scheme was defined for thermoelectric plants suitable for performing this function in the electrical system. However, as the residual demand started to increase since 2012, given the increasing unfavorable hydrological conditions, and the continuous reduction of hydroelectricity's share in total generation, the increasing use of the thermoelectric park to guarantee the electricity supply started to increase the tariff of the consumer (TAVARES, 2016).

With the discovery of natural gas reservoirs associated with oil in the pre-salt and other onshore areas during the last decades, as well as the increase in national production - from 9 million m<sup>3</sup>/d to 26.6 million m<sup>3</sup>/d between 1997 and 2020 -, expectations grew about the possibility of taking advantage of these resources to satisfy the internal demand for energy. However, its use faces significant challenges mainly related to the absence of drainage infrastructure. Furthermore, the incorporation of more significant volumes of natural gas to satisfy the electrical demand in Brazil and act as a backup source for intermittent renewable sources, a guideline visible in the United States, Europe, and other parts of the world, present tough questions due to the setback that could mean in terms of reducing CO<sub>2</sub> emissions in the sector. This is because the Brazilian electrical matrix comprises 87 % of low carbon sources, of which 65.2 % come from hydraulic energy (EPE, 2021). In this sense, with a generation capacity of 405.03 TWh, a big energy storage capacity in its water reservoirs, and an interconnected transmission and distribution system in almost the entirety of its territory, Brazil is in a position to continue advancing in the decarbonization of its power sector. This is by taking advantage of the excellent potential for expanding wind and solar power generation and using hydroelectricity to deal with the intermittence of these new sources. In this context, it is essential to reflect on the best way in energy and environmental terms to take advantage of the existing natural gas reservoirs in Brazil. Thus, the objective of the following article is to analyze the opportunities and challenges for the use of Brazilian natural gas reservoirs in the current context of efforts to advance in the decarbonization of energy matrices.

## Methods

Documental research with a qualitative approach will be carried out. In order to do so, recent discussions on opportunities to use natural gas in the current context of the low-carbon energy transition will be analyzed, emphasizing sectors that are difficult to abate from fossil sources. Then, the trajectory of the natural gas industry and the penetration of this energy source in the Brazilian electric sector from the beginning of the 2000s to the present time will be analyzed. Subsequently, the opportunities and limits for the use of natural gas reservoirs in Brazil will be analyzed, based on the recognition of the

technical and economic characteristics of this sector in the country and the characteristics of the different sectors with the potential to take advantage of these resources to satisfy their energy demand.

## Main results and conclusions

Among the results, the study considers that using a greater volume of natural gas reservoirs in offshore areas presents high costs due to the need to increase the transportation capacity to the coast. In the specific context of the electrical industry, it identifies some difficulties associated with misalignments in the regulation of both sectors to ensure adequate business conditions to encourage greater penetration of natural gas in the electrical matrix. Still considering natural gas as an option for the electrical industry, meeting environmental criteria, the decision would be contrary to the orientation that national energy policies are taking in the search for reducing CO<sub>2</sub> emissions considering the availability of resources in the country. Furthermore, this source would compete with the new renewables, which have been showing increasing gains in cost competitiveness - installation and generation.

However, the study considers some options that could be adopted to monetize these resources. Among the options, in the context of efforts to reduce CO<sub>2</sub> emissions, opportunities are identified to take advantage of natural gas resources in industrial sectors that are difficult to electrify – steel, cement, steel, and chemical industry. Taking advantage of the fact that other countries do not have the same availability of resources as Brazil, an alternative for the monetization of natural gas, especially that located in offshore areas, would be the development of liquefaction infrastructure for the export of LNG to other consumer markets.

In this way, the study concludes by arguing about the existence of some niche opportunities that policymakers could consider to encourage the use of existing natural gas reserves in Brazil without going in the opposite direction to the efforts to reduce CO<sub>2</sub> emissions, necessary to contain the climate emergency.

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