



GUATEMALA'S ELECTRICITY MARKET

July 2020

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INTRODUCTION

Guatemala is a country with great potential and many business opportunities, given its strategic geographic position and a great variety of economic activities, which, most of them need electricity for its operations.

Over the years, renewable energy, has a growing presence within the energy mix. Guatemala has many untapped potential regarding natural resources which could become great business opportunities.

The *Administrador del Mercado Mayorista* (AMM, by its Spanish initials) is the one in charge of operating the electric system and market of the country. In 1996, the government, through the Decree Nº 93-96 issued the Electricity General Law, giving birth to the institution in its 44th article, as a non-profit private entity.

Its mission is to operate the National Interconnected System (SNI, by its Spanish initials) and the Wholesale Market, keeping the continuity and security of supply of the country. Ensure the demand's coverage, contribute to the generation, transmission and distribution expansion of the electric power system and finally, seeking economic efficiency, transparency, independence and fully attachment to the legal framework in all market operations.

Among its duties, AMM coordinates the power plants operations, international interconnections and keeping the power transmission lines to its minimum cost for the whole of operations in the market, under a competitive power contracting framework among its participants. As well as ensure the safety and security of supply in Guatemala.

The managing body is the board of directors and its administration. The first is composed (according to the article 21 of the AMM's regulation) by 10 holders, representing each one of the five participant groups of the wholesale market (generators, distributors, transmission, retail and large consumers). They are elected for a period of two years, with reelection's possibility. The administration is formed by technical and support departments, accounting more than one hundred high level collaborators dedicated to preserve the continuity of the electric service over the 365 days of the year.

AMM's achievements

From the beginning, in 1998 when the first board of directors of AMM was created, big milestones have been achieved within the electricity market. In 1999, the bilateral transactions between Guatemala and El Salvador began, which have continued up to the present day, being part now of an electric regional market, established in 2002, under the AMM's support and leadership; since then, Guatemala has been the mayor energy exporter to Central America.

In 2003, specific regulation agreements were launched, to execute transactions between Guatemala and Mexico, operations began in 2010. Likewise, in 2011, a pioneer project started in Latin America, to install phasor measurement units (PMU) and data concentrator, which allowed a smart system to control and optimize the economic dispatch. In 2018, the new AMM's headquarter was inaugurated, it was designed under high standards of modernization and optimization principles.

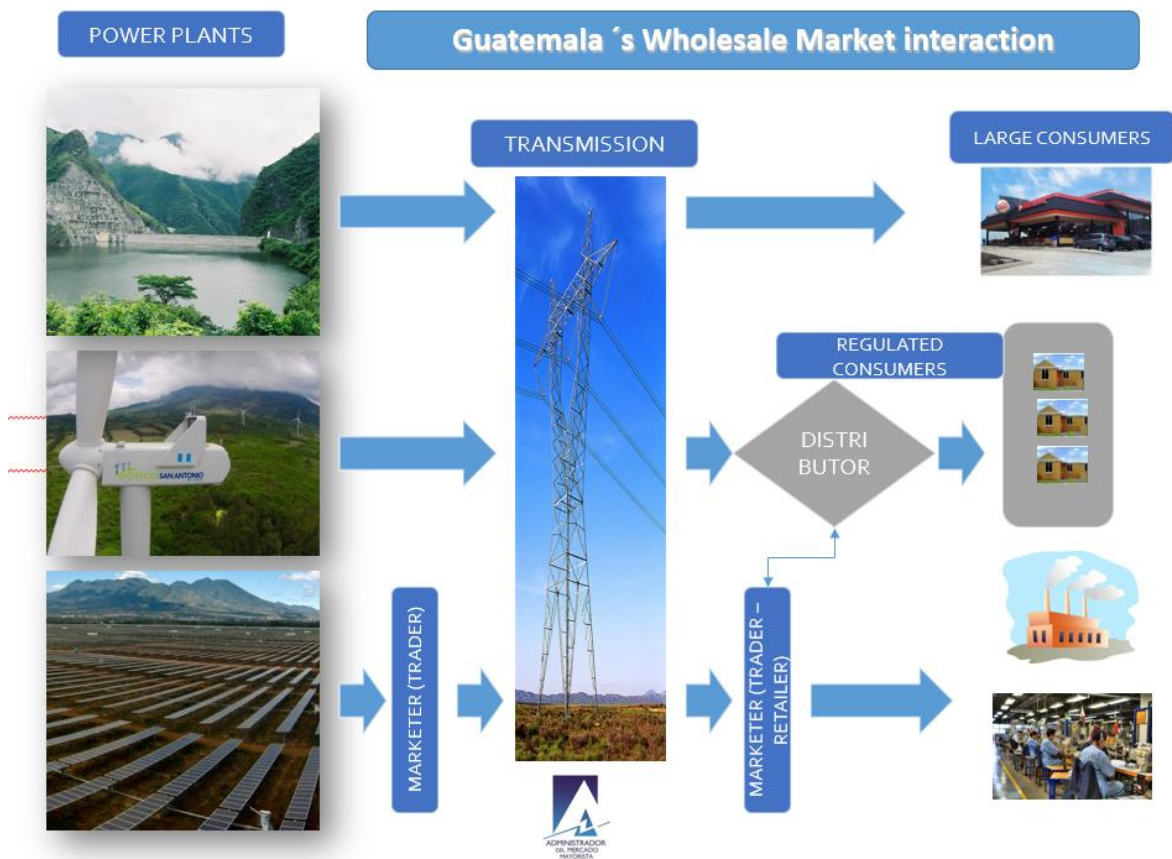
Finally, AMM's vision is to be one of the development motors in the country, through the efficient administration of SNI's operations, its international connections and wholesale market transactions, keeping the values which, with management autonomy, promote its participants development and growth. This document was elaborated to reveal investment opportunities within Guatemala's electric power industry.

GUATEMALA'S ELECTRICITY MARKET AND INVESTMENT POSSIBILITIES

1. How does the energy sector work?

Guatemala's electricity market works as a free and competitive market since 1996, when the activities were unbundled, so competition was introduced to generation and retail activities becoming a free market. Transmission and distribution work as regulated activities where private and public enterprises interact to provide the service, granted through public bids.

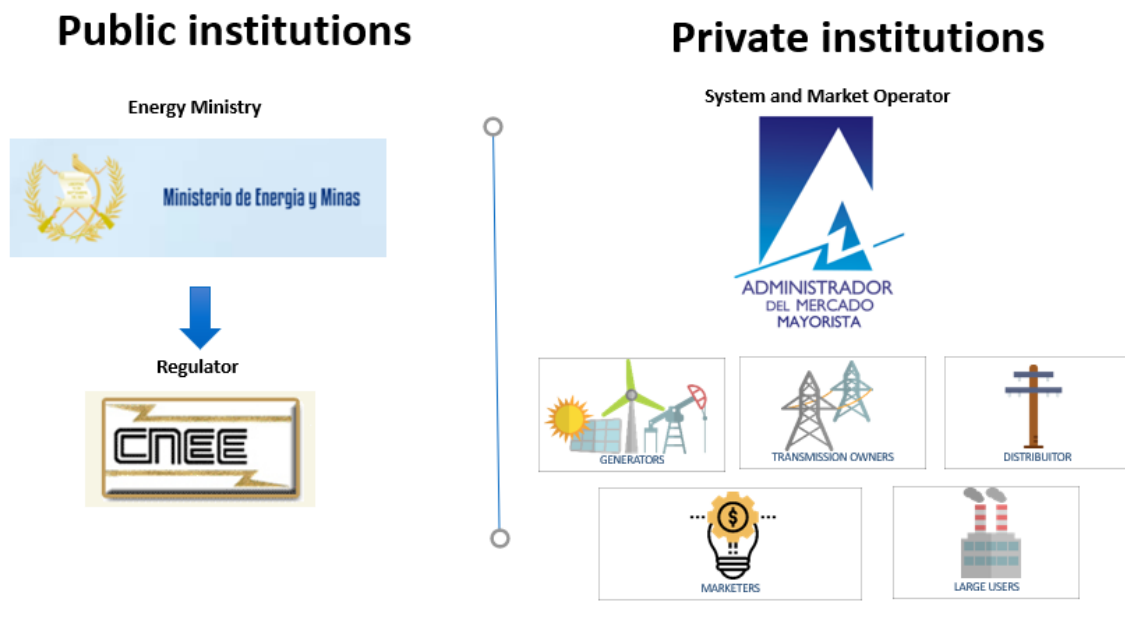
Illustration 1: Guatemala's electricity sector operation



2. How is it structured?

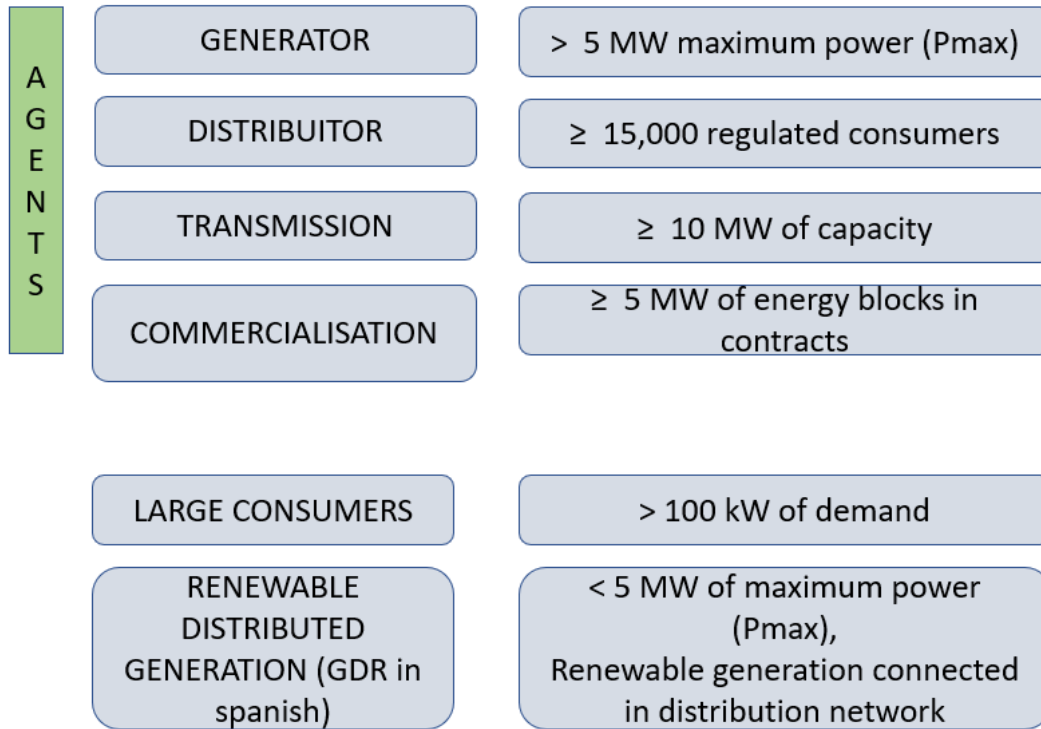
The electric market functioning is carried out through public and private institutions. On the public side the Energy and Mines Ministry (MEM, by its Spanish initials) has as main function to dictate the energy policy, generation and transmission expansion plans, among others. Following the hierarchy, under it, there is the National Electric Energy Commission (CNEE, by its Spanish initials), who regulates the market performance, especially on the transmission and distribution activities. The system and market operator works as one private non-profit enterprise called *Administrador del Mercado Mayorista* (AMM, by its Spanish initials), supervised by CNEE, in charge of the operation of Guatemala's electric system and the transactions clearance made within the market. AMM provides a space where market agents are reunited to realize commercial transactions for buying or selling electric energy.

Illustration 2: Institutional Framework of the electric industry in Guatemala



Market agents, according to article 39 of the General Electric Law Regulation (LGE, by its Spanish initials), are distributed on: generators, distributors, transmission and commercialization. Everyone must fulfill some requirements in order to acquire its agent label, which are detailed below:

Illustration 3: Participants of the electricity wholesale market in Guatemala



Consumers that demand more than 100 kW are able to acquire their label of large consumers, which allows them to buy directly from retailers to cover their consumption. Likewise, there is the figure of Renewable Distributed Generators (GDRs, by its Spanish initials) which are power plants with a capacity of 5 MW or under and are connected to the distribution network have also the possibility to realize transactions within the wholesale market.

Nowadays, there are 61 generators, 13 transmission owners, 21 marketers (traders and retailers), 3 distributors, 62 GDRs and 1164 large consumers¹.

The industry performance is governed by a legal framework enforced since 1996, characterized by legal certainty, stability and consistency from the enactment of the LGE to its operational rules for a proper system and market operation (*Reglamento de la Ley General de Electricidad, 1997*).

¹ Large Consumers participants and represented by a marketer.



(Administrador del Mercado Mayorista, 2020)

3. Operation of the electricity market.

The Guatemalan electricity market is a cost-based market, where the energy supply assignment is made with economic dispatch according to the Generation Variable Cost (CVG, by its Spanish initials) declared by all power plants connected to the SNI. The market possessed two big premises:

1. Firm demand and Efficient Firm Supply: It corresponds to the demand and supply of the capacity market where it is mandatory to consumers to have all its power demand contracted during one year². Therefore, annually, AMM calculates the Firm Demand (DF, by its Spanish initials)³, which has to be covered with Efficient Firm Supply (OFE, by its Spanish initials)³, this is assigned to the producers to sell its power in contracts for DF coverage. The OFE is also determined by AMM, calculated through the modeling of a long term dispatch

² The year correspond to a stationary year determined in function of the summer and winter season in Guatemala, it starts in May and ends in April.

³ The Firm Demand is a defined mechanism in the General Electricity Law (LGE, by its Spanish initials) and the Commercial Coordination Rule N°2, which fixes an amount of power to be consumed during the length of the seasonal year. For more information: https://www.amm.org.gt/portal/?wpfb_dl=211NCC-2%20actualizado%2008-2019.pdf.

(two years) and determined based on the effective power provided to the SNI by each power plant; and the availability that had at the moment in which it was called to dispatch along the previous seasonal year⁴.

2. Economic Generation Dispatch: The spot energy market is a day-ahead market preserving the principle of being a cost-based one. The power plants must periodically present information regarding its CVG that is used to build a list of merit until the national demand, reserves and international commitments are covered. This market is optimized using an economic dispatch which consists of employing the available offer (energy and power) to supply the forecasted demand (energy and power) during a determined period minimizing the total production cost. The dispatch is optimized hourly, where one of the results is the Energy Opportunity Price (POE, by its Spanish initials) or spot price, established through the CVG of the marginal unit (the last power plant needed to cover the demand and reserves of the SNI).
3. Transmission services: It includes the transmission tariff (fixed by CNEE) and is cleared according to the contractual arrangements made between the agents.
4. Ancillary services: the main services consider the operative reserves (primary, secondary and tertiary). Likewise, it considers the frequency control, black-start and reactive power and voltage control. Among the operative reserves there are:
 - a. Primary reserve⁵ is mandatory for all power plants and corresponds to 3% of the hourly generation.
 - b. Secondary reserve⁶ is given by power plants synchronized with a fast response capability to face power imbalances in generation and transmission.
 - c. Tertiary reserve⁷ is given by a quick start of power plants (less than an hour) that must be available to be called within 24 hours.
5. Forced generation (GF by its Spanish initials) is all the generation left out of the economic dispatch used to fulfill security of supply requirements, quality of service, exports, among others.

⁴ Power plants that do not have OFE assigned, have the possibility to be assigned with OF, which allows them to support their power to realize international transactions in the market. For more information see the Commercial Coordination Rule N° 2 from AMM.

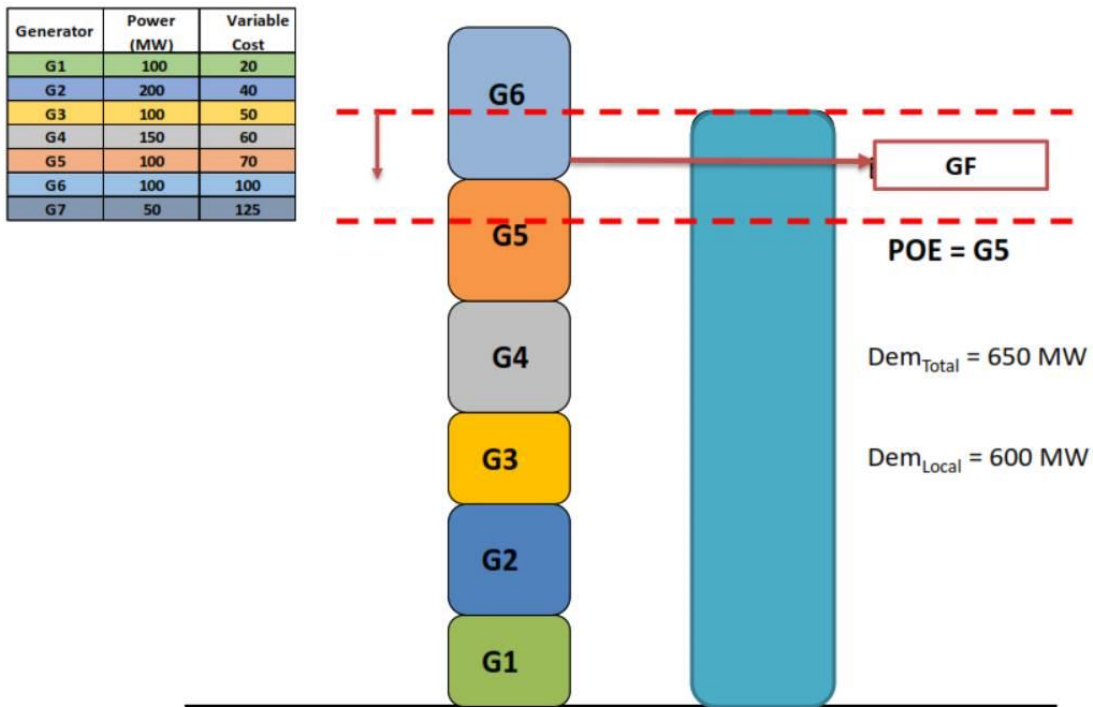
⁵ *Reserva Rodante Regulante* (RRR) in Guatemalan regulation. For more information see the Commercial and Operation Coordination rules from AMM (NCO-1, NCO-3, NCO-4, NCC-1 y NCC-8).

⁶ *Reserva Rodante Operativa* (RRO) in Guatemalan regulation. For more information see the section 4 of this document and the Commercial and Operation Coordination rules from AMM (NCO-1, NCO-3, NCO-4, NCC-1 y NCC-8).

⁷ *Reserva Rápida* (RR) in Guatemalan regulation. For more information see the Commercial and Operation Coordination rules from AMM (NCO-1, NCO-3, NCO-4, NCC-1 y NCC-8).

6. Other charges: authorization charges to be able to realize transactions in the wholesale market (AMM fee), authorization charges for MER transactions, especially those corresponding to regional institutions (EOR and CRIE)⁸.

Illustration 5: Economic dispatch of Guatemala's wholesale market



4. What business/investment opportunities does the country have?

Two main products are traded in the wholesale market:

1. Power: speed in which the energy is transformed or converted into another energy form.
2. Energy: physical attribute that can be converted in useful work or transformed into another energy form. When an electric power current flows in any circuit, it can transfer energy to realize a mechanical or thermodynamic work.

⁸ For more information see the regional legal framework and the Commercial Coordination Rule N°14 from AMM. Available in: https://www.amm.org.gt/portal/?page_id=23

As said in previous section, both products are remunerated under an economic dispatch principle, where the power plants with lower generation variable cost are dispatched with priority until the demand and quality requirements of the service are covered. Both, power and energy are economically remunerated through six different markets:

1. Energy opportunity market: It is a surplus and shortage market, where the price varies, according to different time frames (hour to hour) and providers. In this market, the POE is fixed with the short term marginal cost which is the maximum variable cost incurred each hour to supply an additional MWh (Administrador del Mercado Mayorista, 2015).
2. Contract market: bilateral contracts between agents of power and/or energy. These contracts are managed by AMM (*Administrador del Mercado Mayorista*, 2019).
3. Power deviation market: is the ensemble of transactions in the wholesale market that result in surplus or shortage of power capacity agreed in contracts among its participants (*Administrador del Mercado Mayorista*, 2012).
4. Ancillary service of RRO: depending on the technology type of power plants, generators can provide the RRO service. This is remunerated under a market scheme where the participants present offers and fulfill certain technical requirements to be dispatched in function of the presented bids and their CVG.
5. Regional Electricity Market (MER, by its Spanish initials): Guatemala is connected to the Central America's electric market which works as a seventh market where the regional countries have the possibility to trade energy. Guatemala has positioned itself over the years as the major energy exporter in the MER. This market has many institutions in charge of its functioning, mainly the Regional Commission of electric interconnection (CRIE, by its Spanish initials)⁹ which works as the regulator and the Regional Operator (EOR, by its Spanish initials)¹⁰ which is the system and market operator.
6. The Mexican Electricity Market: it is a very recent market, it opened and started operations in January 2016, founded on a new regulation, affecting transactions between Guatemala and Mexico, opening up the possibility to export Guatemalan energy surplus. At this time, the connection between both countries has a transfer capacity of 400 MW in both ways, imports and exports. The short term market, in which the energy trades are made, has three participation mechanisms: Day-ahead Market (MDA, by its Spanish initials), Hourly Market (MHA, by its Spanish initials) and the Real Time Market (MTR, by its Spanish initials). Clearance is made in Mexican pesos based on Local Marginal Prices (PML, by its Spanish initials)¹¹.

⁹ For more information: <https://www.crie.org.gt/>

¹⁰ For more information: <https://www.enteoperador.org/>

¹¹ Over time, the Mexican electric market has been in development, using the CENACE's 2017-2021 Strategic Plan (*Centro Nacional de Control de Energía*, 2014).

5. What are the current investment projects?

Generation

Currently Guatemala counts with an oversupply of generation which has allowed a solid security in the SNI, as well as the possibility to export energy to Central America and Mexico. However, there are mechanisms within the market rules that enable the investment continuity.

Auctions

Due to regulatory obligations where the consumers must have their power and energy contracted, distributors have under their charge the electric energy selling to end users, so they are in charge of organizing long term and short term auctions to contract their power and energy requirements; where existing power plants or new projects are allowed to participate according to the terms of references of each bidding process. These terms are defined by the distributors with CNEE approval and supervision.

Currently, distributors have organized short term auctions (mainly for DF coverage) and long term ones (for expansion plans, technology changes, existing contracts expiration, among others), described hereafter:

ENERGUATE¹² Biddings

During 2020, an open short-term bidding was realized *Energuate-1-2019*, to contract power an energy, it was awarded to power plants of diverse technologies in April 2020 for 46.23 MW with a duration of 5 years (*Comisión Nacional de Energía Eléctrica, 2020*).

Likewise, in June 2020 was launched an open short-term bidding *Energuate-1-2020*, to contract power and energy that intends to award 15.77 MW for 2 years (*Comisión Nacional de Energía Eléctrica, 2020*).

^{12 12} Corporation in charge of the electric energy distribution in the east and west region of Guatemalan territory.

EEGSA annually launches short-term¹⁴ biddings for DF coverage of 50 MW approximately. There is also planned the launching of a long-term bid in 2021 to supply from 2025 to 15 years on, with a 240 MW contracting objective. In the same way, there is another specific geothermal energy bidding for 50 MW.

Energy policy and indicative generation expansion plan 2020-2050

MEM is in charge of defining the energy policy, as well as the SNI's expansion plans, which dictate the direction at national level to promote the investment and development of the energetic industry.

The main objective of the Indicative Generation Expansion Plan of the System is to guarantee the security of supply in Guatemala's electricity sector. The 2020-2050 plan considers sixty candidate projects, those plants were selected with a reliable criterion of having significant possibilities to begin operations as respond to agent's initiative. After compiling all strategic information, each project was integrated and analyzed, the final feasible projects list was built in order to make the system evaluation (*Ministerio de Energía y Minas, 2020*).

Illustration 6: Candidate power plants to begin operations between 2020 and 2050

Resource	Candidates	Power (MW)	Percentage (%)
Natural Gas	2	150	5.60%
Coal	2	300	11.20%
Biomass/Coal	3	125	4.67%
Hidro	19	1176.8	40.96%
Geothermal	15	356.5	13.31%
Solar	9	310	11.57%
Wind	8	330	12.32%
Biogas	2	10	0.37%
TOTAL	60	2758.3	100%

¹³ Corporation in charge of the electric energy distribution in the central region of Guatemalan territory

¹⁴ Biddings are launched during January and/or February and are assigned during March.

Based on the indicative generation expansion plan 2020-2050, the possible power plants to begin operations between 2020 and 2025 were identified, summing up a total of 309.3MW.

Illustration 7: Candidate Power plants to begin operations between 2020 and 2025

Power Plant	Resource	Power (MW)
Pojom	Hidro	20
San Andrés	Hidro	10.8
Xalalá	Hidro	181
Cerro Blanco	Geothermal	7.5
Atitlán	Geothermal	20
Palencia	Geothermal	20
Ayarza	Geothermal	20
Los Achiotes	Geothermal	15
Retana	Geothermal	15
Total		309.3

Transmission

Transmission Expansion Plan 2020-2050

The main objective of the transmission network expansion is to plan the infrastructure growth needed to satisfy the future country's demand and provide access to the transmission grid for new users, ensuring the quality of service and ensure the accomplishment of the stated goals within the Energy Policy 2019-2050 and the General Governmental Policy 2020-2024 of achieving an electrification rate of 93.5% by 2023 (*Ministerio de Energía y Minas, 2020*).

There are two projects in construction: PET-1-2009 and PTENAC-2014

- PET-1.2009: this project consists basically in reinforcements to the current 230 kV network. In its early stage, the project contemplated an addition of 12 substations and more than 850 kilometers of line.

- PETNAC-2014: the PETNAC consists in the inclusion of new infrastructure to the SNI, mostly to build 69 kV infrastructure. This project pretends to improve the quality of those points in which the service presents some deficiencies. Moreover, bringing the grid closer to consumer centers towards producing a substantial impact in SNI's losses reduction.

6. What are the competitive advantages in Guatemala compared to other Central American countries?

Guatemala is a country counting with a macroeconomic stability during the last 20 years in terms of inflation, exchange rate, interest rate, among others. Likewise, the electric industry is characterized by its solid institutions with strict adherence to current regulation oriented to preserve stability in the market and grant certainty to its participants.

Competitiveness index

The competitiveness report of 2019 published by the World Economic Forum positioned Guatemala in the 98th rank among 141 countries, stepping back two positions in relation to 2018. This competitiveness index allows to identify the ability of a country to provide opportunities for economic development and investments, in comparison with the rest of countries analyzed.

Regionally, ahead of Guatemala, Panamá and Costa Rica have better ratings (World Economic Forum, 2019).

Illustration 8: Global ranking according to competitiveness index for Central American countries

Country	Global ranking
Costa Rica	62
Panamá	66
Guatemala	98
Honduras	101
El Salvador	103
Nicaragua	109

Doing Business

Doing Business is a World Bank index, which gives Guatemalan economy a ranking of 96 out of 190 for 2020, upgrading two positions in comparison to 2019. This index shows the easiness of a country to make businesses (Banco Mundial, 2019).

Illustration 9: Global ranking according to Doing Business for Central American Countries

Country	Global ranking
Costa Rica	74
Panamá	86
El Salvador	91
Guatemala	96
Honduras	133
Nicaragua	142

Country Risk Rating

The rating given by agencies to credits and debts of enterprises or government, bases on the ability to return the funding. These ratings have, as objective, to facilitate the information to investors about risk levels and capacity to overcome debts (SECMCA, 2020).

Illustration 10: Country risk rating for Central American countries

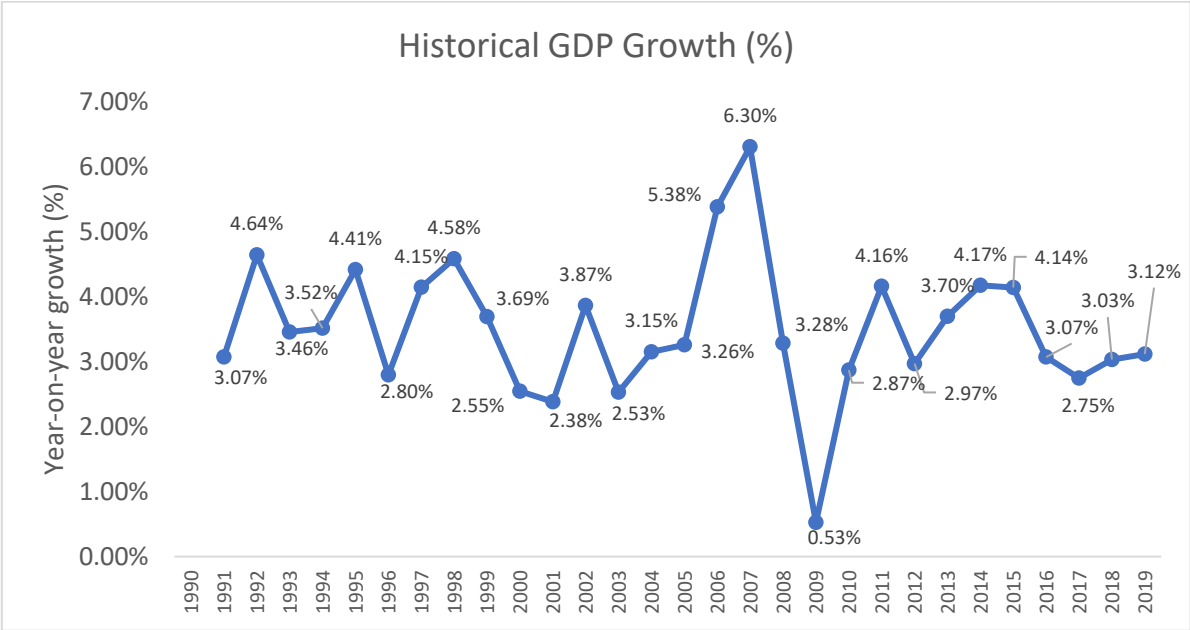
Agency	Description	CR	SV	GT	HN	NI	PA
Fitch Ratings	Rating	B+	B-	BB	NA	B-	BBB
	Perspective	Negative	Stable	Negative		Stable	Negative
Moody's	Rating	B2	B3	Ba1	B1	B3	Baa1
	Perspective	Stable	Positive	Stable	Stable	Stable	Stable
S&P	Rating	B+	B-	BB-	BB-	B-	BBB+
	Perspective	Negative	Stable	Stable	Stable	Stable	Stable

The ratings given to Guatemala by the three main agencies show that the country is the second best in the region only behind Panamá.

Guatemalan GDP evolution 1990-2019 and growth forecasts 2020-2021

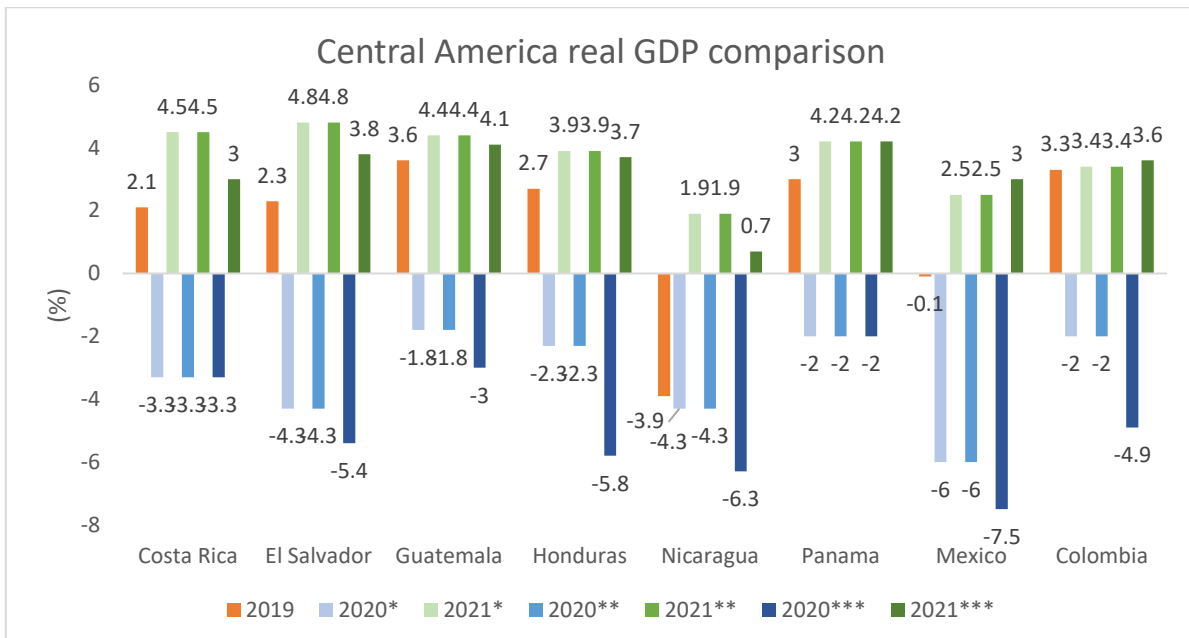
Over the last decade the Gross Domestic Product (GDP) has kept an average growth of 3.4%. The lowest economic growth was 0.53% caused by the world financial crisis between 2008 and 2009. Despite it, the growth was still positive and since then it has remained around 3% (Banco de Guatemala, 2020).

Illustration 11: Historical GDP growth 1990-2019



Nowadays, the strong economic and health crisis across the world will have great negative impacts over all economies, however, according to the most update GDP growth rate forecast from the World Bank, Guatemala will be one of the countries with less negative growth.

Illustration 12: Central America GDP forecast comparison according to the World Bank



*Updated data: March 2020

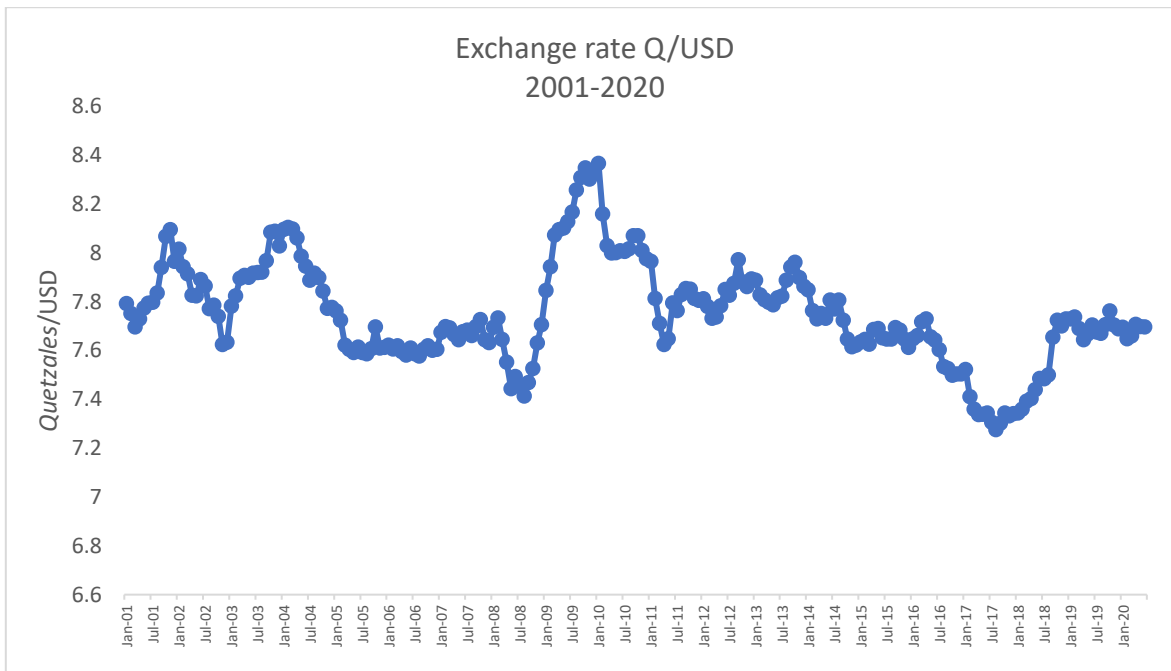
**Updated data: April 2020

***Updated data: June 2020

Referential exchange rate evolution 2001-2020

The exchange rate in Guatemala has been very stable along the years, observing a considerable increase during the economic and financial crisis between 2008 and 2009, nevertheless, then there was a recovery to stable levels since 2011 (*Banco de Guatemala, 2020*).

Illustration 13: Referential exchange rate behavior 2001-2020



*Updated: June 30th 2020

During the first semester of 2020, the exchange rate has been stable at an average of Q7.69 per dollar.

Illustration 14: Referential exchange rate monthly average 2020

Period	Referential exchange rate average
jan-20	Q7.70
feb-20	Q7.65
mar-20	Q7.69
apr-20	Q7.71
may-20	Q7.70
jun-20	Q7.70

It is important to consider the exchange rate since the electric industry in Guatemala is a dollarized market, it means that all the transactions are remunerated and cleared in US dollars and the fluctuations of this variable will impact directly the sector.

Tax rates in Central America

Guatemala is characterized by having one of the lowest tax rates in Latin America and even in Central America. In 2018, the tax collection in Guatemala was 12.1% in relation to the GDP, the lowest of the region. Guatemala is therefore the country with less tax charges for new investments (Comisión Económica Para América Latina y el Caribe, 2020).

Illustration 15: Tax collection in relation to the GDP for Central American countries

Country	Tax collection in relation to the GDP
Guatemala	12.10%
Panamá	14.60%
El Salvador	21.10%
Honduras	22.30%
Nicaragua	23%
Costa Rica	24%

Legal Framework of the electric sector stability

The legal framework in the electric industry in Guatemala is based on recognizing the three powers: executive, legislative and judicial, thus it respects and follows an order established by the Constitution.

The LGE has not suffered major changes since its publication in 1996, more than a reform that gave more dynamism to the market in 2007.

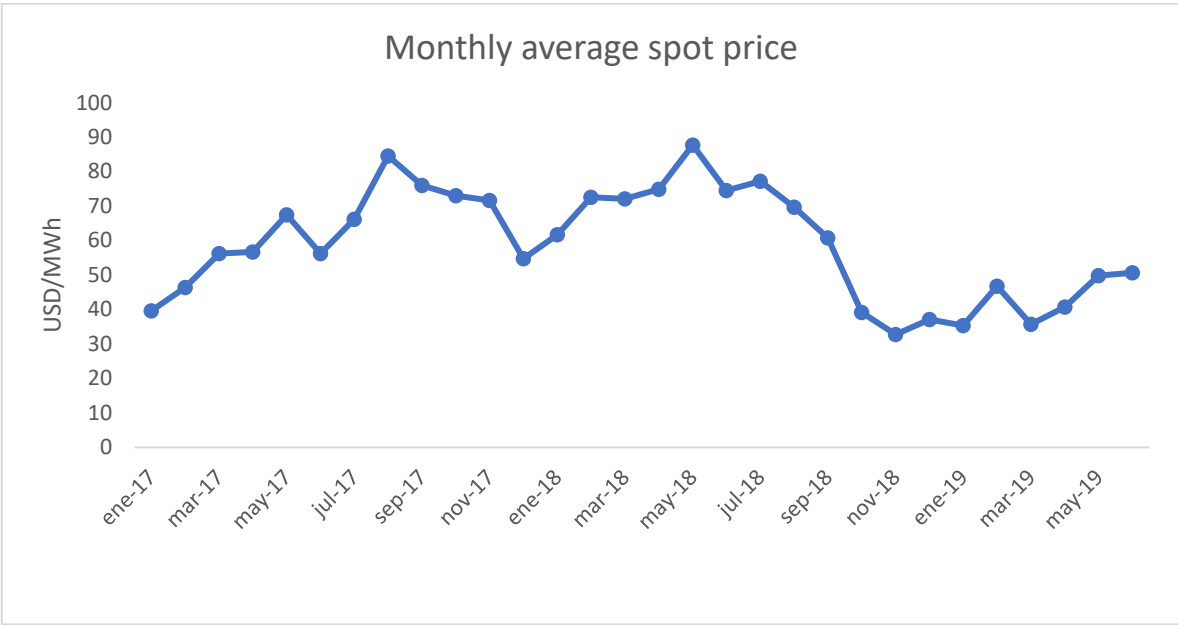
Those who represent the different activities of the industry, respect the order, and comply fully with the regulations, likewise, the market transactions are transparent and respect the legal framework.

The stability of the legal framework and the good functioning of the sector has enabled Guatemala to have presence in the region as exporter and promote new investments in the market since its liberalization.

Guatemalan spot price and Ex ante MER prices comparison

The spot price is defined in the Regulation of AMM (RAMM, by its Spanish initials) as “...the energy’s short term marginal cost for each hour, or during the period defined by CNEE, it is established by the *Administrador del Mercado Mayorista*, as a result of the dispatch.” The spot price is used for clearance in the Guatemalan energy opportunity market and serves as reference for the transactions made in the MER.

Illustration 16: Monthly average spot price

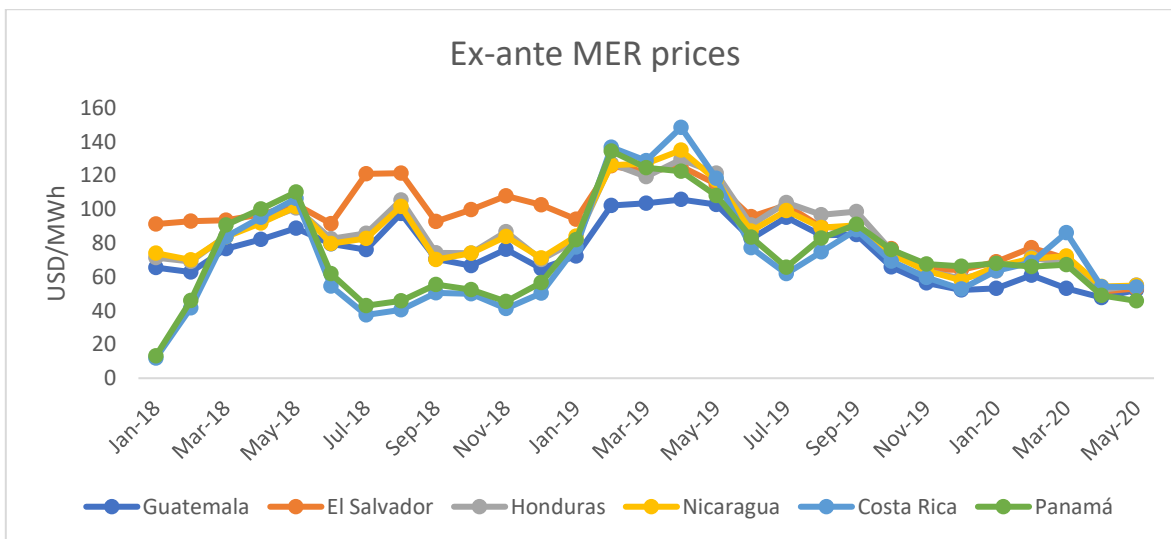


*Updated data: June 30th 2020

It is worth to mention that Guatemala have a competitive and stable price at regional level which permits to maintain its transactions level as exporter in Central American electricity market (Ente Operador Regional, 2020).



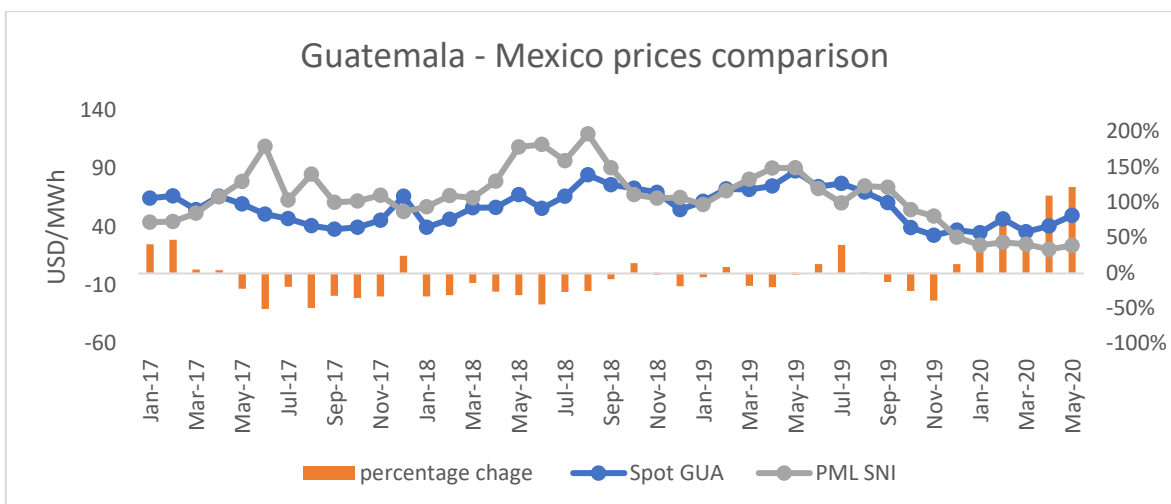
Illustration 17: Ex-ante Central American prices comparison



*Updated data: June 30th 2020

In the same way, Guatemala shows competitive prices with regard to Mexico, where the spot price is usually lower than Mexican marginal local prices.

Illustration 18: Guatemala-Mexico spot prices comparison

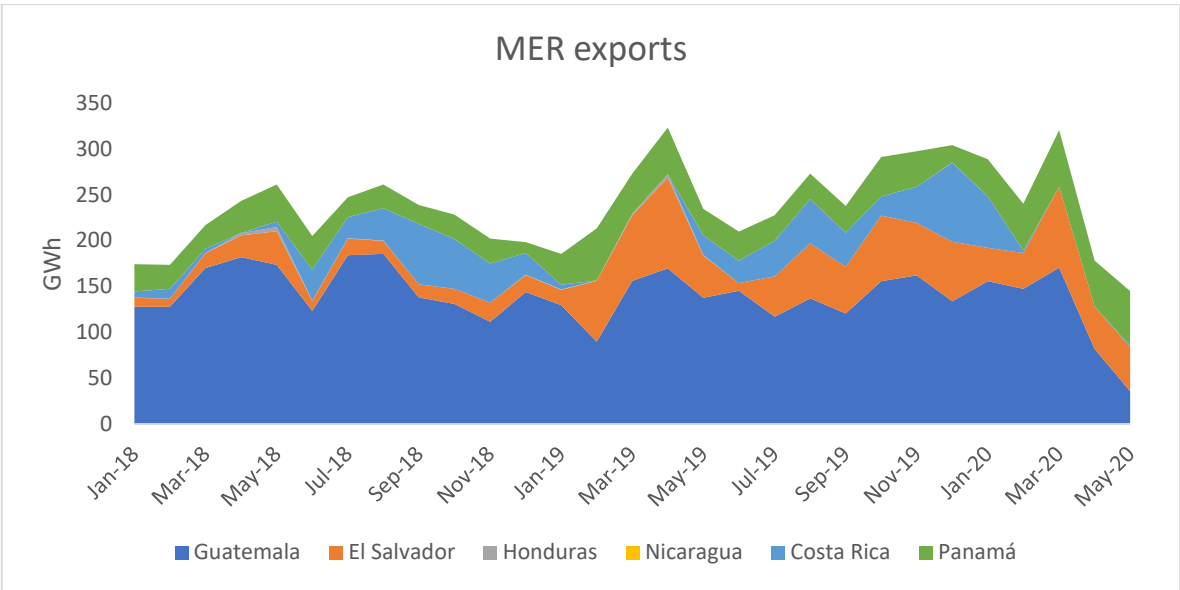


*Updated data: May 31th 2020

Energy exports and imports

Guatemala is renowned as net energy exporter across the MER, as a result of the competitive prices offered. Its market participation, as energy exporter, raised up to 54% in 2019 and from January to May 2020, its sharing was maintained around 50% of the total market (Ente Operador Regional, 2020).

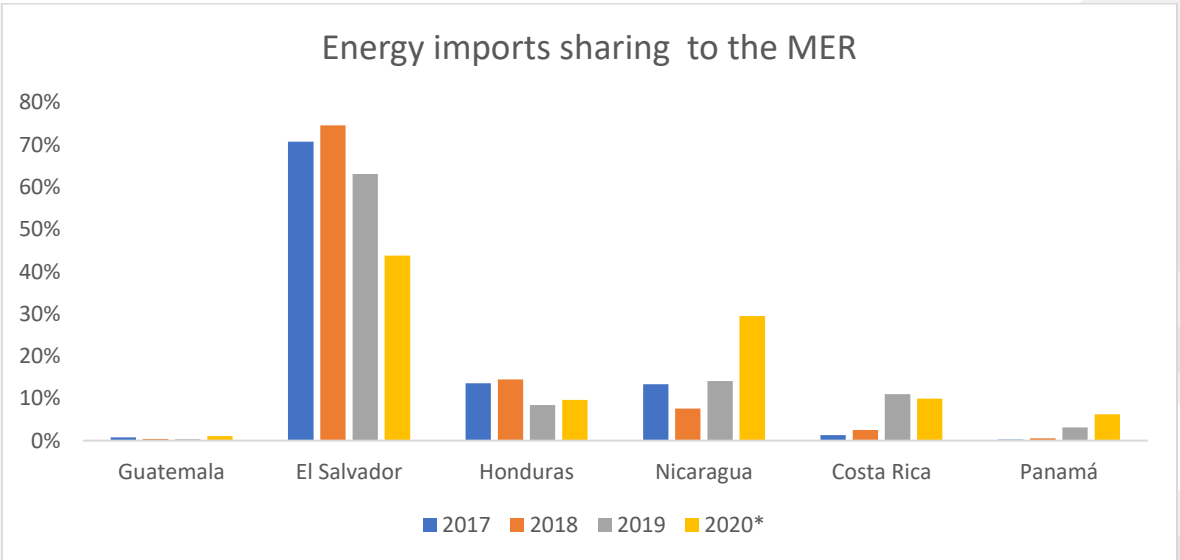
Illustration 19: Guatemala to MER exports behavior



*Updated data: May 31th 2020

With regard to the imports, Guatemala has an importing sharing less than 1% of the total regional market due to its high generation capacity.

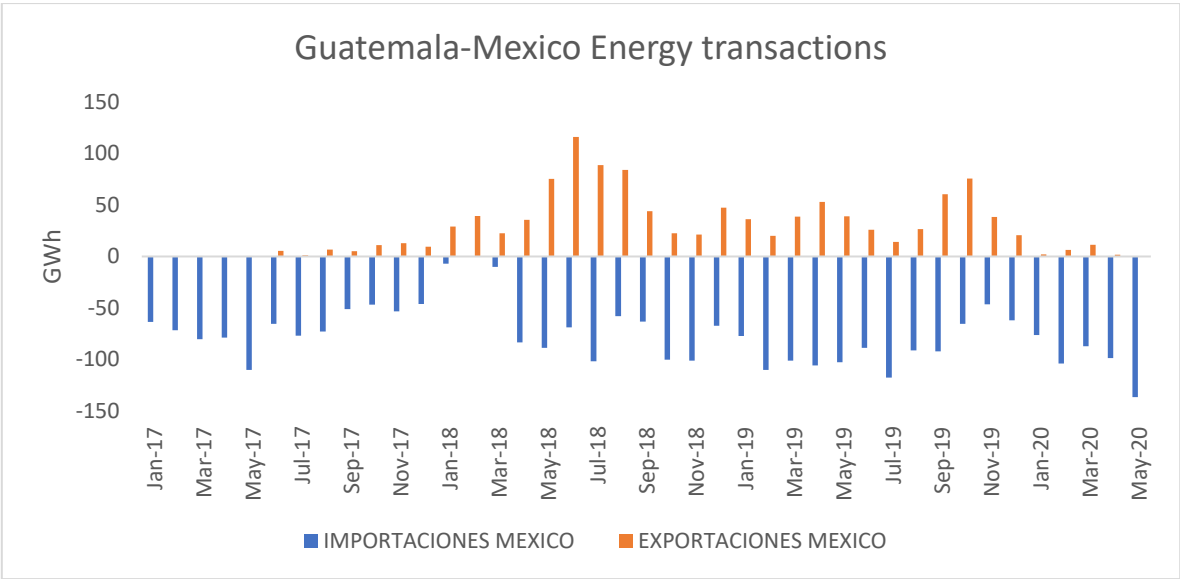
Illustration 20: Imports sharing to the MER behavior by country



*Updated data: May 31th 2020

Nowadays, Guatemala is connected to Mexico through Los Brillantes-Tapachula node. This interconnection is operated independently of the interconnection Guatemala-MER, which is based on two import bilateral contracts while the exports are opportunity transactions between two agents from each country.

Illustration 21: Guatemala and Mexico transactions behavior



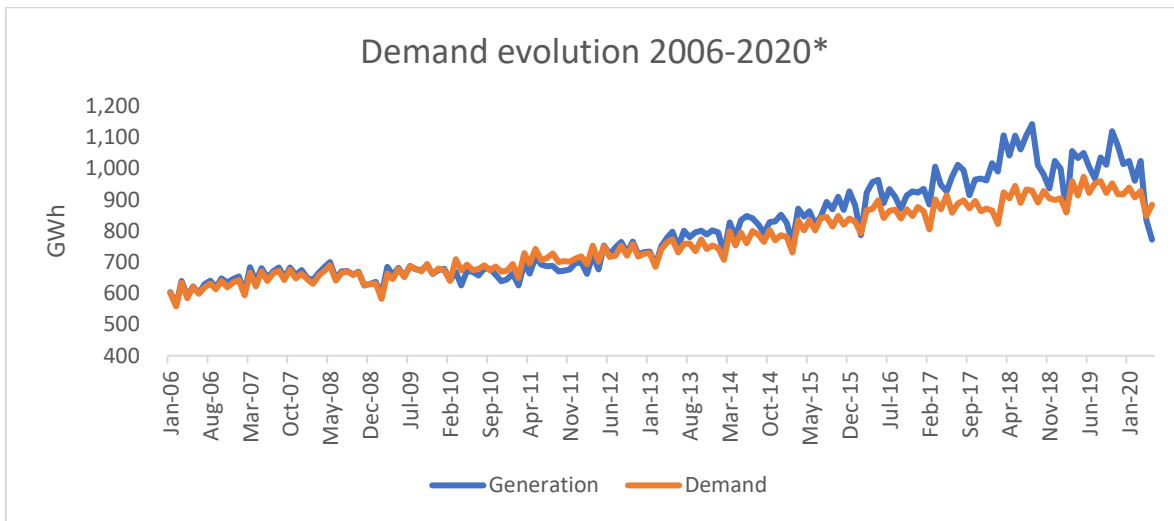
*Updated data: May 31th 2020

7. Relevant information

Electric energy generation and demand

In 2019, generation achieved 12,228.23 GWh, being 57.91% renewable energy with an energy demand of 11,154.93 GWh. The difference between the generation and the demand is an advantage to the industry since it provides an amount of energy available to place into international markets, as it has been done for years now, except for the recent unusual months, affected by the COVID-19 crisis.

Illustration 22: Electric energy demand evolution



*Updated data as of May 31st 2020

For more statistical information of the electric industry in Guatemala follow the below links:

1. Digital magazine from the AMM: <https://rd.amm.org.gt/>
2. Wholesale market operation results available in: https://www.amm.org.gt/portal/?page_id=145

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