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Analysis of a power generation project in the face of increased demand for Liquefied natural gas (LNG) in the context of the new gas market

Análise de um projeto de geração de energia frente ao aumento da demanda por gás natural liquefeito (GNL) no contexto do novo mercado de gás

Análisis de un proyecto de generación eléctrica ante el aumento de la demanda de GNL en el contexto del nuevo mercado del gas

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Abstract
Natural gas is the primary fuel for Brazil's current expansion of thermoelectric generation. Imported LNG is considered a relevant energy source for developing new energy sources intermittently in the short and medium-term through plants that operate in the GW (gas-to-wire) and RTW (reservoir-to-wire) model. Given potentialities and restrictions, this study aimed to evaluate the prospects of using LNG as an alternative energy source. This article will use bibliographic, analytical, and qualitative methods and the SWOT tool. With this in mind, the expected results for analyzing strengths, opportunities, weaknesses, and changes in the expansion of LNG consumption refer to Eneva's Azulão Jaguatirica project. This research contributes to the debate on construction decision-making, the beginning of the operation of LNG terminals with a focus on thermoelectric generation, using the objective of the SWOT matrix already built by other authors, and considering possibilities for expansion of the natural gas market in the country.)
Keywords: LNG; SWOT; Power generation.

Resumo
O gás natural é o principal combustível para a atual expansão da geração termelétrica no Brasil. O GNL importado é considerado uma fonte de energia relevante para o desenvolvimento de novas fontes de energia de forma intermitente no curto e médio prazo por meio de usinas que operam no modelo GW (gas-to-wire) e RTW (reservoir-to-wire). Dadas as potencialidades e restrições, este estudo teve como objetivo avaliar as perspectivas de utilização do GNL como fonte alternativa de energia. Para isso, serão utilizados métodos bibliográficos, analíticos, qualitativos e a ferramenta SWOT. Com isso em mente, os resultados esperados para análise de pontos fortes, oportunidades, pontos fracos e mudanças na expansão do consumo de GNL referem-se ao projeto Azulão Jaguatirica da Eneva. Esta pesquisa contribui para o debate sobre a tomada de decisão de construção, o início da operação de terminais de GNL com foco na geração termelétrica, utilizando o objetivo da matriz SWOT já construída por outros autores, e considerando possibilidades de expansão do mercado de gás natural no país.
Palavras-chave: GNL; SWOT; Geração de energia.

Resumen
El gas natural es el principal combustible para la actual expansión de la generación termoeléctrica en Brasil. El GNL importado se considera una fuente de energía relevante para el desarrollo intermitente de nuevas fuentes de energía en el corto y mediano plazo a través de plantas que operan en el modelo GW (gas-to-wire) y RTW (reservoir-to-wire). Dadas las potencialidades y restricciones, este estudio tuvo como objetivo evaluar las perspectivas del uso de GNL como fuente de energía alternativa. Para ello se utilizarán métodos bibliográficos, analíticos, cualitativos y la

herramienta DAFO. Teniendo esto en cuenta, los resultados esperados para el análisis de fortalezas, oportunidades, debilidades y cambios en la expansión del consumo de GNL se refieren al proyecto Azulão Jaguatirica de Eneva. Esta investigación contribuye al debate sobre la toma de decisiones de construcción, el inicio de la operación de terminales de GNL con enfoque en la generación termoeléctrica, utilizando el objetivo de la matriz DAFO ya construida por otros autores, y considerando posibilidades de expansión del mercado de gas natural. en el país.
Palabras clave: GNL; DAFO; Generación de energía.

1. Introduction

The impacts of the emission of gases resulting from the burning of hydrocarbons, mainly derived from oil and coal, has become a matter of concern for countries in the world, having the effect of significant government decisions summits on global CO^2 reduction targets, with an emphasis on replacing clean, renewable energy sources, with a focus on phasing out the use of coal as an energy source.

Currently, the world is going through a period of energy transition that depends on the development of energy generation technologies from renewable sources, such as solar and wind energy, and natural gas (less polluting hydrocarbon) will play a relevant role as an energy source in combination with renewable energy sources, thus ensuring the generation of vital energy (IGU, 2019).

Renewable energies may have enormous room for growth in electricity production, and this movement is already taking place in Brazil. Environmentalists have encouraged policies to decarbonize economies and reduce the use of oil and coal especially.

The prospects for expansion of the energy sector for the next ten years, according to the planning elaborated by the EPE, which is designed for Brazil by the year 2031, an energy matrix of 52% based on non-renewable sources and 48% on renewable sources, where natural gas will have a 14.3% share.

This article aims to analyze the potential of ENEVA's Azulão Jaguatirica project and highlight the advantages and economic, regulatory, and environmental obstacles that can stimulate or hinder the development of the natural gas market, with emphasis on current regulatory and ecological contexts prospects due to increased demand for LNG.

The objective of this work will be to address this project's commercial, environmental and regulatory aspects, using both a methodology of documental analysis and a qualitative approach in interpreting the data and information found. The SWOT analysis tool developed in the work of author Lauron Arend on the LNG market will be used to analyze the potential of this project in the context of the growth of national and international LNG consumption.

2. Methodology

This work will follow the literature review methodology, using the reports of the Brazilian federal government, institutions that work in this area, and scientific articles, selecting those that deal with the theme of Brazilian LNG and the potentialities of the Azulão project of Eneva. Concerning the project, the Jaguatirica II plant will be built in the city of Boa Vista (Roraima State) and aims to reach 117 MW of electricity in terms of generation from natural gas from the Azulão field in Amazonas. The energy generated aims to supply 70% of the State's consumption by 2021. The gas extracted from the Azulão field, located in the Amazon Basin, is transported in its liquid form through a trailer and generates electricity in thermoelectric plants (ENEVA, 2020).

The material consulted comprises articles and publications from the academic and commercial world, following bibliographic rules and controls. The research of the material considered reports and scientific articles published in the last five years due to the novelties in the global LNG market and the development of programs that encourage the opening of the natural gas market in Brazil. In addition, the current scenario of pre-salt supply in Argentina and the renewal of the Bolivian

GN import contract.

In addition to the literature review, the methodology will cover a qualitative analysis through the SWOT Matrix tool, a model used in competitive advantage analyses. The SWOT Matrix is an acronym for strengths, weaknesses, opportunities, and threats. It is commonly used for a broad view of a given market, considering external and internal elements (Chen et al., 2014). The methodology will be based on an integrative review, considering the results of previous research that mapped the points of the SWOT matrix in a specific market, the natural gas market, in this case, to then apply the result of this article in the matrix growth of the use of LNG. Moreover, will be determined in this literary review article and studies that cover the years between 2009 and 2022. Authors such as Madsen (2016) use this methodology to precisely analyze a specific moment in the market scenario. Among internal factors, we consider the analysis of strengths and weaknesses. Opportunities and threats are related to the external environment, which has less control and suffers the effect of macro-environmental forces such as demographics, politics, and social, and micro-environmental aspects encompass suppliers, consumers, and logistics.

SWOT was used to identify and detail the advantages and disadvantages of the LNG segment used in the national GN mix (Costa Júnior et al., 2021; Ferrel & Hartline, 2013; Medeiros et al., 2021). The reports and publications come from the agencies of the Ministry of Mines and Energy (MME), the Energy Research Company (EPE), the National Petroleum Agency and Biofuels Agency (ANP), the Getúlio Vargas Foundation (FGV), and the National Confederation of Industry (CNI) still at the national level.

This study will analyze the potential expansion of LNG use in gas-to-wire projects for electricity generation. Given this, the internal factors (strengths and weaknesses) associated with the increase in the use of LNG for electricity generation will be considered. In contrast, external factors (opportunities and threats) are mainly associated with the industry's environmental, economic and regulatory scenario and aspects of environmental licensing, the organizational design of LNG terminals, and relevant legislation to build and operate them.

Thus, it is intended to identify the benefits and obstacles of the expansion of the LNG market using as a reference the Azulão-Jaguatirica project of Eneva. The following session will demonstrate the results of the analysis of the SWOT Matrix, elaborated by author Lauron Arend, concerning the LNG segment, emphasizing the scenario of expansion of LNG demand and the potential for electricity generation in projects in the gas-to-wire and reservoir-to-wire model.

3. Results and Discussion

At the end of the 1950s, LNG trading in the Asian market intensified. Countries such as Japan and Korea became the most prominent consumers after implementing liberalization policies. In parallel, China began importing more LNG and making contracts more flexible with other countries, a factor that has streamlined the LNG supply market from the supply perspective (Yuan, 2013, Satta et al., 2021).

In 2009, Brazil began the purchase of LNG as a way to meet internal needs and the growing energy gap. Currently, the country depends on the generation from hydroelectric plants, which are strongly impacted by climate variations. Between 2011 and 2015, LNG imports grew in conjunction with the expansion of the Brazilian economy due to the drought that affected the reservoirs of the generating plants (Gomes, 2017).

As the most significant monopolistic player, Petrobras (Brazilian Petroleum Corporation) is currently the one who owns and operates the three FSRU terminals in the states of Rio de Janeiro, Bahia, and Ceará. In 2015, Petrobras reached record import volumes of around 5.7 Mtpa and still consumed US$ 2.75 billion in LNG imports. Over the past four years, Brazil and Argentina, which imported 4.7 Mtpa in the same year, have significantly risen in the LNG marketing market.

The record year of LNG regasification in Brazil occurred in 2014, with an average volume of 19.93MM m3/day considering the movement in the three terminals. In the same year, 2014, the government, through Petrobras, invested in the

use of thermoelectric energy powered by natural gas to complement the supply of internal gas, and for this, it was necessary to use large volumes of LNG (Gomes, 2017).

However, in 2021 the scenario of high volatility in prices and increased global demand by 6%, after the rapid post-pandemic recovery, also caused by the low level in inventories and more significant uncertainty in supply, with an impact on prices that went from US$ 2/MMBtu in 2020 to US$ 25 in 2021. The increase in LNG prices globally has taken around thirty British energy suppliers from this market, and some heavier industry companies have dramatically decreased production in the more energy-intensive segments (EPBR, 2022).

The unfavorable price scenario may impact Brazil since the demand for LNG jumped from 8.4 million to 26.1 million m³/day to supply electricity generation due to the low level of reservoirs. It was also considering that the Santos L.N.G. Terminal was recently interrupted by a court decision (Bridge & Bradshaw, 2017). This LNG Terminal that would be built in Santos (SP) would have the licensed nominal regasification capacity of 14 million m³/day and storage of 170,000 m³. 5 The construction and operation schedule of the LNG Terminal when the project was structured provided for the start of operation in the first quarter of 2022.

3.1 Internal Environment

As presented by the lower-left table (Forces), developed by author Arend (Arend, 2022), among the primary listed focusing on the gas-to-wire model is the fact of serving regional supplies (remote delivery) located in markets not served by pipelines, and also the non-dependence of pipelines or chain links to operate, as in the case of the Azulão-Jaguatirica project, in this project the use of cryogenic trucks allows logistics to manage in the supply of the domestic market, which contributes to the expansion of LNG demand by small industries.

The LNG market has a significant advantage in operating in the short-term spot market. There are currently regasification terminal structures in Brazil to receive ships on the coast and water LNG to their gaseous State, allowing the injection into the pipeline network. Currently, Petrobras operates in three LNG terminals in the states of Bahia, Ceará, and Rio de Janeiro. In recent years, the Brazilian government has invested in increasing demand for LNG to meet the energy security needed to ensure the country's development in the coming decades, including flexibility in supply and the need to expand gas-fired UTEs in the planned national energy park (Michelena, 2018).

Also, on the dimension of strengths of the model, it is observed that the use of LNG as an energy source, because it is an activity that is becoming competitive, is capable of providing access to energy and new economic activities in the most inland regions of Brazil. Especially in the most isolated regions, which can be served through virtual pipelines (cryogenic trucks) and generate social development for the population around the cities, as is the case of the Azulão-Jaguatirica project of Eneva.

However, the weaknesses associated with projects that depend on greater use of LNG and the rigidity of the TP (take or pay) and SP (ship or pay) contracts when large volumes need to be transported mainly for power generation in thermoelectric plants and even bureaucratic obstacles to licensing projects that will be dealt with later, in addition to the risks involved in liquefied and regasification infrastructure (Mouette et al., 2019). Therefore, we should seek to mitigate as many of these risks as possible through efficient regulation and supervision and applying the best techniques and technologies for liquefication and transport of LNG. In addition, suppliers need high investments and conditions that can create barriers to consumer markets by adding to the required credit guarantees and the need for bulk deliveries of indivisible cargo in a single terminal (Molnar, 2022).

3.2 External Environment

Among the opportunities observed in the SWOT matrix, we highlight the reduction of high investments in the construction of pipelines, the quick response of demand for the supply of UTEs, in the case of the Azulão-Jaguatirica project in Roraima, it allows generating the development of remote regions since LNG will meet the extremes of Brazil where the pipeline networks do not support or have limited capacity. Another factor concerns the advantage of constantly evolving LNG processing technologies, reducing investments and operating costs.

Among the opportunities observed in the higher demand for LNG listed by the authors, Eneva's project (Azulão Jaguatirica) can be encompassed as other LNG applications through smaller scale transport (Small Scale LNG) through cryogenic trucks. However, it is necessary to consider in this market the external threats that encompass foreign exchange risks (contracts indexed to the variation of the dollar), price risks, and geopolitical risks that can impact the forces of demand and supply of this market and cause sudden variations in price and productivity (Arend, 2022).

In the context of the market and external changes, in the second half of 2019, the federal government announced the "New Gas Market", a program that aims to promote the opening of the gas sector nationally. Generally speaking, this program comprises planning and actions aimed at increasing investments in the gas market in Brazil, increasing competitiveness, and diversifying the number of companies operating in this segment. Among the propositions are the breaking of Petrobras' monopoly mainly in the transport segment, the sale of the company's assets, and the opening of the oil derivatives transport infrastructure so other competing companies can enter this market (MME, 2019).

This new policy will allow greater diversification of agents and greater freedom to move and negotiate contracts to purchase and sell natural gas. With increased competitiveness, it is expected that the price will be impacted and can become attractive to consumers and new entrants. In this way, the industry that needs cleaner and lower-cost energy sources can increase the acquisition of natural gas with the expansion of the LNG market since such policies will increase the viability for these investments and new ventures such as ports and regasification terminals.

Overall, the growth of this market was driven by LNG imports, which significantly impacted the percentage of participation in the domestic supply of natural gas in 2020. In 2021, the national Natural Gas offer went from 57.2 MM (m^3/day) to 52.3 MM (m^3/day). In the same period, Gasbol imports remained stable at more than 20 million m^3/day. Thus, it reduced Brazilian and Bolivian gas use by almost 5 million m^3/day. However, LNG imports ensured an expansion of gas supply to meet the growing demand for Brazilian thermal power plants (INEEP, 2022).

3.3 Regulatory and environmental aspects

Considering that regulatory and environmental aspects are demonstrated in the SWOT matrix as external factors, this chapter will address the regulatory issues related to the licensing of LNG projects (regasification terminals) to demonstrate the current regulatory landscape.

Chapter VI of the Federal Constitution (CF) of 1988, specifically, Art. 225 brings the legal discipline of Environmental Law. In the IV of Art. 225, there is a reference to the requirement of prior study of environmental impact for the installation of work or activity potentially causing significant degradation of the environment.

The Federal Constitution received the existing Federal Law No. 6,938 of 1981 (National Environment Policy) and dealt with the licensing of effective or potentially polluting activities (Art. 9, item IV). This law clears the responsibility of the public authorities regarding granting licenses to those interested in developing such activities.

In this line, CONAMA Resolution 237 of 1997 defines environmental licensing as an "administrative procedure by which the competent environmental agency licenses the location, installation, expansion, and operation of undertakings and activities using environmental resources, considered effective or potentially polluting or those that, in any form, may cause

environmental degradation, taking into account the legal and regulatory provisions and technical standards applicable to the case."

The licensing steps are also described in Conama Resolution 237/1997, in article 10:

(i) definition of environmental documents, projects, and studies necessary for the beginning of the licensing process;

(ii) application for the environmental license by the entrepreneur, giving due publicity;

(iii) analysis by the competent environmental agency of the documents, projects, and environmental studies submitted and the conduct of technical surveys, if necessary;

(iv) request for clarification and complementation by the competent environmental body;

(v) public hearing, where it is appropriate, under the relevant regulations;

(vi) request for clarification and complementation by the competent environmental agency arising from public hearings;

(vii) issuing a conclusive technical opinion and, where appropriate, legal advice; and

(viii) acceptance or rejection of the license application, giving due publicity.

Furthermore, arising from the approval of the application for leave, as well as the nature of the activity, the entrepreneur must obtain:

(i) Prior License (LP) - granted in the preliminary phase of the planning of the enterprise or activity, approving its location and conception, attesting to environmental viability, and establishing the basic and conditioning requirements to be met in the subsequent phases of its implementation;

(ii) Installation License (LI) - authorizes the installation of the enterprise or activity according to the specifications contained in the approved plans, programs, and projects, including environmental control measures and other conditions of which they constitute a determining reason;

(iii) Operating License (LO) - authorizes the operation of the activity or enterprise after verifying the effective compliance with the previous licenses, with the environmental control measures and conditions determined for the operation (art. 8 of Conama Resolution, 237/1997).

As for the environmental agency responsible for environmental licensing, Complementary Law 140/2011 deals with the ordinary competence between the Union, States, and Municipalities. Article 7 states that the Union should act in the promotion of environmental licensing of enterprises and activities:

(a) located or developed jointly in Brazil and a neighboring country;

(b) located or developed in the territorial sea, on the continental shelf, or in the exclusive economic zone;

(c) located or developed on indigenous lands;

(d) located or developed in conservation units established by the Union, except in Environmental Protection Areas (APAs);

(e) located or developed in two or more States;

(f) of a military nature, except for environmental licensing, by the act of the Executive Branch, those provided for in the preparation and use of the Armed Forces;

(g) intended to research, plow, produce, benefit, transport, store and dispose of radioactive material at any stage or using nuclear energy;

(h) that meet typology established by an act of the Executive Power, based on the proposition of the National Tripartite Commission, ensuring the participation of a member of Cinema and considering the criteria of size, polluting potential, and nature of the activity or enterprise.

Article 8 of Complementary Law 140/2011 addresses administrative actions at the State level to promote environmental licensing of activities or enterprises that use ecological resources, effective or potentially polluting or capable, in any form, of causing environmental degradation, subject to federal and municipal competences (item XIV); as well as to promote environmental licensing of activities or enterprises located or developed in conservation units instituted by the State, except in APAs.

Article 9 of Complementary Law 140/2011 deals with municipal competence to promote environmental licensing of activities or enterprises: a) that cause or may cause an environmental impact of local scope, as defined by the respective State Environmental Councils, considering the criteria of size, polluting potential and nature of the activity; or b) located in conservation units established by the Municipality, except in APAs. In carrying out this activity, the municipalities must observe the attributions of the other federative entities.

Due to the institutional characteristics of the Federal District, its administrative competence in environmental matters encompasses state and municipal attributions (art. 10). Complementary Law No. 140 also prescribes that the licensing will be carried out by a single federative group (art. 13). This legislation is referred to for the environmental licensing of Liquefied Natural Gas terminals. The following section will bring procedural details from the point of view of studies conducted in Brazil on approved cases.

3.4 Environmental licensing of Liquefied Natural Gas (LNG) units

LNG projects allow supply and operational security flexibility, whose advantages will enable the balance of the seasonality of renewable energies. Given their characterization as a potentially polluting activity, environmental licensing is necessary to implement LNG Projects.

By LNG projects, the following can be contextualized: (i) the existence of an FSRU ship moored in the territorial sea, on the continental shelf or in the exclusive economic zone, inland waters, or even in the port terminal, with the presence of a pipeline to bring gas to a Thermoelectric Unit (UTE) on land for electricity production or even a city gate for gas distribution, considering several segments of end-users; (ii) or an FSRU ship moored in the territorial sea, on the continental shelf or in the exclusive economic zone, or inland waters or even in the port terminal, with the presence of a gas pipeline to bring the gas to the cryogenic storage tank located on land, from which it can be distributed via LNG trucks.

There are many documents required for the implementation of an LNG regasification terminal; considering this project inserted in the port terminal, among them stands out the studies of technical, economic, and socio-environmental feasibility (Milaré, 2009), in addition to the EIA /RIMA (Environmental Impact Studies and Environmental Impact Report), according to CONAMA Resolution 001/86, which are preceded by Terms of References prepared by the licensing body.

Without looking at the CONAMA mentioned above resolution 237/1997, in article 10, such as descriptive memorial of the company's facilities and processes, plant location of the enterprise, hydraulic plant of pipes that conduct industrial dumps, sanitary sewage, cooling water, rainwater, etc.

Within the licensing procedure, documents may also be required, such as the Opinion of the Brazilian Navy (Directorate of Ports and Coasts or Captaincy of Ports) regarding the planning of waterway space and the safety of navigation; authorization of IPHAN (National Institute of Historical and Artistic Heritage), given the potential occurrence of archaeological sites and areas of historical and cultural interest, before the execution of works (Normative Instruction No. 001/2015 of the Ministry of Culture defines procedures for licensing).

Furthermore, if it involves areas of the Union necessary for the implementation of the port facility, the National Waterway Transport Agency (ANTAQ) may admit the presence of a certificate issued by the Secretariat of The Union Heritage (SPU) that attests that the required area is available for the future destination to the entrepreneur authorized by the

granting power.

In this case, Ordinance SPU 404/2012 establishes rules and procedures for investigating processes aimed at the assignment of physical spaces in public waters and sets parameters for calculating the available price due as retribution to the Union. The port authority and the Local Maritime Authority (REN 52/2015) will also be required. Finally, because it is a customs operation, the rules of the Brazilian Internal Revenue Service Ordinance 3518/2011 should also be observed.

3.5 Regulatory Aspects

According to ANP Resolution No. 50/2011, the construction, expansion, and operation of LNG terminals will depend on prior and express authorization of the ANP. For the Granting of Construction Authorization and Operation of LNG Terminals, the company must follow the requirements established in ANP Resolution No. 52/2015. For entirely new projects, authorization is given in three stages: publication of an executive summary (similar to a prior project license), construction use, and operation (ANP, 2015).

The application for Construction Authorization must be forwarded to an ANP instructed with the documents and information required in Art. 8 of REN 52/2015. In addition to these documents and information, REN 52/2015 also provides in Article 9 a series of complementary and specific documents for terminals. Among other technical standards, the project must follow ABNT NBR 17.505, established by ANP Resolution No. 30/2006 and Joint Resolution ANP/INMETRO No. 1/2013. What must make the company's request through the ANP's electronic petitioning system (SEI). If the company also commercializes natural gas, it must obtain a gas marketer authorization under ANP Resolution No. 52/2011 using the same electronic petitioning system (SEI).

This normative procedure demonstrates that the planning of new projects must be evaluated from the point of view of the regulation and procedure necessary for the construction and proper operation of the same so that these projects do not delay and become uncertain when they need to face the bureaucratic and regulatory obstacles required by the regulatory agencies, which may delay the schedule of implementation and operation of the projects.

4. Conclusion

The increase in LNG demand is due to water scarcity in the reservoirs of the hydroelectric plants in crisis in 2021. This will significantly reduce the power generation capacity in this period, leading to international demand for gas. However, during a pandemic, the supply curve initially follows this change in demand, but in the post-pandemic period, price escalation is inevitable.

Another factor that shows the strength of LNG use is the increased use of natural gas-powered thermoelectric generation as a load production base, as they have a discontinuity characteristic with greater control capacity in terms of power generation (Libby, 2015). The Eneva project in this study follows modern power generation models with lower costs and risks, such as the pipeline. In the case of this project in Roraima, LNG is transported by refrigerated trucks and used for electricity generation. Through thermal power plants. For the final destination of the gas, the Jaguatirica II thermoelectric power plant, the gas is liquefied at the UTG Azulão (AM) extraction site and transported in trucks equipped with isotopes to the city of Boa Vista (Roraima State).

Each truck carries approximately 20 tons of liquefied natural gas (equivalent to 50 m³ of LNG). Upon arriving at Roraima, the gas must return to the gaseous State through a reconditioning process and then be used to power the turbines of the Jaguatirica II thermal power plant.

This work presented the first overview of the SWOT model, including the strengths, weaknesses, opportunities, and obstacles to expanding the LNG market relevant to the Azulão project. Eneva's ocelot also addresses the environmental,

licensing, and regulatory aspects necessary for the country's approval and construction of new liquefied terminals. The gas and LNG market presents significant challenges regarding the need for transport and distribution infrastructure, the negotiation of long-term bilateral contracts, and increased competition, allowing attractive prices.

A road is under construction, mainly related to the opening of segments of this market, and Brazil presents an area of interest from the political, social, and economic point of view, mainly in terms of risk, energy production, and national industry. The subsequent expansion of the LNG market may bring new expectations for its dealers, who require cleaner, disruptive and lower-cost energy.

Future studies' suggestion is based on the possibility of using quantitative data and tools for a better forecast of the demand and supply of LNG to find ways to balance the supply and demand curves so that the price remains at a level of equilibrium and does not affect the decision process of the players in this market and then the potential of LNG can be used to meet the needs for clean energy throughout the planet. In addition, also the conduction of interviews with specialists who work directly with the commercialization of LNG for a better understanding of the real needs and challenges of those who operates in the day-to-day spot market.

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