# Mexico's Energy Industry Update

## Distributed Generation in Mexico

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July, 2021

# Distributed Generation in Mexico

Since the current administration took office in 2018, official publications and government agencies have given increased importance to distributed generation. Recent plans to install solar PV systems in government buildings and local markets made this apparent. The publication of the last two National Electric System Development Programs (PRODESEN), which foresee great increases for this type of generation system, has reinforced the message.

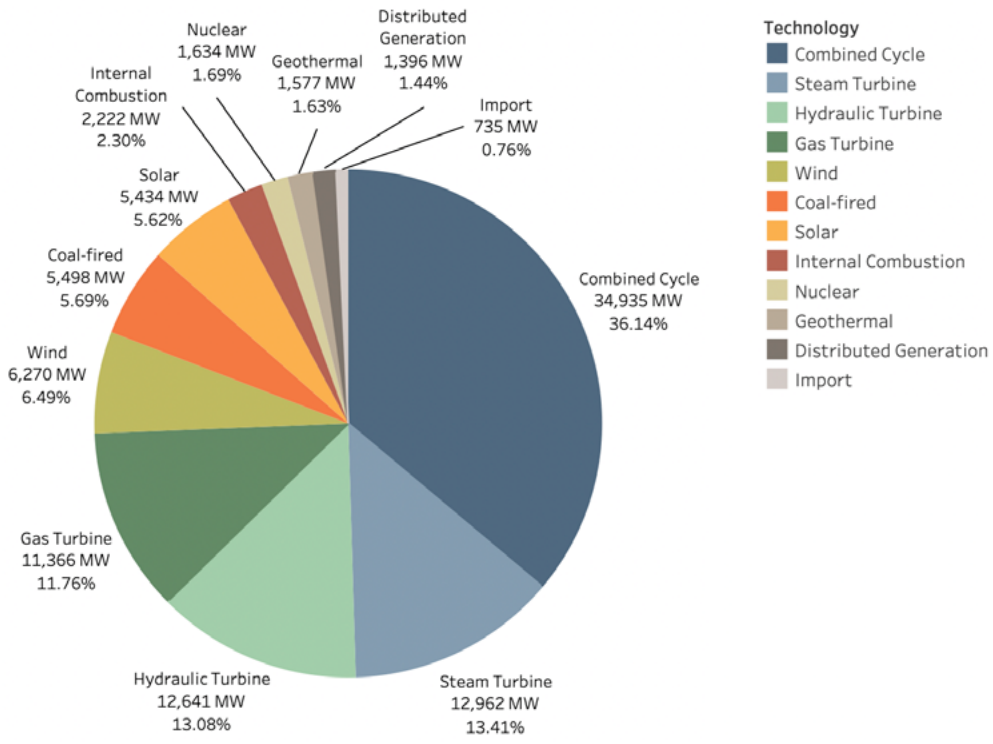
Moreover, the slowdown in the granting of permits and the development of infrastructure projects provide incentives for generation to be near its final users. Distributed generation (DG) serves as a viable solution to these issues due to the simplicity in their operation and low entry barriers. While these generation systems must have a capacity under 500 kW, they do not require a generation permit granted by the Energy Regulatory Commission (CRE). With this in consideration, DG could represent an important part of the country's generation matrix in the foreseeable future, especially as a source of renewable energy and as a short-term remedy to the lack of large-scale transmission infrastructure projects.

# How has distributed generation in Mexico evolved in recent years?

## Distributed generation within Mexico's generation matrix

As of April 2021, there were 96,670 MW of authorized capacity operating in Mexico. The technologies that have seen the highest growth in the past couple of years are Combined Cycle, Solar, and Wind. Distributed generation represents 1.44% of the total capacity operating in the market, as observed in Figure 1.

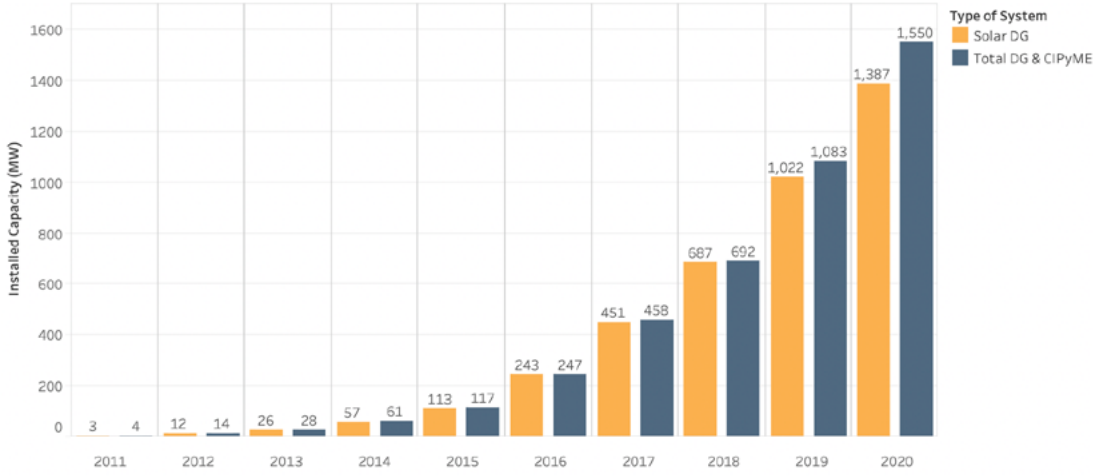
*Figure 1: Authorized Capacity in Operation by Technology*




*Source: Zumma Energy Analytics with information from the CRE*

However, DG has also seen significant increases in its capacity in recent years, as seen in Figure 2, this is especially for solar distributed generation. By January 2021, there were over 165,000 solar DG contracts in the SEN, representing a total installed capacity of 1,388 MW or 99.4% of the total distributed generation capacity in the country. During 2020 alone, 365 MW of solar DG were installed, generating an average of 334 GWh per year. There are other forms of DG such as Biogas, Biomass, and Cogeneration systems; regardless, they represent small percentages of the generation matrix.

*Figure 2: Total Distributed Generation Installed Capacity by Year*[1]

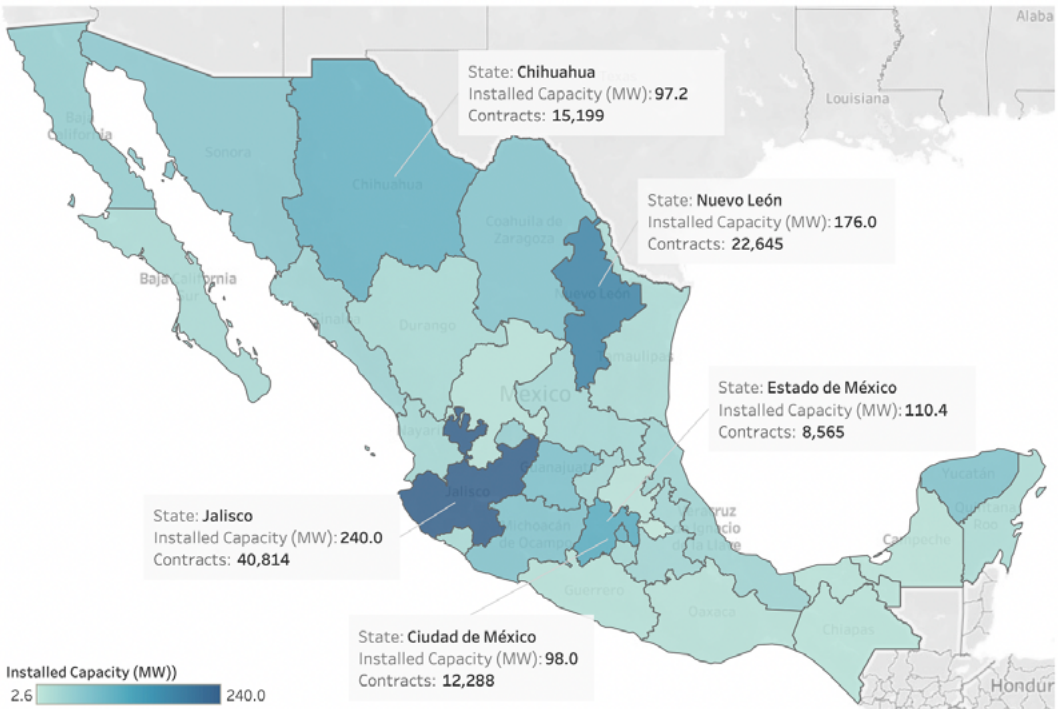



*Source: Zumma Energy Analytics with information from the CRE*

The majority of the DG capacity in operation is located in the states of Jalisco, Nuevo León, Chihuahua, Ciudad de México, and Estado de México (see Figure 3). Regularly distributed generation projects are installed in urbanized areas as their main users are domestic consumers. Besides, the Northern, Central, and Peninsular regions of the country all have significant DG generation capacities thanks to the high solar potential experienced in Mexico.

[1] CIPyME refers to "Contratos de Interconexión de Pequeña y Mediana Escala", generation systems under 0.5 MW which submitted their interconnection requests before 2016, after which the CRE published a resolution migrating these projects to the Distributed Generation modality.

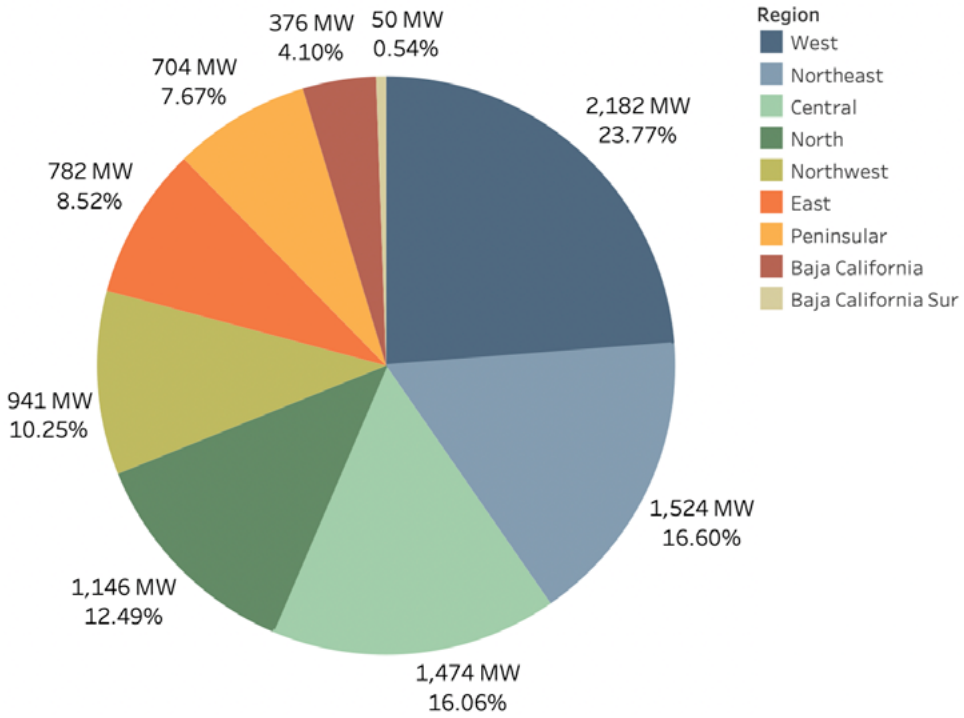
*Figure 3: Distributed Generation Installed Capacity by State*




*Source: Zumma Energy Analytics with information from the CRE*

Not only this but the 2021-2035 PRODESEN forecasts that by the end of its analysis period, distributed generation will be among the most rapidly growing technologies in the country. According to this document, 19,219 MW of large-scale generation capacity will be installed from 2021 to 2024, alongside 2,072 MW of distributed generation capacity. By the end of this period, the PRODESEN forecasts that the generation matrix will include 45.38% of combined cycle capacity, 24.78% of solar, 13.38% of wind, and 12.47% of solar distributed generation. As such, by 2035, solar DG capacity will reach 9,179 MW, representing a significant portion of the generation matrix in the country, with projects being installed mainly in the West, Northeast, and Central regions (see Figure 4).

*Figure 3: Distributed Generation Installed Capacity 2021-2035 Forecast by Region*




*Source: Zumma Energy Analytics with information from the PRODESEN*

## Market Potential

Other than domestic users, smaller industrial users and commercial businesses are potential users for distributed generation systems. These types of users are classified under the GDMTO, PDBT, and GDBT tariffs by the Federal Electricity Commission Basic Service Provider (CFE SSB). As of February 2021, there were over 4.6 million of these users with an aggregate monthly consumption of approximately 2170 GWh. Detailed information on these smaller C&I users, as well as the average monthly rates they pay to CFE SSB, are available in Table 1.

*Table 1: Small C&I Users and Monthly Consumption*

| | Users | Consumption (MWh) | CFE Energy Rate[2] (MXN/MWh) |
|---|---|---|---|
| GDBT | 19,157 | 83,191 | 1175.2 |
| PDBT | 4,284,589 | 943,562 | 994.6 |
| GDMTO | 309,092 | 1,141,919 | 1262.5 |

*Source: Zumma Energy Analytics with information from the CFE*

[2] This Energy Rate is just the cost for the production (and consumption) of energy from CFE SSB, without considering capacity nor regulated costs.

According to a report published by the German Society for International Cooperation (GIZ), among others, the installation costs for solar DG systems are between 1.0 and 1.4 USD/Wp and maintenance costs between 33 and 24 USD/kWp per year. Costs are reduced by almost 30% for units with 250-500 kWp of capacity. Considering this and the CFE SSB rates, if GDBT and GDMTO users were to install these systems they could see a return on their investment as early as 3 years and 7 months after installation, PDBT users could experience the same after 4 years and 4 months. While this depends on each user's consumption, location, and the developer of the system, this implies a substantial amount of savings for final users able to invest in solar DG systems.

While the DG modality was not designed for large users, these systems could also support bigger users, classified under the GDMTH, DIST and DIT tariffs, to reduce their demand. This would allow large users to reduce the electricity costs owed to CFE SSB and mitigate fluctuations in electricity rates. These users could also easily diversify their energy matrix, ensuring part of it comes from renewable energy to meet sustainability goals and obligations of Clean Energy Certificates (CELs). Lastly, developing DG systems would help large users in areas such as Baja California Sur and the Yucatan Peninsula address the lack of Qualified Supply in these zones.

# Why evaluate distributed generation as an electricity supply option?

## State of the Energy Grid

Since 2018 the development of transmission lines has been slow, only growing 0.8% from 2018 to 2019 and 0.1% from 2019 to 2020, amounting to a total of 109,023 km in transmission lines in the National Electric System (SEN). This was also the case for transformation substations, which only grew 0.7% from 2019 to 2020, for a total capacity of 189,999 MVA. From 2015 to 2021, the SENER instructed CFE Transmission and CFE Distribution to develop 144 transmission works and 97 distribution works. Of these, only 4 transmission works and 6 distribution works are in operation.

The PRODESEN plans for 131 transmission projects and 91 distribution projects to start operations between 2021 and 2026. This is equivalent to 3349 km-c of transmission lines, mainly located in Baja California, Hidalgo, Guanajuato, and Estado de Mexico. Additionally, the development of 13,158 MVA of transformation capacity, mainly in Jalisco, Chihuahua, and Baja California has been instructed.

Nevertheless, the slow development of this type of infrastructure in past years does not provide much certainty for the development of large generation projects. This is especially the case for large plants

in the North of Mexico, which lacks transmission capacity, making the transport of energy from the North to the South less competitive due to high congestion costs. The North, Northwest, Northeast, and Western regions all face insufficient transmission capacity that impedes the evacuation of energy from these regions. The Peninsular and Baja California Sur regions have a shortage of supply for the same reasons. The Central, East, and Northeast notably face shortages in transformation capacity.

The issues related to the slow development of the transmission and distribution networks of the SEN have made the value of generation near the consumption zone more evident. The accessibility of distributed generation and the fact that these systems do not need to be connected to a transmission line make them a viable solution to these problems.

## Permit setbacks

Very few generation permits have been awarded by the CRE in the past year and there is a large number of generators waiting to begin or in an interconnection process with the CENACE. Since March 2020, the CRE has only awarded nine permits: four were granted to state-owned companies, CFE and PEMEX, four to the Veolus for small generation projects (1.2 MW each one), and one to Energía Solar Cachanilla for a 98 MW Internal Combustion plant.

Recent regulatory changes could further slow down the development of large generation projects. The current administration's recent publications and Reform to the LIE state that only those projects that are aligned with the SENER's planning for the SEN will be awarded permits. While most regulatory changes have been suspended by federal judges, according to the 2020-2034 PRODESEN, only the generation projects with an interconnection contract and those identified as strategic infrastructure "necessary to comply with the national energy policy of the National Development Plan"

will be considered for development before 2024. From 2025 forward, only projects “whose objective is to ensure the efficiency, quality, reliability, continuity, and safety of the SEN as well as the fulfillment of Clean Energy goals” will be evaluated. No renewable projects, public or private, were included in the PRODESEN’s forecasts for the energy matrix before 2025.

DG generation systems offer an alternative to renewable developers as they are exempt from being required a generation permit from the CRE. They only need an interconnection contract and in some cases a compensation contract from the CFE. Unlike large-scale generation plants, the interconnection request is submitted directly to CFE SSB and not to the National Energy Control Center (CENACE). The CFE, through its Distribution subsidiary, evaluates the request and determines if it is necessary to carry out an interconnection study. The requirement for this study has become for frequent in recent years, especially for systems to be installed in high-congestion areas such as the northern parts of Mexico. However, the usual times for these procedures are around 3 months, much less than the wait time for large generation projects which usually wait over a year to receive an interconnection permit. Additionally, DG is more likely to align with the current administration’s planning of the SEN and their emphasis on the reliability of the system, as it can reduce demand volatility in high consumption zones.

# Conclusion

Transmission and permit processes are often mentioned by the industry as some of the main challenges for the development of Mexico's electricity sector, particularly, for the continued growth of renewable-based generation. Renewables ultimately support the country as it moves to achieve its clean energy goals, specifically its Paris Agreement goal of generating 35% of its energy with clean sources by 2035. However, the 2021-2035 PRODESEN forecasts that, by the end of this period, Mexico will only generate 31% of its energy from clean sources. As the state of the grid and the awarding of permits stall, other options must be explored to ensure the availability of competitive, accessible, and clean energy.

Given that the vast majority of distributed generation projects are Solar, this type of generation system could support Mexico's clean energy generation goals. Not only this, but this generation modality has great market potential, made evident by its rapid growth in recent years. As such, distributed generation can be expected to play a significant role in the generation matrix in the following years as they have less entry barriers than large-scale power plants.

Nevertheless, the development of distribution networks is essential for this to be possible. While the investments needed for these types of projects are less than those for larger transmission projects, increasing their viability, it will still be important to follow up on the development of the grid in following years. Further development of DG could provide more certainty to users who seek less exposition to energy rates or a more diverse supply and business opportunities to participants in the electric sector amid regulatory changes.

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