CHALLENGES AND OPPORTUNITIES

FOR **FINANCING** RENEWABLE ENERGY PROJECTS

IN THE WHOLESALE ELECTRICITY MARKET IN MEXICO

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ACRONYMS

ABS	Asset Backed Securities
AEMO	Australian Energy Market Operator
ANIQ	National Chemical Industry Association
BANCOMEXT	Mexico's Development Bank in charge of financing international trade (Banco Nacional de Comercio Exterior)
BANOBRAS	Mexico's National Works and Public Services Bank (Banco Nacional de Obras y Servicios Públicos)
BCA	Baja California
BCS	Baja California Sur
BPM	Balancing Power Market
CAISO	Operator of the USA Transmission System in the California region
CANACEM	National Cement Chamber
CANACERO	National Steel Chamber
CANACINTRA	National Chamber of the Transformation Industry
CBFE	Energy and Infrastructure Fiduciary Stock Certificates
CCGT	Combined cycle
CDS	Credit Default Swap
CELs	Clean Energy Certificates (Certificados de Energía Limpia)
CENACE	National Center for Energy Control
CERPIS	Investment Project Certificates
CESPEDES	Private Sector Studies Commission for Sustainable Development
CFE	Federal Electricity Commission (Comisión Federal de Electricidad)
CKD	Certificates of Capital Development
CRE	Energy Regulatory Commission (Comisión Reguladora de Energía)
CTCP	Total Short-Term Cost. Spot Price used before the Energy Reform
DFTs	Financial Transmission Rights (Derechos Financieros de Transmisión)
DG	Distributed Generation
DSCR	Debt-service coverage ratio
ERCOT	Electric Reliability Council of Texas (USA Transmission System Operator in the Texas region)
EEX	European Energy Exchange AG
EPEX	European Power Exchange
FERC	Federal Energy Regulatory Commission
Fibras E	Energy and Infrastructure Investment Trust
FIT	Feed-in Tariff
GP	Price Guarantee (Garantía de Precio)
GPO	Payment Guarantee (Garantía de Pago Oportuno)
GW	Gigawatt
ICE	Intercontinental Exchange
IRS	Interest Rate Swap
kW	Kilowatt
LIE	Electricity Industry Act (Ley de Industria Eléctrica)
LTA	Long term auction (Subasta de Largo Plazo – SLP)
LTE	Energy Transition Act (Ley de Transición Energética)
MDA	Day-Ahead Market (Mercado de Día en Adelanto)
MexDer	Mexican Derivatives Market
MIGA	Multilateral Investment Guarantee Agency
MISO	Electric Power Markets –Midcontinent
MTR	Real-time Market (Mercado de Tiempo Real)
MXN	Mexican Pesos
MW	Megawatt
MWh	Megawatt hour
NEM	National Electricity Market of Australia (market operator)
OPF	Financed Public Works (Obra Pública Financiada)
OTC	Over-The-Counter
PJM	Regional transmission organization in eastern USA
LMP	Local Marginal Price
UNDP	United Nations Development Programme
PPA	Power Purchase Agreement
PRODESEN	Program for the Development of the National Electricity System
REE	Electricity Interconnection System of Spain (Red Eléctrica de España)
RNT	National Transmission Network (Red Nacional de Transmisión)
SEN	National Electricity System (Sistema Eléctrico Nacional)
SENER	Ministry of Energy (Secretaría de Energía)
SGD	Distributed Solar Generation System (Sistema de Generación Solar Distribuida)
SIN	National Interconnected System (Sistema Interconectado Nacional)
MTA	Medium Term Auction (Subasta de Mediano Plazo – SMP)
SPV	Special Purpose Vehicle
T&D	Transmission and Distribution
TBFins	Bilateral Financial Transactions
TBPots	Bilateral Power Transactions
USD	United States Dollar

EXECUTIVE **SUMMARY**

In 2016, the Wholesale Electricity Market entered into operation in Mexico, where generators and buyers carry out transactions on electric power and ancillary services through the submission of bids in a short-term electricity market (or spot market). Since the system is relatively new and involves market risks, electricity generation projects in the spot market (merchant projects) still face barriers for accessing suitable financing.

This report intends to provide information on the main risks, barriers and opportunities for projects with full or partial participation in the spot market (fully or partially merchant projects). To this end, the report seeks to identify financial instruments and mechanisms that help mitigate the risks associated with the financing of merchant projects. This report aims to provide more information on these projects for financial institutions, project developers, government entities and advisors, in order to promote the renewable energy market in Mexico.

The report begins with a descriptive analysis of the situation of merchant projects in the Mexican Electricity Market to provide information on the current status of the market and its financing, as well as on the development potential and main risks associated with the sector. Subsequently, the relevant financial instruments that could address the main risks in Mexico are identified and described. Lastly, other mechanisms and public policies are presented that would support the growth of this market.

KEY **RESULTS**

The current situation in Mexico shows that:

- There are different **aspects** that **could promote the development of merchant projects**, such as: **high Local Marginal Prices (LMPs)** within the spot market (currently ranging between 75 USD/MWh and 40 USD/MWh according to official forecasts), **market initiatives other than Long-Term Auctions (LTA), scarcity of off-takers with a high credit rating** in projects involving energy purchase and sale contracts (known as Power Purchase Agreements or PPAs), and a growing t**rack record of merchant projects that have already been financed.**

- **Due to the competitiveness of renewable energy projects when compared with the LMPs**, renewable energy projects are advantageous in merchant scheme projects.

- More renewable energy installations will contribute to achieving the clean generation goals[1], growing from 21% in 2018 to 35% in 2024.

- Mexico needs to generate an additional 68 MWh of clean energy, which is equivalent to approximately 25 GW of required installed capacity. A portion of the additional clean energy capacity could be developed through merchant projects. If the growth of merchant projects seen in recent years continues, **an estimated pipeline of potential merchant generation projects of at least 2 GW is expected between 2022 and 2032, equivalent to USD 2.2 billion.**

- However, the financing that is currently available for merchant projects does not reflect the market's potential. In particular, **the participation of commercial banks has been limited**, and no fully merchant projects have been financed by commercial banks (in other words, these have been financed through subordinated loans jointly with Development Banks).

- The **main risk identified, as a result of 30+ interviews and 30+ surveys** conducted with key agents in the sector (Development Banks, private banks, developers, advisors, etc.) for financing or developing merchant projects is the **volatility of LMPs.**

- Due to the above, merchant projects have obtained financing under conditions that require a **robust study of variables** associated with the developer and the LMP in the node of interest.

- Given the need to mitigate the volatility risk in LMPs, **financing conditions for** merchant projects have generally favored **short term loans** (~7 years), with **a leverage close to 55%**, DSCR of 1.55, **cash sweeps**, and envisage a **break-even price** (close to ~20 USD/MWh).

- To promote financing for merchant projects, the **LMP volatility risk could be hedged by managing the risk of each of its components**: hedging instruments such as fuel derivatives to hedge the energy component, Financial Transmission Rights (Derechos Financieros de Transmisión – DFTs) to hedge the congestion component, and network expansion to reduce the loss component.

Looking at Wholesale Electricity Markets in other countries, the following can be observed:

- In the last year, the **average spot prices** in the different international markets have shown minimum values of **26 USD/MWh,** and are generally **above 50 USD/MWh**. Each electricity market has a set of particular characteristics; when comparing Long Term Auction prices (Subastas de Largo Plazo – SLP) in Mexico against other countries with a longer price record, Mexico's prices have been considerably lower.

1. The Government of Mexico has defined clean energy goals that include: renewable energies such as hydroelectric, wind-powered, geothermal, solar photovoltaic, thermosolar and bioenergy, as well as nuclear power and efficient cogeneration.

- In relation to the types of hedging used by the financial entities to manage risk, in **mature markets such as the United States, derivative instruments** are used as income proxy hedges. In Mexico, there are no energy derivatives available. The Mexican Derivatives Market (MexDer) is working on the first futures contract, which is expected to begin operation next year.

- In **Spain, threshold price guarantees have been used**, mitigating revenue risk associated with fluctuations in electricity prices; the cost of the guarantee is paid upon maturity. During the interviews conducted, it was noted that this type of instrument could be very useful for the development of merchant projects.

- **Partially merchant projects, which ensure a portion of their revenue flows through PPAs** and another portion through revenue flows from the spot market, are being developed in several countries. Even when PPA prices are lower than spot prices, PPAs constitute a hedging instrument that financial entities are comfortable with, as long as energy buyers –known as off-takers – have a good credit rating. **In the case of Mexico, physical and virtual PPAs require greater dynamism** because: i) the number of off-takers with a high credit rating is limited; ii) DFTs have not yet been assigned due to a delay in the first auction; and iii) the market for negotiating Clean Energy Certificates (Certificados de Energías Limpias - CELs) over the S-CEL platform is not up and running, and iv) the market in general has experienced changes in regulation. Recent changes were made (October 2019) in regulations to allow the participation of older power plants that generated renewable energy prior to 2014 in the CELs market, generating uncertainty in relation to the price of CELs.

Following an analysis of **existing and potential financial instruments for merchant generation projects** that could help promote financing for a greater number of projects and increase debt leverage, it could be identified that:

- There are **various financial mechanisms and instruments** that could potentially mitigate risks inherent to the financing of merchant projects, some of which are already in use in Mexico: i) Syndicated term loans, ii) Payment guarantees (Banobras), iii) Insurance and guarantees, iv) Climate bonds, v) Equity Certificates (CKDs) and Fibras E, vi) Energy Futures (MexDer), vii) Financial options (Put or Collar) on energy prices (BID Invest), and viii) Electricity Swaps (Fisterra).

- A **payment guarantee (Garantía de Pago Oportuno - GPO) and a minimum price or price range guarantee** were identified as **instruments with implementation potential with back-up from Development Banks**[2]; these would promote financing by mitigating certain risks for the financial entities, addressing the main concern and risk of market participants: future fluctuation in LMP levels.

- In general, **Development Banks** play a key role in mitigating the risks identified. National Development Banks are in charge of serving priority markets that promote the sustainable development of the country, and promoting financing of new practices, technologies and projects that are not a priority in the financial sector. They have two main modes of delivering this mandate: I) Acting as first movers, i.e: financing new areas that do not yet receive commercial financing, in order to show their financial viability to other players in the financial sector; II) Providing financial instruments that reduce risks and grant greater certainty to commercial banks.

Additionally, **public policies and mechanisms that would support the growth of merchant renewable energy projects** were identified:

- **Access to public consensual LMP projections:** Electricity sector associations and financial entities could hire advisors to prepare LMP projections on a regular basis and publish scenarios with their data input in order to provide the market with a price reference. In the United States, the Energy Information Administration (EIA) publishes short-term (1 year) market prices for the main markets, including California and Illinois. In Mexico, this role could be taken on by the Energy Information System (Sistema de Información Energética - SIE).

- **Promote the physical and virtual PPA market.** The availability of physical and virtual PPAs allows: i) investing partners in merchant projects to free part of their equity, ii) developers to secure the price of a portion of their revenue flows, and iii) the search for refinancing to improve project conditions.

- **Maintain PPA dynamism.** Some factors to achieve this include: i) the promotion of training for qualified users and off-takers by associations representing industrial users (example: CESPEDES and Coparmex); ii) establish a Clearing House to promote a secondary negotiation market that allows the identification of a public breakeven price, volumes negotiated over a given period of time, and the placement of energy surpluses or shortfalls relating to projects; iii) the Energy Regulatory Commission (Comisión Reguladora de Energía - CRE) could promote the use of a platform for indicating the price of CELs and volumes traded on this market; iv) the National Center for Energy Control (Centro Nacional de Control de Energía - CENACE) could develop and call the first Auction of DFTs, providing greater certainty in relation to the cost of dispatched energy and off-take at each node for PPA counterparts, generation projects and load serving entities.

- **Promote the expansion and modernization of the National Transmission Network (Red Nacional de Transmisión - RNT):** To ensure the availability to install capacity, it is necessary to provide certainty regarding the loss component, and reduce the congestion component. To this end, the interested entities could prepare a cost-benefit study for the Ministry of Energy (Secretaría Nacional de Energía - SENER) and

2. In this report, "Development Banks" refers mainly to National Development Banks. In some cases it also refers to Bilateral and Multilateral Development Banks, as specified in each case.

CFE Transmisión that leads to investment in new works through PPAs (Private-Public Associations) or Financed Public Works (Obra Pública Financiada - OPF), reducing exposure to risk and indebtedness of CFE Transmisión.

- **Develop pilot renewable energy projects with storage:** To analyze the option of dispatching energy during downtime hours of renewable energy plants, allowing greater revenue from energy sales.

- **Promote Distributed Generation (DG) projects with merchant remuneration:** To grant greater dynamism to merchant DG (Total Sales and Net Billings), information could be provided on how to group/bundle projects to reach the minimum financing objectives established by financing entities. To this end, the banking sector could inform on the minimum financing provided for a project portfolio and terms under which financing would be granted.

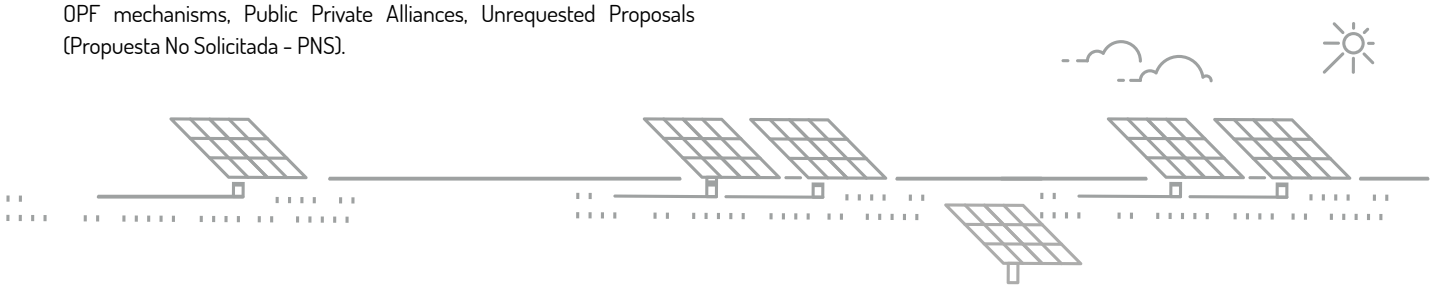
As a result of this analysis, the following is **recommended:**

- Renewable energy sector and bank associations could **issue a public consensual LMP projection** jointly with advisors and financial institutions, that establishes an acceptable price range based on agreed stress scenarios, thus increasing certainty in relation to those projections for developers and banks.

- **Development Banks could favor the development of merchant projects through financial instruments that help mitigate risks** inherent to those projects. These financial instruments could comprise derivatives (energy price futures, financial options, etc.) or minimum price or price range financial guarantees. The clients of these instruments could be commercial banks and/or developers.

- **An understanding of the different concepts relating to the electricity market should be provided** (LMP components, DFTs, etc.) to potential investors and/or project financiers to grant certainty in relation to products, participants and markets in the Mexican electricity sector.

- **Certainty should be generated regarding congestion through a plan for the expansion and modernization of the RNT** between importation and consumer zones through binding a plan of expansion and modernization of the RNT that authorizes investment and financing structures such as the bids for Direct Current High Voltage Power Lines, OPF mechanisms, Public Private Alliances, Unrequested Proposals (Propuesta No Solicitada - PNS).



CONCEPTUAL NOTE RELATING **TO THE METHODOLOGY USED**

The methodology used to conduct the study comprised four stages:

1. **Gathering of information:** During the first stage of the study, the key agents of the electricity sector and other players directly involved in the development of merchant projects were selected. Subsequently, those agents were interviewed and/or surveyed on the risks, financing mechanisms, hedging instruments and general conditions of merchant projects in Mexico[3].

2. **Analysis of the merchant market in Mexico:** The second stage comprised the analysis of the information gathered in the interviews and surveys. At the same time, a diagnosis was made of merchant projects in international markets. During the analysis, non-financial mechanisms and non-financial instruments used in Mexico and in other markets to promote the development of merchant projects were identified.

3. **Evaluation of potential financial instruments:** Using the diagnosis of the current situation in Mexico and the outlook of key agents in the sector, the financial instruments that would have potential in the Mexican market were identified by defining evaluation criteria (cost, term, etc.). Following an evaluation of the potential instruments according to the proposed criteria, the financial instruments with the best fit in the Mexican merchant market were defined.

4. **Preparation of recommendations:** A summary was prepared of the main non-financial mechanisms and financial instruments and used as a basis for preparing tangible recommendations for the agents in the sector.

BACKGROUND **OF THE REPORT**

This report forms part of a project under the framework of the technical and financial cooperation between GIZ, KfW and Bancomext. The Large-Scale Solar Energy Program of GIZ contributes to the strengthening of the institutional capacity of Bancomext.

In recent years, the German Development Bank KfW and Bancomext subscribed several concessional loan facilities to create incentives and mobilize the necessary resources to promote the growth of renewable energies in Mexico.

The purpose of Bancomext is to contribute to the development and generation of employment in Mexico. Bancomext grants loans and guarantees directly or through commercial banks and non-banking financial intermediaries, to enable Mexican companies to increase their productivity and competitiveness.

Bancomext, GIZ and KfW work together to identify financial instruments that will facilitate the mobilization of private financing for renewable energy projects – which is the objective of this project.

3. Refer to Annex 2 and 3 for questions used in interviews, and results of the interviews and surveys.

1

DIAGNOSIS OF THE CURRENT SITUATION of merchant projects IN THE MEXICAN ELECTRICITY MARKET

THIS CHAPTER CONTAINS A GENERAL ANALYSIS OF THE WHOLESALE ELECTRICITY MARKET AND OF GENERATION PROJECTS WITH TOTAL OR PARTIAL SALES OF THEIR POWER GENERATION TO THE SPOT MARKET (ALSO KNOWN AS MERCHANT PROJECTS) THROUGH 30+ INTERVIEWS AND 30+ SURVEYS OF KEY PLAYERS IN THE SECTOR, IN ADDITION TO DESKTOP RESEARCH. THE OBJECTIVE IS TO INFORM ON THE GENERAL FINANCING MECHANISMS AND CONDITIONS AVAILABLE FOR MERCHANT PROJECTS, AND THE MAIN OPPORTUNITIES AND RISKS TO BE CONSIDERED.

1.1 General understanding of the Wholesale Electricity Market and the short-term market

The Short-Term or Spot Electricity Market is the market where electricity sales and purchases are carried out in Mexico. This market comprises the Day-Ahead Market (Mercado de Día en Adelanto - MDA) and the Real Time Market (Mercado de Tiempo Real - MTR). On the MDA, the hourly energy supply and demand planning takes place 24 hours in advance. In this market, CENACE evaluates offers made by all the available power plants and sends dispatch orders to the most efficient generators. On the other hand, the energy offered on the MTR is for immediate purchase or sale in line with the differences between planning in the MDA and real time fulfillment of the energy demand (MTR).

PRODUCTS	MARKET	DESCRIPTION
Energy	Short Term Market	Electricity consumption from and dispatches to the National Transmission Network. It is measured in kWh and its value represents the Local Marginal Price (PML) at the corresponding time and consumption / delivery node.
Ancillary Services		Market based products required to guarantee system reliability: these include: reactive power reserve, voltage control, reserves, etc.
Clean Energy Certificates	CELs Market	Clean Energy Certificates (CELs), created with the aim of achieving clean generation targets and reducing CO2 emissions.
Power	Balancing Power Market	Installed capacity required by the system to guarantee physical production availability during times of high demand and/or low reserve capacity.
Financial transmission entitlements	Auctions of Financial transmission entitlements	Financial product created to assign value to the difference in Local Marginal Prices (PMLs) between consumption and dispatch nodes.

Figure 1. Main products and markets that make up the Wholesale Electricity Market in Mexico - Source: CENACE, CRE.

On the spot market, power plants dispatch according to a mechanism based on merit order, where CENACE classifies available generators according to their variable cost of electricity generation from lowest to highest until it reaches the last generator needed to cover the demand at a given time. The cost of supplying the last section of demand is called the marginal cost of electricity generation.

The Local Marginal Price (LMP) is the electricity purchase and sale price for the 53 price zones of the National Electricity System (Sistema Eléctrico Nacional - SEN), and it established using three main components: energy, congestion and losses. The energy component is determined for the National Interconnected System (Sistema Interconectado Nacional - SIN) based on the marginal cost of generation; the loss component depends on the capacity limits that must be respected to protect power lines[4], and the congestion component depends on the supply/demand balance at each node and its interconnection with other nodes[5].

The revenue obtained by merchant generation projects depends on the LMP in the node where they dispatch their energy[6]. Historical average LMPs have been above 30 USD/MWh, with maximum values close to 110 USD/MWh. The SENER has published four official LMP projections, all of which envisage an average LMP for the next 15 years close to 40 USD/MWh.

4. When economic dispatches infringe established limits, transmission becomes a scarce resource and new dispatches are required to keep the system within safety conditions.
5. The congestion caused by physical constraints in the transmission network is a key element to consider when seeking an efficient market. This congestion is generated by insufficient trans mission capacity to carry the entire energy flow generated by low-cost sources to the demand centers during peak hour, which are in turn characterized for being located at great distances from the generating centers.
6. Generators are paid the LMP using a dual payment system, through which they are initially paid the amount corresponding to the MDA, and subsequently the sales difference between the MTR and the MDA.

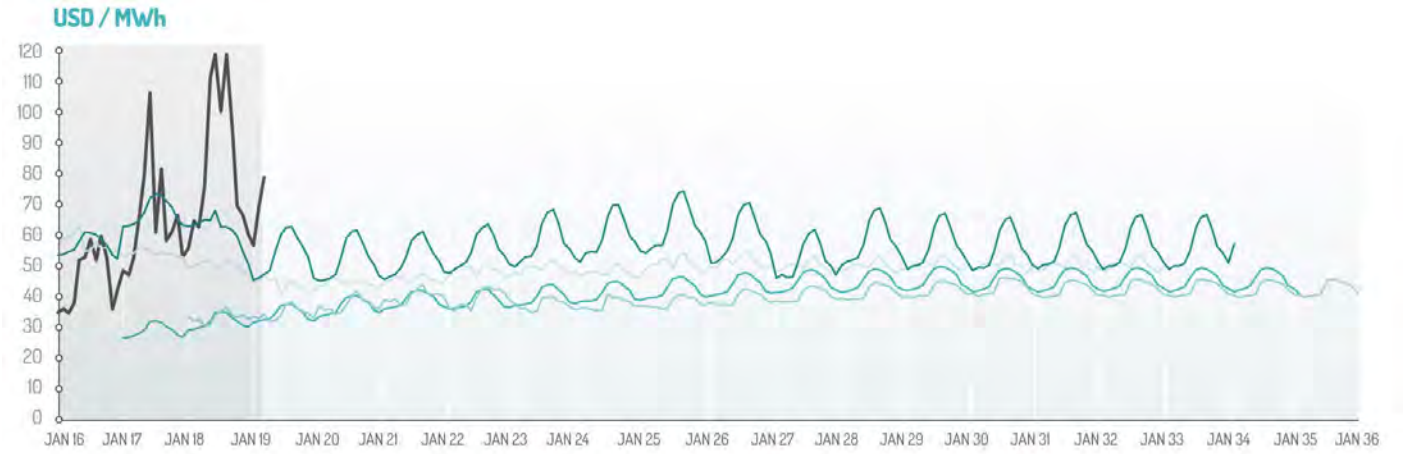


Figure 2. Historical and projected PMLs (Local Marginal Prices) for each Long-Term Auction (2016, 2017, 2018, 2019) – Source: CENACE

Regarding the Wholesale Electricity Market, the region with the lowest historical prices is Baja California (BC) due to the general characteristics of the region, which include access to natural gas pipelines, significant production using combined cycles, and surplus supply versus demand.

The Baja California Sur (BCS) region shows the highest historical average LMPs, mainly due to the lack of access to natural gas pipelines, lack of access to the SIN power lines, and generation with high variable costs due to the use of fuels such as diesel and fuel oil.

Considering the balance between supply and demand, the Northeast and Oriental regions are classified as net exporters. The Central, Occidental and North regions are importers since their demand exceeds their local generation.

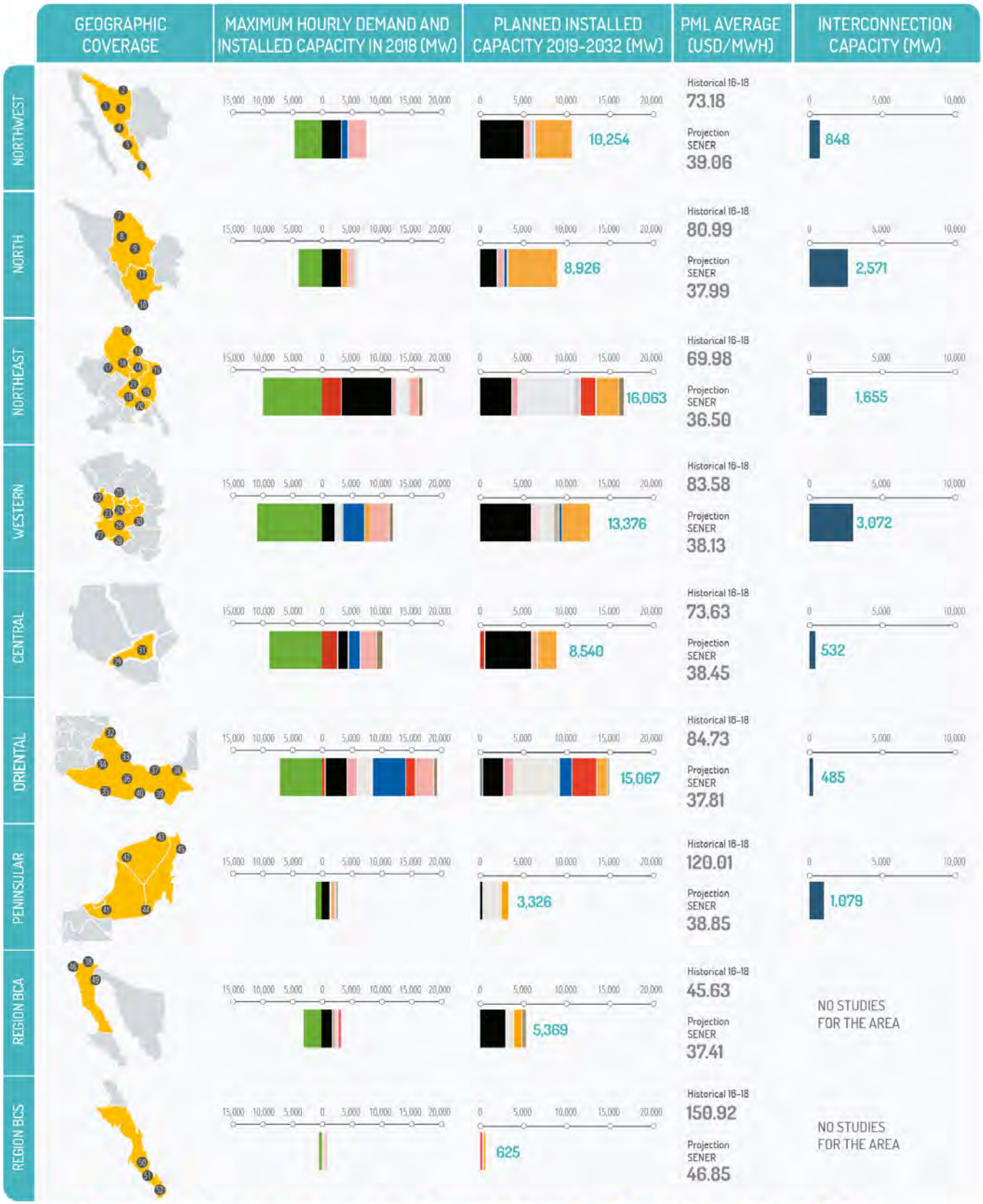


Figure 3. Balance of supply/demand (MW), planned additions (MW). Historical and projected PML (USD/MWh) and interconnection capacity (MW) by control regions in Mexico[7] - Source: CENACE, PRODESEN 2018

1.2 Market potential of merchant generation projects

Based on interviews held with central agents of the Mexican electricity industry[8], the potential for the development of merchant generation projects was identified:

- The opening up of mechanisms other than Long-Term Auctions (LTA) implies that generators and suppliers must identify new project development and product allocation mechanisms.

  The LTA process created dynamism for the development of clean energies in Mexico, attracting investments of approximately USD 8.6 billion in wind and solar energy[9], achieving highly competitive awarded prices, with an average weighted price of 43 USD/MWh in the 1st. LTA, which dropped 30% in the 2nd. LTA, reaching 33 USD/MWh, and 40% in the 3rd. LTA, reaching prices of 20 USD/MWh.

  Mexico currently has over 260 clean energy power plants, which represent 30% of the installed capacity[10]; however, this represents 21% of total generation (see Figure 18). This is 68 MWh short of the goal of 35% clean generation by 2024 (indicating there are around 25 GW missing to reach goals)[11].

SOLAR	WIND	HYDRO	Geothermal	Bioenergy
41 plants	53 plants	86 plants	8 plants	77 plants
11 States	13 States	17 States	5 States	25 States
3,305 MW	5,499 MW	12,642 MW	926 MW	1,011 MW

Figure 4 Renewable energy generation projects in operation in Mexico in 2019 – Source: SENER, CRE

LTA prices awarded are competitive compared to LMPs (see Figure 5). The momentum created with those LTAs could continue as renewable energies unfold through merchant projects.

- LMPs are high in various nodes (for example, the average LMP for Q1-Q3 2019 is 75 USD/MWh[12]), making it attractive in relation to prices in private PPAs and in PPAs regulated through competitive processes such as auctions.

Figure 5 Differential between LMP and average prices awarded in Long Term Auctions (USD/MWh) – Source: CENACE

7. The PRODESEN 2018 was used as a reference to draw up the descriptive matrix of the SEN regions:
   - Demand was based on the maximum hourly value obtained in 2018 for each control management that makes up the SEN, according to the planned demand for 2018-2032 of the CENACE.
   - Installed capacity was estimated based on the generation published in PRODESEN 2018, adding up existing power plants in each control management.
   - Planned to-be installed capacity was obtained using the generation baseline in PRODESEN 2018, filtering power plants that are planned to be installed over the period 2019-2032.
   - The historical LMP was obtained as an average for each control management, based on information published by CENACE on LMPs for the period 2016-2018.
   - The projected LMP was obtained as an average of the indicative prices presented by SENER in the last four PRODESEN. These price projections depend on fuel, generation mix, and projected expansions and modernizations of the transmission network.
   - The interconnection capacity was obtained by using as a reference the addition of interconnection capacity available at substations in each control management of the SEN published by CENACE in the last Long-Term Auction (LTA).
8. The annexes contain the detailed results of interviews with 13 renewable and conventional energy generators, 5 Mexican commercial banks, 4 foreign commercial banking entities, 6 Development Banks, 3 investment funds, 2 underwriters and 3 advisory firms.
9. According to CENACE.
10. Approximately 50% of this capacity corresponds to Federal Electricity Comission (CFE for its Spanish acronym) power plants.
11. The total generation reported by CENACE in 2018 was 310 TWh, of which 65 TWh were clean energy (21% of the total). The total estimated generation by 2024 indicated in PRODESEN 2018 reaches 379 TWh, 35% of that generation represents 133 TWh. The difference between clean generation in 2024 and 2018 is 68 TWh. These 68 TWh are equivalent to ~25 GW considering a capacity factor of 30%.
12. The average LMP at all SEN nodes is equivalent to 1,439 MXN/MWh. An exchange rate of 19.5 MXN/USD is used.

- The length of time to recover debt financing in merchant projects is lower than in PPA projects.

- A pipeline of potential merchant generation projects worth $ 2.2 bn USD is estimated between 2022 y 2032: i) considering the percentage of fully merchant solar and wind power projects in operation and in construction (504 MW, see Figure 8) relative to the total wind and solar power projects in operation and construction (7,369 MW)[13], ii) applying this percentage of fully merchant projects to the additions expected between 2022 - 2032 (an estimated potential market of ~2 GW), and iii) using the CAPEX published in the study by CESPEDES for wind and solar power projects (see Figure 6).

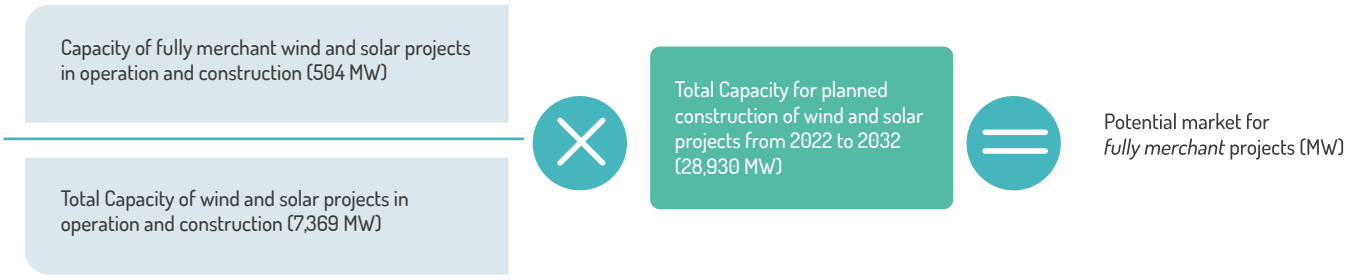


Figure 6. Estimated market size for fully merchant projects in Mexico until 2032 - Source: SENER, CENACE

Technology	CAPEX Range ($ USD/W)	Potential Market for fully merchant projects (MW)	Potential Investment (Millions of US $)
SOLAR	MIN $0.99 · Average $1.10 · MAX $1.21	1,179 MW	MIN 1,167 · Average 1,296 · MAX 1,425
WIND	MIN $1.08 · Average $1.20 · MAX $1.32	799 MW	MIN 862 · Average 958 · MAX 1,054

Figure 7. Range of investment costs by type of technology, expected installed capacity (MW) and potential investment (in millions US$) - Source: Estudio de Energías Limpias CESPEDES, PRODESEN, Lazard, IEA, IRENA

13. To estimate the projects in operation, the total wind and solar capacity published by SENER in PRODESEN 2019 is considered, while for projects in construction, electric power plant interconnection "Contracts and Agreements" that have received "Accepted" status published by SIASIC until January 2019, for solar and wind technology, that start operating at latest in 2021, have been considered.

- There is a scarcity of off-takers with a high credit rating to sign long-term PPAs, since most of these agents have already executed contracts. In general, these off-takers are interested in short-term contracts.
- Technology improvements have reduced investment costs in solar and wind power projects.
- As a result of the economic based dispatch, renewable energy projects with variable costs close to zero will almost certainly be dispatched if available.

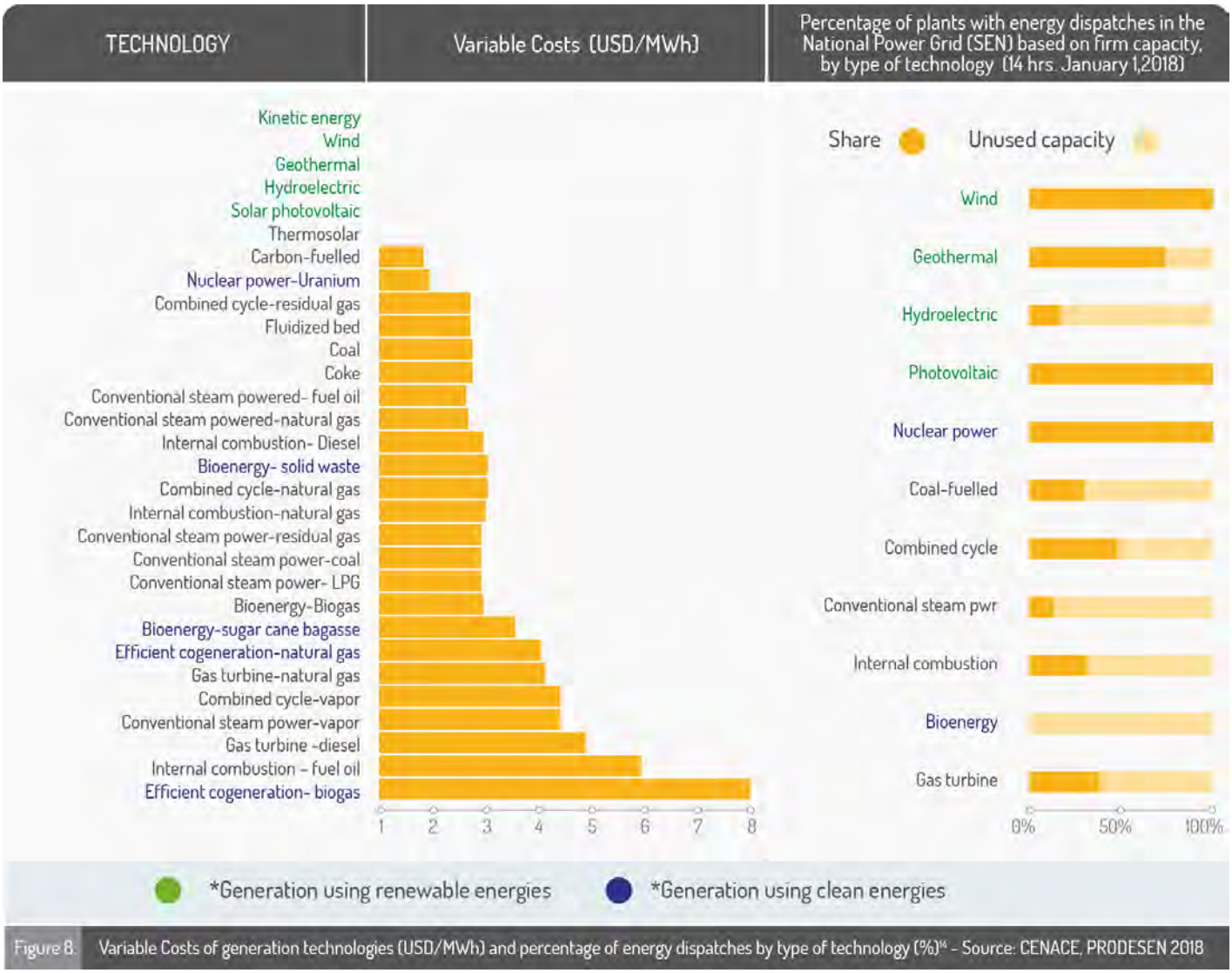


Figure 8. Variable Costs of generation technologies (USD/MWh) and percentage of energy dispatches by type of technology (%)[14] - Source: CENACE, PRODESEN 2018

14. This analysis was carried out using information on energy allocations in the SIN and sale offers in the SIN published by CENACE on March 1, 2018 at 2 p.m.

- In Mexico, various fully and partially merchant generation projects have obtained financing. Development banks have played an important role in a many of these projects; they know the best practices and results of financing of this type of project. Development banks could share their knowledge with other financial entities, such as commercial banks that are interested in participating in the financing of similar projects but that have not done so to date.
- Some commercial banks have participated in financing of full and partial merchant generation projects, where they adjust the leverage ratio conditions due to the increased risk.

PROJECT	CAPACITY	TECHNOLOGY	MERCHANT EXPOSURE	DEVELOPER	FINANCING AND/OR HEDGING	FINANCIAL ENTITIES	DATE OF COMMERCIAL OPERATION
Aura 1	30 MW	Solar	Total	Gauss Energia & Martifer	Term Loan ($75M USD)	IFC & NAFIN	2013
Huerto solar Jalisco 1 and 2	16 MW	Solar	Total	Fortius	NA	NA	2017 / 2018
Eólica Corumel	50 MW	Wind	Total	Eurus energy	NA	NA	2018
Chihuahua	111 MW	Gas Turbine	Total	Emerging Americas	Term Loan ($100M USD)	Banorte & NAFIN	2019
Potrero solar	270 MW	Solar	Total	FRV	Term Loan ($140M USD)	IFC & Bancomext	2020
Celaya	1,350 MW	Combined cycle	Partial (66%)	Fisterra	NA	Bancos en USA	NA
Planta EOSOL	138 MW	Solar	Total	Eosol	Term Loan ($55M USD) 50:50	Bancomext & Sadabell	NA

Figure 9. Description of fully merchant projects identified in Mexico – Source: Inframationnews

Merchant projects are a common mechanism in several countries. The United States, Spain, Germany, Australia and Chile have witnessed the development of renewable and fossil merchant projects. Several projects of this type have been financed in the US, a market considered among the most mature in merchant project development. In the sample of merchant generation projects in other countries, an installed capacity of +6 GW has been identified: 63% Combined Cycle, 16% Solar PV, and 21% Wind power.

The markets studied have a similar operation to the Wholesale Electricity Market since they feature MDA and MTR markets, and economic merit is used to determine power plant dispatches. Contrastingly, the markets studied show a longer track record of spot market prices which, according to the interviews conducted, has an impact on the general understanding of financial institutions in the sector. In terms of spot price ranges, the minimum values in the countries studied reach ~ 26 USD / MWh in the United States ERCOT market.

With regard to hedging instruments used by financial entities to manage risk, in mature markets like the United States, derivatives such as income proxies are common as hedging instruments for merchant projects. Another example are the threshold price guarantees used in Spain. These mitigate income risk associated with electricity price fluctuations; the cost of the guarantee is paid upon maturity.

A detailed analysis of the merchant projects analyzed in each of the countries referred to above is showcased in Annex 1, together with the financing mechanism applied in each case and a general overview of how each market operates.

COUNTRY	MERCHANT PROJECTS IDENTIFIED			TOTAL CAPACITY (MW)			
UNITED STATES	1	4	5	18	560	3,576	39 PROJECTS
CHILE	5	2	0	546	69	0	
AUSTRALIA	4	2	0	254	359	0	
SPAIN	1	3	0	155	327	0	
GERMANY	1	2	0	2	540	0	8,993 MW
MEXICO	4	1	4	454	50	2,085	

Figure 10. Number of merchant generation projects identified in Benchmark countries and Capacity (MW). Sources: Inframation News, PV Magazine, Clear Grid Alliance, Solar Market Parity Spain, Sojitz, Acciona, Libra Group, Voltiq, Vestas, Renewables Now.

1.3 Typical financing conditions for merchant projects in Mexico

In Mexico, merchant projects have been financed mostly by Development Banks[15] and very few with commercial bank financing. According to the information gathered, private financial institutions are currently showing interest in financing merchant projects, managing the risk associated to LMP volatility through non-financial mechanisms or financial instruments.

The financing structure commonly used in Mexico is based on term loans. These have been granted through syndicated debt in order to reduce the exposure to risk of the involved entities. The financial institutions that have participated in the financing of merchant projects in Mexico are listed below:

· Bancomext · Nacional Financiera · Sabadell
· Corporación Financiera Internacional (IFC) · Banorte

Development banks (Bancomext, Nafin) have pioneered in the financing of merchant projects in Mexico thanks to their knowledge of the power sector and role as infrastructure developers.

In international markets, term loans are also the most common financing mechanism, and have been used for solar, wind and combined cycle projects. Other mechanisms used include VAT (Value Added Tax) facility for solar and wind power projects, and revolving credit facility for combined cycle and wind power projects.

15. This refers to national, bilateral and multilateral development banks.

Figure 11. Percentage of different types of financing and hedging used in the different projects in the International Benchmark by energy type. Sources: Inframation News, PV Magazine, Sojitz, Acciona, Libra Group, Voltiq, Vestas, Renewables Now

Around half of the projects that use term loans as a financing mechanism have also used syndicated debt (loans granted by a group of financial entities); the other half used traditional loans.

In Mexico, the merchant projects identified were granted term loans using a syndicated debt structure. This is partly due to the lack of certainty relating to LMPs in the market, which affects the willingness of financial institutions to assume financing risk on their own, and they resort to sharing the risk with other institutions.

UNITED STATES	CHILE	AUSTRALIA	SPAIN	GEMANY	MEXICO
• Term Loans • Tax Equity Bridge Loan • Cash Collateral Loan • Proxy Revenue Swap • Equity Bridge Loan • Revolving Credit Facility • Preferred Equity • Hedge in place of PPA	• Term Loans • VAT Facility • Multilateral Facility	• Term Loans	• Term Loans • Asset Backed Bonds • VAT Facility • Guarantee Facility	• Term Loans • Decommissioning LOC • Standby Facility • Revolving Credit Facility	• Term Loans

Figure 12. Type of financing and hedging identified in each of the countries in the international benchmark - Sources: Inframation News, PV Magazine, Clear Grid Alliance, Solar Market Parity Spain, Sojitz, Acciona, Libra Group, Voltiq, Vestas, Renewables Now

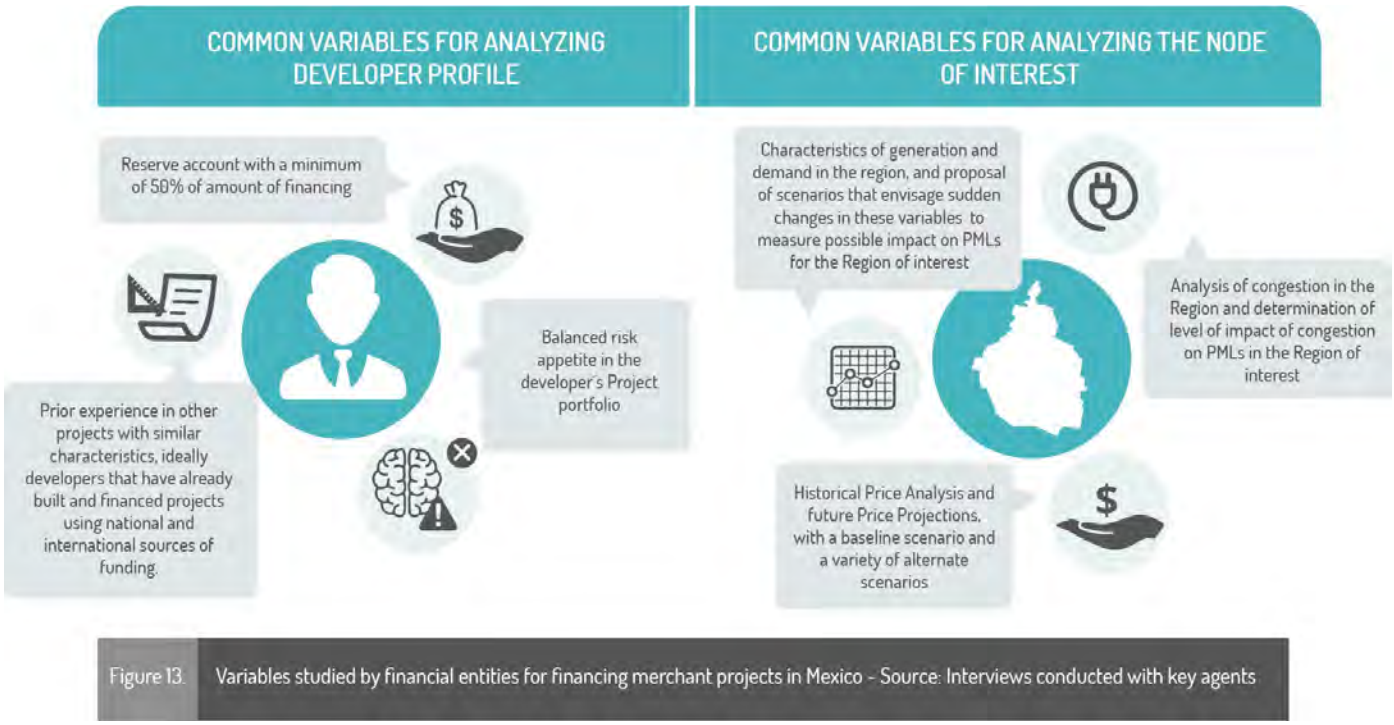


Figure 13. Variables studied by financial entities for financing merchant projects in Mexico - Source: Interviews conducted with key agents

Merchant projects were granted financing after an analysis of the variables associated with the developer and the node of interest.

The main aspects analyzed by financial entities in relation to developers include: i) experience in project development, ii) project portfolio, and iii) equity of at least of 50% of the amount to be financed. The most relevant aspects analyzed in relation to nodes of interest include: i) existing supply and demand in the generation node, ii) expected future behavior of the LMP in stressed scenarios, and iii) expected congestion for the generation zone.

In view of the need to mitigate LMP volatility risk, the conditions established for financing fully merchant projects comprise, on average, short term loans (7 years), maximum leverage of 60%, a DSCR of 1.55, cash sweeps, a break-even price of ~20 USD/MWh based on price projections.

Figure 14. Range of financing characteristics for merchant projects in Mexico - Source: Interviews conducted with key agents.

1.3.1 Cash Sweeps

From the interviews carried out, most financial institutions use cash sweeps for project financing in order to: i) accelerate debt repayment, and ii) hedge risk in the event of LMP variations that exceed the agreed threshold.

Under cash sweep mechanisms, when the LMP exceeds the upper limit agreed, financial institutions use the borrower´s excess cash flows to repay the loan. Conversely, if the LMP falls below the minimum threshold defined, financial institutions will require activation of the reserve to cover debt repayments.

Figure 15. Graph displaying cash sweep mechanism in relation to PMLs

The use of cash sweeps mitigates the risks associated with sharp changes in the long-term LMP levels and minimizes the term of the debt.

1.3.2 *Break Even Price*

Another identified good practice used to measure the viability of a project with merchant revenue flows is the definition of a break-even price. This price is equivalent to the minimum LMP that would be required on the market for the developer to cover the cost of debt.

Several financial entities generate a stress scenario for LMP projections under the assumption that the marginal power plant with the lowest variable cost will be an efficient combined cycle generation plant; this plant will determine the LMP price.

A sensitivity analysis of the impact of power plant efficiency and natural gas price was carried out. Power plant efficiency (heat rate) and natural gas price were varied in order to identify the impact that these variables have on the variable cost of a combined cycle plant. This analysis revealed that, with a highly efficient Combined Cycle Gas Turbine (CCGT) (heat rate of 4.5 GJ/MWh) and cost of natural gas (considering molecule and transport cost) of 1.5 USD/MMBTU, the variable cost would be 10 USD/MWh. The minimum break-even price mentioned in interviews was 15 USD/MWh, and the average was $23 USD/MWh.

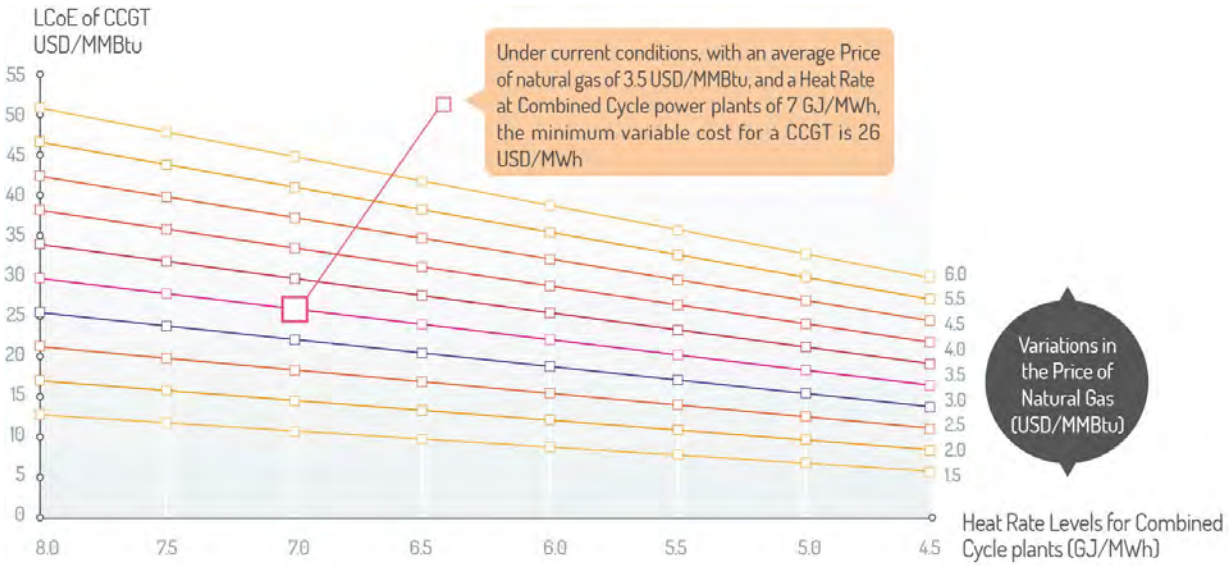
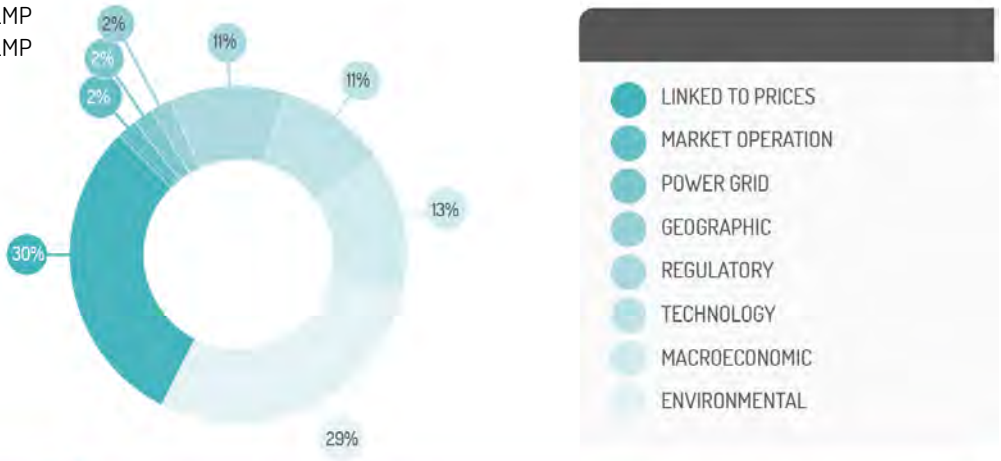


Figure 16. Analysis of sensitivity of the variable cost of a Combined Cycle plant (USD/MWh) due to changes in cost of gas (USD/MMBTu) and heat rate (GJ/MWh) - Source: CENACE, EIA.

1.4 Potential risks for merchant projects in Mexico

The perceived risks relate mainly to LMP volatility, and changes associated with the LMP components: energy, congestion and loss.



RISKS RELATED TO PRICES	MARKET OPERATION RISKS	RISKS ASSOCIATED WITH THE POWER GRID
• Risk in Price projections • Lack of transparency in calculation of PMLs • Price volatility • Very low estimates of future prices • Drop in Price of fuels and associated impact on PMLs • Mistaken perception of prices due to reference to auctions • Risk of devaluation of the peso	• Lack of development of the merchant market in Mexico • General lack of knowledge of the operation of the merchant market • Lack of agreement by the commercial banking sector on conditions for the merchant market • General lack of confidence in the market • Scarce historical market data	• Risks of congestion on the power grid • Lack of development of the National Transmission Network (RNT)

Figure 17. Risks identified in relation to the development of merchant projects in Mexico – Source: Interviews and surveys

1.4.1 Volatility risk associated with the energy component of LMPs

The main risk perceived by the interviewed and surveyed actors is the uncertainty associated with the volatility of LMPs.

Historical LMPs are available since the electricity market opened in 2016. Prior to that, the Total Short Term Cost (Costo Total de Corto Plazo - CTCP) was the indicator used for estimating energy price. The CTCP was calculated using a methodology different from the one used today. LMPs historical prices (3 years record) do not meet the standards required by financial institutions and developers for the development of merchant projects.

The energy component of LMPs depends largely on the cost of fuels, since close to 80% of the generation matrix in Mexico relies on conventional technologies.

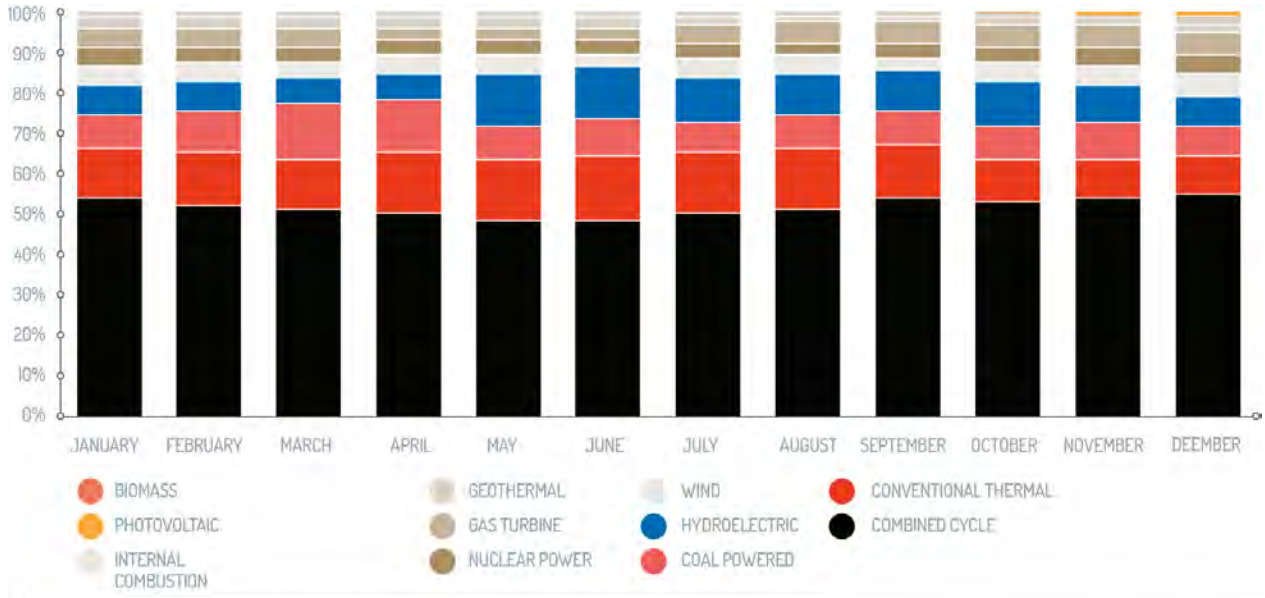
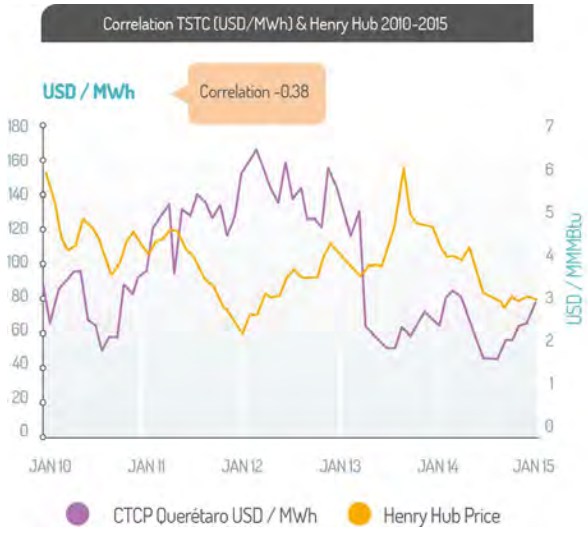
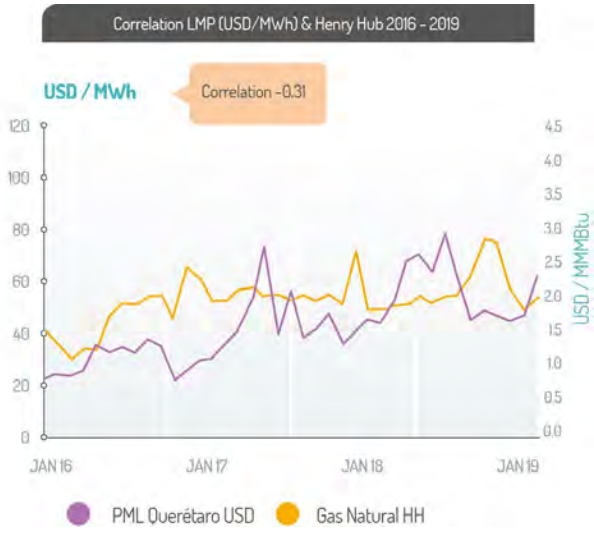


Figure 18. Structure of the generation matrix in Mexico in 2018 (%) – Source: CENACE

As shown in the above graph, in 2018, power plants that burnt natural gas as fuel accounted for over 60% of dispatched power. Even though this represents the majority, there is no correlation between the LMPs and natural gas price.





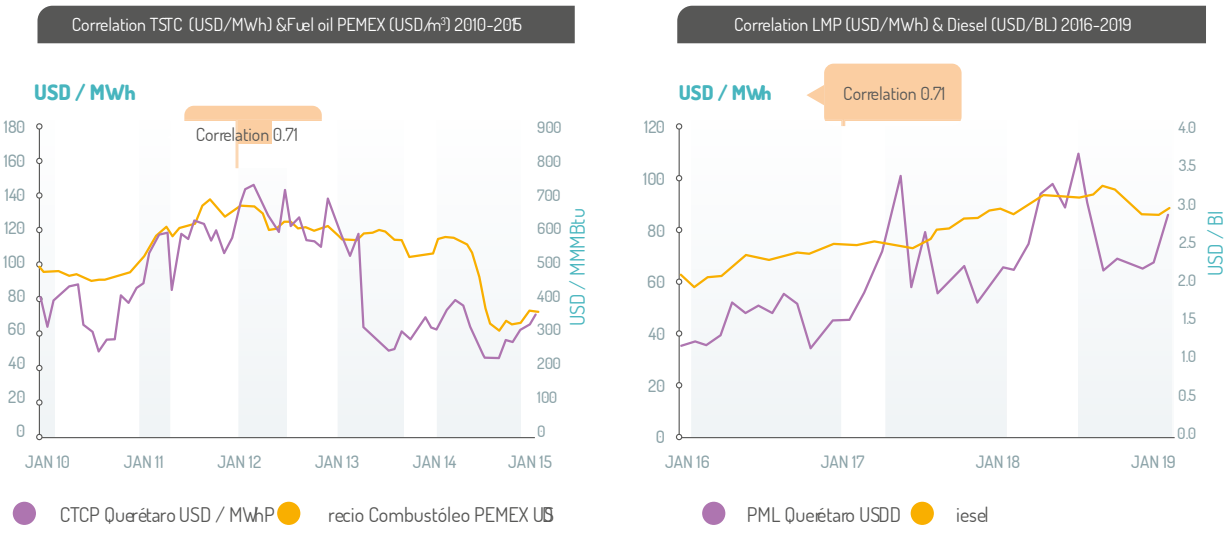


Figure 19 Historical correlation between CTCP an LMP, on the one hand, and natural gas and oil by products on the other. Source: CENACE, EIA, SIE, SIE de SENER

There was a correlation between CTCP[16] and heavy fuel oil (PEMEX) of ~0.71 until the middle of 2015. The LMP showed a similar correlation with the diesel price from 2016 to early 2019.

The correlation between the LMPs and a fuel price help provide certainty in the estimations of LMPs in the future, adjusting the correlation based on the country's generation matrix.

Today, the LMP is has a higher correlation to the cost of diesel than to the cost of natural gas. However, based on the expected installations in the medium term, natural gas is expected to replace this fuel. In fact, LMP projections by SENER assume that the marginal technology will be a combined cycle with variable costs of around 40 USD/MWh

1.4.2. Volatility risk associated with the congestion component of LMPs

Congestion was one of the key risks identified; this factor has a direct impact on the estimation of LMPs and consequently in the expected income of such power plant.

Congestion arises due to: i) a surplus of supply and the inability to dispatch this surplus; ii) surplus of demand and the inability to supply this energy with the current transmission network.

Based on the values recorded by CENACE, the regions with lowest congestion components are the Northeast and Northwest. These values have ranged in average from -6 to -8 USD/MWh in these regions. During the same period, these regions have maximum values of 10 and 22 USD/MWh. The region with highest average congestion is Peninsular with a maximum of 80 USD/MWh. Other regions have and average congestion value close to 0 USD/MWh indicating that congestion is not a disruptive component for the LMP in those regions.

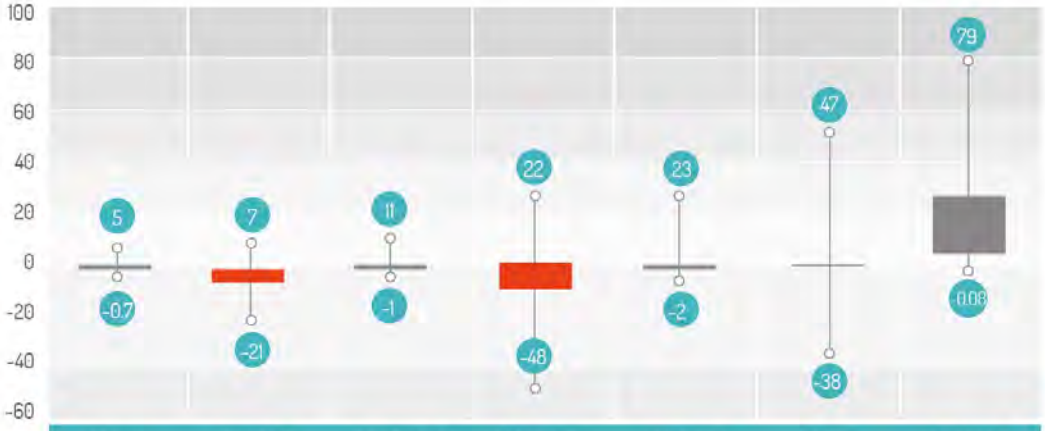
During the international overview, there were projects in Chile that were financed with leverage ratios ranging from 30% - 50%, with financing terms from 10 to 15 years. While these projects were in operation, the spot prices dropped due to the following reasons:

16. For the purpose of this study, Total Short Term Costs have been taken as an equivalent of the LMP, since both the TSTCs and the LMP were used by generating plants to pay energy dispatches using the hourly and node-based mechanism in force prior to the opening up of the market.

- Insufficient interconnection network: Considering that Chile has different interconnected systems, the increase in the installed capacity of solar projects in the Atacama region, saturated transmission lines and dropped the prices in the interconnected region.
- Low cost of initial investment: the decrease of investment costs enabled a larger number of participants to enter the market under the merchant generation mode.

After the drop of prices in Chile, financial entities redefined their requirements for the financing of merchant projects. They accelerated the recovery debts, considered more conservative price estimation scenarios and held more detailed analysis in order to provide any new funding for merchant projects.

Analysis of Congestion in Zones controlled by the National Interconnected System (SIN) (2016-2018, USD/MWh)



	CENTRAL	NORESTE	OCCIDENTAL	NOROESTE	ORIENTAL	NORTE	PENINSULAR
Average Value 2016 (initial value)	-0.05	-0.4	0.1	1	0.2	0.7	2
Average Value 2018 (final value)	0.8	5	1	-8	1	0.8	25
Maximun value recorded for the period	-5	7	11	22	23	47	79
Maximum value recorded for the period	-0.7	-21	-1	-48	-2	-38	-0.08

Figure 20. Analysis of average historical congestion by National Interconnected System (Sistema Interconectado Nacional - SIN) zones 2016-2018 (USD/MWh). Source: CENACE

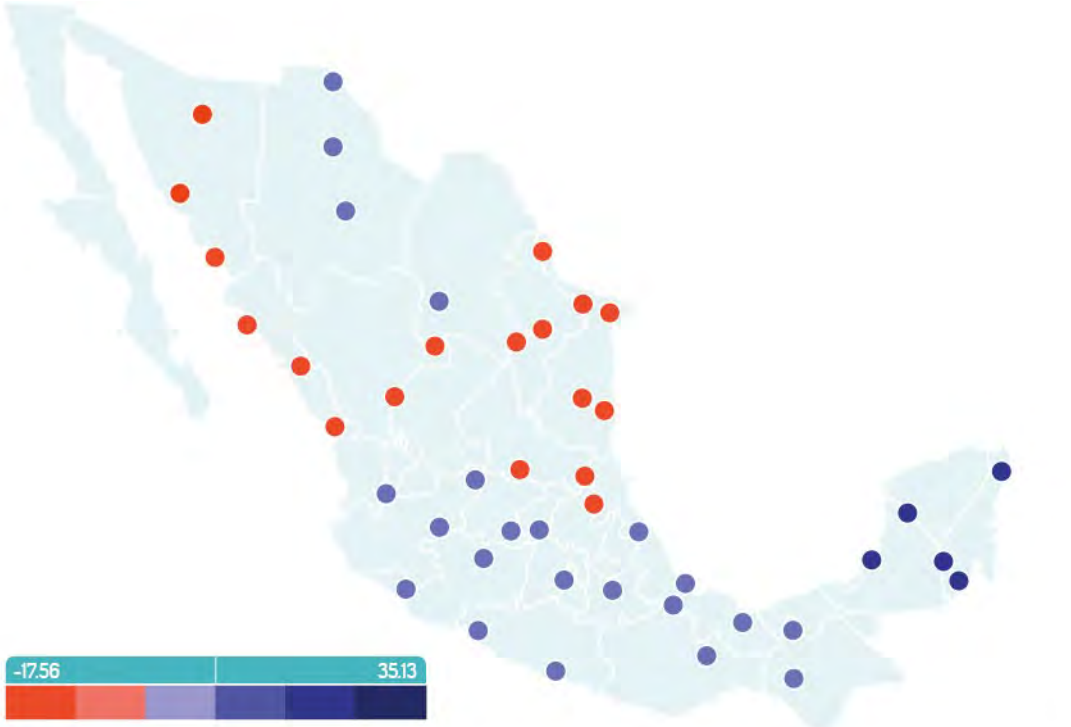


Figure 21. Map of average congestion in the transmission regions of the National Interconnected System (Sistema Interconectado Nacional – SIN) in 2018. Source: CENACE.

1.4.3.Volatility risk associated with the loss component of LMPs

The National Transmission Network (Red Nacional de Transmisión – RNT) is a variable that has an impact on the LMPs. The current extension of the network is of 108,018 km and a capacity of 113,143 MVA[17]. The transmission and distribution entity and CENACE are in charge of developing the RNT Expansion Plan. According to this Expansion Plan the regions that reached the maximum operative limit are the following:

Mazatlán	•	Culiacán
Nacozari	•	Nuevo Casas Grandes
Chihuahua	•	Moctezuma
Camargo	•	La Laguna
El Encino	•	Río Escondido
Durango	•	Mazatlán
Noreste	•	Norte
Champayán	•	Güemez
Durango	•	Mazatlán

Altamira	•	Tamos
Villa de García	•	Ramos Arizpe
Ramos Arizpe	•	Primero de Mayo
Tamazunchale	•	Querétaro
Malpaso	•	Tabasco
Tabasco Potencia	•	Escárcega

Supply network to the zones of Cancun and Riviera Maya

17. According to PRODESEN 2019.

According to the RNT, the regions with the lowest power line expansion for the 2019 – 2022 horizon are Baja California, Baja California Sur and Peninsular. The regions with the highest incidence of short circuits are the Occidental and the Oriental regions.

Regarding the power lines proposed in PRODESEN 2018, the High Voltage Direct Current (HVDC) lines were cancelled at the end of 2018, reducing the certainty regarding the evolution of the RNT.

The regions with the greatest available capacity for interconnection to substations are the Occidental and North regions. The installation of additional generation capacity is viable in these regions.

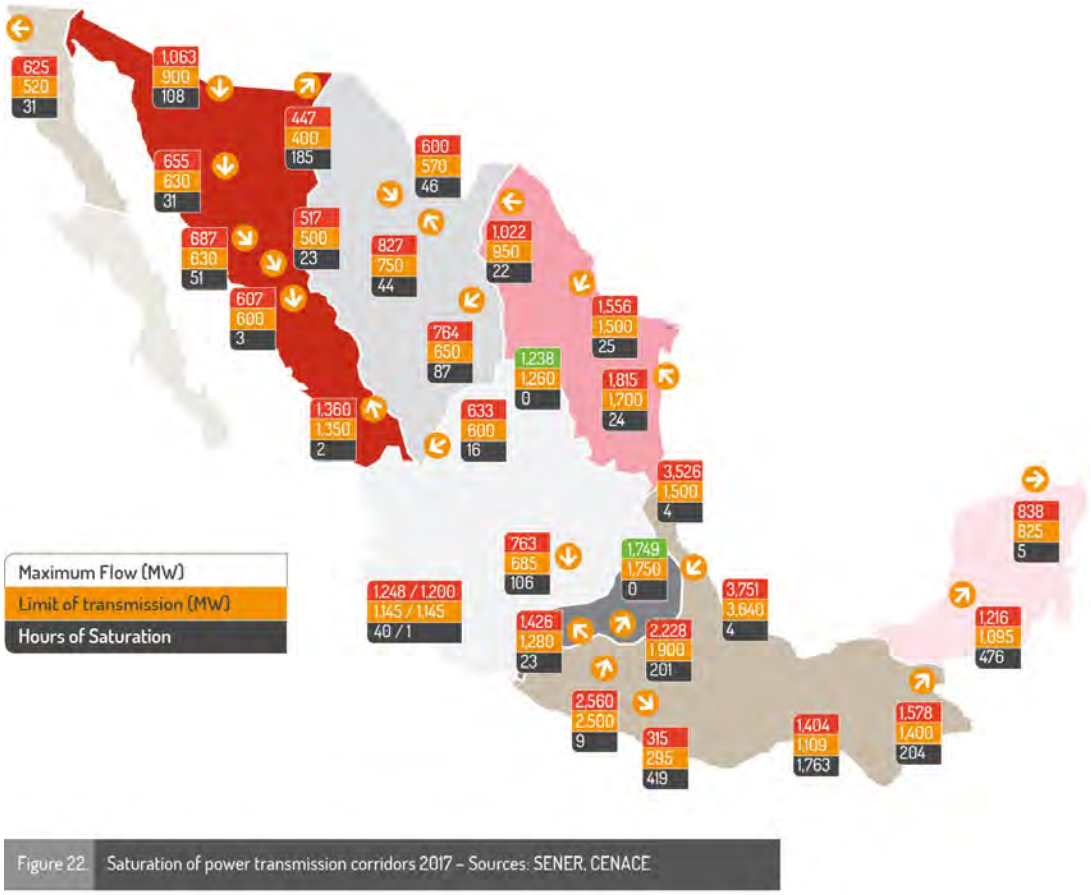


Figure 22. Saturation of power transmission corridors 2017 – Sources: SENER, CENACE

The areas with the highest number of hours with saturated lines is the Oriental region. This region has a high wind power generation potential but it does not have enough transmission capacity to transport the generation to regions with higher demand.

The line that goes from the Oriental to the Peninsular region is saturated due to the high demand in the Oriental region and low connectivity to other regions. All the lines in the SIN, except the connection between Oriental and Central, were saturated for at least one hour in 2018.

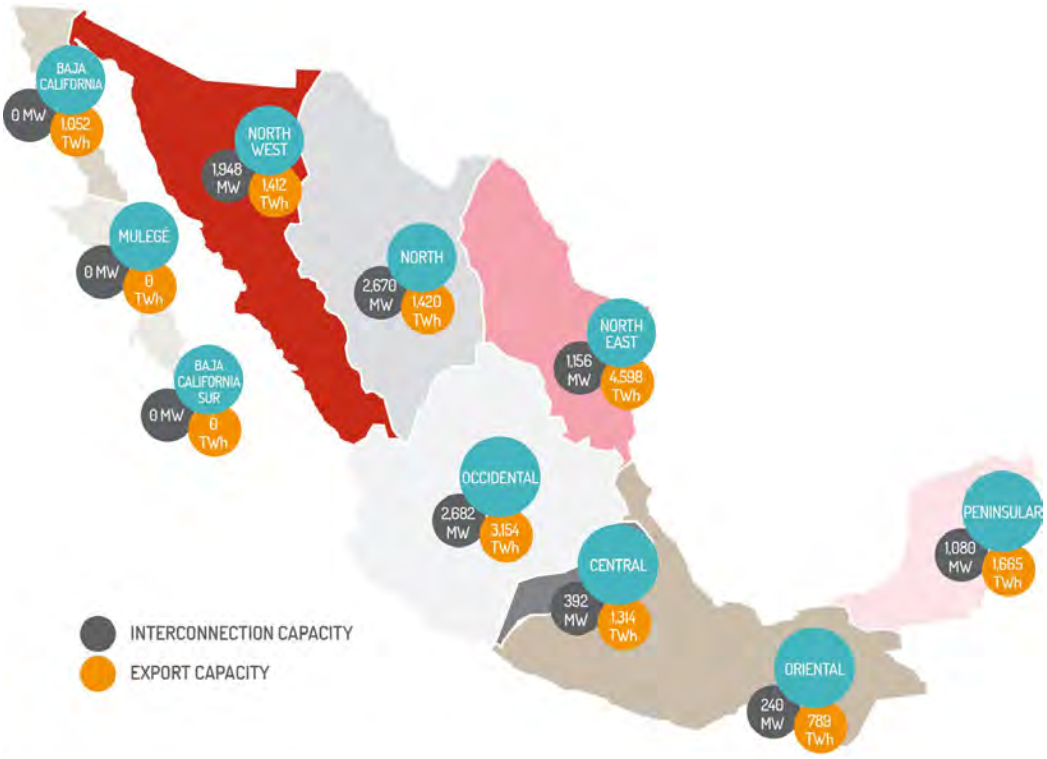


Figure 23. Interconnection and export capacity without priority by Control Region for the 4th Long-Term Auction. Source: CENACE

For the 4th Long Term Auction, CENACE published the available interconnection capacity of the regions based on the RNT. The regions with the highest available capacity are: Occidental, North and Northwest. The regions with the lowest available capacity are Baja California, Mulegé and Baja California Sur; and, in the SIN, the Central and Oriental regions.

Power plants dispatching could change due to surplus supply and lack of transmission capacity, affecting the expected income for merchant power plants. Additionally, merchant project developers should take into consideration various variables when defining the location of a merchant project. Amongst these variables, they consider the current conditions of the RNT, expected modernizations, supply and demand balance in the region and export capacity.

The current and expected conditions of the RNT have an impact on the development of merchant generation projects. A well-interconnected network would allow the flow of generation from high generation regions to high demand regions; balancing the prices in the nodes.

Developers and financing entities should analyze the impact that the lack of modernization and expansion of the RNT have on the LMPs, since this could hamper the development of merchant projects.

2

FINANCIAL INSTRUMENTS that promote the financing OF MERCHANT GENERATION PROJECTS

THIS CHAPTER CONTAINS AN ANALYSIS OF THE MAIN FINANCIAL INSTRUMENTS CURRENTLY AVAILABLE OR BEING DEVELOPED THAT COULD HELP REDUCE RISKS IDENTIFIED IN THE INTERVIEWS / SURVEYS. THE ANALYSIS INCLUDES A FINANCIAL INSTRUMENT THAT COULD PROMOTE THE DEVELOPMENT OF MERCHANT PROJECTS: THE MINIMUM PRICE LEVEL GUARANTEE.

2.1 Main instruments used to manage risks inherent to merchant generation identified in the interviews and surveys

The following mechanisms and instruments have been identified as an essential component for mitigating risks inherent to financing of merchant projects, which could help promote the availability of financing for a larger number of projects, and increase debt leverage ratio.

	RIESGOS	POSIBLES MITIGANTES
	Energy price (LMP) risk	• Financial hedges • Price guarantees • Derivatives on commodities (fuel) • Insurance / guarantees • Corporate PPAs
	Liquidity (cash flow) risk	• Payment guarantees • Letters of credit • Lines of credit • Contingent subordinated debt • Cash sharing and cash sweeps • Debt issues (bonds) Issue of CKDs (Certificates of Capital Development), Fibras E (Investment Trust in Energy and Infrastructure), CERPIS (Investment Project Certificates)
	Counterpart risk (noncompliance)	• Derivatives in standardized markets negotiated through a Clearing House with margin calls • Counterpart Credit Default Swap (CDS) derivatives
	Interest rate risk	• Interest rate Derivatives
	Currency risk	• Exchange rate Derivatives • Tranche loans in pesos and in foreign currency
	Currency risk	• Performance bonds covering political / country risk granted by multilateral agencies such as the MIGA (Multilateral Investment Guarantee Agency).
	Rollover risk	• Equity Instruments (CKDs (Certificates of Capital Development), Fibras E, CERPIS (Investment Project Certificates) • Investment vehicles (SPV- Special Purpose Vehicles) • Interest rate derivatives
	Environmental and social responsibility risks	• Climate bonds
	Project risks	• Corporate PPAs • Cash sweeps and cash sharing • Derivatives • Power generation Guarantees • Revenue guarantees

Below is a description of the segmentation and classification of the mechanisms and instruments that promote financing for energy projects identified in the analysis:

FINANCIAL GUARANTEES

Description

These instruments help borrowers back their contractual obligations; they are only enforced when a scenario has a negative impact on the project revenues, for example: in the event of cash flow liquidity risk. In merchant projects, financial guarantees have granted certainty and financial backing for project risks such as fluctuations in LMP and payment default.

Financial entities indicated that if a project has obtained backing from a development bank in the form of guarantees, complying with debt payments, this grants them greater certainty for financing those projects. Additionally, requiring borrowers to furnish a guarantee or insurance also helps mitigate default risk.

Examples

- Letters of credit
- Minimum price or LMP range financial guarantees
- Revenue guarantees
- Payment guarantees – credit lines
- Contingent subordinated credit facility
- Guarantee / Insurance
- Power generation guarantees
- Performance bonds covering political /country risk granted by multilateral agencies like the MIGA.

To be implemented by:

- Development banks
- Commercial banks
- Underwriters
- Surety companies

TYPE OF DEBT FINANCIAL INSTRUMENTS THAT COULD DRIVE MORE FINANCING

Description

This category comprises primary financial instruments directed at obtaining third party resources for a project or other purpose. For merchant projects, these instruments are the main source of financing in the form of syndicated loans (loan granted by various institutions) with high rates and commissions due to the risk. Another alternative consists in issuing debt instruments on financial markets to obtain financial resources through bonds. These instruments provide a mechanism that helps mobilize greater financing for this type of projects since they comprise incentives tied to the project. For example, syndicated debt diversifies risk by distributing it among various creditor banks.

Ejemplos

- Syndicated term loan
- Revolving loans
- Climate bonds, which serve to obtain resources applied exclusively to the financing or refinancing of renewable energy projects (generation and transmission), reduction of carbon emissions and energy efficiency.
- Tranche loans in pesos and tranche loans in US dollars to mitigate the parity between the Mexican peso (MXN) and the United States dollar (USD).
- Secured Bonds (ABS – Asset Backed Securities)

To be implemented by:

- Generators
- Development banks
- Commercial banks

DERIVATIVE FINANCIAL INSTRUMENTS

Description

Financial instruments whose price depends on another instrument or variable, known as an underlying asset, used to mitigate the risk of price fluctuations in commodities, interest rate levels, or exchange rate risk, etc. They are traded on standardized markets through a Clearing House or over the counter (OTC), outside the standardized market.

Examples

- Financial options (call, put and collars) and swaps on energy prices or commodities. These instruments operate as a financial hedge for the LMP, and are a mitigating mechanism.
- Futures on the price of fuel (Natural Gas and Brent). Since energy prices hold a correlation with the price of these fuels, these futures offer a market with liquidity and volume in countries like the United States.
- Electricity futures traded in organized markets such as the Intercontinental Exchange (ICE) and the European Power Exchange (EPEX).
- Interest Rate Swaps (IRS) to protect against interest rate volatility.
- FX Forwards to hedge against changes in the parity of the Mexican peso to the United States dollar, since financing is granted by entities in the latter currency, whereas power prices in Mexico are nominated in pesos.
- Proxy Revenue Swaps, derivatives structured to ensure the exchange of an estimated fixed revenue and the actual revenue generated by the project over time.

To be implemented by:

- Generators
- Commercial banks
- Mexican stock exchange - MexDer

FINANCIAL CAPITAL INSTRUMENTS

Description

Market listed securities issued through trusts and used to finance one or more projects. The instruments pay flows based on the yield of the project, and transfer ownership or property of the asset or right to the holder. Normally, Retirement Fund Administrators (known as Afores in Mexico) invest in these instruments since they are long term and offer long-term profitability.

Examples

- Equity and Fiduciary Certificates (CKDs, CERPIS)
- Fibras E
- Investment Vehicles (SPAC)

To be implemented by:

- Investment funds
- Development banks
- Commercial banks

FINANCIAL MECHANISMS

Description

Financial mechanisms help mitigate risks inherent to projects that could cause a default in debt payments. This hedging includes instruments such as cash sweeps, cash trap, cash sharing, or Power Purchase Agreements (PPAs).

Examples

- Cash Sweep – when a project has surplus cash flows, the surplus is allocated to debt payment, generating early debt amortizations and reducing the debt repayment term.
- Cash Sharing – diversified capital shared among several investors to mitigate risk.
- Cash trap or cash reserve – in the event of noncompliance with the stipulated debt coverage ratio, establishing a resource reserve is required to prevent potential default with payments.
- Corporate PPAs – these work as a mechanism for mitigating energy prices by establishing a fixed price during the effectiveness of the contract.

A ser implementado por:

- Generators
- Sponsors
- Development banks
- Commercial banks

2.2 Financial instruments currently used or being developed in Mexico

The following financial mechanisms and instruments are currently in use or in development process for the financing of merchant projects:

Syndicated term loan

Term loans provided jointly by several financial entities are used as a main source of financing, with average terms up to 20 years. To grant this type of financing, financial entities consider the project finance evaluation, taking into consideration the establishment of Coverage Ratios (DSCR), leverage ratio, available flow, debt service payments, reserve accounts, etc.

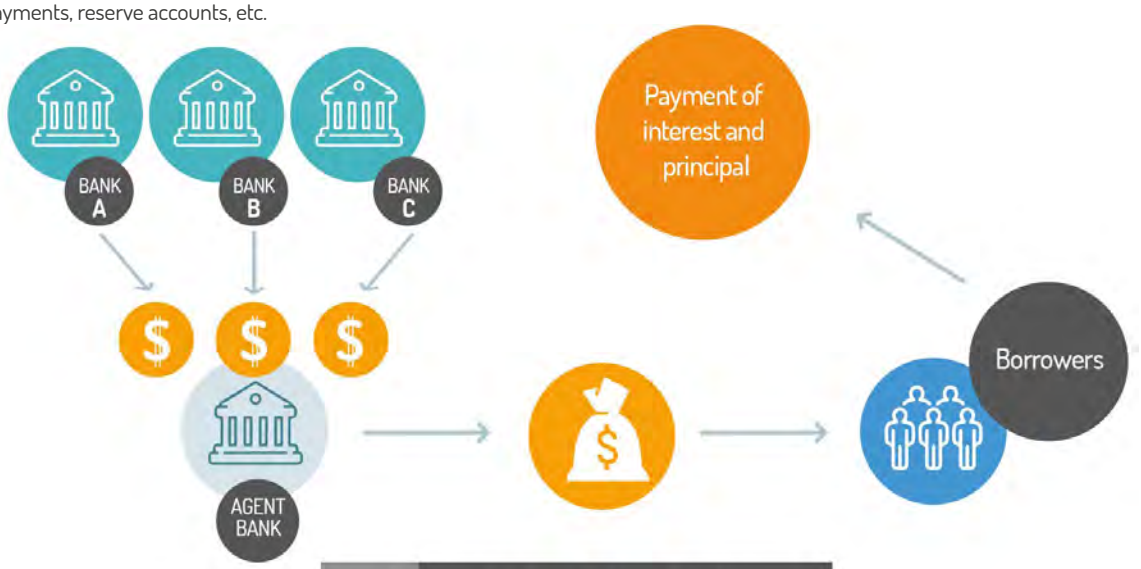


Figure 24. General structure of syndicated term loans

2. Payment guarantee

Banobras currently offers a Payment Guarantee mechanism that is implemented in the farming, forestry, fishing and agriculture and livestock sectors, and is granted mainly to states and municipal administrations. The Federal Mortgage Society (Sociedad Hipotecaria Federal) has also implemented GPOs oriented at mortgage-backed issues or mortgage securitizations. This mechanism has provided backing for timely debt repayment in cases of default in debt payment in time and in form. GPOs require a trust that fulfills the following functions: i) include the source of payment in its net worth, ii) act as vehicle for paying the Financing or Secured Obligation and, where applicable, of the loan arising from the enforcement of the Full Outturn Guarantee (FOG), iii) be entitled to enforce the Financial Guarantee in the order of priority established in the trust´s waterfall payment scheme. Financial guarantees must have a Reserve Fund that covers at least a period of the debt service of the FOG. This means that the FOG cannot be enforced until that fund has been depleted.

In the context of merchant projects, Banobras is currently evaluating a debt payment guarantee oriented at this type of project to back the financing granted by financial entities through the establishment of this guarantee for cash flow liquidity problems relating to the price of energy, thus establishing a minimum price for the LMP. The guarantee is enforced when the LMP falls below the minimum price established.

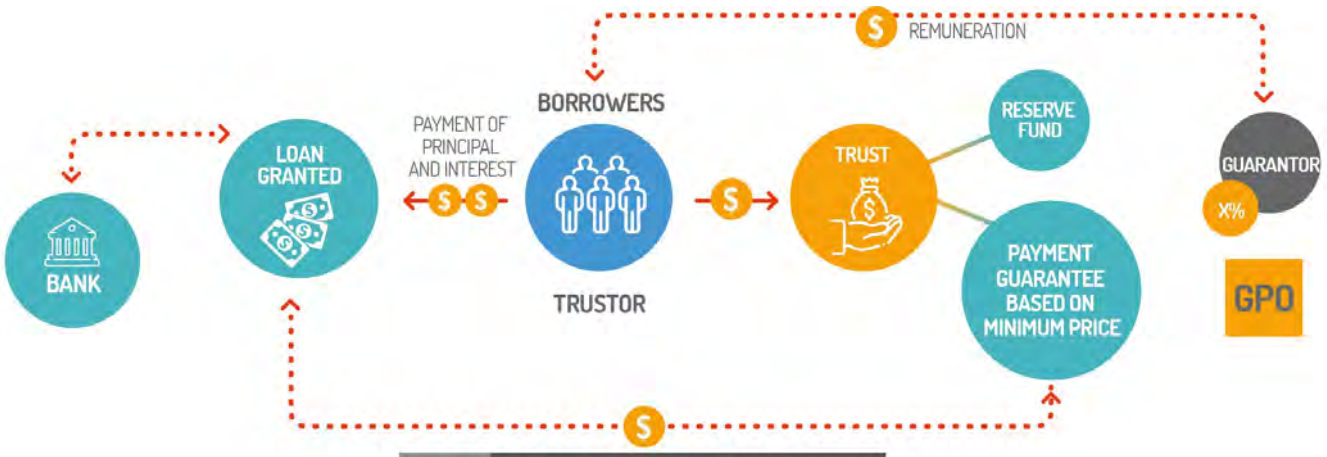


Figure 25. General structure of Payment Guarantee

3. Insurance and performance bonds

Financing contracts include clauses that require hiring insurance and performance bonds to cover in the case of noncompliance by the borrower. These bonds are for use under certain conditions, depending on the specific project. In high-risk projects, these types of insurances may be very costly, and in some cases, the projects may or may not be insurable. In other cases, there are no records of key variables (probability of noncompliance, severity of the loss, etc.) with sufficient track-record to make reliable expected loss projections.

Figure 26. General structure of insurance and performance bonds

4. Climate bonds

These type of bonds are issued on the financial market by enterprises, governments, public institutions and investment funds in order to obtain resources to use exclusively for financing or refinancing renewable energy (generation and transmission), energy efficiency or other projects that meet climate criteria; such as the generation of clear and specific environmental benefits. They require the sustainable endorsement of a Committee and must obtain certification of compliance with the climate bond principles related to: i) use of resources, ii) project evaluation and selection process, iii) resource management, and iv) reports and compliance with reports, report of temporary investments of unallocated resources at each date, and environmental results or benefits in the form of qualitative and quantitative indicators. There are few incentives for these bonds, and market appetite for them is scarce due to the lack of knowledge of the benefits of green finance, low liquidity, scarce placement due to the lack of sustainability practices and social and environmental responsibility of entities, and –to a lesser extent- due to the interest rates granted compared with other corporate bonds with a similar term. At the end of December 2018, close to 11 climate and sustainability bonds were traded on the market.

TYPE OF BOND	ISSUER	BOND		
CLIMATE	GOBIERNO DE LA CIUDAD DE MÉXICO	90	GCDMXCB1	6V
CLIMATE	GOBIERNO DE LA CIUDAD DE MÉXICO	90	GCDMXCB1	8V
CLIMATE	BBVA BANCOMER	94	BACOMER	18V
CLIMATE	NACIONAL FINANCIERA	CD	NAFF	16V
SUSTAINABILITY	GOBIERNO DE LA CIUDAD DE MÉXICO	90	GCDMXCB1	7X
SUSTAINABILITY	GRUPO ROTOPLAS	91	AGUA	17-2X
SUSTAINABILITY	GRUPO ROTOPLAS	91	AGUA	17X
SUSTAINABILITY	VINTE VIVIENDAS INTEGRALES	91	VINTE	18X
SUSTAINABILITY	BANOBRAS	CD	BANOB	17-2X
SUSTAINABILITY	BANOBRAS	CD	BANOB	17X
SUSTAINABILITY	BANOBRAS	CD	BANOB	18X

Figure 27. Series "V" and "X" Bonds traded on the market at December 31, 2018 (Source: Proveedor Integral de Precios)

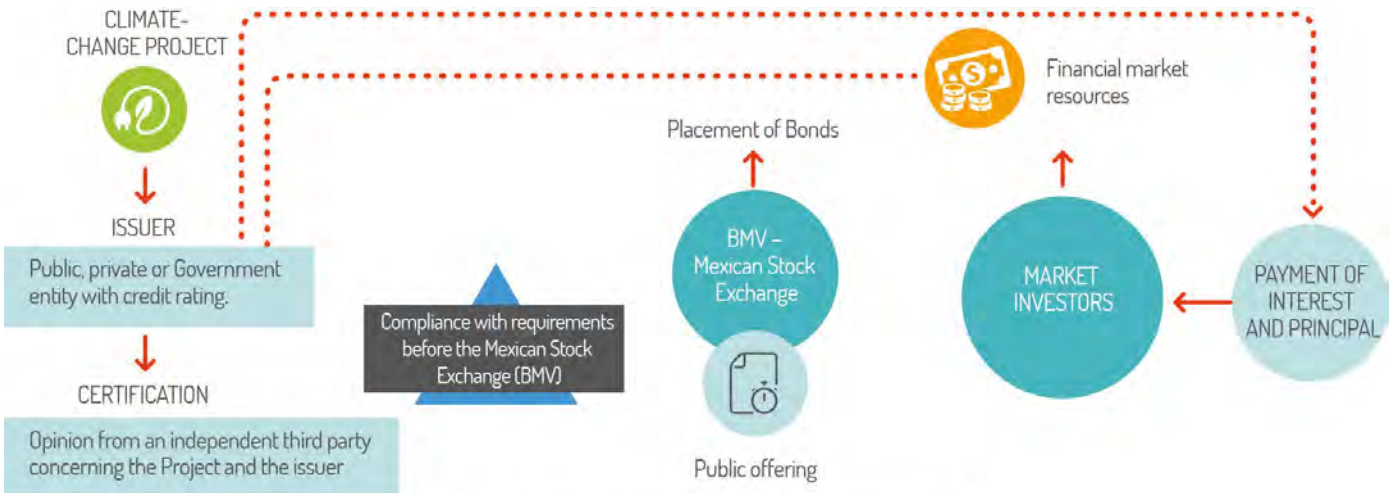


Figure 28. General structure of issues of climate bonds

5. Equity Certificates - CKDs and Fibras E

These instruments have been authorized by the Mexican Stock Exchange for obtaining capital through trusts destined to financing one or more projects. They pay flows based on project yield and transfer ownership or property of the associated assets or right. The first Fibras (bonds issued by Infrastructure and Real Estate Trust) and equity certificates placed on the market were directed at the real estate market. Subsequently, in 2015 the Mexican Stock Exchange launched the Fibras E, which are trusts that invest in the energy and infrastructure sector and that issue energy and infrastructure fiduciary stock certificates (CBFE) on the Mexican market or on regulated foreign markets. These vehicles are used to monetize assets that are already in operation. The Fibra E, issued by the Federal Electricity Commission in the first quarter of 2018 after having monetized a percentage of the country´s electric power transmission network, represented the largest issue. The most recent issue comprised the Fibra Estructura, launched by Promotora y Desarrolladora Mexicana (Prodemex), with an initial offering of a portfolio comprising three assets: two detention facilities (one in Jalisco and another in Durango), and a road concession in the State of México.

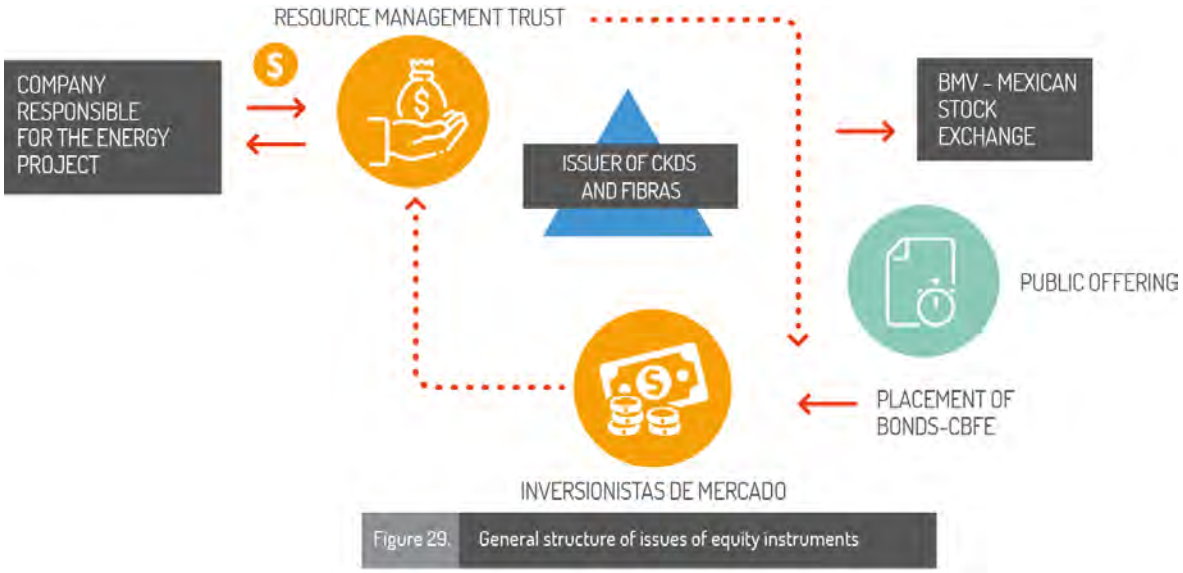


Figure 29. General structure of issues of equity instruments

6. Energy Futures (MexDer)

The standardized derivatives market in Mexico (MexDer) announced the launch of this instrument on the stock market scheduled for the end of December 2019 or beginning of 2020, according to the Stock Exchange Notices Gazette: Modification of General Contract Conditions (Condiciones Generales de Contratación - CGCs) Future Price of Electricity. Costs include Stock Exchange fees, initial margin, opening of a private account, or commissions payable to the Paying Partner, etc. However, the resources available to the holder of this instrument will depend on the amount negotiated in contracts and term of coverage. A greater percentage of coverage will indicate a higher cost.

These energy futures offer a financial hedge in the event of adverse fluctuations in the LMP, generating daily payments arising from differences between the price of electricity published by the CENACE for the Day-Ahead Market (MDA) base load (24 hours), corresponding to the "Reference Node" of the SIN, at a constant power of 1 MW, and the observable market price of the future based on the same reference.

The daily cash 'remuneration/payment' corresponds to the difference between the price of energy published by CENACE and the price of the future (average weighted price and volume in relation to the competitive bid).

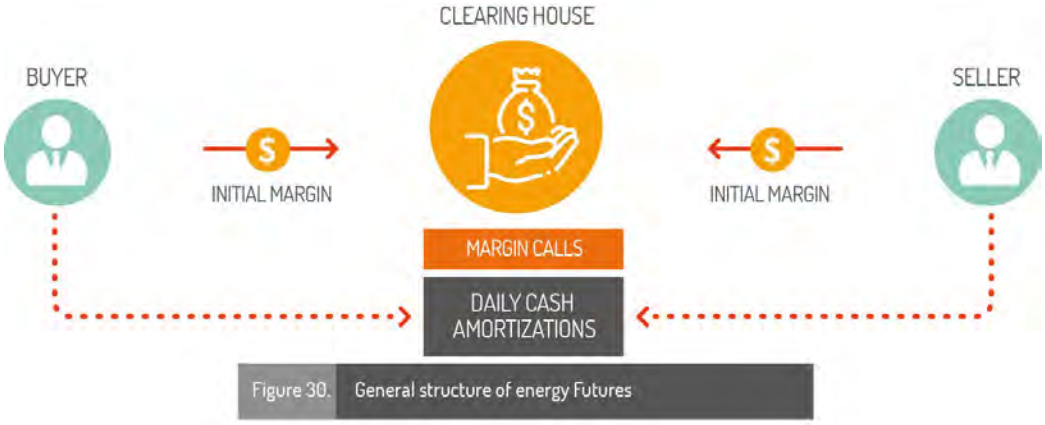


Figure 30. General structure of energy Futures

7. Financial Options (Put or Collar- Currently in study)

These instruments have been authorized by the Mexican Stock Exchange for obtaining capital through trusts destined to financing one or more projects. They pay flows based on project yield and transfer ownership or property of the associated assets or right. The first Fibras (bonds issued by Infrastructure and Real Estate Trust) and equity certificates placed on the market were directed at the real estate market. Subsequently, in 2015 the Mexican Stock Exchange launched the Fibras E, which are trusts that invest in the energy and infrastructure sector and that issue energy and infrastructure fiduciary stock certificates (CBFE) on the Mexican market or on regulated foreign markets. These vehicles are used to monetize assets that are already in operation. The Fibra E, issued by the Federal Electricity Commission in the first quarter of 2018 after having monetized a percentage of the country´s electric power transmission network, represented the largest issue. The most recent issue comprised the Fibra Estructura, launched by Promotora y Desarrolladora Mexicana (Prodemex), with an initial offering of a portfolio comprising three assets: two detention facilities (one in Jalisco and another in Durango), and a road concession in the State of México.

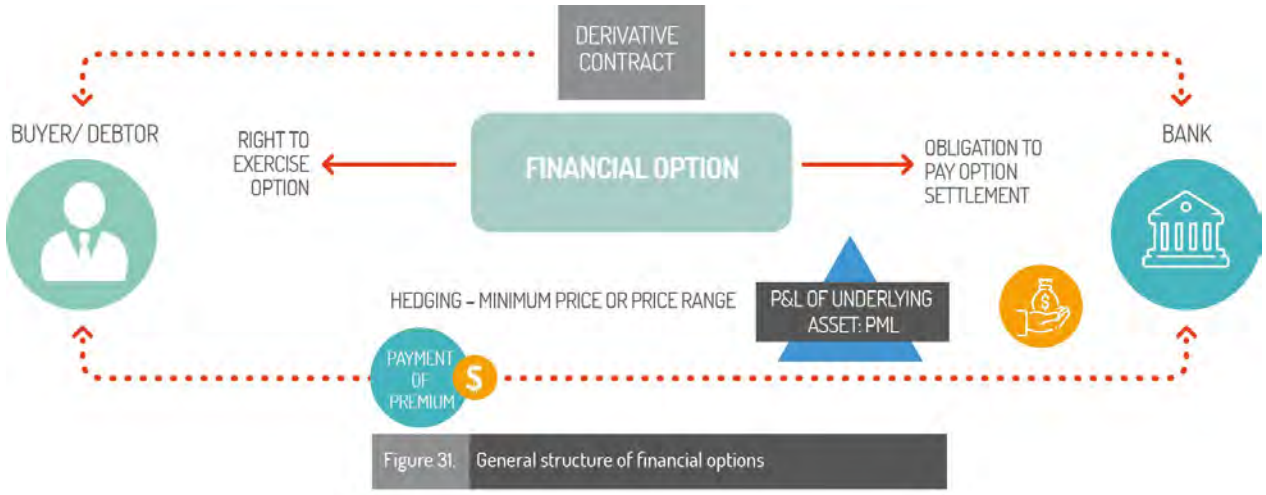


Figure 31. General structure of financial options

8. Electricity Swaps

Electricity swaps constitute financial derivatives that establish the exchange of an agreed fixed price of energy vs. the spot price of that energy, considering the effect of climatic conditions, price of natural gas, congestion, risk premium, simulations, etc. Fisterra implemented this instrument in May 2017 through its trademark EKTRIA, offering a base load swap (24-hour base load), with the financial settlement of the difference between the fixed price agreed and the variable price published by the CENACE for the SIN. This aims to reduce the risk of participants in electricity auctions; however, lack of liquidity and market participation have been observed.

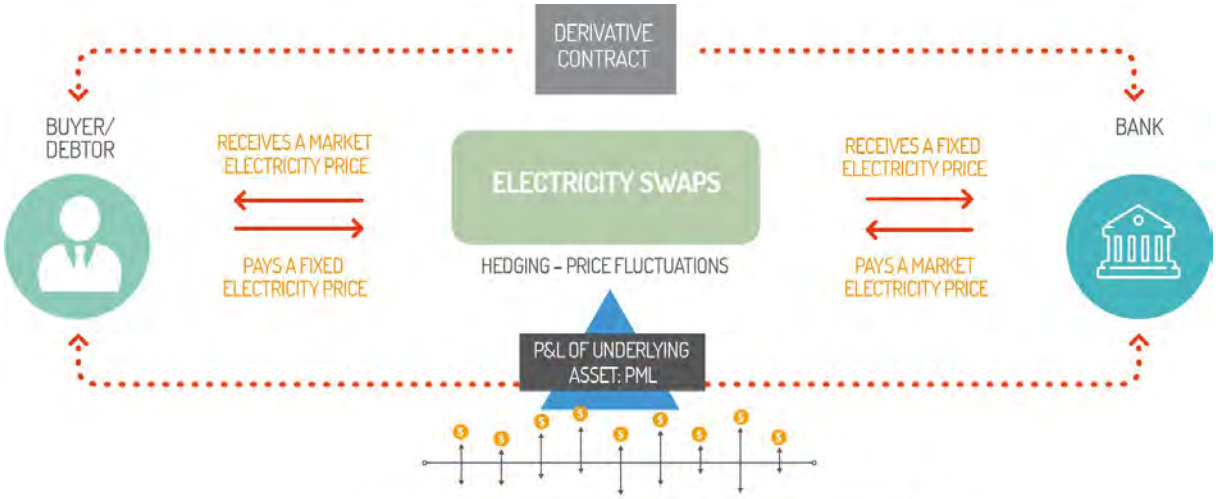


Figure 32. General structure of Electricity Swaps

2.3 Evaluation of the potential mechanism/instrument to be implemented by Development Banks

The interviews and surveys conducted revealed a need for the development of a minimum price or price range guarantee as a potential instrument to be develop with the support of Development Banks. This would promote the offer of financing by financial entities and address the main concern and risk of market participants: future fluctuations in the LMP.

To evaluate this type of guarantee, seven criteria were considered to determine implementation viability, based on market expectations and key components involved in its implementation:

Figure 33. Criteria analyzed to determine the viability of financial instruments

An estimate was made of the weighting of the criteria, in a qualitative manner, based on the market's perspective, prioritizing those variables with the greatest weight and importance for market participants according to their expectations in obtaining financing.

Figure 34 Defined weighting of financial instrument evaluation criteria.

Considering the criteria and weightings defined previously, a minimum price or price range guarantee represents a market opportunity for promoting financing for merchant projects.

• Minimum Energy price or price range Guarantee

Some of the main barriers to this type of guarantee are the possibility of high fees for the borrower, which may affect the profitability of the project; high credit quality, required for access to the guarantees; little flexibility in certain parameters, such as leverage; and a lack of consensus or uncertainty in the price estimations, given the short history of the market and price volatility.

However, this mechanism offers the advantage of constituting backing/collateral for financial entities, which would allow them to offer better conditions of the interest rates, amounts and terms. In some cases, the guarantor is required to leverage the reserve account using own funds, and hire counter guarantees to diversify risk. These would constitute incentives for the borrower. Lastly, the market expectation is perceived as a scarcity of guarantees, which represents a market opportunity, since the price risk is the main market concern.

The man risks mitigated by this mechanism include:

- PRICE RISK (LMP)
- NODE RISK
- LIQUIDITY RISK
- COUNTERPART RISK (NONCOMPLIANCE)
- PROJECT RISK

Description and structure

Financial backing in the event of adverse fluctuations in the LMP, activating the financial guarantees when the minimum price or price range established are not reached, thus ensuring management of electricity price risk during financing, and guaranteeing sufficient minimum flows to fulfill debt repayment.

An "offsetting" amount would be established as the difference between the market spot price of energy vs the minimum price or upper/lower range stablished in the guarantee; a percentage of that offsetting amount would be absorbed by the bank and will be recovered with future revenues in excess of the established LMP (upside price).

Figure 35. General structure of minimum price or price range Guarantees

Main players

Figure 36. Main players involved in the structure of minimum price or price range Guarantees

Operation and parameters

- The structure must obtain a minimum rating (at local or internal scale) before considering the effect of the guarantee.
- The minimum rating must be determined according to project risk by credit rating agencies or using in-house models based on internal ratings.
- It will be establish a minimum amount of credit covered, as well as a maximum amount of compensation, as a percentage of the loan. The Guarantor will determine these percentages.
- The term of availability of the guarantee will be shorter than or equivalent to the maturity of the "Secured or Induced Loan".
- The fee will depend on the interest granted under the loan, price levels established and creditworthiness.

The recurring market cost ranges from 1% to 5%. Commissions charged seek to preserve the neutrality of financial costs of loans and guarantees.

- The Debt Service Coverage ratios (DSCR) and leverage ratios, could be improved with the use of price guarantees, because the funds only will guarantee a portion of the initial investment, and there is high possibility, that these are offer as a revolving loan.
- A Management Trust must be created as a source of payment within the equity, serving to pay obligations and as a Reserve Fund to be used before resorting of the guarantee.
- Counter guarantees may be considered to offset the cost of these structures.
- Estimated recovery rates are used to determine the amount of the guarantee and associated risk under probability of occurrence.

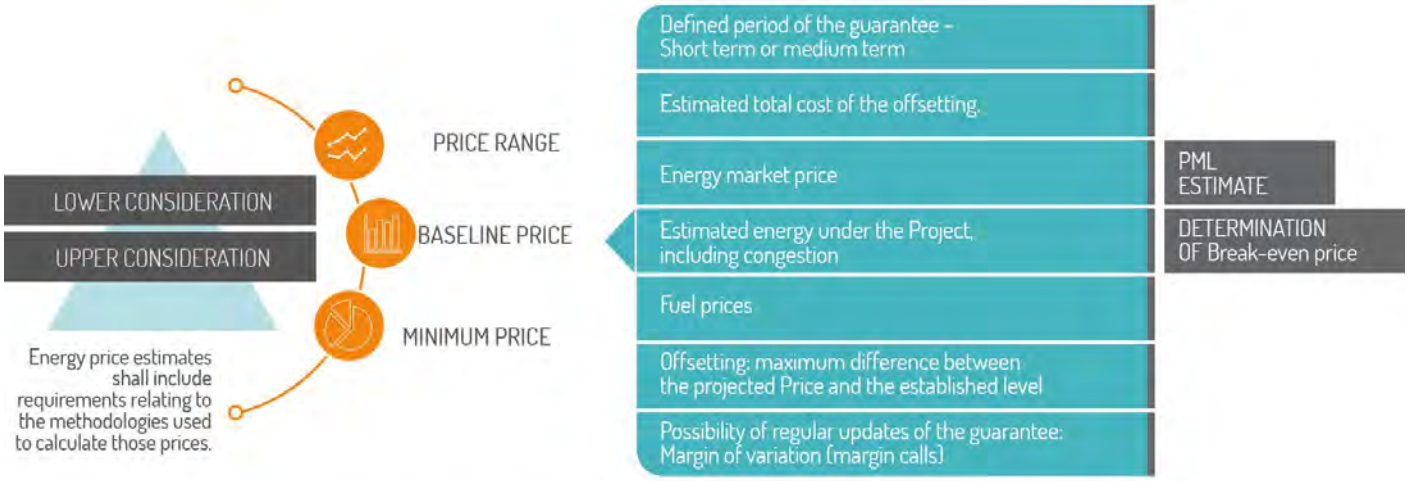


Figure 37. Key variables considered in minimum price or price range Guarantees

Barriers in incentives

PROS

- Guarantees certainty in terms of PML level in a specific node
- Access to better financing conditions
- Improves debt profile and credit profile of the Project.
- Possible backing from Development Banks
- Strengthening of financing opportunities on the market
- Third party backing in the event of payment difficulties due to fluctuations in the PML, avoiding penalty interest
- Possibility of grouping several energy projects, to generate an overall guarantee, thus reducing transaction costs associated with individual guarantees.

CONS

- Minimum rating (local or internal scale) prior to the guarantee
- Conditions and requirements for the granting of the guarantee: minimum amount, creation of a trust, remuneration, determination by the parties of the minimum Price or Price range, etc.
- May imply high evaluation and transaction costs
- Direct dependence on the Price estimate.

Figure 38. Pros and cons relating of minimum price range Guarantees

Risk Mitigation

Figure 39. Main risks mitigated by minimum price or price range Guarantees

- **Price (LMP) and node risk**
  The guarantee is enforced when the borrower cannot pay the debt, both principal and interest amortization, because the price of the energy in a given node ends up below the minimum price or outside the range

- **Liquidity risk (cash flow)**
  The guarantee is executed when the borrower cannot pay the debt, both principal and interest amortization, due to insufficient cash flows caused by fluctuations in the LMP.

- **Counterpart risk (default)**
  Timely payment of debt obligations is guaranteed through third party backing, avoiding default situations and mitigating risks relating to covenants.

- **Project risks**
  Collateral insurance such as a Reserve Fund, financial price guarantee, and the possibility of a counter guarantee, mitigates the risk of any adverse situation that could occur under the project due to energy prices.

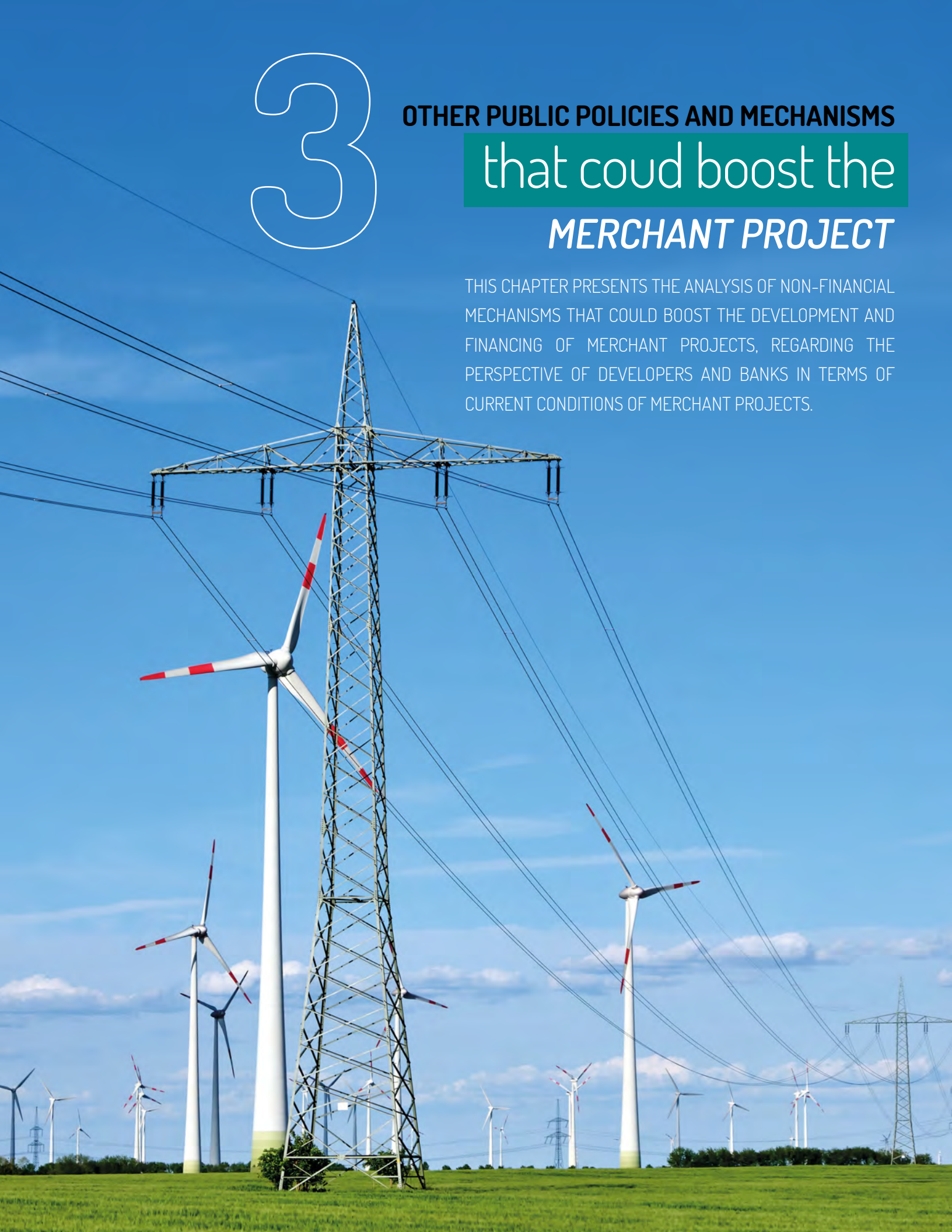
Analysis in Mexico and international markets (where applicable)

MEXICO

Federal Government. Guaranteed prices for producers of beans, rice and wheat (government subsidy)
ASERCA. Incentives for agricultural producers through price hedging (contract agriculture through derivative instruments related to the future price of corn, put and call financial options).
Banobras. At present, a prospective GPO for energy projects is envisaged, involving minimum energy prices.

OTHER MARKETS

Brazil. A partial performance bond mechanism is currently being developed through the United Nations Development Programme (UNDP), whereby, if a project underperforms and energy savings are below 10% of the guaranteed savings, the guarantee pays the bank the difference between the actual and contract savings. (Cost rate: 0.75%) Spain. This country has developed thres hold price guarantees to mitigate revenue risk due to fluctuations in electricity prices.



3

OTHER PUBLIC POLICIES AND MECHANISMS that coud boost the *MERCHANT PROJECT*

THIS CHAPTER PRESENTS THE ANALYSIS OF NON-FINANCIAL MECHANISMS THAT COULD BOOST THE DEVELOPMENT AND FINANCING OF MERCHANT PROJECTS, REGARDING THE PERSPECTIVE OF DEVELOPERS AND BANKS IN TERMS OF CURRENT CONDITIONS OF MERCHANT PROJECTS.

3.1 Access to public and consensual LMP projections

One of the leading non-financial mechanisms identified in the interviews for promoting the development of merchant projects is the availability of public price projections, build with transparency in terms of assumptions and inputs used for all the available scenarios. This is important because currently, financial entities conduct Due Diligence processes for each potential project, and prepared and analyzed their own LMP projections. Therefore, this mechanism would save theme time and provide certainty to all parties involved during project finance analysis. Additionally, the only official projection available is the one published simultaneously with the PRODESEN, which is indicative[18].

This proposed mechanism would facilitate access to coherent, homogeneous public information concerning the current and expected situation of LMPs, published by a recognized and impartial organism, envisaging sensitivity/ stress scenarios that consider consensual assumptions and inputs used by different industry agents. For example, industry and financial entity associations could engage recurring advisory services to prepare LMP projections, average bearish scenarios, and publish those projections with the corresponding inputs and assumptions for distribution to developers and co-financers interested in carrying out merchant projects.

In the United States, the EIA publishes short-term (1 year) market prices for the leading markets, such as California (CAISO) and Illinois (MISO), among others. Following this practice, it was identified that CENACE, could promote greater certainty and encourage the development of merchant projects through the publication of reports containing statistics related to historical LMPs and their energy, loss and congestion components; information on negative LMPs; nodes and times featuring the greatest congestion; statistics on generation project curtailment; and statistical information on ancillary market services.

3.2 Promotion of the physical and virtual PPA market

Another important issue identified in the interviews is that, even when financing is obtained for merchant projects, borrowers seek to allocate part of the total capacity under the project to physical PPAs (for example, Qualified Suppliers) and virtual PPAs (for example, Competitive Electricity Bids or the Electricity Market[19]). This would allow: i) investing partners in merchant projects to free part of their equity; ii) the project to guarantee the price of part of its flows; and iii) seeking refinancing to improve project conditions.

The promotion of education, training and knowledge of the electricity market and its implications for qualified users and off-takers was also identified as a key requirement to provide PPAs greater dynamism. This type of education for end users could be carried out through workshops, courses, conferences offered, for example, by associations representing industrial users (ex: CESPEDES, Coparmex, CANACINTRA, ANIQ, CANACERO, CANACEM, Paper Chamber, etc.).

Training sessions could focus on the main types of contracting mechanisms, enabling factors and barriers relating to the contract mechanisms, market participants, historical and expected price indicators (ex: tariffs and LMPs), among others.

Also in terms of promoting the PPA market, interviewees referred to the establishment of a Clearing House to promote a secondary negotiating market. This market could help identify a public equilibrium price and volumes negotiated in specific periods. This would promote the availability of market information, provide price indications, and enable the placement of excess dispatches or shortages under projects, as happens in other international markets.

The implementation of a mechanism such as a Clearing House for financial PPAs would require the involvement of financial entities and sophisticated Market Players. It could use existing regulations as a baseline for negotiating contracts and guarantees in Long Term Auctions, seek improvements in relation to the specific Clearing House for auctions, and build on existing experience.

Another mechanism identified to promote physical and virtual PPAs and, consequently, merchant projects in search of contracts, would require the CRE to encourage the use of the S-CEL platform and of a secondary CELs market through workshops, conferences on the requirements/ certification mechanism, deferral mechanism, etc. This would provide indicators of CEL prices and volumes traded on that market, showing liquidity and granting certainty to clean generation projects and CELs buyers. For some PPAs, CELs constitute one of the main drivers for off-takers to seek clean energy supply contracts, to: i) comply with internal sustainability policies, ii) avoid changes in fees paid, and/or iii) use these as a strategy for positioning their brand.

Another mechanism identified that would contribute significantly to mitigating the congestion component in LMPs would require the CENACE to develop and issue a call for the First Auction of DFTs. The acquisition of DFTs by nodes would provide generation projects and Load Serving Entities greater certainty in terms of the cost of energy dispatches and offtakes at pairs of nodes.

18. In terms of the publication by PRODESEN of indicative projections, in several interviews the need was also mentioned for public policies and regulations that provide reliability and transparency in relation to: i) the calculation of LMPs published with the PRODESEN, and ii) ensuring that plans for the development of the generation matrix and the transmission network are of a binding nature.
19. http://www.concursoselectricos.com/ https://mexicoelectrico.com/

3.3 Promotion of the expansion and modernization of the National Transmission Network

Another issue mentioned in most of the interviews was the need to expand grid capacity. This would: i) provide the necessary output capacity for projects, ii) grant certainty in terms of the loss component, and iii) contribute to reduce the congestion component.

The expansion and modernization of the RNT through Public Private Partnerships or OPF (as permitted under Section 30 of the Electricity Industry Act) would reduce exposure to risk and the level of indebtedness of CFE Transmisión. The organisms that seek to develop the electricity sector could conduct a survey and cost-benefit analysis of regions that offer room for network expansion and modernization (addressing lack of interconnection capacity, high LMPs, need for renewable energy output, etc.). This analysis would be useful to the SENER, CFE Transmisión and private power transportation companies, in the definition of the ideal participation mechanisms for financing, installation, maintenance, management, operation and expansion of the necessary infrastructure for the Electricity Transmission and Distribution Public Utility.

This study could lead to a Private-Public Alliance bidding process, OPF or other type of mechanism, and build on the partially developed elements of the 2018 High Voltage Direct Current Power Line bids.

Simultaneously, the CENACE could publish information and monthly updates on network constraints at substations, export sub-zones, export zones and connection facilities. This would grant merchant generators greater certainty in relation to saturated zones and zones with available capacity.

3.4 Development of renewable energy pilot projects with energy storage

Following international trends, power storage has been identified as a future potential driver of merchant renewable energy; mainly because of the dispatching advantages.

Figure 40. Map of international projects using batteries - Source "Interactive map of global energy storage" by the Consortium for Battery Innovations, (2019).

Based on the surveys and interviews conducted, various stakeholders consider that storage could play an important role in the LMPs in the medium term. The profitability of renewable energy projects could benefit from the installation of storage facilities.

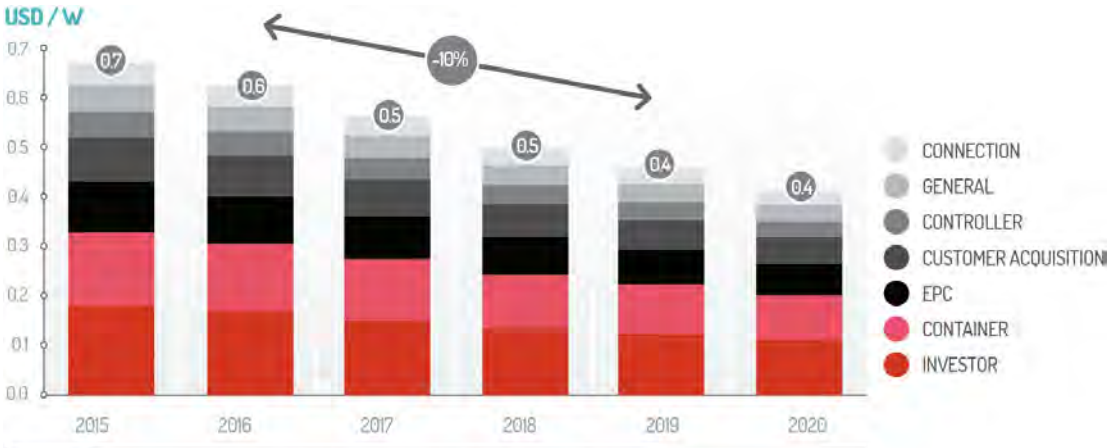


Figure 41 Costs associated with the installation of an energy storage facility – Source: NREL

As shown in the preceding graph, in the case of Mexico, according to a study published by NREL[20], the costs associated with storage systems declined from 2015 to 2018 (falling close to 10% for the entire storage system), a trend that is expected to continue until 2020.

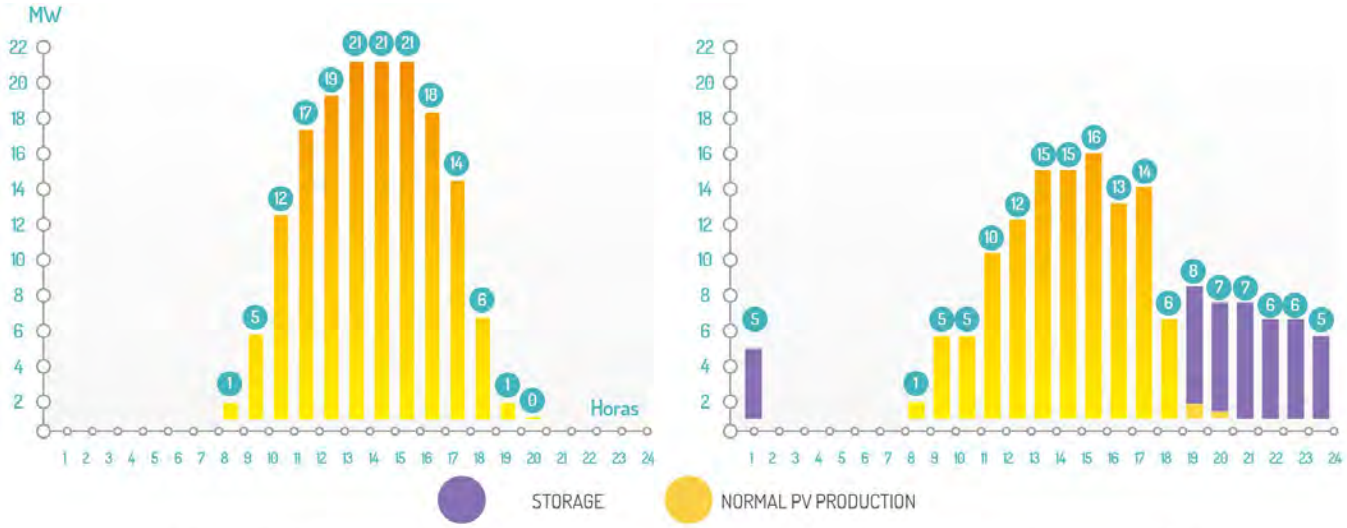


Figure 42 Example of increase in productive hours of a solar plant through use of storage. Prepared internally.

Additionally, the use of batteries in the renewable energy industry, and in particular for merchant projects, offers the possibility of dispatching power to the system during non-generating high LMP hours.

Based on energy storage pilot projects in Mexico, batteries have a capacity to store up to one third of peak energy produced by a solar power plant. The installation of a storage system in a merchant renewable energy power plant offers the following benefits:

- Energy dispatches at higher LMPs
- Reduction of curtailment risk through the capacity to distribute power generation during non-generating hours.

The installation of storage systems would mitigate the intermittent factor on the transmission and distribution network, and would increase installed firm capacity.

According to Fluence (a company belonging to Siemens) and the CRE; the future installations of power storage systems in Mexico will be approximately 6% of installed renewable energy by 2031. This amounts to a total 2.3 GW from the total expected of 36.8 GW.

Additionally, SENER and CRE could promote the use of power storage systems in pilot demonstration projects, create public cost and benefit case studies, and promote the development of merchant projects associated with storage systems.

20. To obtain these values, a graph without total values in the document "Opportunities for Battery Storage Technologies in Mexico" has been used. The data presented constitutes an approximation of total prices and parties for 2020 and 2015, and a CAGR was calculated for each one, using an estimated growth rate for intermediate prices for that period.

3.5 Promotion of Distributed Generation projects with merchant remuneration

Distributed generation (DG) is a form of electric power generation installed close to consumption points; the broad DG concept includes decentralized generation. In Mexico, the law defines DG as electric power plants with a capacity below 0.5 MW interconnected to the National Network. Systems with a higher capacity, of 3 MW, 5 MW or 10 MW, represent an interesting opportunity for decentralized power generation using renewable energy; but these projects are not exempt generators under the Mexican law[21].

The applicable legislation for DG power plants issued by the CRE in 2017 establish three remuneration mechanisms, two of which comprise the merchant context, i.e. sales on the energy market (under Total Sales and Net Billing), with potential in high LMP zones. The third remuneration mechanism (Net Metering), with the greatest amount of installed capacity to date, does not include a merchant scheme.

The business models for revenue generation under DG projects are described below:

1 **Total Sales:** Under this business model, generators sell their entire production to the merchant market at the LMP applicable to the generation node.

2 **Net Billing:** Power generated is sold at the LMP applicable to the generation zone, and consumption occurs under a regulated tariff (agreed contractually between the user and the generator). The generator consumes electric power and consequently has a dual metering system: one for consumption and one for generation.

3 **Net Metering:** In this model, exempted generators also use electricity, but unlike in the net billing scheme, generators use the energy they produce, and sell only excess energy[22].

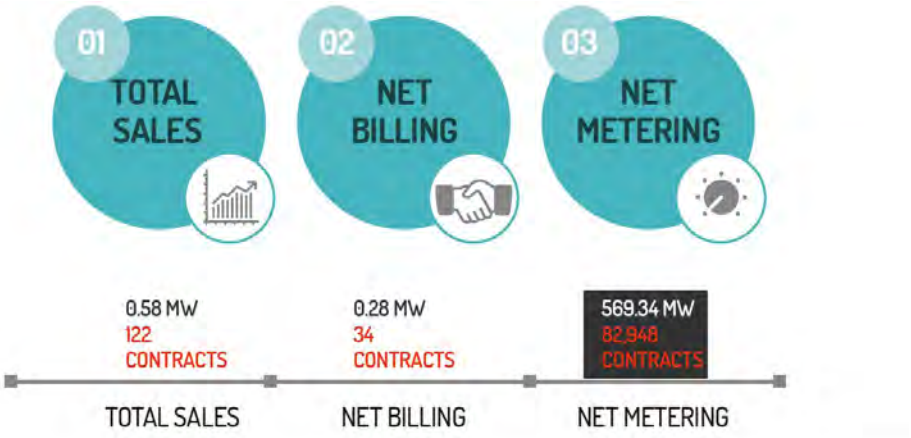


Figure 43. Breakdown of capacity (MW) and distributed generation contracts by type of remuneration - Sources: CRE

According to the CRE, the accumulated installed capacity of DG in 2019 will amount to +900 MW, growing to over 2,800 MW by 2023. This data comes out of the presentation "Evolution of Small and Medium Size Contracts / Distributed Generation" published in 2018.

21. In this report, Distributed Generation refers both to distributed generation (up to 500 kW) and to decentralized generation (up to 10 MW).
22. When excess energy exists, this is offset -for a tariff- against shortfalls over the 12 subsequent months. In other words, CFE Suministro Básico (Basic Supply) keeps record, and when a plant consumes more than it generates, it determines the net consumption to be charged by first subtracting prior supluss energy. When a generator has a credit in its favor, once the 12 month period following the month in which the credit was generated has elapsed, exempted generators may demand payment of overdue credit (not offset after the 12 month period) at the average LMP value for the period of time over which the credit was generated.

Figure 44. Projected capacity installation (MW) and distributed generation contracts and small and medium scale contracts - Source: CRE

According to the Distributed Generation Report by the Mexican Climate Initiative (ICM) and ABM (Asociación de Bancos de México), the capital costs for solar systems with an installed capacity of less than 10 kW follows a downward trend from 2013 – 2016, reducing its value in 11%. In 2018, these capital costs dropped to 1.68 USD/W. The graph below shows the historical behavior of capital costs for systems below 10 kW until 2018, with the breakdown of the main components for that year. Capital costs for DG projects with installed capacity under 100 kW are around 1.34 USD/W.

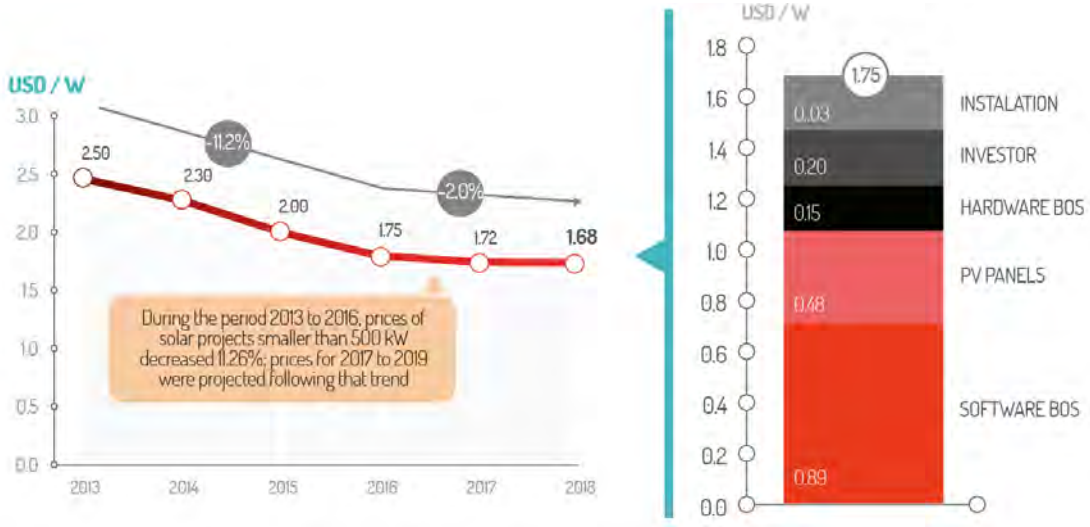


Figure 45. Trend in costs of installation per KW for a plant smaller than 500 kW in Mexico (USD/W)[23]. Source : ABM and Iniciativa Climatica de Mexico (2017). Instituto Nacional de Electricidad y Energías Limpias (INEEL) and Iniciativa Climática de México (2019)

23. Historical CAPEX values for plants that generate less than 500 kW were obtained from the report on the Low Scale Photovoltaic Energy Market ("MERCADO DE ENERGÍA FOTOVOLTAICA DE BAJA ESCALA") published by the Mexican Bank Association (Asociación de Bancos de México (ABM)), in collaboration with the Mexican Climate Initiative (Iniciativa Climática de México (CLIMA)); the CAPEX value for 2018 was obtained from the report on Financing for Accessing Distributed Electricity Generation Renewable Energy Technologies in Mexico ("Financiamiento para Acceder a Tecnologías de Energías Renovables de Generación Eléctrica Distribuida (FATERGED)) en México", published by the National Institute for Electricity and Clean Energies (INEEL) and CLIMA. The value for 2017 was estimated using the growth rate calculated for the period 2016 - 2018.

In order to identify the most attractive DG project regions, a high-level analysis was conducted; through the identification of potential merchant flows and considering sensitivities in the capital costs and investment recovery period.

The Baja California region and the Peninsular region have the most attractive potential for development of DG merchant projects; mainly because of the high LMPs and high capacity factors[24]. The calculated payback period for both regions is from 2 to 6 years, considering variations in CAPEX between 1.8 USD/W and 0.8 USD/W[25] (assuming that historical LMPs for these regions are maintained).

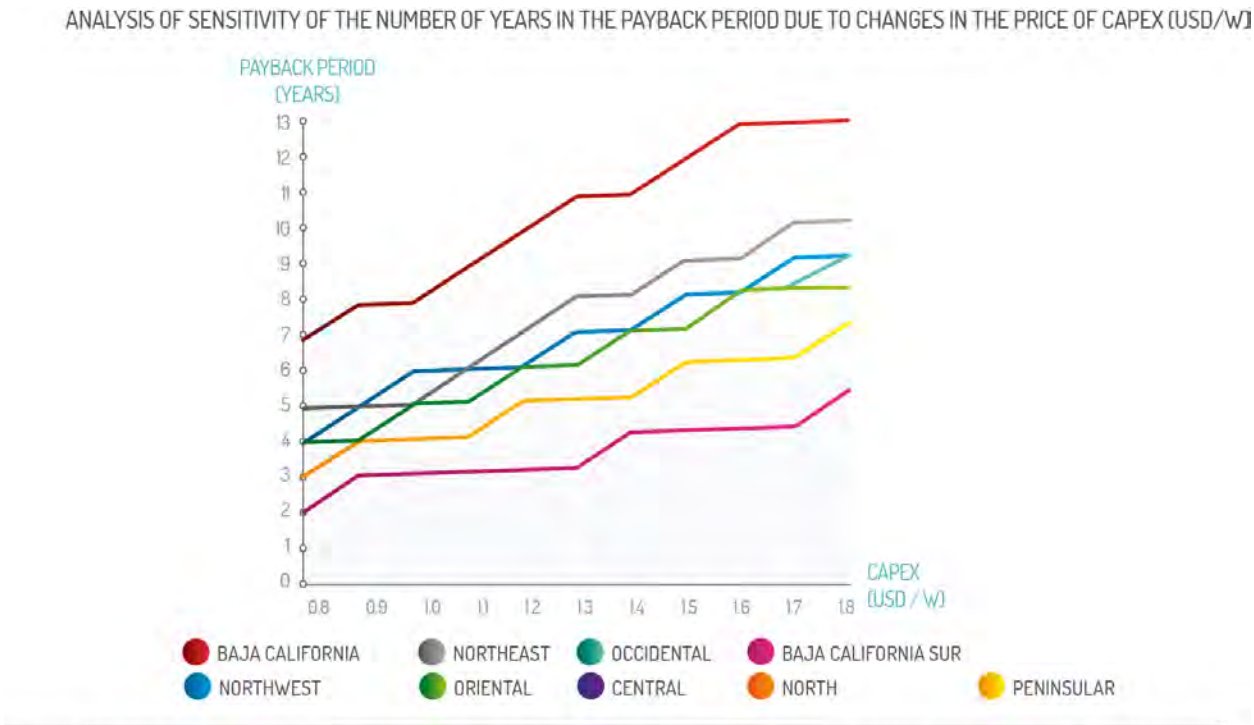


Figure 46. Sensitivity of return on investment (years) in the face of changes in Capex (USD/W) of a merchant GSD project – Source: CRE, CENACE

Additionally, the return on investment is calculated by varying the growth expectation of the LMP in each region. For the Baja California Sur and Peninsular zones, the return on investment is the lowest[26] . Considering a 5% drop in the LMP (i.e. from 120 USD/MWh in 2018, to 114 USD/MWh in 2024), there is no significant change. The return period goes from 6 years with current prices to 8 years with the lower prices in the Peninsular region. Something similar happens in BCS, with payback varying from 4 to 5 years.

24. Capacity factors considered are obtained from projects involved in Long Term Auctions (33% for the Baja California Sur region, 32% for the Baja California, Northwest and Central zones, 31% for the North and Occidental zones, 30% for the Northeast and Oriental zones, and 27% for the Peninsular region). LMPs shown are the average values for 2018 in each of these regions ($45.6 USD/MWh for the Baja California region, $150.9 USD/MWh for Baja California Sur, $73.6 USD/MWh for the Central region, $69.98 USD/MWh for the Northeast region, $73.1 USD/MWh for the Northwest region, $80.99 USD/MWh for the North region, $83.5 USD/MWh for the Occidental region, $84.7 USD/MWh for the Oriental region, and $120 USD/MWh for the Peninsular region).
25.
26. To analyze this sensitivity, a fixed CAPEX of 1.68 USD/Watt was considered, in line with the installation costs of solar generation systems below 0.5MW, published by INEEL and CLIMA for systems below 10 kW in 2018 (see Figure 45).

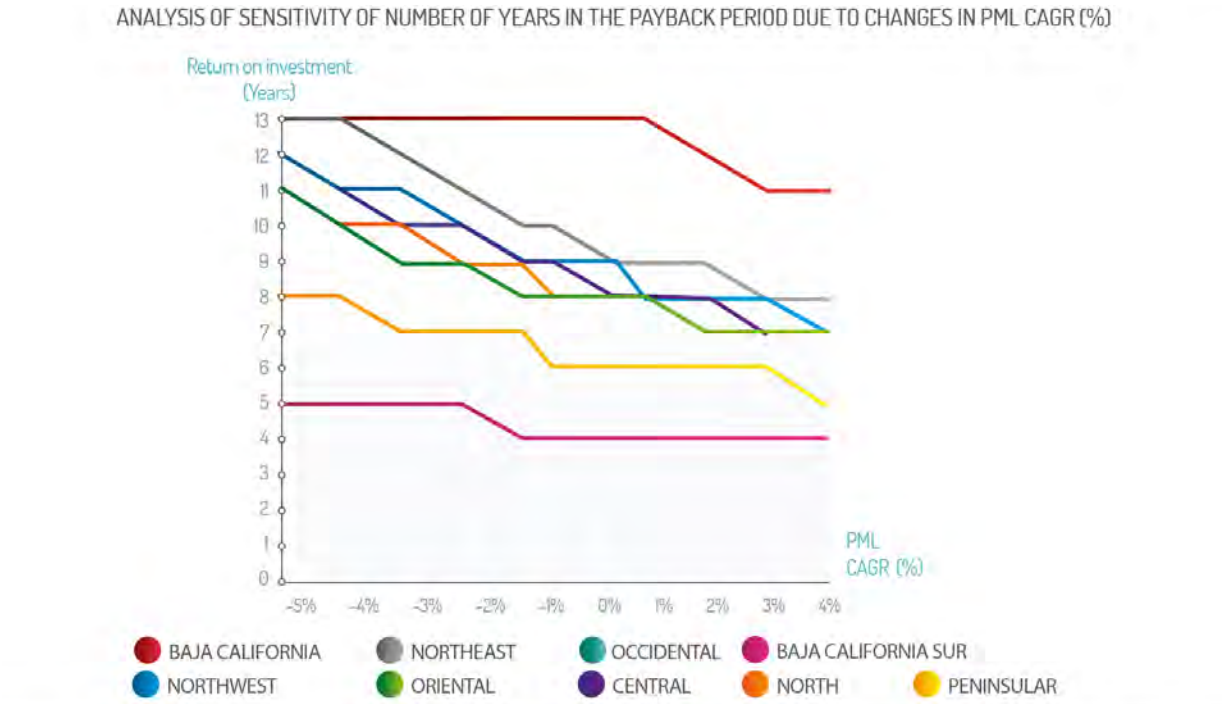


Figure 47 Sensitivity of return on investment (years) due to changes in growth of LMP over time (%) for a merchant DG Project – Source: CRE. CENACE

If merchant DG projects are installed in the Peninsular and BCS regions for a total of the incremental capacity, there would be a potential of 146 MW from 2018 to 2033, based on the growth in DG capacity projected by the CRE[27]. This could represent a merchant DG market of close to USD 180 million up to 2023.

3.5.1. Financing options and main mechanisms for promoting the development of merchant DG projects

Developers that participate in DG and decentralized solar generation projects considered that there was a lack of financing schemes tailored for these type of projects. They consider there is no Project Finance type of mechanisms available. The only type of financing available considers business loans, with general conditions of a 16% interest rate and 7-year term.

Most financing schemes available for DG projects are aimed at consumers from the residential, commercial and industrial sector. A financing option that is currently available is the Electric Power Savings Trust (Fideicomiso para el ahorro de Energía Eléctrica – FIDE) but is used only by residential and small C&I clients.

This trust, established by CFE, has financed the installation of generation systems that use renewable energy sources. The projects include mainly solar energy systems for the residential sector, and small and medium scale C&I (commercial and industrial). This mechanism includes financing at a preferential rate (lower than the rate offered by commercial banks) and an economic incentive to promote the development of DG (currently covering 10% of the installation cost), provided the user meets the technical, financial and legal requirements.

Developers have portfolio with various projects amounting up to 10 MW; for this business scheme; some financial entities are currently developing a new financing model focused at this group of developers.

The key aspects for developing a financing model for grouped DG projects compromise: i) standardization of minimum conditions required in terms of income and expenditure, ii) definition of ideal zones for development liable of obtaining financing, iii) defining ideal network conditions, and iv) identifying risks associated with different nodes and scales.

27. Based on the projected distributed generation capacity by the CRE and the participation of each region, the following regions are estimated to have the expansion potential indicated between 2018 and 2023: Baja California, 64 MW, Baja California Sur, 33 MW, Central region, 532 MW, Northeast region, 343 MW, Northwest, 119 MW, North, 189 MW, Occidental region, 476 MW, Oriental region, 212 MW, and Peninsular, 113 MW.

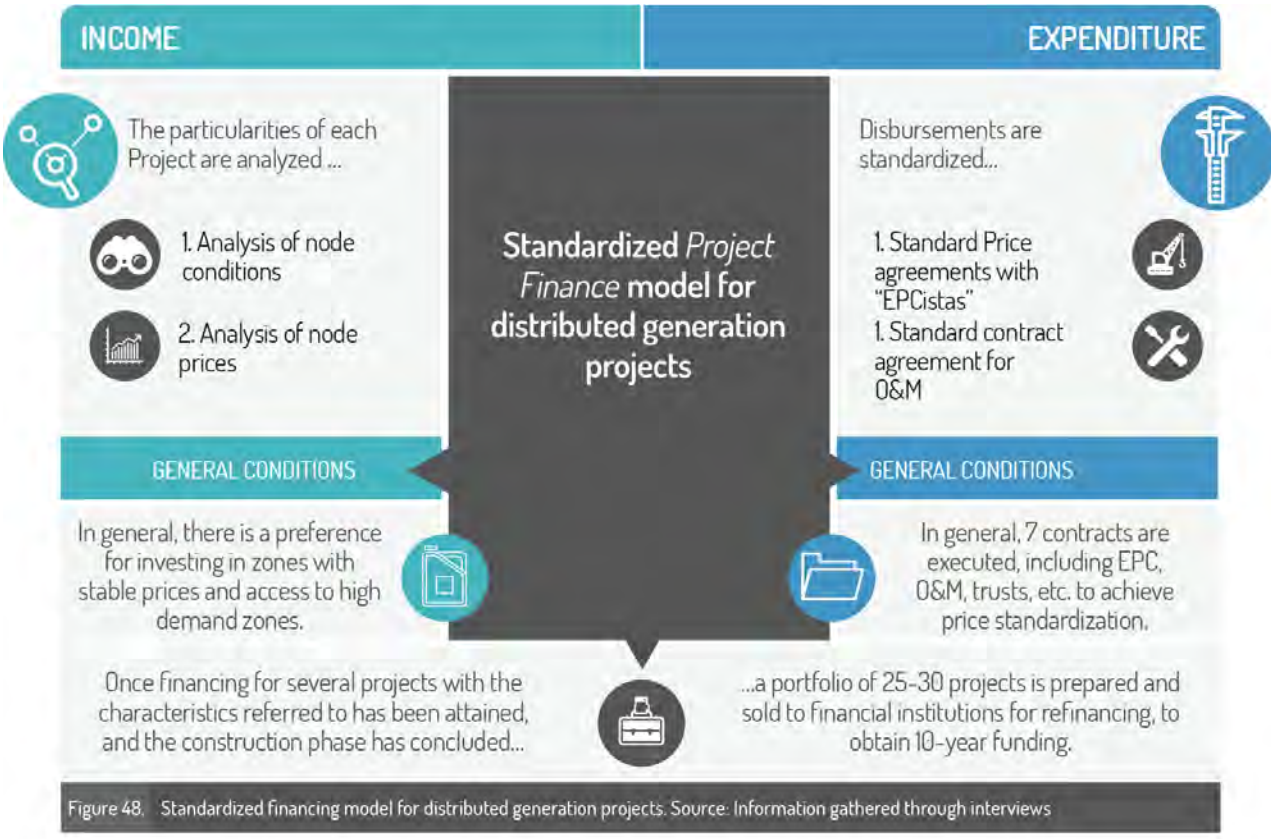


Figure 48. Standardized financing model for distributed generation projects. Source: Information gathered through interviews

Some of the benefits of implementing this financing scheme for distributed generation projects include:

1 **Geographic distribution of risks:** Distribution of nodal risk and potential revenues due to the location of the different projects.

2 **Easy processing of projects:** Distributed generation is exempted from obtaining generation permits (CRE) and complex interconnection applications (CENACE). By using standard contracts for all the projects in a portfolio, processing times are reduced, optimizing the due diligence process and time for each project.

3 **Reduction of operating and construction risks:** DG projects inside a portfolio must be in operation, which reduces construction and operating risks.

Users are not aware of the schemes available for DG or the financial benefits each one of them may have. DG mechanisms with sales to the spot market can be attractive depending on volumes of consumption, consumption tariff and LMP values. Consequently, it is important to educate end users to know how the different remuneration models work, including tariffs and LMP trends in their zone, and choose the DG remuneration that best suits them.

Development banks, CRE or other regulatory entities could provide information on how to group/bundle projects to meet the financing requirements of such bundles. This could encourage different companies to develop distributed generation portfolios in order to refinance. Development banks could publicly disseminate information on the minimum size of a project portfolio in order to be eligible for financing (for example: 20 MW, represented by forty 0.5 MW DG projects), conditions for granting financing (e.g. projects in operation that seek refinancing in certain target regions of the country, under net billing remuneration mechanisms, with standardized contracts, payments in MXN pesos, etc.), and, where possible, publicly provide information on a pilot project.

1) Additional initiatives:

In order to ease the financing for SMEs (small and medium sized enterprise) with solar generation projects is the initiative CSolar was developed by the National Institute of Electricity and Clean Energies (Instituto Nacional de Electricidad y Energías Limpias - INEEL), ICM and the UNDP for the Environment, in order to facilitate financing of DG for SMEs.

The initiative seeks to complete several functions: i) allow the end user to understand the DG mechanism and the reasons why it could install such a mechanism, ii) connect potential end users with DG installation companies validated by the initiative, and iii) offer a guarantee to encourage national commercial banks that are program members to grant attractive financing under suitable conditions.

Another less used mechanism that could boost DG projects, is a loan for users. This commercial or development financial entity could generate the loans for end users indirectly. The loan would be granted to the developer who sells the DG assets to final users. End users absorb the portion of the loan that corresponds to the DG system acquired. This type of loans would boost the DG installations and would ease access to capital.

These loans would operate on a similar basis as existing mortgage loans, where the bank lends an agreed amount and the end user repays it with interest over a defined period. Loan interest rates and terms could be adjusted according to the level of income/savings expected by end users in line with generator estimates. The minimum payment by end users would be defined based on the expected LMP for each DG system installed.

Additionally, software programs have been developed (i.e. the specialized system for solar installers, by Sunwise) that facilitate profitability analysis of DG projects. This software-run analysis can include potential benefits for developers under net billing or total sales mechanisms. In general, standardization using these platforms allows end users to understand the operation of the market and the profitability features associated with the project to be developed.

4

RECOMMENDATIONS

THE MAIN RECOMMENDATIONS RESULTING FROM THE ANALYSIS AND FINDINGS ARE PRESENTED BELOW, AND COMBINE THE RESULTS OF THE INTERVIEWS, SURVEYS AND ANALYSIS CARRIED OUT. THE KEY POINTS PRESENTED IN THE PRECEDING CHAPTERS CONSTITUTE THE BASIS FOR THE CONCRETE RECOMMENDATIONS FOR PROMOTING THE DEVELOPMENT OF MERCHANT RENEWABLE ENERGY PROJECTS IN MEXICO.

DEVELOPMENT CHALLENGES OF PROJECTS OF RENEWABLE ENERGY	ENTITY RESPONSABLE	RECOMMENDATIONS
MARKET PRICE UNCERTAINTY	ASSOCIATIONS	One of the main deterrents for financial entity investment in merchant generation projects is the lack of LMP certainty in the future. This risk could be mitigated through the publication of a referenced LMP projection by electricity sector associations, such as ASOLMEX, AMDEE, jointly with advisors and financial institutions. This establishes an acceptable price range based on consensual stress scenarios, thus increasing the level of certainty regarding the projections for developers and banks.
LACK OF TRACK RECORD OF FINANCING OF MERCHANT PROJECTS	DEVELOPMENT BANKS	One of the factors identified as a cause of the limited investment in merchant projects in Mexico is the short price record of the Electricity Market in that country (LMPs since 2016). The countries analyzed in the international analysis had a short-term market with a price record of +5 years. Development banks could promote investment in merchant projects by demonstrating their financial viability as first movers, thus contributing to the track record of merchant project financing. Additionally, they could share best practices and lessons learned, for example relating to the structuring of financing, to increase knowledge and trust within the financial sector.
LACK OF PARTICIPATION OF COMMERCIAL BANKS IN MERCHANT PROJECTS	ASSOCIATIONS, DEVELOPMENT BANKS AND COMMERCIAL BANKS	The need to promote the participation of commercial banks in merchant projects was clearly highlighted during the interviews. Strong aversion to price risks (LMP) was referred to by members of banking and financial institutions due to their volatility and lack of historical prices. Consequently, there is a need for financial instruments that act as hedging, such as derivatives (energy price futures, financial options, etc.) and minimum price and price range financial guarantees.
LACK OF USE OF INNOVATIVE FINANCIAL INSTRUMENTS BY DIFFERENT MARKET PLAYERS	MEXICAN STOCK EXCHANGE, INVESTORS, COMMERCIAL BANKS AND DEVELOPERS	Currently, there is no active market in Mexico for financial instruments that hedge energy prices, envisaging proxy hedge structures. However, credit agencies and financial entities such as the Mexican Stock Exchange could promote the implementation of direct hedging instruments on the price of energy based on sound assumptions and valuation models. This could be prepared jointly with electricity market experts, encouraging investment in those instruments by providing certainty and reliability to activate market participation in those instruments, generating certainty, liquidity and longer term hedging.

DEVELOPMENT CHALLENGES OF PROJECTS OF RENEWABLE ENERGY	ENTITY RESPONSABLE	RECOMMENDATIONS
SCARCE UNDERSTANDING OF MERCHANT GENERATION PROJECTS	ASSOCIATIONS, DEVELOPMENT AND COMMERCIAL BANKS	Facilitate the understanding of the different concepts of the electricity market (ex: CELs market, power market, Financial Transmission Rights, spot market, etc.) for potential project financiers and/or investors, to grant certainty in relation to products, participants and markets in the Mexican electricity sector. One mechanism for promoting market understanding is the publication of general reports that describe the operation, risks, benefits and mechanisms available on the Wholesale Electricity Market. Similarly, workshops could be held to identify the main concerns of participants and conduct work sessions.
UNCERTAINTY REGARDING THE FUTURE EXPANSION AND MODERNIZATION OF THE RNT	SENER, CENACE, CFE	Based on the current situation of the RNT, there is a need to increase the transmission capacity between generating and consuming zones. At present, there is no certainty in the expansion and modernization projects in the future. A binding plan of expansion and modernization with the RNT would generate greater certainty among developers, encouraging their participation in merchant projects. This could be carried out through investment and financing structures admitted by the Electricity Industry Act, such as HVDC/HVAC bids, Public Private Alliance mechanisms, Unrequested Proposals, and other mechanisms that enable the modernization and expansion of the electricity network.
NEED FOR GREATER PROMOTION AND REGULATION OF DISTRIBUTED GENERATION	CRE, ASSOCIATIONS	Collective Exempted Generation business models should provide greater clarity regarding remuneration systems, minimum percentage of contracted quantities, terms of commitment, credit background conditions, etc. Community Solar power could be promoted for low-income users or users living in energy poverty. There are public and private financing options that could address this demand.
	ASSOCIATIONS, CRE	One reason for the lack of development of DG projects with merchant schemes is the lack of understanding of the spot market by end users. Workshops and initiatives could be developed for users to learn about the DG schemes with potential merchant sales. Associations such as ASOLMEX, ABM, ICM, among others, could promote an understanding of the merchant market and the financing options available to end users.

GLOSSARY

- Term Loan: loan repaid in regular payments over an agreed term (may be syndicated or traditional).
- Revolving Credit Facility: credit facility under which financial institutions take-on the necessary loans on condition of paying an additional instalment upon repayment of the debt.
- Multilateral Facility: Debt granted by global/international financial entities to support country development.
- Asset Backed Bond: Bonds or notes backed by financial assets.
- VAT Facility: Financing technique that serves to manage the deficit incurred under the Value-Added Tax during the construction of a project.
- Decommissioning LOC: Letter of Credit under which the buyer undertakes to pay the seller and, in the event that the buyer cannot fulfill its payment obligations, the bank will provide the necessary funds to complete those obligations.
- Cash Collateral Loan: the borrower uses its own funds as collateral for loans taken out.
- Proxy Revenue Swap: Type of income risk mitigation mechanism that substitutes the fluctuating spot market prices and climate risks for energy generation for stable revenue flows.
- Standby/Contingency Facility: credit facility where the borrower can draw part of the sum loaned by a financial institution, according to its needs, without having to draw the full amount of the loan.
- Equity Bridge Loan: short term loan that is used until permanent financing is secured. It provides quick cash flows at high interest rates and backed by some form of collateral.
- Tax Equity Bridge Loan: bank loan under which the lending bank is repaid upon completion of construction using funds from fiscal investors that enter the equation once the plants start producing tax credit.
- Preferred Equity: any class of security that has higher priority for distributions of a company's cash flow or profits than common equity.
- Guarantee Facility: Guarantee offered by a financial institution to back the fulfillment of debts and responsibilities of the borrower. When a borrower cannot comply with debt repayment, the institution will cover those debts.
- Project finance: structured funding based on long term cash flows generated by the financed project, involving infrastructure or energy projects whose initial investment is particularly costly with a lengthy profitability period.
- Covenants: Commitments assumed by the lender with the borrower under the loan contract describing specific actions to be carried out by the borrower over the life of the loan granted. These may be positive commitments (actions the company must carry out, such as auditing their financial statements) or negative (actions the borrower must abstain from, such as distributing dividends to its shareholders), or the fulfillment of certain financial ratios.
- Track record: background of the instrument if currently used in Mexico and/or in other international markets.
- Rating: classification granted according to a specified scale by a recognized entity based on an evaluation of credit risk.
- Break-even: profitability equilibrium point or threshold, where revenue is equivalent to (fixed and variable) costs.
- Roll over: extension or transfer of a debt or other financial arrangement.
- Swap: financial exchange of flows between two counterparts that is agreed under contractual terms (fixed vs. variable or variable vs. variable).
- FX Forwards: derivative financial instruments agreed outside organized markets under a contract between two parties to exchange a pair of currencies at a fixed rate on a future date.
- Call: financial option that grants the holder the right to buy or receive the underlying asset at an agreed price on a future date in exchange for payment of a premium.
- Put: financial option that grants the holder the right to sell or pay the underlying asset at a fixed price on a future date in exchange for the payment of a premium.
- Collar: financial derivative instrument that involves a hedging strategy that combines a call and a put, in other words, establishing a price band or range for the underlying asset.
- Clearing House: association or institution whose mission is to guarantee and defend the rights of credit entities, investors and other financial agents, enabling them to make their payments and carry out offsetting and settlement transactions.
- Over the counter: informal market in which transactions are entered into and settled directly between two parties without the involvement of intermediaries or clearing houses.
- Credit Default Swap: swap-type instrument where the underlying asset is the probability of default of a given entity. It allows to hedge the default risk of the entity that buys the CDS, who pays a regular premium to obtain coverage in the event of default.
- Commodity/Commodities: raw material, product or asset for which a market demand exists, and which are traded without a qualitative difference in purchase and sale transactions carried out in recognized markets; examples: oil and gas, corn, etc.
- Due diligence: steps taken by an entity to meet certain legal requirements, in particular in relation to the purchase or sale of a given asset.
- Curtailment: restrictions on dispatches placed by the operator of the distribution system on a specific power plant.
- Crowdfunding: a financing mechanism that involves the sale of stock of a given asset at low prices to many shareholders.

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CHALLENGES AND OPPORTUNITIES

FOR FINANCING RENEWABLE ENERGY PROJECTS IN THE WHOLESALE ELECTRICITY MARKET IN MEXICO

MEXICO CITY 2019