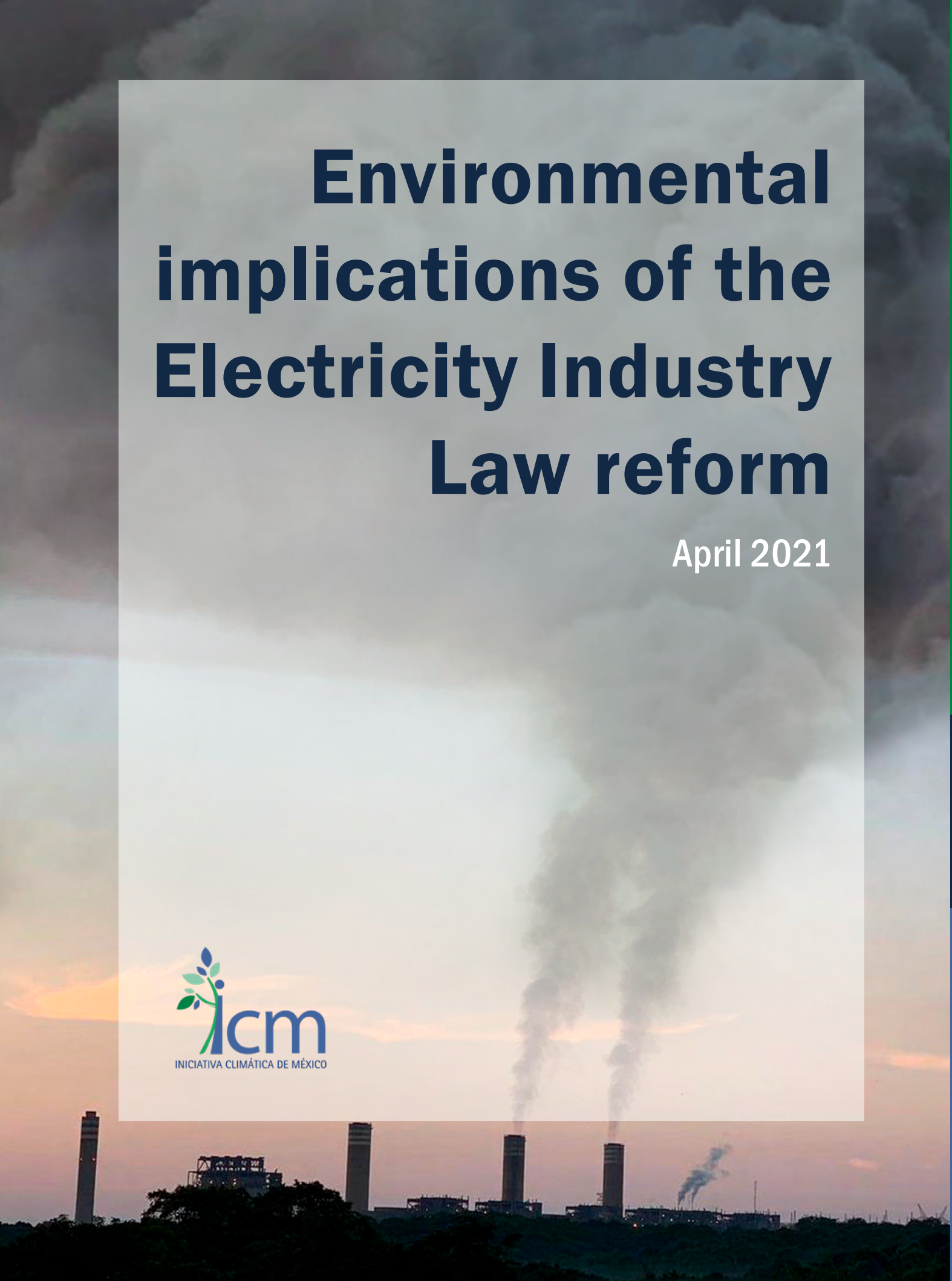
Environmental implications of the Electricity Industry Law reform

April 2021



INICIATIVA CLIMÁTICA DE MÉXICO

Executive summary

A quantitative assessment has been conducted of the immediate or near-future effects on atmospheric emissions of the implementation of the modified Electricity Industry Law (LIEm), recently (March 9, 2021) approved by Mexican Congress and closely following an earlier proposal by president López Obrador. The LIEm grants CFE (the state-owned electric utility) discretionary powers for generator priority dispatch and explicitly displaces renewable energy power plants to the near end of the dispatch queue, abolishing economic merit order market operation rules and economic competition. It also lifts the requirement set by the original Electricity Industry Law (LIE) for CFE Basic Supply (CFE's retail electricity supply company) to procure its long-term contracts for energy, Clean Energy Certificates (CELs, for its acronym in Spanish) and grid-services through competitive processes. Such processes or inverse auctions, have been very successful in the past, leading to record-low prices for wind and solar energy.

An immediate effect of the unchallenged implementation of the LIEm would be an intensified use of outdated CFE-owned thermal plants, most of which are currently fired with natural gas but are increasingly being run with high-sulphur heavy fuel oil, a residue of crude oil refining. As opposed to international standards, Mexican refineries convert a large fraction of the incoming crude into fuel oil. Under the López Obrador administration this fraction has still increased, from around 25% in 2019 to about 35% in 2020 and up to date. These figures have to be compared with a typical figure of 5% in international refineries operated under best practices. This high supply of fuel oil is meeting an increasingly tight off-take market, with high-sulphur (>0.5%) fuel oil now banned from the use on maritime vessels.

To estimate the near-term effects of the LIEm, plausible scenarios have been constructed, considering a gradual increase of the capacity factor of CFE-owned dual-fuel thermal plants over the next three years, as well as an increase in the use of fuel oil, starting with the current fraction of about 15% and reaching 90% in 2024. Compared to the baseline values, an increase in CO_2 emissions of about 30% is estimated for the end to the term of the López Obrador administration in 2024, with an estimated combustion of up to 300,000 barrels/day of fuel oil by day. The increase of SO_2 emissions is more dramatic, given the high sulphur content of Mexican fuel oil and the absence of desulphurization systems in thermal plants. An increase by a factor of 3 in SO_2 emissions is expected for plausible near-term scenarios; this would further jeopardize the health of communities already strained by excessive environmental stress, such as at the CFE and PEMEX hubs at Tula, Salamanca, and Manzanillo, with Tula also significantly contributing to poor air quality in the Mexico City area.

The modified Electricity Industry Law is the most recent step undertaken by the López Obrador administration to stall private investment and renewable energy generation, with over 5.7 GW

worth of wind[1] and 2.8 GW of solar photovoltaic development[2] currently considered stranded assets. In case the LIEm were to be upheld by the Supreme Court, renewable energy development would become impossible in Mexico and Mexico's commitment to climate change mitigation would be abandoned completely.

Background

The modifications to the Electricity Industry Law (LIE, for its acronym in Spanish) proposed in February 2020 by President Andrés Manuel López Obrador (AMLO), are aimed at rolling back open market competition and restoring the state utility Federal Commission of Electricity (CFE, for its acronym in Spanish) to the predominant position in the electricity industry. If implemented as approved (March 19, 2021) by both chambers of Congress, closely following an earlier proposal by president López Obrador, the modified LIE (LIEm) would bring the industry to a state very similar to what it was before the Energy Reform of 2013, in addition to abolishing, at least partially, the five special regimes[3] which allowed for private sector participation in the electricity sector and renewable energy generation in particular, under discretional criterion for permits revocation. Annex 1 briefly describes the situation of the electricity sector before and during the Reform.

To restore the *de facto* monopoly, the López Obrador administration started out by undertaking a number of steps to overturn the electricity sector reform through administrative and regulatory dispositions, including agreements by 1) the National Center for Energy Control (CENACE, for its acronym in Spanish), issued in late April of 2020 on the grounds of an alleged emergency created by the COVID-19 crisis, and 2) the Secretary of Energy (SENER, by its acronym in Spanish), issued on May 15, 2021. The SENER decree, termed "policy", tried to invalidate significant portions of the LIE through regulatory measures. SENER's "policy" was decreed without complying with the mandatory consultation requirements. Both the CENACE *accord* and the SENER *policy* were successfully challenged in courts by companies, non-governmental organizations, state governments, and the Economic Competition Commission (COFECE, for its acronym in Spanish); as a result, the two agreements were declared unconstitutional and without effect. Additional dispositions against private sector participation and renewable energy participation have been issued subsequently, but have remained largely inconsequential so far because of corresponding court rulings.

The LIEm is president López Obrador response to the legal setbacks to his efforts to overturn the electricity sector reform at administrative and regulatory levels. The LIEm recycles a number of

1 Source: AMDEE, 2021.

2 Source: ASOLMEX, 2021.

3 The five special regimes established by the Electric Energy Public Service Law (LSPEE, for its acronym in Spanish) were: 1) Independent production, 2) cogeneration, 3) self-supply, 4) small production, and 5) export/import.

the previous dispositions, already suspended by federal courts, and introduces a new element: priority dispatch for CFE-owned or –contracted plants. While being subtle in appearance, these modifications eliminate competition in the electricity sector and relegates renewables, the lowest cost generators on the Mexican grid, to the end of the dispatch queue.

The following section explains the implications of the LIEm. A brief analysis of each of the proposed changes is presented, followed by the environmental impact, with an emphasis of GHG emissions, of operating the thermal plants with fuel oil, the new dispatch order, and the self-supply permits.

- **Modifications to the merit order dispatch.** CFE-owned or –contracted power plants have to be dispatched first, independently of their operating cost. As a result of this, the most expensive and polluting generators would be dispatched first before the cheapest and cleanest. The average cost of CFE-owned plants is between 1,505 to 2,536 pesos per MWh compared to renewable energy generator who sell electricity to CFE at 381 pesos per MWh. It is well documented that CFE's generating plants are highly polluting, causing damage to public health.

- **Generation permits, issued by the (formally autonomous) Regulatory Energy Commission (CRE) are subjected to planning decisions of the State.** It is proposed to eliminate the guarantee of free participation of the Electricity Industry Law (LIE). This affects the competitiveness of the market, the suppliers, and any user that is seeking to satisfy their own needs through isolated supply[4] or by purchasing electricity as a qualified user through a qualified service supplier[5].

- **Clean Energy Certificates (CELs) are granted to all of CFE's clean generation plants regardless of their ownership and date of entry into operation.** Ownership was never a consideration in awarding the certificates. The objective of the CELs (Article 69 of the Energy Transition Law, LTE) was to promote the penetration of Clean Technologies (through investments in NEW clean plants), so granting it to plants that have been in operation before the LIE and the LTE, undermines its usefulness as a driver for new clean energy capacity, and threatens Mexico's commitments before the Paris Accord and the Renewable Energy goals established in the LTE. This modification would exempt CFE's Basic Supply branch, the company in charge of electricity retail, from having to pay fines for failing to comply with its CEL requirements and eliminates the need to acquire new CELs. The resulting oversupply of CELs will lower its price and negatively impact on the return on investment of the clean plants installed after the energy reform.

4 Isolated Supply (Abasto Aislado) it is defined in article 22 of the LIE as power generation and imports of electricity for self-supply or export purposes, but not requiring access to the T&D grid infrastructure.

5 Qualified user (Usuario Calificado) it is defined in article 3 of the LIE as an End User who has registration with the CRE to acquire the electricity supply in the Wholesale Electric Market.

- **Mandatory auctions or other competitive processes for long-term electricity supply contracts by CFE Basic Supply are eliminated.** Auctions are a mechanism designed so that basic users have cheap energy through competition between suppliers. By not proposing another mechanism, there is a risk that the generation costs will be higher for the Basic Supplier and will transfer it to the users. The auctions increased installed capacity by around 7,000 MW (most of it clean) and create jobs and positive impacts for the industry.

- **Self-supply permits can be revoked.** The Mexican industry invested in generation capacity for its self-consumption as a strategy to have competitive energy costs. Revoking the permits will increase the cost of energy for these industries, which will be reflected in an increase in the costs of their products and services, generating negative consequences for the Mexican consumers, as well as the possibility of losing attractiveness for national and international companies who could seek for other countries with more competitive energy costs.

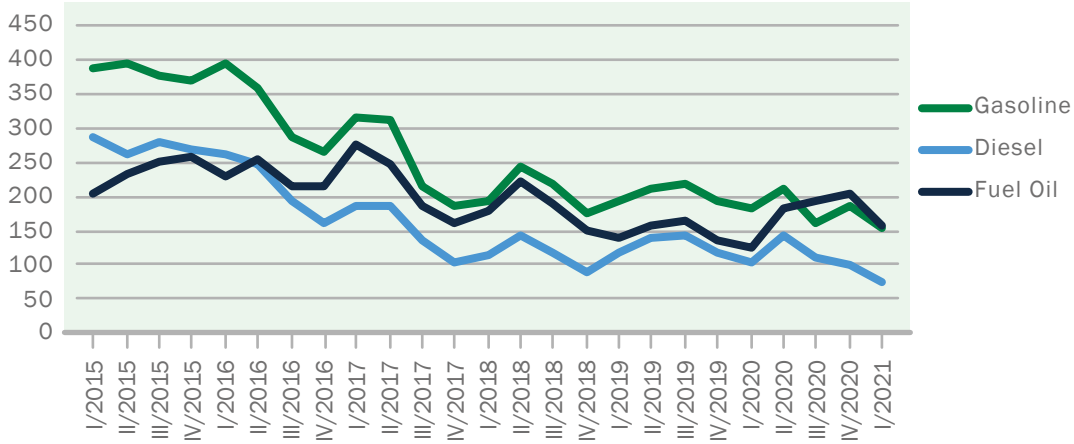
Given that many of the provisions of the LIEm have already been found unconstitutional by federal courts, and the fact that the preferred dispatch of CFE power plants is clearly a violation of the constitutionally mandated free competition in the generation and procurement of electricity, is may be asked why the López Obrador administration was willing to risk yet another setback at the courts. The reason for this may lie with urgency to use a residual by-product from oil refining, fuel oil. In Mexico, the fuel oil is produced by PEMEX as a result of refining heavy oil, commonly referred as "crudo Maya", which has high sulphur content, between 4 and 6%. The use of fuel oil with high sulphur content has been restricted and was excluded in maritime navigation where the new regulation stipulates that sulphur in fuel must be limited to 0.5%[6]. Additionally, the new policy that seeks to refine all the gasoline consumed in the country, has caused an unsustainable increase in fuel oil stocks. This policy decision produces a large amount of the fuel oil by-product that was previously refined abroad where there are plants that can transform it into higher-value products.

6 Known as "IMO 2020", the rule limits the sulphur in the fuel oil used on board ships operating outside designated emission control areas to 0.50% m/m (mass by mass) - a significant reduction from the previous limit of 3.5%. Within specific designated emission control areas the limits were already stricter (0.10%). This new limit was made compulsory following an amendment to Annex VI of the International Convention for the Prevention of Pollution from Ships (MARPOL).

Fuel oil as the main driver of the modified LIE

Only three out of the six refineries owned by PEMEX are capable[7] of processing heavy crude, since they are equipped with coker plants: Madero, Minatitlán, and Cadereyta. These plants can produce approximately 15 percent of fuel oil. The other three, produce up to 30 percent of fuel oil, almost the same level of production as gasoline and diesel. The following graph shows the production of refined by-products gasoline, diesel, and fuel oil by quarters from 2015 to the first quarter of 2021. The inevitable relationship between these components is clear: the higher the production of refined by-products, the higher the production of residual fuel oil. In addition, the increasingly heavy Mexican oil causes that each increase in refining increases the production of fuel oil significantly more than that of gasoline. In recent quarters, fuel oil production has exceeded gasoline production.

Figure 1 *Quarterly evolution of gasoline, diesel, and fuel oil (*combustóleo*) production.*



There has been a noticeable increase in the production and use of fuel oil attributable to several factors: 1) excess production of fuel oil due to the policy of locally refining heavy oil to achieve self-sufficiency in the supply of petroleum products (gasoline and diesel); 2) the policy objective to increase CFE's market power and return its monopoly character by displacing private generation that mainly concentrated in renewable energies; 3) the loss of the maritime fuel oil market due to new international standards; and 4) the economic losses caused by other factors such as the salaries of workers assigned to obsolete idle fuel oil plants. The latter reasons provide a rationale for the main goals of the López Obrador administration, which can be summarized as follow: 1) achieve national self-sufficiency in the supply of petroleum products, 2) increase the use of fuel oil in electricity generation, 3) recover full control of the electricity sector by returning CFE to its vertically integrated monopoly status.

7 This capability is somewhat limited compared to the best practices of the industry; state-of-the-art refineries produce less than 5% of fuel oil.

There are credible indications that fuel oil storage capacity is close to its limit due to the recent increase in production, and that the logistics for transporting it by rail did not contemplate such an increase. The differential between inputs and outputs is causing excess stocks that have led to greater pressure for its use in thermoelectric plants. According to PEMEX quarterly reports, in 2020, around 64.4 million barrels of fuel oil were produced, 1.6 million were imported and 40.1 million were exported, leaving an approximate gross domestic supply of 25.9 million barrels. The consumption in the same year was 20.2 million barrels, leaving a surplus of 5.7 million barrels of fuel oil.

The president has stated that the national goal is to refine one million barrels of crude per day. PEMEX has announced investments for the existing refineries and the construction of the new Dos Bocas refinery, which is being built in López Obrador's home state of Tabasco. With these actions, the Federal Government expects to increase refining capacity to 1.5 million barrels of crude oil per day. This increase in refining activity, along with the reduction of the imports of gasoline and diesel, has caused a significant increase of high-sulphur fuel oil in the country This trend will only tend to increase and therefore CFE is being pressured to use this surplus.

All six current refineries jointly processed 584,000 barrels of crude oil per day in 2020. Given that PEMEX in past years had the capacity to process more than one million barrels per day, it is plausible to assume that this capacity can be restored. If so, it is also plausible to assume that the near-term fuel production could be significantly higher than the current 200,000 barrels per day. As the national gasoline refining goals gain traction, and the presidential goal of refining one million barrels of crude per day is achieved, fuel oil production could reach 300,000 barrels per day or more in the next few years.

Scenario building

In order to estimate the effect of the LIEm in terms of GHG emissions and its impact on the transition towards renewable energies, the following medium-term scenario was analysed:

- 2020 is taken as the base year.
- The estimated growth in demand is taken as 2.5% for 2021 and 2022, and 3% for 2023 and 2024
- The capacity factor of CFE's thermal plants used is 22.59% in 2020, and is assumed to increase to 42% in 2021, 46% in 2022, 50% in 2023, and 54% in 2024.
- The percentage of fuel oil consumption in CFE plants was estimated at 14.49% in 2020; projections for the near future assume 35% in 2021, 50% in 2022, 65.00% in 2023, and 70% in 2024. The remainder is completed with natural gas.

The selected capacity factors are based on historical data. The scenarios proposed assume increased maintenance of thermal plants in the very short term, investments in operational improvements in the medium term.

The assumed increase in fuel oil consumption is higher, since the dual-fuel plants were originally designed to operate with 100% of fuel oil. Annex 2 shows the detailed tables resulting from the assumptions described.

Results: Increase in fuel oil consumption

Based on the scenario proposed in the previous section, the following near-term impacts are projected for the rest of the period of the López Obrador administration (Tables 1-3). Table 1 shows the annual projected fuel oil use, both in energy content [GJ/year] and in volume [barrels/day]. It can be seen that the expected increase in fuel oil combustion during the following three years is about 11-fold, up from about 23k bl/day to nearly 270k bl/day.

Table 1

	Fuel Oil Consumption in CFE Therman Units				
	2020	**2021**	**2022**	**2023**	**2024**
GJ/year	**55,411,111**	**248,785,718**	**389,256,566**	**550,036,452**	**639,734,704**
bl/day	**23,124**	**103,824**	**162,446**	**229,543**	**266,976**

The GHG emissions for the National Electric System (SEN, for its acronym in Spanish) resulting from this intensified use of fuel oil are shown in Table 2. It can be seen that the increase is substantial, up from the initial value of 128 million tons/year to nearly 170 million tons/year, **equivalent to a 32% increase above 2020 GHG emissions levels.** This is evidently a very substantial blow to Mexican efforts to mitigate climate change and **is essentially equivalent to a *de facto* withdrawal of Mexico from the Paris Accord and its own national climate change mitigation goals.**

Table 2

	CO_2 Emissions				
	2020	**2021**	**2022**	**2023**	**2024**
Tons	**127,613,392**	**142,713,905**	**151,367,096**	**161,260,630**	**169,717,680**
Million tons	**128**	**142.7**	**151.4**	**161.3**	**169.7**

The projected SO_2 emissions due to the sulphur content of the fuel oil are summarized in Table 3:

Table 3

	SO_2 Emissions				
	2020	**2021**	**2022**	**2023**	**2024**
Tons	**256,769**	**416,300**	**543,091**	**688,710**	**771,269**

As evidenced by the table, the increases in SO_2 are still more dramatic than the increase in CO_2 emissions, showing a staggering increase by a factor of three. This high load of SO_2 emissions would jeopardize communities already strained by excessive environmental stress, such as at the CFE and PEMEX hubs at Tula, Salamanca, and Manzanillo, with Tula also significantly contributing to poor air quality in the Mexico City area.

The electricity sector is considered the most effective place to begin the decarbonization of the Mexican economy given its relatively few actors, defined dimensions, and legal framework. Also, technological advances have made renewable energies, especially solar and wind energy, the most cost-effective options for the replacement of fossil fuels. Other emitting sectors (such as buildings, industry, and transport) are diffuse, have multiple and diverse of actors, and various sources of emissions, making these sectors a more difficult starting point for decarbonization. This was one of the reasons why Mexico's climate change mitigation strategy, as presented at the COP21 in Paris, placed a special emphasis on the electricity sector as the main opportunity area to tackle climate change in Mexico.

Incompliance of the Mexico's Nationally Determined Contributions (NDC) to climate change mitigation

The following table shows trend-based scenarios from SEMARNAT, the Mexican Secretary of the Environment, with the expected emissions of the electricity sector in the coming years if no effective mitigation policies are undertaken (business as usual). Both the 2015 projection and the figures from the recent (2020) revision are shown. The first was determined in 2015 for establishing the Mexican NDC and the second one, was estimated in 2020 as the basis for the recently presented NDC. The latter is currently being under discussion.

Table 4

	NDC: CO_2eq Emissions, Mton/yr					
	Trend Base Emissions (according to SEMARNAT)					NDC Goal
Trend	2013	2020	2024	2025	2030	2030
2015 NDC	127	143	172.4	181	202	139
2020 NDC	149	166	173	174	186	141

It is important to mention that the lack of ambition manifested by the similarity of both NDCs has been the object of international criticism because, contrary to the rest of the world, it does not commit the country to effectively combat climate change nor increase its GHG emissions reduction ambitions. For both baselines, an interpolation has been made for 2024. The values are very similar, on the order of 173 million tons of CO_2e/year. The right column shows the goals that have been proposed in the NDCs: 139 and 141 $MtCO_2$e/year by 2030, respectively. The projected values for 2024 exceed any of the 2030 goals.

Given the pivotal role of the electricity sector, the 2015 Energy Transition Law (LTE, for its acronym in Spanish) stipulates that clean electricity generation in the national electricity system must reach 35% by 2024, with intermediate goals of 25% in 2018, 30% in 2021, and 35% in 2024. These goals are mandatory for electricity users, including CFE itself, through subsidiary CFE Basic Supply. The compliance with the goals is verified through the Clean Energy Certificates (CELs, by its acronym in Spanish) market. High penalties have been established by law for the case of incompliance. However, the López Obrador administration has largely ignored the CEL market altogether, failing to conduct basic tasks, such as the annual publication of the CEL shares required for the next year, let alone the enforcement of the compliance of the CEL requirements.

It is therefore safe to assume that the López Obrador administration has abandoned, for all practical terms, the CEL market and with it the commitments derived from the Paris Accord and the national clean energy targets.

Based on the current analysis and assuming the LIEm is upheld by the Supreme Court, the share of clean energy generation projected for 2024 is expected to be 21.7% —a dramatic shortfall from the 35% mandated goal established in the LTE.

In order to further support the conclusion that the López Obrador administration has no intention to comply with Mexico's commitments under the Paris Accord and its own national mandated targets, it is interesting to briefly review CFE's recently (2020) published Business Plan, which calls for investments in over 4 GW of conventional fossil-fuel generating capacity, distributed among six plants, while allocating only a small budget to upgrades of the transmission grid. This is in spite of the fact that CFE's transmission company (CFE Transmisión) actually operates profitably and that it has been shown that relatively modest investment by CFE in the expansion of its transmission grid would unlock massive clean energy potential. CFE's generation companies[8] have been consistently been reporting losses for years. In CFE's business plan, the addition of new renewable energy capacity is mentioned as a possibility for 2027 or beyond, without identifying any specific project. It is therefore abundantly clear that the reestablishment of CFE's de facto monopoly as a result of the LIEm, would result in a massive regression towards fossil fuels.

The revocation of self-supply permits

So far, the discussion in this document has focused on the effects that would result from the abolition of the economic merit order as the guiding principle of the electricity sector. However, other dispositions contained in the modified LIE might be just as severe. One of these measures is the revocation of self-supply permits (grandfathered permits issued under an earlier electricity industry law), which would dramatically shut down a large faction of existing renewable generation in Mexico, leaving a space that would be filled by CFE's fossil fuel generation. A brief description of this modality of participation in the electricity sector is made in ANNEX 3. The current generation in self-supply projects is about 16,361 GWh/year, the bulk of which is in renewable generation. This self-supply renewable generation is at risk of being canceled by the LIEm, although a strong legal battle is anticipated. This generation would probably be replaced by fossil fuels with an estimated emission of an additional 8.2 $MtCO_2e$/year.

8 After the LIE, CFE Generación was divided into six generation subsidiaries, CFE Generación I through VI.

Conclusions

The LIEm will be catastrophic for the country for the following reasons:

- The growth of renewable energy generation will be paralyzed. In a scenario of growing use of fuel oil and no economic merit order dispatch, the growth in demand would be satisfied with the thermal plants. The lack of a suitable investment environment for deploying renewables would lead to a stagnation of investments in the electricity sector. Industry estimates indicate that around 5,700 MW of wind energy capacity with an investment of close to 8.5 billion dollars are severely delayed and could turn into stranded assets. A similar situation is occurring in the solar sector, where investments for 2,800 MW of solar energy with an estimated investment of around 3.1 billion dollars is stalled. In both cases, around 50,000 direct and indirect jobs are directly threatened.

- Compliance with national clean energy goals and international commitments to mitigate emissions from the electricity sector will remain only as formal pledges. The country would be subject to the consequences that the international community decides with respect to countries that do not comply with their commitments, especially in matters of world trade, financial mechanisms, investments made by companies with climate commitments, and other relevant aspects of international relationships.

- Neighboring communities of the thermal plants operated with fuel oil would see mortality and morbidity rates above normal rates due to the pollution by sulphur dioxide and PM2.5 particles. Agricultural activities and ecosystems would also suffer in their productivity and conservation because of acid rain and other phenomena.

The price of electricity for all users would rise significantly due to the discrimination against the use of renewable energy in the matrix. Thermal plants that burn fuel oil are highly inefficient and expensive, even though this fuel is subsidized. The Mexican State would assume the increasing costs by decreasing other vital investments for the country such as security, health and education.

ANNEX 1

Before de Energy Reform, the electricity industry was stuck because CFE was in dire financial shape for several years, with no resources for investing, owning an outdated fleet of thermal plants, relying on private generators with exclusivity contracts to cope with the growing demand, insufficient and inefficient transmission and distribution networks, and the electricity cost for commerce and industry, between 84 and 134% higher than the United States. On the other side, the residential electricity was heavily subsidized.

The 2013's Energy Reform main features were, in general, establishing a whole electricity market, private sector participation in generation, while the State kept the so-called natural monopolies for transmission and distribution, and the energy transition toward renewable energies. Other features included the economic merit dispatch order, the non-discriminatory access to the network, CFE subsidiaries separation to avoid interest conflict, mandatory inverse actions to power purchase by CFE, retribution for distributed generation surplus, and industry decarbonization through specific and mandatory goals confirmed by clean energy certificates.

When the current administration took office, the electricity transition was progressing according to the legal mandates. The electricity market was well established and operating in the modes of day-ahead and inter-day. The real-time market and several ancillary services were progressing in their implementation. However, even before the new administration assumed office, they pressed to stop the fourth coming auction on the grounds of several misperceptions. Afterward, it was clear that the real intention was to take apart the energy reform. The three previous auctions carried on by the last administration had excellent results that put the country on the pathway of clean energy goals and the Paris Agreement compliance. These auctions brought 9 billion dollars investment for 7,000 MW renewable capacity (wind and solar). The last administration was very close to complying with the intermediate goal of 25% clean energy by 2018. The other two intermediate goals: 2021 —30%— and 2024 —35%— will be hardly reached.

ANNEX 2

Scenarios´ Assumptions and Results

Annual Demand and Growing Rate, MWh				
2020	2021	2022	2023	2024
	2.5%	2.5%	3.0%	3.0%
312,036,924	319,837,347	327,833,793	337,668,807	347,798,871

Fuel Oil Percentage in CFE Thermal Units				
2020	2021	2022	2023	2024
14.49%	35.00%	50.00%	65.00%	70.00%

Plant Factor in CFE Thermal Unit, %				
2020	2021	2022	2023	2024
22.59%	42.00%	46.00%	50.00%	54.00%

CFE Thermal Units Generation, MWh/yr				
19,312,899	35,899,815	39,318,845	42,737,875	46,156,905

	Anual Generation Mix, MWh				
	2020	2021	2022	2023	2024
Wind	19,684,175	19,684,175	19,684,175	19,684,175	19,684,175
Solar	13,517,173	13,517,173	13,517,173	13,517,173	13,517,173
Hydro	26,804,751	26,804,751	26,804,751	26,804,751	26,804,751
Geothermal	4,508,830	4,508,830	4,508,830	4,508,830	4,508,830
Biomass	89,394	89,394	89,394	89,394	89,394
Nuclear	10,864,278	10,864,278	10,864,278	10,864,278	10,864,278
Coal	12,510,530	12,510,530	12,510,530	12,510,530	12,510,530
Combined Cycle	183,672,568	181,836,060	180,621,274	186,405,932	192,458,007
Internal Combustion	2,873,152	2,844,424	2,825,421	2,915,909	3,010,581
Thermal (Fuel Oil)	23,378,736	31,626,028	39,318,845	42,737,875	46,156,905
Gas Turbine	14,133,336	13,992,020	13,898,544	14,343,665	14,809,363
Total	312,036,924	318,277,662	324,643,216	334,382,512	344,413,987

	Anual Generation Mix, %				
	2020	2021	2022	2023	2024
Wind	6.3%	6.0%	5.8%	5.5%	5.1%
Solar	4.3%	4.1%	4.0%	3.8%	3.5%
Hydro	8.6%	8.4%	8.3%	8.0%	7.8%
Geothermal	1.4%	1.4%	1.4%	1.3%	1.3%
Biomass	0.0%	0.0%	0.0%	0.0%	0.0%
Nuclear	3.5%	3.4%	3.3%	3.2%	3.2%
Coal	4.0%	3.9%	3.9%	3.7%	3.6%
Combined Cycle	58.9%	56.1%	54.8%	55.3%	55.9%
Internal Combustion	0.9%	0.9%	0.9%	0.9%	0.8%
Thermal (Fuel Oil)	7.5%	11.2%	13.4%	14.0%	14.6%
Gas Turbine	4.5%	4.4%	4.4%	4.2%	4.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

	CO_2e Emissions, Tons				
	2020	2021	2022	2023	2024
Coal	15,012,636	15,012,636	15,012,636	15,012,636	15,012,636
Combined Cycle	74,956,775	73,193,723	74,903,273	77,299,743	79,806,420
Internal Combustion	1,355,266	1,323,389	1,354,298	1,397,628	1,442,950
Thermal (Fuel Oil)	26,009,329	43,146,552	49,824,840	56,949,928	62,511,220
Gas Turbine	10,279,386	10,037,695	10,272,049	10,600,695	10,944,454
CO_2e Emissions, Tons	127,613,392	142,713,905	151,367,096	161,260,630	169,717,680
Millions tons	128	142.7	151.4	161.3	169.7

	SO_2 Emissions, Tons				
	2020	2021	2022	2023	2024
Coal	112,595	112,595	112,595	112,595	112,595
Internal Combustion	50,567	49,378	50,531	52,148	53,839
Thermal (Fuel Oil)	59,624	221,143	346,006	488,921	568,653
Gas Turbine	33,984	33,184	33,959	35,046	36,183
SO_2 Emissions, Tons	256,769	416,300	543,091	688,710	771,269

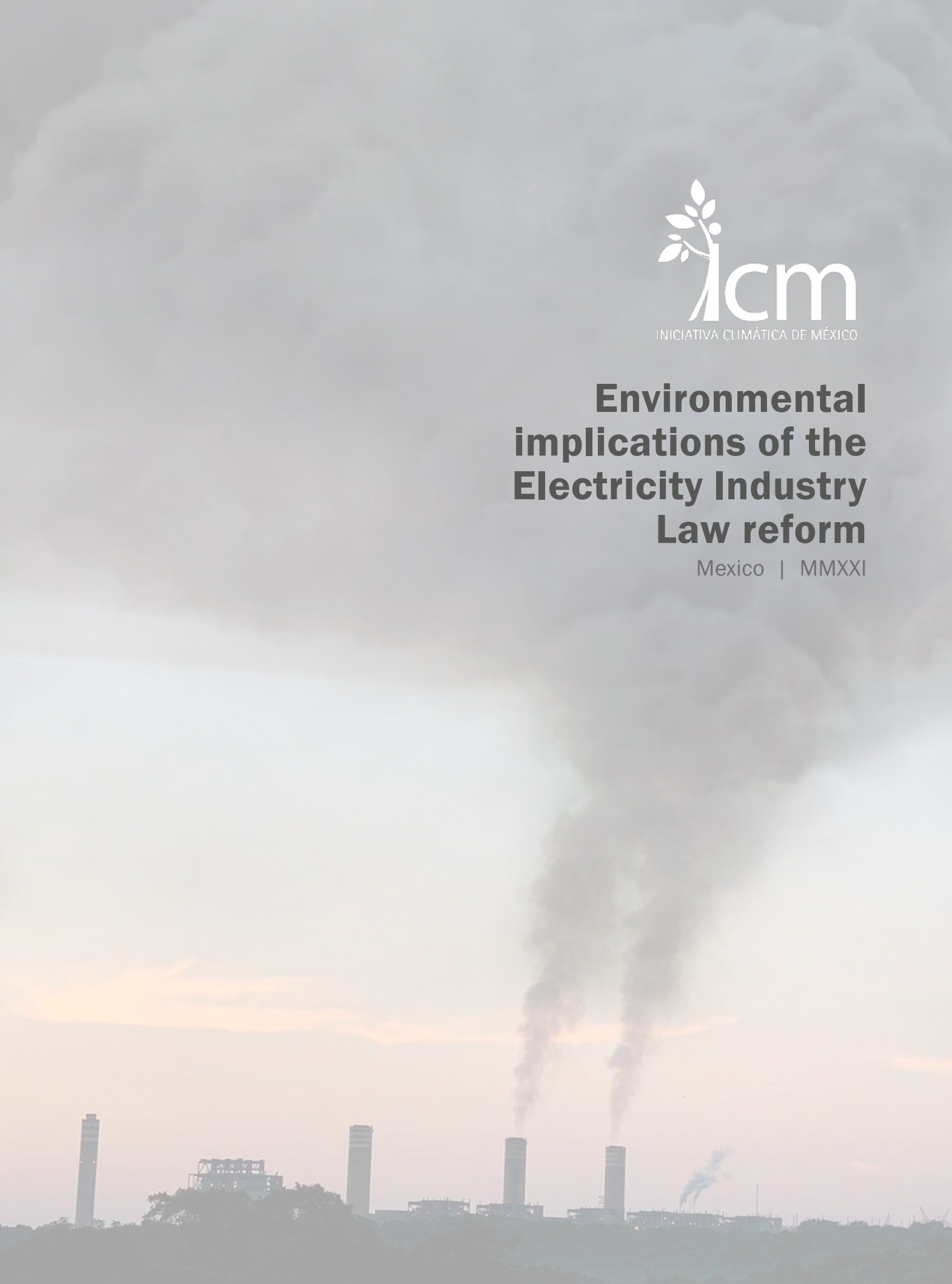
ANNEX 3

Self-supply Regime

The president proposes to withdraw the self-supply permits granted before the Energy Reform. The self-supply regime is under siege by the present administration because most permits were granted to big companies. This regime for electricity generation was created because CFE lacked resources for funding the demand growth, allowing private companies to generate their own power and share it with their subsidiaries wherever they were.

As an example, a nationwide company with thousands of convenience stores. The company has one or more generation plants located in wind-laden regions. Electricity is distributed among the convenience stores through the transmission and distribution networks by paying a fixed post-stamp type transmission fee, set when renewables cost was so high that it needed stimulus to grow. Simultaneously, an energy bank was created to compensate for renewable variations, allowing generators to freely inject energy into the grid and withdraw it when needed.

This regime was abolished by 2013's electricity reform, specifically by the LIE, only allowing the grandfather contracts to survive because the law cannot be retroactive. The present administration has said that these permits were unfair and is constantly menacing the holders to withdraw them even when no formal accusations have been issued.



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