

NATURAL GAS AS A POTENTIAL SOURCE FOR ENERGETIC SUSTAINABLE DEVELOPMENT IN THE DOMINICAN REPUBLIC: A REVIEW

El gas natural como una fuente potencial para el desarrollo energético sostenible en la República Dominicana: una revisión

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Abstract

The Dominican Republic energy matrix is mostly dependent on international markets, with void natural production of oil, natural gas, and mineral coal. This fact could completely be transformed if new studies' outcomes confirm commercial quantities existence of them. The average estimated useful life for fossil fuel power plants is approximately five decades. Currently, half of the installed plants are reaching their end and no structured plans exist to replace their production capacity in the long term. Now is the perfect moment for the nation to shift its energy production towards more sustainable sources. As a result of the investments that include the Oriental Gas Pipeline and the existing central conversion to this fuel, natural gas achieved growth in 2020. At the

Resumen

La matriz energética de República Dominicana depende, mayoritariamente, de los mercados internacionales, con nula producción de petróleo, gas natural y carbón mineral. Este hecho podría transformarse por completo si los resultados de nuevos estudios confirman su existencia en cantidades comerciales. La vida útil promedio estimada para las centrales eléctricas de combustibles fósiles es de aproximadamente cinco décadas. Actualmente, la mitad de las plantas instaladas en el país están llegando a su fin y no existen planes estructurados para reponer su capacidad de producción en el largo plazo. Ahora es el momento perfecto para que la nación cambie su producción de energía hacia fuentes más sostenibles. Producto de las inversiones que incluyen el



same time, the sector continues to make investments that are reflected in an outstanding improvement in the production of electricity from renewable sources. Along with natural gas, renewable sources make up 56% of the generator matrix and predicted a domain of 61% for the past year 2021, contributing to a more economical solution that also promotes the reduction of the carbon footprint within the framework of the Sustainable Development Goals, emphasizing the seventh and thirteenth goals that stand for affordable and clean energy, and climate action, respectively.

Keywords: natural gas, energetic resources, sustainable development, renewable energy, resources conservation.

1. Introduction

Despite the clear international trend towards alternative eco-friendly energy sources, developed and developing countries are still highly dependent on fossil fuels (McConnell, et al., 2010). Different sectors, such as industry, transport, infrastructure, information, technology, agriculture, construction, and household use depend on them (Kåberger, 2018). However, their indiscriminate use has been causing significant environmental consequences throughout the world, as a result, these footprints will have an impact on the succeeding human generations (Barbir, et al., 1990).

Many countries have drawn up various policies aimed at reducing the use of fossil fuels (Covert, et al., 2016), where the shifting of the energy system from oil to natural gas is a potential alternative for decreasing CO₂ emissions to the atmosphere (Covert, et al., 2016). This fossil resource is the world's fastest-growing and widely used due to its important benefits (Chong, et al., 2016).

The Dominican Republic covers the eastern five-eighths of the island of Hispaniola, in the Greater Antilles at the Caribbean region (Ministry of Energy and Mines, 2020). It is the most visited and preferred tourist destination of this region, and it has a

gasoducto oriental y la central de conversión existente a este combustible, el gas natural logró un crecimiento en 2020. Al mismo tiempo, el sector continúa realizando inversiones que se reflejan en una destacada mejora en la producción de electricidad de fuentes renovables. Junto con el gas natural, las fuentes renovables conforman el 56 % de la matriz generadora y se pronosticó un dominio del 61 % para el pasado año 2021, contribuyendo a una solución más económica que, además, promueva la reducción de la huella de carbono en el marco de los Objetivos para el Desarrollo Sostenible, haciendo hincapié en los objetivos séptimo y decimotercero que representan energía limpia y asequible, y acción climática, respectivamente.

Palabras clave: gas natural, recursos energéticos, desarrollo sostenible, energías renovables, conservación de recursos.

favorable investment environment for several sectors (Ministry of Energy and Mines, 2020). The country has the ninth-largest economy in Latin America and is the largest in the Caribbean and Central American region (Dominican Republic Energy Policy, Laws and Regulation Handbook, 2009). The Dominican Republic depends on tourism, mining, agriculture, trade, and services, but its energy matrix is not enough independent yet (Dominican Republic Energy Policy, Laws and Regulation Handbook, 2009). In this sense, it has been projected an increase of 6% annually in energy demand in the coming years with an infrastructure that cannot handle the increased load (Edelman, 2019). The use of natural gas has been increasing in the last years towards contributing to improving the energetic matrix of the country (Edelman, 2019).

Today, this resource is imported, and its use increases considerably and represents 6.18% of the total energy consumed on the island (see Table 1). Renewable energy generation is another source that has increased, representing 14% of total produced electricity (Energy Transition Initiative, 2015). Likewise, the remaining 85% is generated from imported fossil fuels (Energy Transition Initiative, 2015). Therefore, eliminating the reliance on imported fuels requires a diversification of energy sources used for electricity generation (see Table 2).

Table 1. Electricity generation by type of source in the Dominican Republic in 2019

Resource	Generation (GWh)	Percentage (%)
Renewables		
Biomass	0.00	0.00
Eolic	782.19	4.06
Hydraulics	1053.34	5.47
Photovoltaic	149.36	0.78
Non-renewables		
Combined cycle	4454.59	23.13
Diesel Engines	7463.85	38.75
Gas Turbine	1190.99	6.18
Steam Turbine	4166.31	21.63
Total	19260.63	100.00

Source: Data from the National Statistics Office of the Dominican Republic corresponding to 2019 (Oficina Nacional de Estadística, Electricity generation by type of source in the Dominican Republic, 2019).

Table 2. Renewable energy generation potential in the Dominican Republic in 2016

Source	Capacity (MW)	Potential
Wind	85.00	High
Hydropower	582.6	High
Geothermal	0.00	Low
Ocean	0.00	Unknown
Biomass	0.00	High
Solar	2.00	High

Source: Data from the Energy Transition Initiative (NREL).

The use of sustainable energy means not only providing enough energy for current and future energy needs, but also the protection of the environment and the integrity of ecosystems (Seelke, 2015). Therefore, the sustainability of future energy systems is an essential prerequisite for the sustainable development of the

country (Seelke, 2015). Nevertheless, a sustainable energy system by itself does not guarantee sustainable development; technical and financial factors must always be considered (Seelke, 2015).

In the year 2000, the Dominican Republic established a public fund for sustainable energy by the Law 112-00 (law on hydrocarbons), promoting alternative energy sources, as well as establishing standards to guarantee the efficient operation of the hydrocarbon reserves (Dirección General de Impuestos Internos, Ley No. 112-00, 2000). However, the actual implementation of the fund has not been made even though both private and public financing for energy efficiency and renewable energy investments exists (Seelke, 2015). To date, private financing has proved insufficient to allow widespread investment in renewable energy (Seelke, 2015).

The country is facing an important number of challenges that limit its economic growth, such as dependence on imported fuels, exposure to volatility in the price of oil, and uncertainty in the energy supply (IRENA, 2016). Although it is one of the largest and most diverse economies in the Caribbean, it still relies heavily on imported fossil fuels to meet almost all its energy requirements (IRENA, 2016). The authors report that a systematic analysis of the prospects for the use of natural gas as an alternative for sustainable development in the Dominican Republic has not been published. For this reason, the objective of this review is to provide an update on the current state of the use and exploitation of natural gas, such as a potential source for sustainable development to the island.

2. Natural gas deposits in the Dominican Republic

The existence of crude oil in the Dominican Republic is evidenced by the presence of superficial signs in Charco Largo, Azua, in the south of the country (Ministry of Energy and Mines, 2020). In this regard, it has four interest basins: Cibao, Enriquillo, Azua, and San Pedro de Macoris, with fourteen potential blocks, both on and offshore, with

a maximum length per block of 500 km² onshore and 2,500 km² offshore (Ministry of Energy and Mines, 2020). These are distributed in the following watersheds: six in the Cibao, three in the Enriquillo, and one in the Azua, the rest are seaward in the San Pedro de Macoris basin (Figure 1). The prospecting

are mainly performed in the Cibao and Enriquillo's basins, with promising outcomes for gas and petroleum (Ministry of Energy and Mines, 2020). However, deeper research is required to confirm the commercial quantities of this resource (Dominican Republic Energy Policy, 2009).

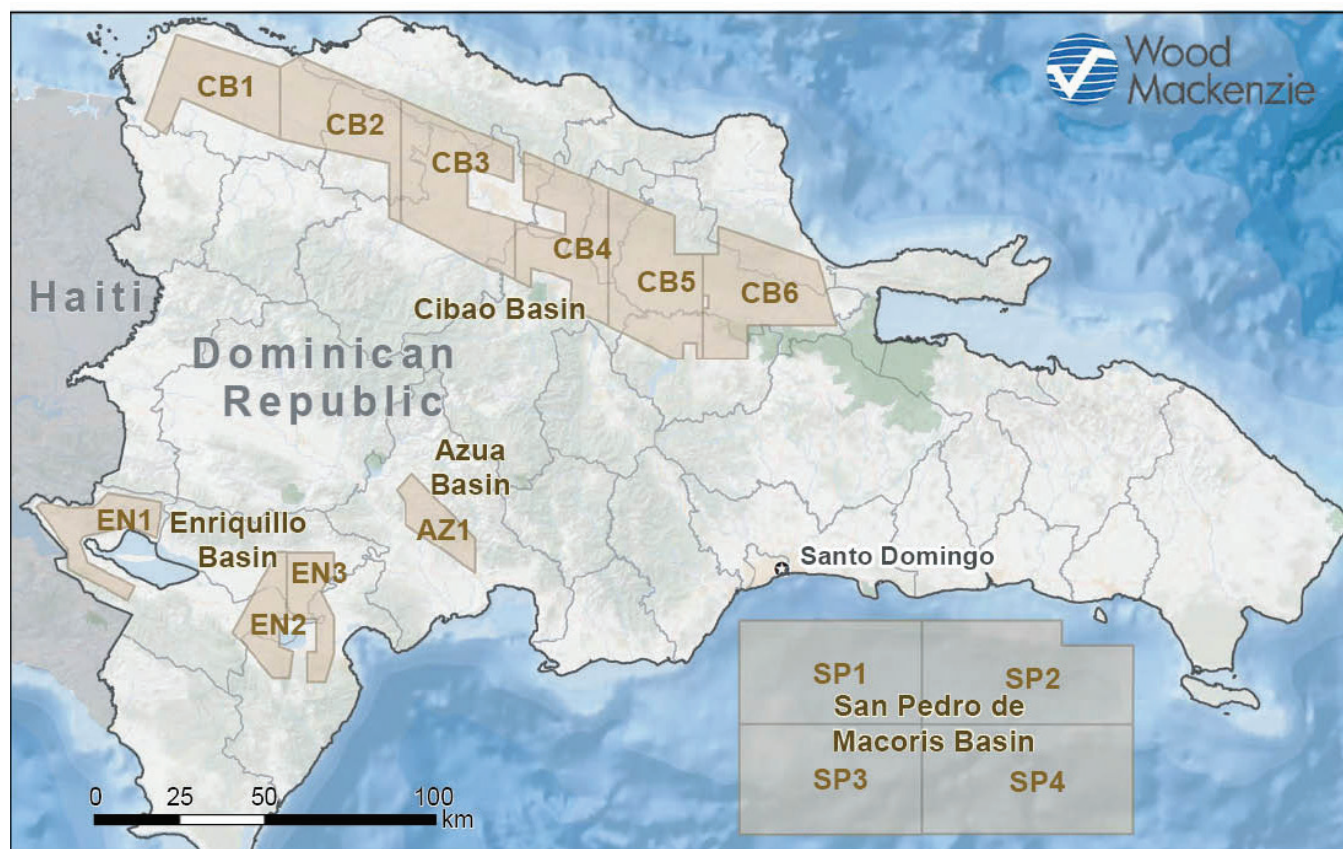


Figure 1. The hydrocarbon potential of the Dominican Republic

Source: Ministry of Energy and Mines, D., Eig, K., & Gibson, I. (2019, September 11).

In the early 1970 decade, some hope for the discovery of petroleum in commercial quantities persisted (Weil, 1973). Oil seeps had been reported in Barahona Province, sedimentary valleys, and basins of the western region of the country had the characteristics meeting the required conditions for the formation and storage of hydrocarbon fuels (Weil, 1973). Most geological explorations in the Dominican Republic have been done by foreign companies, and the reports of these explorations are not

available to the public. This last factor makes a deep analysis of the subject difficult.

Petroleum prospecting has been focused on the southeast region of the island in Azua province. Some discovered shallow wells (less than 304.8 m depth) had limited production, even though deep wells (more than 4,389.12 m depth) did not find production with commercial outlets (Dominican Republic Energy Policy, 2009). Despite the negative

outcomes, it is not possible to rule out the presence of commercial accumulations of hydrocarbons and further detailed explorations are required.

The investigation for coal led to the discovery of the first deposit of coal and the identification of reserves totaling 40 million metric tons (MT) (Miller, et al., 1995). Like other non-petroleum producers' countries, the Dominican Republic decided in 1975 to investigate other sources of energy. Geologic reserves of coal are estimated to be about 72,300,000 MT and renewable reserves to be about 43,800,000 MT (Miller, et al., 1995).

Since 2018, the Energy and Mining Ministry started considering the exploitation of hydrocarbons in the Dominican Republic (EITI, 2019). The natural gas deposits discovered in San Pedro de Macoris and Ocoa are good candidates for their exploitation (Presidencia de la República Dominicana, 2020). This resource can be up to 60% more efficient than other liquid fuels (Listin Diario, 2018), and with its use the energy matrix can considerably increase. In October 2020, the government signed an agreement with the American company Apache Corporation for the exploration and exploitation of hydrocarbons (gas and petroleum) in the San Pedro de Macoris offshore basin. The block awarded by the Ministry of Energy and Mines (MEM) to the Dominican Apache Corporation subsidiary is SP2 (Figure 1) (Presidencia de la República Dominicana, 2020).

Apache Corporation will destine five million dollars as an initial investment for exploration. If the finding of oil and gas results successfully, the investment in exploitation would reach about \$100 million (Presidencia de la República Dominicana, 2020). According to the Dominican Minister of Energy and Mines, this company will assume all costs and risks in exploring the area that has 2,535 km² and a depth ranging from 800 to 1400 m (Presidencia de la República Dominicana, 2020). The period for the first phase of exploration will last around four years.

The contract includes supply to the country of up to 15% of the production of hydrocarbons extracted from the area (Presidencia de la República Dominicana, 2020). The shared production contract guarantees minimum participation of 40% of the benefits attributable throughout the project lifespan, i.e., total oil income (Acento, 2020). The award was made at the country's first auction to develop the hydrocarbons industry.

On the other hand, the company Energía Natural Dominicana (ENADOM) is constructing a second natural gas tank, with an investment of 250 million euros. It is a natural gas (LNG) storage infrastructure of 120,000 m³ that will accompany the energy strategy of the Dominican Republic and the Caribbean region. The Dominican president, Luis Abinader, issued the permits to proceed with the structure, which will oversee the Korean company POSCO E&C (BNamericas, 2020).

3. Natural gas production in the Dominican Republic

The San Pedro de Macorís Electricity Company (CESPM), which contributes more than 300 megawatts to the Interconnected Electric System, reported that its three-generation units will begin the expected process of conversion to natural gas. This conversion completes the first stage of a national project for the transition of three electricity generation plants, which will save the country foreign currency around 3,000 million dollars in the next 10 years, by substituting fuels derived from petroleum. The conversion of the three plants to generate a cleaner fuel will reduce an average of 300,000 metric tons per year of carbon dioxide. The transformation of units to natural gas is becoming a reality due to the development of the East Gas Pipeline, managed by the company Energía Natural Dominicana (Enadom), which also enables the same process in other generators established in the eastern part of the country.

In consonance with a bulletin of the Ministry of Energy and Mines (Bautista et al., 2020), an agreement with the United States Trade and Development Agency (USTDA) was signed through which the USTDA will finance a viability study, at a cost of US \$ 1,209,336 to install a Liquefied Natural Gas terminal and an electricity generator on the north coast of the country, specifically in Monte Cristi. After signing, the Ministry of Energy and Mines will proceed to hire a consulting company in the United States to carry out the feasibility study.

This Liquefied Natural Gas terminal seeks to satisfy the fuel needs of a combined cycle power generation plant, which will also be part of the project, as well as provide a supply of reserve Natural Gas to existing power plants on the southern coast of the island. The feasibility study will review the global Liquefied Natural Gas market and the local electricity market to determine the suitability of the use of this fuel for power generation (Bautista et al., 2020).

According to Worldometer (2015), Dominican Republic occupied the 90th position of the world rank in gas consumption (39,129 Million Cubic Ft) and highlighted that the country has no reserves nor produces natural gas.

4. Natural gas importation in the Dominican Republic

The Dominican Republic imports all the natural gas (see Figure 2 and 3) for its consumption (Dominican Republic Energy Policy, 2009), and until 2016 only this country and Puerto Rico had Liquefied Natural Gas (LNG) import terminals in the Caribbean region (Gomes, & Lambert, 2017). Since 2003, AES Andres LNG has been the terminal for natural gas reception in the country, with a current receiving capacity of 1.9 MTPA. Located 30 km at the east of Santo Domingo, it is a Regasification shore-based Terminal with storage Capabilities of 160 MCM and it supplies 319 MW. The AES Andres LNG has one jetty and started reexporting in 2017 (IGU 2020 World LNG Report). Besides, the LNG

terminal is connected to the AES-owned 236 MW Los Mina DPP power plant via a 34 km pipeline (Gomes, & Lambert, 2017).

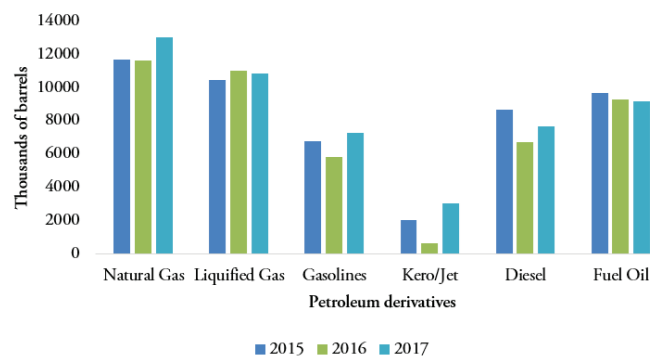


Figure 2. Derivatives petroleum importation

Source: Data from Comisión Económica para América Latina y el Caribe (CEPAL).

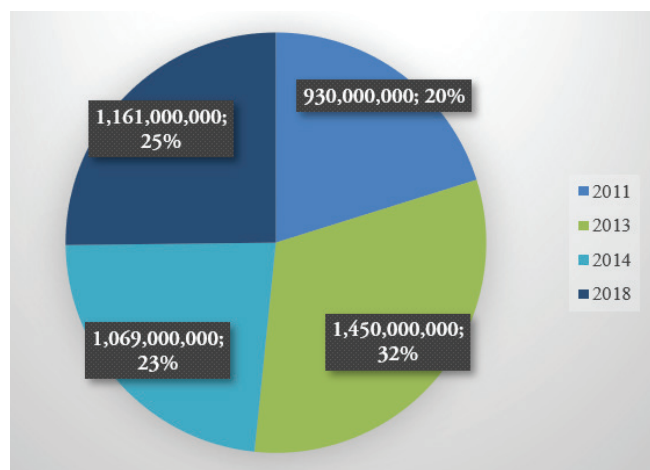


Figure 3. Total natural gas imported in cubic meters in the Dominican Republic 2011-2018

Source: CIA World Factbook.

In most cases, LNG is likely to be the least-cost technical option for delivering natural gas. The exception to this in the Dominican Republic is that Compressed Natural Gas (CNG) could be a lower cost. In the country, the technology and price risk surrounding CNG likely make LNG a more attractive option (Yépez-García, & Anaya, 2019). Note

the presented costs are the range of estimated costs from seven supply points: U.S., Sabine Pass; Canada, Guysborough; U.S., South Florida; Mexico, Altamira; Trinidad, Point Fortin; Venezuela, Guiria; Colombia, Covená. These costs were calculated assuming that natural gas acquired prices would be linked to Henry Hub, at EIA's forecasted price of US\$ 4.8 per MMBtu in 2018, based on information updated in 2015 (Yépez-García, & Anaya, 2019).

In early 2017 AES added 114 MW to Los Mina DPP power plant by converting the open cycle units into a combined cycle power plant, which increased the efficiency of the power plant, but will reduce gas consumption/MWh generated (Gomes, & Lambert, 2017). Hydrocarbon commercialization is essential for the country's economy, the main supply sources are Mexico, Venezuela, and Costa Rica. Natural gas is mainly imported from Trinidad and Tobago (Trading economics, 2021).

5. Natural gas consumption in Dominican Republic

Energy demand in the Dominican Republic has been constantly increasing even though population growth remains relatively stalled in the last 10 years (IRENA, 2016). The projection shows increasing demand of six percent annually for the future years with an infrastructure that cannot handle the increased load. The increase in demand is the result of additional public and private housing and emerging industries in the country (Edelman, 2019).

The Caribbean basin islands are mainly net energy importers, where most electricity generation stations currently use diesel fuel or fuel oil, which could readily be converted to use natural gas. The Dominican government is considering natural gas as an alternative to diesel and fuel oil and, as a result, the country has two gas-fired power plants in operation (Nikolaou et al., 2009).

Until 2010, the growth of LNG consumption in the Dominican Republic was very slow, with AES

achieving contract quantities only in 2011 (Gomes & Lambert, 2017). Since 2016, the Dominican Republic LNG market has consisted of six distribution companies that supplied commerces, industries, and automotive clients. The country has enough consumption rates of Compressed Natural Gas (CNG) to justify its delivery using ships of capacity between 8 and 29 Million standard cubic meters (MMcm) (Nikolaou et al., 2009). The consumption is around 145,000 daily barrels of fuel (see Table 3) with a cost of USD\$ 10,000,000 daily (Comisión Nacional de Energía, 2020). The transportation sector covers 49% of energy consumption while the electricity generation spans 29% (Comisión Nacional de Energía, 2020).

Table 3. Energy indicators for the Dominican Republic

Economy	Country Data	International Rank	Period
Energy consumption per capita	39.03 million Btu per person	112	2019
Energy consumption per GDP	2.2 thousand Btu per USD at purchasing power parties	147	2019
GDP at purchasing power parties	177.3 billion dollars at purchasing power parties	69	2020
Population	10,736 people in thousands	85	2020

Source: Data from U.S. Energy Information Administration.

6. Energy generation

The energy production problem arises because the country has no natural access to fossil fuels (coal, oil, and natural gas) for electricity generation used in most energy plants installed. Thereby, it is necessary to import this resource mainly from the United States (Dominican today, 2019). Then, more than half of power generation is energized by petroleum derivatives, according to the International Energy Agency, where natural gas represented 18% of

the fuel generation mix in 2016 (see Figure 4). In compliance with the Economic Commission for Latin America and the Caribbean (ECLAC), Dominican Republic consumed 48.7% of natural gas for electric generation (Comisión Económica para América Latina y el Caribe, 2017).

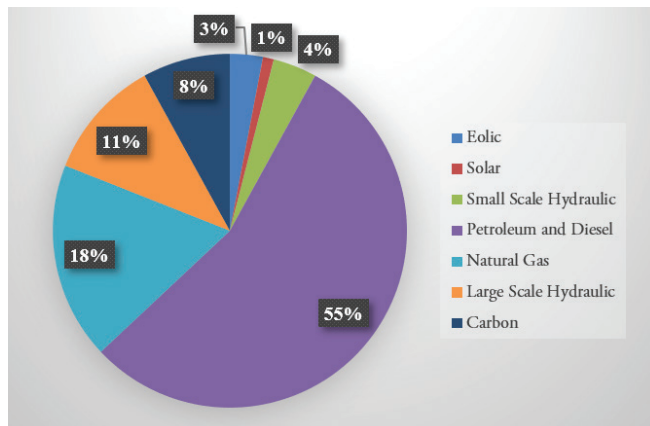


Figure 4. Energy Generation from fuels and renewables in 2016

Source: Data from the International Energy Agency (IEA), Energy Transition Initiative.

The dependence on fuel oil and diesel for power generation makes vulnerable electricity costs due to global oil price fluctuations that are directly proportional. At the same time, the import delays put pressure on generation companies to keep reserves of fossil fuels in case the island is inaccessible during hurricane season (Yépez-García, & Anaya, 2019). The industrial market is small and scattered and the country has a lack of transmission and distribution infrastructure for natural gas (Gomes, & Lambert, 2017).

According to the United Nations in 2014, the Dominican Republic had an installed power generation capacity of 3,692 MW (Gomes, & Lambert, 2017). Only around 2924.9 MW comes from fossil fuel sources, where renewable sources were only 13.8% of the total energy production, which indicates an over-reliance on fossil fuels (Yépez-García, & Anaya, 2019). The country has the largest elec-

tricity market in the region and by 2023, the installed capacity is projected to reach about 3,767 MW; this is more than double the next largest market, Jamaica, at 1,060 MW.

The electricity sector has seen the significant entry of private companies (many of them foreign), particularly in the generation sector. Since 2012, thirteen private companies were generating power in the country. The largest energy generator is the private-owned company, AES Andres, with 15.64% of the total generated energy. This is followed by the state-owned Empresa de Generación Hidroeléctrica and Empresa Generadora de Electricidad, with 13.62% and 12.08%, respectively. All government-owned generation, transmission, and distribution companies in the country are held by The Dominican Corporation of State Electricity Companies (National Renewable Energy Laboratory (NREL) of the U.S. Department of Energy, 2015).

Part of renewable energy is provided by hydroelectric facilities (National Renewable Energy Laboratory (NREL) of the U.S. Department of Energy, 2015). Besides, the country had in 2010 high distribution losses of more than 30%, which have been attributed mostly to electricity theft, blackouts, inappropriate investment in capacity upgrades, and limited regulatory capacity (National Renewable Energy Laboratory (NREL) of the U.S. Department of Energy, 2015). Energy theft is a major issue, with nearly 8% of all connections being from illegal or illegitimate connections (Edelman, 2019).

Electricity production is broken down by geographical location, with all the coal, natural gas, and wind power plants located in coastal regions, while the hydroelectric plants are located on inland rivers and lakes. Electricity transmission is the responsibility of the state-owned company Comisión Nacional de Energía (ETED) and the distribution of electricity is operated by three companies (see Figure 5): EdeNorte, EdeSur (both state-owned), and the private-owned EdeEste (Edelman, 2019).



Figure 5. Map of distribution companies in the Dominican Republic

Source: Data from the Comisión Nacional de Energía (CNE).

An average useful life of 50 years is expected for fossil fuel power plants. Of the twenty fossil fuel plants in the Dominican Republic, ten are nearing the end of their lifecycle with no real plans to replace the capacity these plants produce for the long term. Now is an appropriate time for the nation to shift its energy production to renewable sources. Coal and oil are costly, several of the fossil fuel plants are reaching the end of their lifespan and foreign investors are willing to fund renewable energy projects in the area (Edelman, 2019).

Natural gas and renewables will be 61% of the generation matrix. The national electricity industry gives every timeless preponderance to petroleum derivatives, which barely represent 8% of the generation matrix and are heading towards 4% in 2021, accor-

ding to the most updated statistics of the Dominican Association of the Electrical Industry (ADIE).

The ADIE indicates that in the first six months of the year 2020, energy was supplied in the National Interconnected Electric System by the following primary sources: natural gas, 27.6%; coal, 36.3%; oil derivatives, 19.1%; water, 7.1%; biomass, 0.9%; wind, 7.2%; and sun, 1.9%. However, by the end of 2020, the composition of the generation matrix was expected to be led by natural gas representing 40%, and by the end of 2021 43%, as a result of investments, including the Eastern gas pipeline and the central conversion existing to this fuel. Also, the generation of energy based on water, wind, sun, and biomass contributes to this trend, representing 17% in 2020 and was heading towards 19% in 2021, due

to investments in the sector private, specifically in photovoltaic energy.

At the same time, the sector continues to make investments that are reflected in a prominent advance in the production of electricity based on renewable sources. Together with natural gas, already make up 56% of the generator matrix and project a domain of 61% for the coming year, according to ADIE (Dominican Association of Electrical Industry), contributing with a more economical solution that also promotes the reduction of the carbon footprint within the framework of the Sustainable Development Goals (SDG).

Changes in the generation matrix have a decisive impact on energy costs. In this way, the average energy cost for 2020 was 7.19 cents per kWh, a reduction of 40% compared to the same period in 2019. This cost decreased to values close to 5 cents per kWh in the last quarter of 2020, and to remain in this range throughout the year 2021 (El Dinero, 2020).

7. Environmental impact from natural gas usage in the Dominican Republic

Global warming and other changes in climate patterns are hugely the results of CO₂ emissions derived from burning fossil fuels (IPCC, 2001). Due to unknown CO₂ sources, the possibility of irreversible contamination and damage to the ecological balance in the coming years cannot be ruled out (Begon et al., 2006). With the increasing carbon dioxide emissions in the country (see Figure 6) and worldwide, the carbon cycle could be altered and influence the long term regeneration capacity of environmental systems; the world's atmosphere, biosphere, lithosphere, and oceans are at risk, on account of, the pollution issued today may disserve the absorption capacity of environmental systems and put at risk the sustainability of future generations (Siebert & Nixdorf, 1987; Begon et al., 2006; Sonnemann & Grygalashvily, 2013).

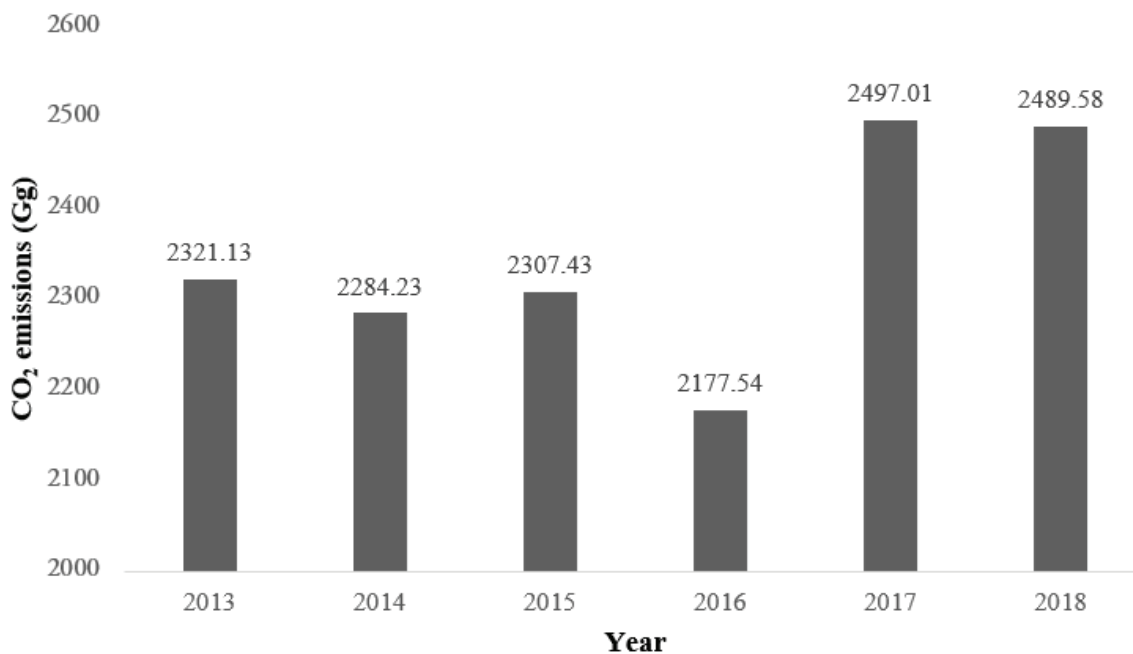


Figure 6. CO₂ emissions from natural gas in the Dominican Republic

Source: Data from Oficina Nacional de Estadística (ONE). Comisión Nacional de Energía.

Fugitive emissions of methane are of particular concern. This substance is the major component of natural gas and powerful greenhouse gas. As such, small leakages are important. Recent modeling indicates methane has an even greater global warming potential than previously believed when the indirect effects of methane on atmospheric aerosols are considered (Shindell et al., 2009). The life-cycle methane emissions estimated for conventional gas are 1.7% to 6% (Figure 6).

Methane is a far more potent greenhouse gas than is CO₂, but also has a tenfold shorter residence time in the atmosphere, so its effect on global warming attenuates more rapidly (IPCC, 2007). This substance is important to both tropospheric and stratospheric chemistry, significantly affecting levels of ozone, water vapor, the hydroxyl radical, and numerous other compounds (Wuebbles, D. J., & Hayhoe, K, 2002). Using natural gas rather than coal to generate electricity might result in a very modest reduction in total greenhouse gas emissions if those emissions can be kept below a range of (2.4-3.2)% (Howarth, 2014, p. 57).

8. Perspectives of natural gas and its role to achieve the Sustainable Development Goals

Natural gas is expected to serve as a cleaner bridge to a renewable energy future. It is the only fossil energy source that is estimated to grow to 2050 during The Grand Transition, a period when demand for either coal or oil will peak (World Energy Council, 2017).

The role of gas will be closely linked with developments in the power (World Energy Council, 2017). Global electricity demand is projected to increase by 2060 and the power sector offers the highest growth potential for natural gas (World Energy Council, 2017). A growing market share in power generation will be the main driver of gas demand growth in the medium term but gas faces tough

competition from other energy sources, notable renewables, and the scope for growth will depend on key policy decisions by governments and regulators and presents the highest uncertainty (World Energy Council, 2017).

Thanks to large reserves, gas supplies are likely to be plentiful in the medium to long-term making the cleanest of hydrocarbons a good bridge to a low-carbon future (World Energy Council, 2017). However, the pressure for continued de-carbonization of energy supplies means that this relatively clean fuel is likely to come under demand-side pressure (World Energy Council, 2017).

Even though it has lower emissions than oil and coal, natural gas is still a fossil fuel that emits greenhouse gases (World Energy Council, 2017). However, emerging innovative technologies could give the possibility to position itself as renewable energy and dramatically change the role of gas in the energy transition (World Energy Council, 2017). The potential of biogas remains significant but there are technical and economic hurdles (World Energy Council, 2017). Nevertheless, the experience of Germany with nearly 2,000 projects and 6 TWh production shows that biogas cannot be written off (World Energy Council, 2017).

The role of gas in the transport sector is also questionable (World Energy Council, 2017). Decarbonization of the transport sector is one of the most challenging elements of energy transition (World Energy Council, 2017). The contribution of gas to this process is limited to heavy-duty freight and marine transport, with a potential market share of around 7%-8% of transport fuels by 2060, but at most 300 billion cubic meters (bcm) (World Energy Council, 2017). CCNG for light vehicles could also have an important role to play in the decarbonization of transport provided the economic and regulatory environment is favorable (World Energy Council, 2017). In the European Union the “Clean Power for Transport” package, which established

natural gas and biomethane as part of the European Union mix of alternative fuels, lays the foundation for significant development of CNG and LNG in the road and maritime transport, which could give gas market shares substantially above the one predicted in the three scenarios (World Energy Council, 2017).

9. Conclusions

Natural gas will play an essential role in changing the energy matrix of the Dominican Republic in the coming years. A 6% annual increase in natural gas consumption for electricity generation is expected, not counting its use in other applications such as transportation. This energy carrier will play an important role in the country's transition to energy independence with the gradual transition to electricity generation with renewable energy sources, to guarantee sustainable development. In this way, it is necessary to achieve efficient use of natural gas to generate electricity and reduce the carbon footprint by reducing carbon dioxide emissions.

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