

Lessons in Energy Law in Mexico

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Universidad Nacional Autónoma de México
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LESSONS IN ENERGY LAW IN MEXICO

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FOREWORD

Daniel Yergin recently wrote a book titled “The new map, energy, climate, and the clash of nations”, but in my mind the title was immediately rephrased as: “the new map, energy, climate, and the clash of visions”. This is exactly what you will find in this book, a clash of visions between energy governance frameworks. On the one hand, a technical-investor vision, on the other hand, a political-social vision, both well represented and explained as lessons in energy law in Mexico.

You will also find several lessons to be learned. One that I found powerful and interesting was governance instability and its correlation with the rule of law as a cornerstone.

The unifying thread is the Energy Reform that took place on December 20, 2013, when the General Constitution was amended as a result of the controversial [Pacto por México], let’s say a new social contract risen at a constitutional level aimed to foster market liberalization under competition standards. Then the secondary legislation was issued in a record time as acknowledged by the IEA, for instance, the Hydrocarbon Law, the Law of the Electricity Industry, the Energy Transition Law, among others, as well as the administrative and technical regulations based on international best practices.

Energy regulatory agencies were also empowered to regulate market participants and to encourage sustainable long-term investments by providing legal certainty and income maximization in favor of the Nation. Balance is not easy to achieve.

The implementation of the Energy Reform was successful in terms of the law. Oil contracts were awarded, permits were issued, power auctions were carried out, investments flowed, and environmental and social impacts were addressed, at least by regulation.

The action plan went well as an ordinary business, except that State-owned enterprises were probably unprepared to compete at this level of sophistication. Moreover, tangible energy benefits for ordinary citizens did not arrive soon enough, on the contrary, people got upset when the gasoline subsidy was cut off abruptly.

Which is why the pendulum rapidly swung to the political left. In 2018, President Andrés Manuel López Obrador took office and began to fulfill his political promises. The lens of the energy policy switched overnight into a gray concept: energy sovereignty —with an angle to help poor people—, perhaps taking advantage of the still immature Energy Reform despite its empirical success. Indeed, President López Obrador interfered and decided to keep on going with the USMCA (T-MEC), if Chapter 8 placed his vision of energy sovereignty exactly as stated in the text of the General Constitution, which was accepted, but not as a means of implicit reversion of the Energy Reform nor to affect investment rights. This political behavior has been called by academics the Energy Counter Reform.

At that time, the degree of hard or soft applicability upon the energy sovereignty vision was unknown, however it was unveiled quickly. The energy sovereignty vision was spread throughout the main energy policies, such as the National Development Plan, the Ministry of Energy Sectorial Plan, the Business Plans of PEMEX and CFE —giving them preferential treatment—, daily discourses, and administrative decrees. Regulators, with new *ad-hoc* appointed officials, were compelled to follow these instructions, partly because the General Constitution states in its transitory framework that regulation cannot contravene the current energy policy. As such, this provision became a loophole that enabled a rewriting of the regulation.

Since then, oil contracts have not been awarded, permits have been delayed, power auctions have been cancelled, investments have been quietly folded and inspections leading to close private facilities strengthened.

It didn't stop there. President López Obrador introduced two bills to Congress to amend critical secondary legislation, the Hydrocarbon Law and the Law of the Electricity Industry. Both bills were fast-track approved by the majority of the political party in power.

These actions were obviously not welcomed by the investors who trusted the Energy Reform, arguing that President López Obrador's policies and new regulations were unconstitutional and affected their accrued rights. Additionally, these could be considered discriminatory and uncompetitive measures leading to an unlevelled playing field.

Thus, a litigation battle started to the point that a presidential bill to amend the General Constitution was introduced to Congress in order to place the energy sovereign vision at all costs. This time, the bill was rejected by a newly instated political opposition, deepening the ideological polarization.

In any case, most of the arguments against the Hydrocarbon Law amendments have not been fruitful yet and might not be soon either. These

amendments do not affect the upstream sector, only the midstream and downstream sectors; nevertheless, a standoff in the value chain continues.

However, in the case of the Law of the Electricity Industry, specialized Judges on competition affairs took jurisdiction. They started ruling in favor of the investors and granted temporary injunctions against the government. At the same time, the aforesaid amendments were challenged by the lawmakers and other public entities by filing an unconstitutional action before the Supreme Court of Justice. The Court decided that the amendments were generally constitutional but recognized the jurisdiction of lower courts to rule upon individual cases. Specialized Judges on competition keep ruling in favor of the investors, arguing environmental damages, lack of competition, and discriminatory treatment.

It is likely that, once again, the Supreme Court of Justice will rule some concrete cases derived from the Law of the Electricity Industry. However, the criteria of Supreme Court Justices and their individual votes might be hard to be change, so they might defer in favor of the energy sovereignty vision.

At the international level, the United States and Canada have initiated consultations in accordance with the USMCA, arguing Mexico's breach of treatment standards. If unsuccessful, an arbitral tribunal will proceed to decide the scope and effects of the energy sovereignty vision among trade partners. Retaliatory measures, as tariffs, might hinder the Mexican economy if a settlement is not reached.

Current polls suggest that Mexicans would prefer energy sovereignty over investments protected by the T-MEC (USMCA), but those may be biased, since costs of indemnifications are not being considered into the discussion yet.

David Yergin anticipates struggles over climate, more tensions, and a fragmenting global order as drivers of the clash of nations, but it can also be called the clash of visions, or even better, the clash of notions, or why not, the clash of ideologies, as opposed to the agreement of visions, the concurrence of notions, or the assent of ideologies. In one word, reconciliation, needed to accomplish the greater good of the Mexican people and future generations.

I am grateful for the opportunity to preface this book, which will be of great benefit to the academic community. I am honored.

Miguel Ángel MARMOLEJO CERVANTES
Summer, 2022

INTRODUCTION

I have the honor to introduce the collective work entitled *Lessons in Energy Law in Mexico*, directed by Dr. Marisol Anglés Hernández and Dr. Margarita Palomino Guerrero, as the first book arising from an exchange of knowledge in the context of the Interdisciplinary Diploma Course in Energy Law, taught at the UNAM Institute of Legal Research.

Both the novice and the expert reader in the field of energy hold in their hands a work that has gathered the experience of qualified law experts, researchers, chemists and members of the Energy Regulatory Commission and the Ministry of Energy, who have come together to combine theoretical and practical knowledge from a multidisciplinary perspective. In keeping with our times, the approach taken for any energy issue must be based on a holistic perspective of sustainable development, which is why it includes legal, economic, technical and environmental considerations.

This reflects the coordinators' views in conceiving the work as an important academic contribution, geared to appear at a critical moment in Mexican history. After the structural changes carried out in 2013 and 2014, things could head in a new direction during the 2018-2024 administration.

The contribution of this publication is not limited to enriching the national bibliographic archive, which in itself would justify its existence, but by addressing the issues at a time of change —uncertainties and risks that are politically and legally related to energy, without forgetting the dizzying technological advances and environmental commitments— this book fuels a debate that has just only started.

Mexico might currently be facing a threefold challenge. The first, from a State perspective, concerns compliance with acquired rights, regulatory stability and legitimate trust, i.e., legal certainty in the broadest sense, on the one hand, and energy sovereignty, political reforms and regulatory changes, on the other.

The second, from a market perspective, seeks to achieve economic efficiency, the best use of renewable sources of energy without an abrupt departure from conventional sources and the enhancement of R&D&I, on one hand, and to guarantee universal, safe and affordable access to sustain-

able energy, the use of distributed generation to ensure supply to all users and the advancement of digitalization, especially with the Internet of Things (IoT), to better exploit energy efficiency, on the other.

The third, from an environmental and social perspective, international commitments are addressed, such as the Sustainable Development Goals, specifically those regarding energy (seven) and climate action (thirteen) with the latter reinforced in the framework of COP21; the guidelines set out by the Inter-American Court of Human Rights in Advisory Opinion OC-23/17 of November 15, 2017, on the environment and human rights and the implementation of the Escazu Agreement. On the other hand, there is the reduction of poverty in all its forms, including energy poverty, contributions to social cohesion and the guaranteed exercise of the human right to energy once the theory of its effective recognition has been consolidated.

The above is presented in the context of the Fourth Industrial Revolution, in which it is expected that conventional energy sources will be used alongside renewable ones during the transition stage, and that the latter will gradually take the place of the former in the process of decarbonizing the economy until the brown economy disappears altogether and is replaced by a new green economy.

Given that Mexico has recently revised the North American Free Trade Agreement (NAFTA), as well as amended the Free Trade Agreement between Mexico and the European Union (EU-Mexico-FTA), these observations have been formulated in a dozen essays centered on the following topics.

The chapter entitled “The US Energy Revolution: Energy Dominance in the North American Region” by Rosío Vargas explains how the United States of America has become a dominant player in the international oil and regional gas markets by increasing the production of unconventional oil & gas. Rosío Vargas holds that by collaborating with Canada and Mexico, the Trump administration has banked on energy dominance and energy security in gas with the latter’s energy reform as a gateway to U.S. expansion in Mexico and the rest of Latin America. She warns that while the United States of America has a strategic vision, Mexico has removed the status of oil and electricity industries as strategic, settling for a market-centered vision, reduced to becoming a country reliant on and importing the different types of energy generated by its northern neighbor. On the other hand, she notes that the separation of industry-related activities and vertical disintegration affect economies of scale, which poses considerable risk to energy security and national sovereignty. She also affirms that Mexicans will pay for the construction of the new energy market. Vargas is of the opinion that

only by becoming aware of what is happening will it be possible to change its course.

In “The Energy Reform and the Transformation of Public Law”, Jaime Cárdenas argues that the energy reform in Mexico came about in the context of a neoliberal State that changed the pre-existing development model implemented in the late 1930s. At that time and because of successive constitutional reforms, the State took on exclusive and exclusionary ownership of energy resources and activities, leaving all private companies in the sector playing a secondary role. The 2013 constitutional reform changed those paradigms and, in addition to shifting the sector from public to private, liberalized it and introduced new regulations that stimulate competition between national and foreign economic operators, for both national and international markets. This reform was further developed with the secondary laws enacted in 2014, leading to the dismantling of the State, the privatization of public law, the reduction of the welfare State to a minimum and the subordination of Mexico to the geostrategic interests of the United States of America.

Written by Guillermo Zúñiga Martínez, “New Energy Model, Market Failures as a Basic Principle of Regulatory Legitimacy” explains how the different energy subsectors have been shaped to create a new energy model in which the State, once it relinquishes its role as a business leader, cannot disappear, but is called upon to intervene between the various economic agents as a regulator, especially when the market presents failures, hampering, discouraging or simply not allowing effective competition or economic efficiency. The new regulatory policy calls for strengthening technical and impartial institutions, moving away from the political and economic pressures of individuals. The arrival of new economic agents creates a competitive environment with new products and dissolves old State monopolies. The new wholesale electricity market has generated substantial savings for large consumers through better negotiations for supplying energy. On the other hand, public consultation, particularly with indigenous communities, has led to a better understanding of their needs and planning the project in a way that is compatible with such needs. In short, it has been necessary to redesign energy markets and come to understand them in order to intervene in a way that guarantees their effective operation.

The chapter on “The Energy Transition to Clean Technologies: A Driving Force for Mexico’s Development” submitted by Guillermo Ignacio García Alcocer, recalls that the energy transition in Mexico is not isolated, but is part of a global process. Decarbonization should not be undertaken at the expense of sustainable economic growth. Energy efficiency contributes

to reducing energy poverty and improves access to energy. With the policies developed since 2000, the foundations have been laid for the energy transition currently underway.

In “Wind Energy in Mexico: An Analysis of the Technical and Regulatory Challenges”, Luis Guillermo Pineda Bernal asserts that the decarbonization of economies is the result of the serious environmental and social effects caused by climate change resulting, among other things, from greenhouse gas emissions. Mexico has made commitments to mitigate climate change, reduce greenhouse gas emissions, use renewable energies and provide universal access to electricity services. In the case of regulating renewable energies, wind energy in particular, legal certainty and regulatory stability are highly valued by investors. Moreover, any entry barriers that are not essential for encouraging investment and project development must be eliminated. Regulations must guarantee the right to consultation and free, prior and informed consent, in addition to being accompanied by oversight mechanisms to ensure compliance. The new political period is an opportunity to advance in the consolidation of the new energy sector, but it must be done in compliance with the rule of law since it has been precisely the lack of security that has driven away new investments.

“Considerations on a Comprehensive Regulatory Framework for Energy Storage in Mexico” contains a proposal put forward by Cecilia Montserrat Ramiro Ximénez. Mexico has a great potential for sources of renewable energy due to its geographic location; however, their exploitation is still low. A climate action policy that prioritizes renewable energies, especially those that may be intermittent, should bear this in mind when designing regulatory instruments. This is precisely the scenario in which electricity storage plays a key role in determining how generation and demand can be coordinated when they do not occur at the same time. In other words, energy must be collected and stored to be used when needed. Storage contributes to increasing energy security, empowering end users, and boosting distributed generation while also constituting an asset for transmission and distribution. The challenges of storage are to redefine them as multipurpose in nature; to develop a methodology for related services not included in the market; to coordinate efforts among the competent authorities to establish regulated rates for transmission and distribution activities; to create a methodology that identifies the best alternatives so that transmission and distribution services are technologically neutral and that the storage used as a grid asset can offer services to the market without compromising the efficient operation of the grid; to classify the services that can be provided; to review the market instruments and to modify any that may be necessary.

In the chapter entitled “Universal Access to Electricity as a Strategy to Close Socioeconomic Gaps in Mexico”, Neus Peniche Sala begins by highlighting the fact that the new regulatory framework, in addition to covering large projects and investments, provides specific alternatives that help reduce ecological footprints and boost economic development. Energy poverty has a significant impact on poverty within countries, which is why guaranteeing access to energy is essential to reducing poverty. Although taking energy to rural or isolated areas may not be appealing from an economic point of view, from a social perspective there are benefits that could be enhanced with the introduction of high-efficiency energy technologies, as well as the use of decentralized sources of renewable energies, which will lead to the strengthening and effective exercise of human rights. Even though the new energy model is in place, it needs to be geared more inclusively to improve people’s quality of life. Hence, it is advisable to comprehensively plan the design and instrumentation of public policies that help meet the country’s energy needs and lead to long-term global planning to guarantee sustainable energy consumption.

The chapter on “The Taxonomy of Upstream Contracts in Mexico’s Hydrocarbons Industry” was contributed by Iván Lázaro Sánchez. Contracts for hydrocarbons exploration and extraction are hybrid in that they have a special regime. Since public law is paramount for entering into contracts and private law is preeminent for their execution, according to the customary international legal framework which requires defining contracts in the scope of energy law as an autonomous branch of legal science. This leads to an analysis of the importance of *lex mercatoria* (genus) and, within them, *lex petrolea* (species), as international regulatory instruments that govern oil industry business. This new legal framework stimulates the market economy and encourages private participation and investment, which must be governed by the above instruments and the contractual rules formalized with the State and guaranteeing the sustainability of the energy industry in Mexico.

In the chapter “Hydrocarbons Crimes: An Analysis of the Law”, Erika Bardales Lazcano begins by advocating the reversal of the premises currently used, in the sense that the idea of privatizing oil should be abandoned, and instead suggests the idea that profits from Mexican oil should be optimized. There is currently a federal law to prevent and punish hydrocarbons-related offenses, and is jointly implemented by federal, local, municipal and sector authorities. However, although the law is well-intentioned, it seems not to be fulfilling its objective of prevention, especially because in the case of public officials, the punishment is so insignificant that it does not

discourage corruption, hence the proposals to reform the law to improve its shortcomings.

“Limits on the Implementation of the Principle of Legitimate Expectations in the Field of Hydrocarbons” is the title of the research carried out by Margarita Palomino Guerrero and Héctor Alejandro Martínez Durán. The authors of this chapter raise the question of whether the legally protected right to the irrevocability of provisions based on the principle of legitimate expectations is applicable to contractors in the hydrocarbons sector. The initial response is that if the authority was obliged not to change the regulatory conditions to protect the operators of a sector like hydrocarbons contractors, it would harm the community without responding to the social reality since the rule has been petrified. The principle of legitimate expectations is subordinated to the constitutional principle of legal certainty. An expectation is a hope that something will happen, but it does not constitute an acquired right, nor does it constitute the public interest protected by public authorities. Mexican courts have recognized that legitimate trust implies the protection of a reasonable expectation, created for a private individual and closely related to the unilateral irrevocability of administrative acts in favor of beneficiaries. This principle does not prevent modifications to a regulatory framework indefinitely, but it does mean that new provisions are not applied retroactively to legal situations established in the past. Thus, in the hydrocarbons sector, the principle of legitimate expectations does not affect the acts of lawmakers and even less the right to compensation. If the Regulatory Energy Commission does modify the formula for calculating prices or tariffs in order to update it, it does not imply changes to the contracts signed with hydrocarbons operators.

The chapter on “The Mexican Oil & Gas Sector: Between Environmental Progressivity and Regression” contains the observations of Marisol Anglés Hernández, who holds that although the energy reform retains State ownership over natural resources, this changes once they are extracted. In the same way, a new administrative institutional framework has been created, based on provisions that have disregarded the principles of the separation of powers, regularity, legality and the rule of law, as well as those interconnected with sustainable development and the guarantee of human rights to a healthy environment and water, which may even compromise progressivity and, therefore, the international responsibility of the Mexican State.

Moreover, by pushing an economic model of fossil fuel exploration and extraction, Mexico fails to comply with its commitments under the United Nations Framework Convention and the Paris Agreement to reduce green-

house gas emissions, thus increasing the vulnerability of populations and ecosystems. The reform also establishes a new administrative organization vertically integrated into the federal government, thereby contravening the human right to good governance. It likewise finds that environmental protection in the hydrocarbons sectors is obscure and undemocratic because it does not guarantee participation, access to public information or environmental justice, which must be rectified under the rule of law. In addition, the international obligations under the Inter-American System of Human Rights mandate respect for the human rights of the inhabitants of the communities or geographic areas where the exploitation of natural resources is carried out. Lastly, it is observed that the energy reform in the oil and gas sector is regressive since the regulations of the General Law of Ecological Equilibrium and Environmental Protection in matters of Ecological Planning violates the principles of legality, legal reserve and hierarchical subordination.

Written by María de las Nieves Carbonell León, the chapter entitled “Climate Change, Energy Transition Policy in Mexico and the Promotion of the Use of Natural Gas” completes the repertoire of collaborations. In it, Carbonell León points out that climate change is currently one of the greatest problems humankind faces and is threatening the world as we know it if nothing is done to stop or bring it under control. In the Mexican case, this situation implies examining the Energy Transition Law, which is intended to regulate the sustainable use of energy, clean energy commitments and the reduction of polluting energies in the electricity industry. Based on energy and climate policies, a cross-sectional analysis of the law leads to conclude that the use of natural gas is being encouraged, by prioritizing this fuel in the substitution of solid and liquid fuels. Natural gas generates a large amount of methane emissions with a global warming potential higher than carbon dioxide, which will result in an increase in the planet’s average temperature and the alteration of the climate system. In conclusion, it is about reluctance to make a real paradigm shift in the energy matrix, when what is really needed is a genuine decarbonization of the economy; the adoption of an effectively sustainable model, fully committed to protect the environment; efficient consumption and encouraging the use of renewable energy sources.

It has been a privilege to have the opportunity to read these works before their publication. In addition to showing the paths the energy sector is taking, they give those of us outside Mexico the possibility to learn about the crossroads where Mexicans find themselves. From that point, we can reflect on what may happen in the medium and long-term.

I do not want to end without first congratulating the coordinators and all the authors for the work they have undertaken and successfully carried out. I would also like to take this opportunity to express the hope that this collective work is the first of a collection of many other publications stemming from discussions and sharing knowledge generated at the Interdisciplinary Diploma Course in Energy Law taught at the Institute of Legal Research of the National Autonomous University of Mexico.

I would also like to thank all the authors because, on having written such wonderful papers, they have given me the opportunity to write the introduction to this outstanding work.

I invite energy operators to read and to reflect on international treaties, secondary legislation, the general principles of law, rulings, arbitration awards and scientific research in the spirit of constructive criticism and in the light of the Political Constitution of the United Mexican States. In that way, the ongoing conversation that should take place between the various political, legal, academic, economic, technical and environmental actors may enable the energy sector to move forward with better regulation, ensuring access to adequate energy services to satisfy the needs of all Mexicans across the board and guaranteeing the effective exercise of human rights.

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PART ONE
THE ENERGY REFORM AND TRANSFORMATION
OF PUBLIC LAW

THE US ENERGY REVOLUTION: ENERGY DOMINANCE IN THE NORTH AMERICAN REGION

Rosío VARGAS*

SUMMARY: I. *Introduction*. II. *Energy in the US presidential strategy*. III. *The National Security Strategy of the Donald Trump Administration*. IV. *Energy as the basis for economic power*. V. *The Joe Biden administration and the global energy crisis (2022)*. VI. *Conclusions*. VII. *Bibliography*.

I. INTRODUCTION

The scarcity of strategic natural resources has shaped the national security and defense policy of the United States of America (USA) since World War II.¹ Guaranteeing access to natural and mineral resources regarded as strategic has led the US government to include them as part of its strategic and defense projects since the first half of the 20th century. This goal would be embodied in its oil policy, its National Security Strategies, and its global foreign policy. Oil policy has been considered a matter of national security, basically because of the country's high dependence on foreign oil, and has contributed to setting US military policy,² because it compromises a number of aspects essential to the preservation and survival of the American way of life. For six decades, this issue has been present in determining US strategic security policy and military policy, and since 2001, it has been contemplated in the design of its energy security. Underlying this last point is US exploitation of non-conventional resources (lutite) as a response to its structural dependence on foreign oil supplies. For this reason, we maintain that the US hegemonic project seeks

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¹ Estenssoro, Fernando, "Escasez de recursos naturales y crisis ambiental como amenazas estratégicas a la seguridad de Estados Unidos. Las implicancias para América Latina en el siglo XXI", *Revista Estudios Avanzados*, Santiago de Chile, January 28, 2018, p. 170.

² Klare, Michael T., *Guerras por los recursos: el futuro escenario del conflicto global*, Barcelona, Urano, 2003, p. 28.

to reposition itself internationally using non-conventional fuels and management of technologies and investments in renewable and low-carbon energy.

The design of this international geostrategy incorporates Mexico and Canada by means of the North America project. Mexico's Energy Reform would assist in this project by maximizing the development of its energy potential, including the production of non-conventional³ and conventional fuels, as well as renewable energies. Non-conventional fuels⁴ deserve special attention as their potential was expected to be instrumental in explaining the Energy Reform (2013): to turn Mexico into a place to market surplus production from the USA (shale gas and tight oil derived from shale) as well as derivatives and petrochemical products. In 2020, this strategy would place Mexico as a producer of non-conventional fuel through the development projects of US companies. Even though Canada is part of this geostrategy, our interest centers on Mexico since the former has been widely studied and has a different structure and integration dynamics.

This paper gives priority to geopolitics⁵ as a theoretical approach by linking geography to political and geostrategic aspects⁶ of the US government. Although we also use the historical and descriptive research methods

³ Specialized literature considered following developments non-conventional: deep water exploration and production, some heavy crudes (orimulsion), Arctic oil, oil sands and shales and lutites. According to the International Energy Agency (IEA), non-conventional ones are also: liquid coal and natural gas; extra heavy oil; tar sands or bituminous sands; light tight oil and kerogen oil shale. See: Marzo, Mariano, "Petróleos no convencionales: recursos, previsiones de producción e impacto geopolítico de su desarrollo", *Informe estratégico de la fundación para la sostenibilidad energética y ambiental*, Fundación para la Sostenibilidad Energética y Ambiental, Barcelona, 2014, pp. 4-6, available at: http://www.funseam.com/phocadownload/petroleos_nc_mariano_marzo.pdf.

⁴ As for hydrocarbons, the conventional ones are those found in a porous and permeable rock from which they can flow to the surface when drilling the reservoir.

⁵ Geopolitics is the study of the effect of geography (human and physical) on international politics and international relations. It is a method of studying foreign policy to understand, explain and predict international political behavior through geographic variables. It is a science that deals with the science of spatial causality of political events and the upcoming or future effects thereof. It draws on other fields, such as history, international relations, political geography, political science, and sociology. Geopolitics focuses on political power linked to geographic space, particularly resources and land territory in correlation with diplomatic history. Academically, geopolitics analyzes history and social sciences from the perspective of geography and politics.

⁶ Academics and geopolitical theoreticians do not agree on a standard definition for geostrategy. Most definitions, however, combine strategic considerations with geopolitical factors. Geostrategy would involve comprehensive planning, allocating the means to reach national goals or secure assets of military or political import. Initially, the concept was almost exclusively tied to the military field. Today, in contrast, the term geostrategic has be-

to build the analysis, we rely on official sources of information from the USA and Mexico, as well as publications from US think tanks and news from Mexican and US media.

II. ENERGY IN THE US PRESIDENTIAL STRATEGY

In this article, we will focus on non-conventional resource development based on US Energy Agency (EIA) statistics. The US energy revolution, as it is known, refers to changes in the energy scene, which have been brought about by technological developments in the exploitation of hydrocarbons considered non-conventional.⁷ These resources were known since the early 20th century, but the technology to extract them did not yet exist. At the initiative of the US government in the early 1970s, private operators, the US Department of Energy (DOE) and the Gas Research Institute joined forces to develop technologies that would allow its exploitation. Due to these technological developments, the combined use of horizontal drilling and hydraulic fracturing made it possible to produce this fuel, which led to an increase in the national production parameters of non-conventional hydrocarbons (oil and natural gas).

With these new resources, dependence on foreign sources has gradually gone from being an issue of “national security” to a matter of energy security and has allowed the country to reach “self-sufficiency” and eventually become a net natural gas and oil exporter in 2017 and 2020, respectively (hydrocarbon exports are exceeding imports). However, this good news comes along with the adverse environmental impact involved in its exploitation in the USA.

1. *A change of paradigm?*

The USA already knew there were large amounts of resources (particularly shale) throughout its territory although its production was not eco-

come more generalized, referring to any rational series of actions aimed at achieving an end through the economic and less risky use of specific means available.

⁷ The production of non-conventional hydrocarbons differs from that of conventional fuels since the geological features of non-conventional fuels have very low levels of porosity and permeability because the fluids have a density that approaches or even exceeds that of water. Therefore, they cannot be produced, transported, or refined by conventional methods. The “difficulty” in their extraction is why, to date, the exploitation of hydrocarbons has focused almost exclusively on conventional hydrocarbons. In a conventional reservoir, hydrocarbons are stored in the pores, i.e., in the open spaces of the rock.

nomically viable. Technological developments have enabled its exploitation and changed the energy scene marked by a shortage of resources, as seen in the production decline curve of many oil and gas producing countries, which have already exceeded their peak oil. Having the technology that allows the exploitation of very large amounts of shale, now called technically recoverable resources (or prospective resources in Mexico), forms the basis for a new paradigm that purports to have overcome the shortage,⁸ which has led to new policies and actions. In the case of the USA and some other countries, this technology makes it possible to extract residual oil from the exploitation of conventional fossils, whose average recovery rate did not exceed 35%.⁹ Given this boom, it is fitting to point out that relying on “prospective or technically recoverable resources”, and not proven reserves, only guarantees about a 10% probability of converting them during production.

This change of perspective is dominated by the point of view of economists, who do not consider a production peak significant since the production curve can be replicated or extended with investments and technology. This ends up minimizing the importance of geology, as well as the decline and depletion of conventional reserves, by claiming that they are the same as non-conventional resources. The difference is enormous, above all because of the environmental and social costs, which are not internalized in the total.¹⁰

The monumental figures of non-conventional resources in trillions of barrels, quadrillions of British thermal units (BTUs), or in barrels of crude oil equivalent (BCOE) and those denominated technically recoverable, also have a political content, which is useful for promoting the adoption of fracking technology for exploration and exploitation around the world.¹¹ The U.S. Energy Information Administration (EIA) has contributed to this by magnifying its estimates. For instance, a study on the world's shale gas resources in 48 basins and 32 countries estimated an amount of 5,760 trillion cubic feet, a figure which has been used to promote investments and frack-

⁸ Maugeri, Leonardo, *Oil: The Next Revolution, The Unprecedented Upsurge of Oil Production Capacity and What It Means for the World*, Geopolitics of Energy Project, Harvard Kennedy School, June 2012, p. 16.

⁹ *Ibidem*, p. 13.

¹⁰ To illustrate the difference in resources, we can use the analogy that the rats have run out of cornflakes (conventional fuels) and have moved on to the cereal box (non-conventional fuels).

¹¹ In the USA, shale oil reserves have been overestimated by at least 100% and, between 400-500% by operators, according to actual production data presented in various states.

ing technology to thus encourage its development in other countries. In this study, Mexico was ranked 4th on the list of countries with this type of resource. It later dropped to 6th in gas and 8th in shale oil, which has not yet reached the category of proven reserves but is already required for investment projects.¹²

The USA is producing and consuming at record levels. Natural gas production has significantly increased by 50%¹³ over the past 10 years. The energy revolution is also boosting employment and the Gross National Product (GNP) by exploiting these resources. In the foreign market, it intends to turn the USA into an important gas exporter, selling it either through its pipeline or as Liquefied Natural Gas (LNG). It has placed its highest expectations on natural gas in the short- and long-term (2050). In the short-term, it expects to produce 5 mmb/d (natural gas liquids production) by 2023, which will stand at 5.5 mmb/d in 2050, under the reference scenario.¹⁴ The USA aims to become the third largest exporter by 2020 along with Qatar and Australia.

The growth in gas production has led to its being exported as LNG since February 2016, and therefore more regasification plants are being built and planned under the supervision of the US Federal Energy Regulatory Commission. More permits are required to build new liquified natural gas plants.

Despite this bonanza, not all US geologists are convinced of its enormous potential, as is the case with Arthur Berman¹⁵ and David Hughes. Others believe that the official DOE (EIA) figures are overestimated because of the methodologies with which they are calculated. The production of non-conventional fossil fuels may not be possible due to actual production

¹² Kuuskraa, Vello A. *et al.*, *EIA/ARI World Shale Gas and Shale Oil. Resource Assessment*, Prepared for U.S. Department of Energy, U.S. Energy Information Administration, EIA 2013 Energy Conference, Washington, D. C., June 17, 2013, p. 2.

¹³ Ladislav, Sara *et al.*, "U.S. Natural Gas in the Global Economy", *CSIS Center for Strategic and International Studies*, Washington, November 1, 2017, p. 1, available at: www.csis.org.

¹⁴ U.S. Energy Information Administration, *Annual Energy Outlook 2018 with Projections to 2050*, February 6, 2018, p. 43, available at: www.eia.gov/aeo.

¹⁵ Berman has published more than 20 articles and reports on shale gas plays, including the Barnett, Haynesville, Fayetteville, Marcellus, Bakken, and Eagle Ford lutes. Over the past four years, he has made more than 50 presentations to energy industry boards of directors and executives, committees, financial analyst conferences, oil and gas association meetings, and engineering and geological society meetings. He worked at Amoco Corporation (now BP p.l.c.) for 20 years and has been an independent consulting geologist for 17 years. He holds an M.S. (Geology) from the Colorado School of Mines and a B.A. (History) from Amherst College, available at: <http://www.artberman.com/about-art/>.

costs and other challenges.¹⁶ Scientist David Hughes of the Post Carbon Institute in California, believes that:

Over the short term, U.S. production of both shale gas and tight oil is projected to be robust-but a thorough review of production data from the major plays indicates that this will not be sustainable in the long term. These findings have clear implications for medium and long term supply, and hence current domestic and foreign policy discussions, which generally assume decades of U.S. oil and gas abundance.¹⁷

The underlying assumptions of the resource estimates are also questioned.¹⁸ In 2000, approximately 23,000 hydraulically fractured wells produced 102,000 barrels per day (b/d) of oil in the USA, which represents less than 2% of the national total. By 2015, the number of wells that used fracking grew to an estimated 300,000 and well production to over 4.3 million b/d, which is only 50% of total US oil production. However, a substantial number of wells are required to maintain production levels, and this would require permanent expansion and high drilling rates for tight oil (shale and lutite) production wells.

According to David Hughes, virtually all the producing regions in the USA have reached their peak production, except for the Permian Basin. The Organization of Petroleum Exporting Countries (OPEC) also considers certain limits. The limit for tight oil, which is the main contribution to the oil supply outside OPEC, is estimated for 2025, when it will reach its peak production. Global tight oil production will grow by 4.8 mmb/d be-

¹⁶ Hughes, David, *Drill Baby Drill. Can Unconventional Fuels Usher in a New Era of Energy Abundance?*, Santa Rosa California, Post Carbon Institute, February 2013, p. ii.

¹⁷ Hughes, David J., *Drilling Deeper. A Reality Check on U.S. Government Forecasts for a Lasting Tight Oil & Shale Gas Boom*, Santa Rosa, California, September 17, 2015, available at: <http://www.postcarbon.org/tight-oil-reality-check/>.

¹⁸ These assumptions might not be considering the short life (of the wells) and of the fact that they used as the basis for the official estimates that some specialists find questionable. Admittedly, the EIA's track record in estimating resources and projecting production and futures prices has historically been poor. Granted, forecasting this type of thing is very difficult, especially as it relates to changes concerning economic and technological realities. But the root of fundamental aspects like the geology of these works and changes are not very clear from one year to the next. However, there are major differences between benchmark cases in the AEO2015 and AEO2014 reports. With the exception of Eagle Ford, the EIA's projections for major tight oil plays have significantly shifted upward or downward. (Summarized by the author). Hughes, David J., *Shale Gas Reality Check. Revisiting the U.S. Department of Energy play-by-play Forecast through 2040 From Annual Energy Outlook 2015*, California, Post Carbon Institute, 2015, p. 20.

tween 2016 and 2022, mostly in the USA, before declining around 2030.¹⁹ In the estimates of the most recent US Department of Energy publication, the maximum production volume will be between 7/8 mmb/d and will take place in 2040 to then begin decreasing slightly in 2050.²⁰

Even when the outlook in the USA is extremely optimistic, it should not be forgotten that this is a non-renewable resource with a production curve limited to 4 or 5 years, a fact that should be taken into account in light of the large investments in associated infrastructure.

2. *Think tank project*

The most important Washington “think tanks” are involved in designing the geopolitics of US shale,²¹ as are numerous government agencies. On the US government side, the leadership of the geostrategy is in the hands of the Global Shale Gas Initiative (GSGI), launched in April 2010, with the participation of the Department of State (DOS) which is the leading agency in promoting it internationally along with the other government partners, such as the Agency for International Development (USAID); the Department of the Interior (DOI); the US Geological Survey (USGS); the DOI Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE); the Department of Commerce; the Commercial Law Development Program (CLDP); the Environmental Protection Agency (EPA) and the Department of Energy.

In the case of the Department of Defense (DOD), leaked documents from Washington think tanks have raised security concerns regarding geographical supply and demand points for the resource, i.e., logistics while also exhibiting the evolution of proposals for early developments in shale gas. Once believed to offer a certain “leeway”, it is now accepted that these resources strengthen the economy and will serve to retain power before rival powers.

In order to encourage renewable energies, the USA promotes them by granting tax credits for investment and their production in its territory. In general, the changes in energy industries and markets are considered

¹⁹ Organization of Petroleum Exporting Countries, *2017 World Oil Outlook 2040*, Vienna, October 2017, p. 18.

²⁰ U.S. Energy Information Administration, *Annual Energy Outlook 2018 with Projections...*, *op. cit.*, p. 45.

²¹ For instance: Manning, Robert A., *The Shale Revolution and the New Geopolitics of Energy*, Washington, Atlantic Council, 2014.

transcendental factors capable of impacting US security and national interests.²²

In the scope of domestic policy, the Obama administration scored success in estimating its attaining “energy independence” by 2028, a date widely surpassed. Even in 2013 and 2014, the gap between consumption and production accounted for 37 and 32%, respectively, in terms of import dependence. This did not ensure the extent of oil autarky,²³ but as production has increased, the date of its occurrence was brought forward to 2016 and 2022, according to the 2018 Department of Energy report. The goal of narrowing the dependency gap was a political milestone in the Obama administration,²⁴ and the Trump administration later used it to estimate that the exports would surpass imports in 2022.

With regard to crude oil production in the baseline scenario, maximum total crude production (including non-conventional oil) was projected for 2020, which corresponds to the minimum level of imports for the USA.²⁵ However, these figures have also changed over time. A clear indication of the limits of the non-conventional resources is that, according to international reports, humankind will return to conventional OPEC hydrocarbon production between 2030 and 2040.

3. 2010 and 2015 National Security Strategies

National Security Strategies (NSSs) have been praised and defended by many US presidents at times of uncertainty in the international oil scenario and market. The Executive Branch is required to prepare one when requested to do so by Congress for the purpose of making government body or agency actions compatible with the guidelines set forth by the White House.

²² Pascual, Carlos, *The New Geopolitics of Energy*, New York, Columbia University (SIPA), 2015, p. 6.

²³ The change in the energy scene shows an upward trend in tight oil and shale gas production with a maximum output in 2020 set as the baseline scenario. The counterpoint of this curve corresponds to the trend of imports declining over time, reaching a minimum around 2020.

²⁴ Vargas, Rosío, “El Shale gas, un proyecto geopolítico de cobertura mundial”, *Revista Petroquímex*, Year 12, No. 78, November-December 2015, pp. 16-22.

²⁵ DOE/EIA, “U.S. Dry Shale Gas Production”, available at: http://www.eia.gov/energy_in_brief/article/shale_in_the_united_states.cfm, and “U.S: Tight Oil Production Selected Plays”, available at: http://www.eia.gov/energy_in_brief/article/shale_in_the_united_states.cfm.

On analyzing the 2010 NSS, it is possible to find elements of continuity with regard to the sections in the 2002 and 2006 strategies alluding to the pursuit of energy security, due to the importance of oil and the global situation. The 2010 and 2015 NSSs place particular emphasis on the issue of homeland security—which is also compared to national security—and on the greater importance given to the resources of diplomacy over military power.²⁶

The 2010 NSS calls for the adoption of a “more pragmatic and shared leadership” that seeks greater global stability, the strengthening of the international system, the recognition of new non-State actors on the international scene and the integration of the concepts of national security and homeland security. References to energy security in Chapter I, entitled “Overview of National Security Strategy”, state that one of the keys to integrating domestic security and national security is the need to develop “new sources of energy [that] will reduce our dependence on foreign oil”.²⁷ This mention in the first pages of the document demonstrates the importance that the energy policy merits as a matter of national security for the USA.

Likewise, it validates the focus on developing resources other than fossil fuels by highlighting the priority of “transform[ing] the way that we use” and the need for “diversifying supplies, investing in innovation and deploying clean energy technologies”.²⁸

As a net importer, the USA seeks security and the free flow of energy resources on a global scale. The justification for this policy is closely related to reducing the country’s vulnerability to possible interruptions in the supply of energy resources, especially oil, as it constitutes a situation that “will continue to undermine [US] security and prosperity”.²⁹

Considering regions and countries, the role that the NSS accords to the Middle East in terms of ensuring secure access to energy in this region is central, albeit not as much for the USA as for the global market.

As far as the Western hemisphere is concerned, the role the 2010 NSS gives to the Americas is important to achieving the energy security objectives. To this end, the USA would leverage geographic proximity, market integration and energy interdependence in its implementation.

²⁶ Arteaga, Félix, *La estrategia de seguridad nacional del presidente Obama*, Real Instituto Elcano, 2010, available at: http://www.realinstitutoelcano.org/wps/portal/rielcano_es/contenido?WCM_GLOBAL_CONTEXT=/elcano/elcano_es/zonas_es/eeuu-dialogo+trasatlantico/ari104-2010.

²⁷ The White House, *National Security Strategy*, Washington, The White House, 2010, p. 2, available at: <http://nssarchive.us/NSSR/2010.pdf>.

²⁸ *Ibidem*, p. 10.

²⁹ *Ibidem*, p. 30.

Moving towards a new industrial revolution focused on developing clean energy is offered as a solution throughout the document, thus showing President Obama's intention to use renewable energy to solve the problem of energy dependence by increasing investment in renewable energy research and development. This would serve the dual purpose of positioning the USA as an international leader while at the same time contributing to a reduction in fossil fuel consumption, demonstrating a different approach to achieve this goal than historically has been the case.

The self-perception that the country has improved its global leadership was embodied in the NSS prepared by the White House and published in February 2015,³⁰ a document in which the USA acknowledges its "indispensable leadership" on a global level. This new position comes from the validation of an energy potential that has made the USA the world leader in oil and gas production. The NSS asserts that the country's resources have no limits thanks to technology, and the latter is seen as a tool to change borders. With this boost, energy security is therefore redrawn under a global and long-term perspective; it is not limited to non-conventional resources since it also incorporates renewable energies and, in general, low-carbon fuels, as seen in the NSS:

Greater energy security and independence within the Americas is central to these efforts. We will also stay engaged with global suppliers and our partners to reduce the potential for energy-related conflict in places like the Arctic and Asia. Our energy security will be further enhanced by living up to commitments made in the Rome Declaration and through our all-of-the-above energy strategy for a low-carbon world. We will continue to develop American fossil resources while becoming a more efficient country that develops cleaner, alternative fuels and vehicles. We are demonstrating that America can and will lead the global economy while reducing our emissions.³¹

The 2015 NSS is a document that follows practically the same structure as the previous one (2010) with the same sections on security, prosperity, values, and international order. The introduction points to the relationship between arresting climate change and enhancing US energy security. The breaking point can be seen in the reference to US production, championing

³⁰ The White House, "National Security Strategy", *op. cit.*, June 2015, available at: <http://www.elnuevoherald.com/noticias/estados-unidos/article9474065.html>; http://fride.org/descarga/PB194_The_2015_US_National_Security_Strategy.pdf, and https://www.whitehouse.gov/sites/default/files/docs/2015_national_security_strategy.pdf.

³¹ *Ibidem*, p. 16.

the status the USA has gained in the international oil market where it boasts being the “world leader in oil and gas production”.³²

The NSS includes the collective needs of the USA, its allies, and its trading partners, which responds to an expanded approach to energy security, with a view to ensuring secure and reliable access to energy resources on a global scale. It is a common strategy among its allies to defend the free flow of energy and to encourage and reinforce cooperation and market expansion. This enhanced understanding of energy security is a strategy of energy consuming countries, especially those that are part of the International Energy Agency (IEA).

The 2015 NSS emphasizes the impact the so-called US “energy revolution” has had, insofar as it has already led the country to position itself prominently in the international oil market, given its levels of production and demand. This situation had led to a change of focus in the country’s oil policy, by shifting the discourse of “American exceptionalism” to the energy sector.

4. *The Regional Strategy: North America*

As the abundance of non-conventional fossil fuels grows, the concept of energy security for the region changes, according to Carlos Pascual:³³ the US relies on North American supply. In the US strategy, the integration of the North American region is meant to ensure regional energy security by incorporating its neighbors. However, its approach to regional energy security is biased in that it draws on only three components of energy security: availability, reliability, and low economic cost. This definition overlooks the environmental factor for which renewable energies are intended to compensate. The argument is that with this “revolution” we are moving towards a more sustainable planet.

Given the devastating effects of fracking production, we believe that there is no such compensation. It is clear, however, that it ignores all of the non-internalized environmental effects³⁴ and costs nor does it question the greater

³² The White House, “National Security Strategy”, Washington D. C., The White House, 2015, p. 16, available at: <http://nssarchive.us/wp-content/uploads/2015/02/2015.pdf>.

³³ Pascual, Carlos, *The New Geopolitics...*, *op. cit.*, p. 6. Mr. Carlos Pascual is a former US Ambassador to Mexico. He was also in charge of international energy affairs during Hillary Clinton’s tenure at the State Department. He is currently Vice President of the IHS-CERA consulting firm with offices in Mexico City, available at: https://www.energypolicy.columbia.edu/sites/default/files/The%20New%20Geopolitics%20of%20Energy_September%202015.pdf.

³⁴ For more about these properties and effects, see: Vargas, Rosío, *El papel de México en la integración y la seguridad energética de Norteamérica*, Mexico, CISAN-UNAM, 2014, *in extenso*.

amount of energy needed to obtain a barrel of non-conventional oil and gas (energy return on investment or EROI), or other social effects related to rights of way and property rights of indigenous communities.

In the case of Mexico, energy security is not ensured with fracking either because it does not yet have proven reserves, but only prospective resources. Even so, the production of non-conventional fuels in Mexico would start in 2020. According to the DOE, “[a]fter 2020, U.S. [natural gas] pipeline exports to Mexico gradually decrease, reflecting the initiation of new oil and natural gas production projects in Mexico and the increased use of renewables for electricity generation”.³⁵ This will legitimize the benefits of the energy reform that will attribute the restitution of collapsed levels of production and reserves to foreign investment.

Official information from Mexico does not correspond to estimates made by the DOE in the USA. The official Mexican statement endorses the use of fracking to the extent of stating that “Mexico has gas that PEMEX will not exploit,” at least not in the short-term, but its production has not yet arrived, and resources have not progressed towards the criterion of proven reserve. However, it should be noted that since 2015, production with fracking has already been underway in Sierra Norte de Puebla (233 wells in operation), not necessarily for lutite, but for marginal wells. There are 47 wells in Coahuila, 182 in Nuevo Leon, 13 in Tabasco, 100 in Tamaulipas and 349 in Veracruz. San Luis Potosi has 20 municipalities with concessions, from where water is expected to come to feed the Monterrey VI aqueduct that would then be used for fracking. The companies that drill with this technique are Halliburton, B. J. Service, Sowell Schlumberger, Baker Hughes and Diavaz. Exploitation could be higher, if we consider the one carried out in Chicontepec under the “Tertiary Gulf Project” where 1,323 drillings were carried out as multidirectional drilling, which is actually fracking.³⁶

In the short term, the predominant trend for Mexico is to import natural gas (88% of its national consumption in 2018), refined products (77.3% of gasoline for national consumption), and petrochemicals (70% for national consumption), as well as even “buying” 100,000 barrels of oil (light petroleum products from fracking). Consequently, we are heading towards a structural dependence on fuels, especially natural gas, because of its prevalence.

³⁵ U.S., DOE, EIA, *Annual Energy Outlook 2016, Early Release: Annotated Summary of Two Cases*, May 17, 2016, p. 55, available at: www.eia.gov.

³⁶ Olvera, Al-Dabi, “A México se le divide como un pastel. Las amenazas de fracking de empresas de EE. UU.”, R. T., July 9, 2016, available at: <https://actualidad.rt.com/actualidad/212699-mexico-fracking-gas-petroleo-eeuu#V4Gf3eq6FIM.gmail>.

5. *The participation of Canada and Mexico*

The energy revolution has also influenced the design of regional power originating in “North America”. In this case, the region’s participation lies in developing the resource potential that will make it the next big energy player in the world.

Here, the proposal is based on the fact that North America has the potential to surpass the Middle East as the world’s energy supplier. It consists of making the North American region a major global energy player by maximizing the oil production of US’s neighboring countries to achieve the production goal of 90 trillion BTUs by 2017.³⁷ Canada would participate with 6 mmb/d and Mexico would be able to revert its declining production trend through the Energy Reform, with which it could reach a production platform of 3.7 mmb/d by 2040.³⁸ This clearly shows the role the Energy Reform will play in achieving the great US project, where although the aim is productive, it goes hand in hand with financial and commercial objectives through oil contracts to be awarded.³⁹ By doing this, North America will gain global pre-eminence as an energy player, allowing the USA to challenge and compete with rival powers of the likes of China and Russia.

US government spokespersons are looking to maximize the benefits of the non-conventional resource boom by encouraging officials to devote time to finding ways to further integrate the energy markets of the three countries. Lifting the ban on US oil exports could help both Canada and Mexico by contributing to the approval for building the infrastructure for cross-border energy transportation. Mexico “benefits” from the same en-

³⁷ DOE/EIA, *Total Energy Supply, Disposition and Price Summary, Reference Case (2011.2040)*, Washington, EIA, 2011, p. 8.

³⁸ DOE/EIA, *International Energy Outlook*, Washington, September 2014, p. 17.

³⁹ According to the Department of Energy, the four new contract models differ from the former entitlement system and differ from each other in their fee and royalty structures. Service contracts are similar to the ones introduced as part of the 2008 energy reform. Under this arrangement, all crude produced is delivered by producers to the State in exchange for cash paid by the Mexican Petroleum Fund. License agreements, on the other hand, allow private producers to take the crude at the wellhead and arrange for it after paying the State. The profit-sharing and production-sharing contracts, as well as licenses, will effectively allow producers to book reserves and reflect the potential value of the oil in their accounts, a particularly attractive incentive for investment in Mexico’s energy sector. It is expected that the different types of contracts will be applied according to the degree of risk associated with specific projects. DOE/EIA, *International...*, *op. cit.*, p. 16.

ergy privileges and arrangements agreements as Canada within the context of the North American Free Trade Agreement (NAFTA).⁴⁰

It intends to go beyond what was agreed upon in NAFTA by capitalizing on investment opportunities availed from non-conventional oil and gas resources, as a result of Mexico's energy reform.⁴¹ It is understood that opening the upstream sector in Mexico will have significant implications in the USA.⁴² Thus, it is possible to see the link between Mexico's contribution to the regional energy supply and the Energy Reform.

Businesspeople see business opportunities in the extensive infrastructure that will have to be built on implementing the energy reform: pipelines, collection and processing infrastructure, export capacity, power generation, and meeting industrial and fuel transportation demands, among others. It is also expected that Mexico will become a shale gas producer by 2020. So, in the context of North America, the strategy would mean a geographical shift of production to maintain production levels,⁴³ which could then go to US refineries. This shows that the model of productive integration Mexico has followed with the US oil industry would not only not change but would tend to intensify while relinquishing its role as an operator in the national oil industry.

More than a couple of years after the energy reform was passed, substantial changes have been made in energy policy design, its institutions and the regulatory framework that will regulate the Mexican market. Along with this, the country is opening to US companies that use fracking, which means that there are winners and losers. In the USA, banks and fracking projects themselves are closely related to financial speculation associated with land. Wall Street spurred the frenzy of shale gas drilling, which led to prices lower than the cost of production and reaped huge profits from the resulting mergers and acquisitions. In Mexico, the winners are the financial consor-

⁴⁰ O'Sullivan, Meghan, "North American Energy Remakes the Geopolitical Landscape: Understanding and Advancing the Phenomenon", *Geopolitics of Energy Project*, Harvard University, Working Paper, May 31, 2014, p. 13.

⁴¹ Medlock III, Kenneth B., "The Land of Opportunity? Policy, Constraints, and Energy Security in North America", Working Paper at the James A. Baker III Institute for Public Policy, Rice University, Texas, June 2, 2014. p. 5.

⁴² *Ibidem*, p. 6.

⁴³ Current projections anticipate that US crude oil will level off and begin to decline around 2020, after rising by 800,000 barrels per day each year until 2016. AEO, Early Release Overview, EIA, 2014, p. 9; at "U.S. will Meet Energy Needs by 2020: Citi Researcher, Ben Geman, "Exxon Chief", cited by O'Sullivan, Meghan, *op. cit.*, p. 2, available at: <https://www.goldmansachs.com/insights/pages/north-american-energy-summit/reports/mos-north-america-energy-remakes-the-geopolitical-landscape.pdf>.

tium affiliated with US shale gas producers and the building of the massive Los Ramones pipeline to import gas to central Mexico (IENOVA and Sempra Energy), Black Rock financial company, to whom Mexican Petroleum (PEMEX) sold pipelines, as well as Texas producers and service companies that use fracking, such as Halliburton, which has been in Mexico for years.

The benefit for society as a whole is questionable. The companies that will be operating with fracking in Mexico are from the USA, so their multiplier effects will benefit other industries in the USA. Even if new jobs were to be created in Mexico, this would far from compensate for the environmental devastation, water waste and social costs associated with this type of production. Holistic analyses that consider winners and possible losers in its implementation are necessary.

III. THE NATIONAL SECURITY STRATEGY OF THE DONALD TRUMP ADMINISTRATION⁴⁴

In this new context, not only is energy considered part of security in the 2017 NSS, but it is used as an element of power insofar as the USA is recognized as an important oil player. Under the slogan of “America First”,⁴⁵ the USA is militarizing its energy policy⁴⁶ in its struggle against “rival” actors.

Under the Trump administration, the US national security strategy⁴⁷ has been unveiled in three different unclassified documents, at three different times and at different levels of detail:

- A National Security Strategy issued by the White House.
- A National Defense Strategy issued by the Department of Defense.
- The US defense budget requested from Congress for the 2019 fiscal year.

On this occasion, the White House NSS is a 68-page report that aims to pave the way for the USA to continue being the leader in world affairs.

⁴⁴ The White House, “National Security Strategy of the United States of America”, Washington D. C., The White House, December 2017, available at: <https://www.whitehouse.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf>.

⁴⁵ Vargas, Rosío, “«América primero»: La construcción de una potencia energética mundial”, *Revista Petroquímex*, Year 14, No. 89, September-October 2017, pp. 58-64.

⁴⁶ Vakhshouri, Sara, “The America First Energy Plan. Renewing the Confidence of American Energy Producers”, Washington, The Atlantic Council, August 17, 2017, p. 1.

⁴⁷ Cordesman, Anthony H., *U.S. National Security Strategy and the MENA Region*, Working Draft, Washington, CSIS, March 29, 2018, p. 1.

There are some differences compared to the Obama administration's NSSs that can be summarized in three important aspects:

1. The economy is considered an issue of national security in this version. The economic perspective is woven throughout the strategy, where trade has national security status. The NSS reports the existence of significant US trade imbalances with other countries and the economic aggression of countries like China and warns of the serious threat posed by this. It reiterates China's abusive business practices such as the theft of intellectual property from US companies. It clearly states that the USA will ensure that trade is "fair and reciprocal" and will not allow violations, abuses, or economic attacks. Furthermore, it promises changes to the rules governing the way foreign countries invest in the USA. It also addresses how to better protect R&D centers, such as universities, in order to safeguard US intellectual property.
2. It places "unprecedented" emphasis on national security where the issue of energy is one of the elements in deploying its competitiveness strategy. The document draws attention to China and Russia as two countries that challenge US power, influence and interests by attempting to erode its security and prosperity. It describes these powers as "rival actors". It particularly disqualifies Russian behavior around the world, including alleged violations of Ukrainian and Georgian sovereignty, as well as Russia's "attempt to undermine the legitimacy of democracies". According to the NSS, Russia uses information operations as part of its cyber efforts to influence public opinion across the globe, but the document also stresses the importance of cybersecurity.

Other threats come from "rogue regimes" like North Korea and Iran, as well as other less specific ones like terrorism. North Korea's nuclear weapons and ballistic missile activities have become the most pressing national security concern for the Trump administration. The "America First" strategy does not mean isolationism.

One issue that the 2017 NSS downplays is that of climate change. Its approach broke with the previous administration's assessment in the sense that climate change poses a threat to US national security. Instead, it refers to the low importance the administration gives to environmental issues in a section focused on the energy dominance, which includes the use of US domestic energy resources, including fossil fuels like coal, natural gas and oil. The decision to not recog-

nize climate change as a threat has materialized in the US president's action earlier this year to withdraw the USA from the Paris climate agreements, despite international criticism. Similarly, he has repealed a series of national environmental regulations and has deregulated others to push oil projects forward.⁴⁸

3. The NSS seems to be a response to the above concerns: protecting the homeland, the American way of life and the enforcement of immigration laws, which is why it reiterates the call for building a wall along the Mexican border.

In the NSS, President Trump shows his proclivity to interpreting the world under a “principled realism” in an “ever competitive world” where the issue of how to move objectives forward becomes important. He makes it very clear that his competitiveness strategy, “America First” goes beyond a campaign slogan to become a guiding force for international engagement in crafting US foreign policy. Homeland security is one of his principal concerns in terms of border security and missile defense. Mexico should react to the change of direction —not just discourse— of US policy towards Mexico and the world.

The NSS proposes that US allies and partners build up their power and assume a fair share of the responsibility to protect themselves against “common threats”. As in past NSSs (2010 and 2015), partners and allies are deemed important for the country's global expansion.

Following the same tone of the NSS,⁴⁹ the central challenge of the defense strategy is the revival of long-term strategic competition against Russia and China.⁵⁰ The Department of Defense and the Pentagon that outlined the 2018 National Defense Strategy, based on an assessment of a global security that takes place in a chaotic and competitive scenario, with a power structure and dynamics that are increasingly more challenging for US National Security. Faced with a technological panorama in which the USA believes its traditional strength is diminishing, it sees itself at a disadvantage because of its internal conflict which could constitute a high level

⁴⁸ Ashley Parker y Coral Davenport, “Donald Trump's Energy Plan: More Fossil Fuels and Fewer Rules”, *The New York Times*, available at: <https://www.nytimes.com/2016>.

⁴⁹ The 2017 NSS was a precursor to other laws also related to defense, such as the National Defense Strategy, the Nuclear Posture Review, the National Biodefense Strategy and the Ballistic Missile Defense Review, all of which have been published throughout 2018.

⁵⁰ U.S. Department of Defense, *Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge*, 2018, available at: <https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf>.

of vulnerability compared to its enemies. In this strategy, it is clear that the USA's main concern is national security for reasons of competitiveness against its rivals. Terrorism does not hold first place. Therefore, one of its defense objectives is to dissuade its adversaries from attacking its vital interests. These objectives are reflected in the Department of Defense budget⁵¹ (Key Budget Changes in FY2019), sent by President Trump to Congress for the 2019 fiscal year amounting to \$716 billion dollars for national security, of which \$686 billion dollars of which are for the Department of Defense. This request includes energy projects.

Trump's foreign policy:⁵² Energy dominance

As noted, under the Trump administration the “energy revolution” is a cornerstone in upholding the single-powered scheme against rival powers. In the December 2017 NSS, the USA proposes prosperity based on preserving its leadership in research and technology while protecting its economy and embracing energy dominance, freeing up an abundance of domestic energy resources to stimulate the economy.

It takes advantage of the power that oil resources give to it to strengthen its position in the international arena. Thus, the strategy of maximum extraction of hydrocarbons becomes part of the struggle for world domination. Maximizing production is an important pillar of the national security policy given that, for the first time in generations, the USA is an energy-dominant nation. Its energy dominance stems from its status as a producer, consumer and innovation leader that also boasts a resilient and secure infrastructure⁵³ and a diversified energy sector.

One of the key pillars of the proposal is the North American energy system, with cross-border energy trade and investment as part of building competitive industries for the USA, in an effort to maximize energy production in the region and thus reinforce its energy security. The pro-

⁵¹ U.S. Department of Defense, *U.S. Strategy and the MENA Region: Excerpts from the U.S. Department of Defense FY2019 Budget Overview*, Revised February 13, 2018, available at: <http://comptroller.defense.gov/budget-materials>.

⁵² In his book “The Great Chessboard”, Zbigniew Brzezinski sought to define the master plans of North American foreign policy that would allow the USA to continue to act as the only great global arbiter of international relations. Secondly, he wanted to convince the great American nation of how essential it is for the USA to retain its position as the only great dominant world power for world peace. At present, his proposal is to strengthen relations with Russia and China to work towards global stability.

⁵³ The White House, “National Security Strategy...”, *cit.*, 2017, p. 22.

posals go beyond achieving energy independence to become an export power. Therefore, it is important to remove any regulations and obstacles that prevent the increased production of non-conventional hydrocarbons and coal.⁵⁴ This policy also explains the Trump administration's retraction on environmental matters from policies and actions taken by his predecessor. Environmental commitments would be seen as obstacles to production maximization.

Despite having withdrawn from the Paris Agreement, the USA is attempting to continue shaping the world energy system by deeming it indispensable to counter an energy agenda that undermines its economic interests and energy security. It is therefore backtracking on its environmental commitments. The science underpinning environmental impacts has been reduced to fake science. It is based on denialist positions on the repercussions of polluting emissions and their effect on climate change. In general, climate denial opposes any stance that hinders energy projects in the USA.

Energy security is envisioned as expanding and diversifying energy sources, routes and supplies within the USA, as well as outside, through access to reliable and affordable energy and cutting-edge technology to continue to lead using "innovative and efficient" energy technologies.⁵⁵ As with the previous NSSs, it fails to meet the objective of an expanded energy security, which would allow allies and partners the possibility of supply and thus gain greater economic gains for the USA and a competitive advantage for its industries.

The limitations of a policy that seeks to become an export power are found both internally, to cover its own requirements, and externally, because it does not have adequate infrastructure to dominate international markets even though it can be seen as an expanding capacity.

Therefore, this strategy looks for support in the North American region in an attempt not only to gain markets for its oil and gas production, but also to secure energy resources from Mexico and Canada. To this end, a process of in-depth integration has been devised to create the capacity to

⁵⁴ In 2015, the Obama administration announced that it would allow oil and gas extraction off the Atlantic Coast, but the US Department of the Interior (DOI) overturned those plans in 2016. Now headed by former Republican representative Ryan Zinke, the department announced that it would open large tracts of federal areas to oil and gas extraction, including the coasts of Florida and California. The DOI's new five-year plan for continental shelf drilling is one of the largest expansions of drilling in years and includes areas that have been off limits for years, such as the Arctic wildlife refuge.

⁵⁵ *Ibidem*, p. 23.

satisfy domestic demand, guarantee energy security, and increase regional competitiveness in order to become an export power.⁵⁶

It is in North America where it will succeed in ensuring its energy security by strengthening integration with Canada and Mexico. Consequently, the North America project is in line with their strategic interests and energy dominance is plausible from a regional perspective. This is where the Trump administration's energy dominance strategy, Mexico's energy reform (2013) and the renegotiation of NAFTA are intertwined with the North American project.

In doing so, the United States would seek to use energy exports as an instrument to exert influence on recipient countries and compete for markets controlled by nations deemed hostile to its interests in the world such as Russia. The North American energy surplus would be used not only to balance the markets, but also to uphold the system of international alliances under its leadership; in other words, it would use energy as a geopolitical weapon. This geopolitical advantage would encourage foreign friends and partners to increasingly rely on the USA for their requirements, rather than buying from adversaries like Russia, Venezuela and/or Iran. Moreover, it enables the USA to offer its services "as a provider of energy resources, technologies and services around the world" under the pretense of helping its allies and partners become more "resilient". The Energy Dominance strategy is important in the Trump administration's assertion of power to consolidate its international supremacy, where hydrocarbons play a key role in bolstering US power, military strength, and geopolitical power.

The militarization of the energy policy will be pivotal to the national security policy with which the USA will compete with "rival" powers like China and Russia, according to NSS 2017. The "hard" part of this policy goes through the convergence of transnational oil and gas interests, their relationship with the Deep State and the industrial military complex in whose interest it is to perpetuate and stoke conflicts, as part of the business of selling weapons. The CIA, the Pentagon, the National Security Agency, and private companies, such as Booz Allen Hamilton, are all part of this web of interests.⁵⁷

In this context, the attempt to return to the Monroe Doctrine is worrisome, starting with former Secretary of State Rex Tillerson's tour of Latin

⁵⁶ Vargas, Rosío, "Dominio energético global estadounidense", *Revista Petroquímex*, ed. 91, February 27, 2018, p. 57, available at: <https://petroquimex.com/dominio-energetico-global-estadounidense/>.

⁵⁷ Fazio, Carlos, "Tillerson: la militarización y el petróleo", *La Jornada*, February 26, 2018, available at: <http://www.jornada.unam.mx/2018/02/12/opinion/021a1pol>.

American countries in an attempt to reinforce the alignment of their regional and local military forces, so as to enforce national security programs under the figure of public policy legislation—as in the case of Mexico’s internal security law—aimed at protecting the liberal transnational regime, as well as stimulating “regime change” policies and sanctions to countries not to its liking, as is the case of Venezuela. In the latter case, its importance for US dominance is not only related to the lack of submission to the hegemony of Washington and other Western countries, but also to the existence of vast oil reserves (almost 300,000 mmb of conventional oil), its strategic minerals, its biodiversity and other resources deemed important by the major powers.

Historically, the US oil industry has been studied as part of its national security, because of its strategic dependence on foreign oil and the need to ensure access to these resources. However, the turnaround that the USA has taken by becoming an energy power has not changed the strategic perspective under which it is analyzed. Furthermore, President Trump promises to use the power afforded by such resources to militarize the energy policy as part of his global geopolitics in an effort to sustain the single-powered scheme for world dominance.

IV. ENERGY AS THE BASIS FOR ECONOMIC POWER

1. *The price of oil and government budgets*⁵⁸

The power that the production of non-conventional fuels gives the USA lies in the capacity this trade has to alter the balance of the world market, fundamentally, because of its possibility of influencing the international oil market through the world supply and international energy prices.

The supply of non-conventional fossil fuels became the most novel single factor in the international oil market in 2014, as it was the cause behind the plunge in prices (2014 and 2015). Although in the international price market (IPM) the OPEC (30 mmb/d) is a prominent player, new participants (USA) have had major involvement through their new production by contributing to the total supply with 9.3 mmb/d—with, as mentioned above, 4.3 mmb/d coming from tight oil—and the rest from conventional oil, an amount that together and facing a drop in demand has led to the collapse of oil prices we are experiencing today. A 73% drop from the June

⁵⁸ An exchange of notes with Carlos Mendoza Potellá on this subject.

2014 price of the Mexican basket (its lowest level was \$18.90 d/b) makes it one of the biggest losers among producers.

With the IPM situation affecting many US oil companies and Arab nations, the OPEC and other non-OPEC countries signed an agreement in late 2016 to reduce oil extraction by 1.8 billion barrels per day, which was to last until the end of 2018.⁵⁹ With this, the OPEC expected to balance the market despite the sustained increase in the production of the USA, a country that has been able to overcome the crisis through its improved efficiency and its relationship with the financial sector.

In the IPM, the large production of non-conventional fossil fuels made it possible to use “energy as a political weapon” to advance US interests, along with those of its European allies in the G7. This has happened by flooding the IPM, bringing prices down, trying to weaken the finances and, in general, the economy of countries that are highly dependent on oil revenues (Russia, Venezuela, Iran, Iraq and Mexico). The USA has acknowledged this to be a goal during the Reagan administration.

The drop in the international price also affects hydrocarbon producers in developed countries and their companies, especially US tight oil producers since its production cost was high. Therefore, some independent producers left the market, but in general, most have survived owing to advantages and strengths, such as: an extensive resource base, support for technological innovation, investment environment, easy access to capital, and an enabling infrastructure, which has allowed them to weather the crisis of falling prices.⁶⁰ Moreover, they are convinced that the price will rise at some point. Their sense of abundance and the business opportunities that new production represents has led the US Congress to remove the ban on oil exports that had existed since the 1970s, imposed in the wake of the oil crises. This was done under the legal framework of H.R. 2029, the Consolidated Appropriations Act of 2016, also known as the Omnibus Appropriations Bill, which on December 18, 2015, the Obama administration repealed the 40-year-old security ban on exports of crude oil produced in the USA.⁶¹

⁵⁹ Reuters, “OPEC analiza prolongar aún más el acuerdo”, *El Economista*, December 13, 2017, available at: <https://www.eleconomista.com.mx/mercados/OPEC-analiza-prolongar-aun-mas-acuerdo-20171213-0109.html>.

⁶⁰ Donilon E., Thomas, “Remarks at the Center on Global Energy Policy School of International and Public Affairs”, Columbia University, January 21, 2015, available at: https://energypolicy.columbia.edu/sites/default/files/Remarks%20by%20Thomas%20Donilon_Columbia%20Center%20on%20Global%20Energy%20Policy_1.21.15.pdf.

⁶¹ Ban on U.S., Crude Oil Exports Repealed Energy Update December 2015, available at: <http://www.bakerbotts.com/ideas/publications/2015/12/ban-on-us-crude-oil-exports-repealed>; Spector,

The industry lobbied and made exports a “priority” by getting the bans that had been in place since 1975 removed. With this, the industry has already exported more than 150 million barrels of crude oil. While natural gas raises the highest expectations since the country, like Russia, Iran, and Saudi Arabia, is among those with the world’s largest gas reserves, in the case of the USA, it is non-conventional natural gas.

As can be seen, the success of the US production that began in 2008 contributed to the plunge in prices in June 2014, and its impact will continue to be felt insofar as US production reaches its goal,⁶² when the advantages as an exporter under the current Republican administration become more apparent given conditions, such as the following ones:

- Shale productivity is gaining between 3% and 10% per year from key plays, according to Goldman Sachs.
- Due to improvements in efficiency, they have managed to cut production costs, so that the breakeven US oil price has gone from \$85 d/b to \$40-60 d/b.⁶³
- The USA is not subject to any agency, alliance or organization that limits its national production, in light of its anti-monopoly law (Sherman Antitrust Act) which prevents US companies from entering into price regulation agreements. This will allow them to continue producing shale oil, seizing the financing opportunities in their country. Financial companies encourage, enable and reward short-term production growth despite the marginal economy of the project.
- On the other hand, most of the producers in the rest of the world, united in an organization that is seen as a cartel, have historically tried to defend the international price of hydrocarbons through the OPEC. On this occasion (2014) and also emphasizing its par-

Julian, “What the New Spending Bill Means for American Energy Consumption”, from the Atlantic CityLab, December 18, 2015, available at: <http://www.citylab.com/politics/2015/12/omnibus-spending-bill-congress-2016-budget-energy-oil-renewable/421254/>, and Bush, Jeb, “Making the Domestic Energy Boom Work for America and Its Allies”, October 2, 2015, available at: <http://www.nationalreview.com/article/425008/making-domestic-energy-boom-work-america-and-its-allies-jeb-bush>.

⁶² World Economic Forum, “The New Energy Equation”, 2018, available at: <https://www.youtube.com/watch?v=9ALs7jMYKY>.

⁶³ Kuuskraa, Vello, *Evolution of U.S. “Tight Oil” Development and Its Applicability to Other Global Plays*, Prepared for the short term Outlook for U.S. Tight Oil production, Center for Strategic and International Studies CSIS Energy & National Security Program, Washington D. C., February 27, 2018, p. 7.

ticipation in the market, the US Congress set up a commission to investigate anticompetitive practices in the OPEC.⁶⁴ The countries in this organization have the advantage of having lower production costs than those for oil and gas, but their fiscal dependence on oil revenues (fiscal breakeven price) makes them vulnerable when oil prices collapse. Furthermore, the USA has imposed sanctions on some of these countries (Venezuela), making their situation even more difficult in the face of a declining market price. Turning the USA into an export power is undoubtedly influencing international oil prices, by driving them down. In this sense, companies' business logic does not necessarily coincide with the strategy for energy dominance.

In this case, we are interested in the concept of fiscal breakeven price, which indicates as of what price the government budgets of countries highly dependent on oil trade revenues are affected. The global impact of oil and gas production is being felt through the increase in supply and the subsequent slump the international price of oil, which has affected major producers like Russia, Venezuela, Mexico, Iran, Ecuador, and others. To a lesser extent, it has affected Saudi Arabia and other Gulf producers —countries with high oil revenues— because of their large monetary reserves and low population density.

Although a high energy price is usually a cause for concern in terms of its impact on inflation and the economic growth, particularly for importers, it offers producers a better margin for fiscal management and influence over those with sovereign wealth funds. What really harms producing countries is a drop in international oil prices. In this case, producers experience serious financial problems, which vary from country to country, although in general these problems are lined to their production cost structure and the proportion of oil revenue in their government budget. As their income decreases, a series of tax adjustments are introduced to align spending. Consequently, investments in the oil industry are suspended or delayed.

Lower incomes mean that public companies in particular receive a smaller budget, thus delaying investment and laying off workers. In the case of private companies, the urgency arises from the need to have income and profits for the shareholders.

⁶⁴ *U.S. tight (shale) oil producers, which had steadily increased production since 2008 and contributed to a period of oversupply. H.R. 545 would establish a commission to investigate anti-competitive actions taken by OPEC (the bill had been previously introduced as H.R. 4559 in the 114th Congress).*

When debt levels rise, a strategy of acquisitions and mergers is implemented, even among transnationals. This has occurred with independent companies (shale gas and tight oil producers) which have been absorbed by the large US oil transnationals. A downturn in price can lead to important restructuring in the energy market which, due to the size of the companies, usually leads to a greater concentration of capital and technology.

A low oil price restricts long-term investments that guarantee the production of new barrels of oil in the future and even has the potential of driving high-cost producers out of the market. Hence, market balances can be narrowed per share.⁶⁵

The OPEC shift from a strategy of production cuts to one of defending market positions as of November 2014 responds to this differential in the cost structure, in which Saudi Arabia can extract a barrel of oil for \$9.9 d/b, Kuwait for \$8.50 d/b, Iraq for \$10.70 d/b, United Arab Emirates for \$12.30 d/b, Iran for \$12.60 d/b, Russia for \$17.20 d/b, Argelia for \$20.40 d/b, Venezuela for \$23.50 d/b, Libya for \$23.80 d/b, Kazakhstan for \$27.60 d/b and Mexico for \$29.1 d/b.⁶⁶

Competition among producers depends on its production cost structure and, therefore, the OPEC expects the price can recover by *natural selection* and not by cut-back intervention, i.e., the market balance by cutting production from higher-cost competitors. The ones with marginal cost are those from the USA, so they would be expected to be the first to break out. However, the USA is also the largest consumer worldwide and thus the effects of a price drop are twofold. Other beneficiaries include the United Kingdom and other European countries where the price of gasoline and other refined products, such as natural gas, is falling, thereby benefitting the economy in general with a substantial improvement in its competitiveness. A drop in oil prices contributes to the energy security of consuming countries by improving their market situation for additional purchases and filling their inventories, as well as making it possible for them to reduce their financial imbalances in their balance of payments.

As a result of the collapse of prices, investments in exploration have been dramatically scaled down since late 2014.⁶⁷

⁶⁵ CNN Money, "Petróleo: el costo de producir un barril", *CNN en español*, January 5, 2016, available at: <http://cnnespanol.cnn.com/2016/01/05/petroleo-el-costo-de-producir-un-barril/>.

⁶⁶ *Idem*.

⁶⁷ BBC, "Los países en los que es más barato y más caro producir petróleo", *BBC Economía*, January 20, 2016, available at: http://www.bbc.com/mundo/noticias/2016/01/160119_economia_paises_mas_caro_mas_barato_petroleo_lf.

This implies a risk of a shortage in coming years since, in order to keep production at the pace of demand, the International Energy Agency (IEA) estimates that investments of the order of \$900 billion per year are needed by 2030 (IEA, 2014). According to the Wood Mackenzie consulting firm, a study published in January 2016 on the 68 megaprojects that have been deferred found that “the United States, along with Canada, Angola, Kazakhstan, Nigeria and Norway are the nations with the most deferred production”.⁶⁸

While the economies of most countries are making budget cuts and facing stagnation with austerity policies, investments to cover the demand will unlikely be allocated to projects as long as the price remains low, both for increased hydrocarbon production and for renewable energies.

As can be seen, there is a contradiction between the expectations of the main importers who want low prices in the short term, and the need for long-term investment considering the time it takes between the exploration project and the actual commercial delivery of the first barrels of oil.

It is important to note that the financial intermediaries influence price formation, which affects the volatility and uncertainty of oil prices. A high energy price is the result not only of the policies of producing States, but also of the speculative interests of Wall Street and the City of London, that use *privileged information to magnify the risks and even exacerbate price collapses, thereby obtaining financial returns based on these expectations*. Additionally, international oil companies and some governments participate in the activities of the derivatives markets and obtain additional returns. The financial sector’s constant intervention in the oil market undermines one of the principles of orthodox economic theory: *free price system mechanism*.

2. The USA: An LNG Export Player

The exploitation of non-conventional resources gives the USA the possibility of becoming a major exporter of LNG worldwide, modifying trade routes and displacing competitors from their markets and controlling regional trade as well as infrastructure.

The countries with trade agreements with the USA would benefit from LNG exports, but this extends to others. Mexico is being considered for the construction of LNG plants to re-export gas to other countries, especially

⁶⁸ Fajardo, Luis, “Los megaproyectos que se esfumaron por la crisis del petróleo”, *BBC Mundo*, January 15, 2016, available at: http://www.bbc.com/mundo/noticias/2016/01/160114_economia_proyectos_cancelados_petroleo_lf.

Asian countries. Its potential poses a challenge to other major gas exporters like Russia and Qatar with whom the USA competes for the tremendous revenues earned from LNG production and trade. This is a very good business.

The competition for markets is currently centered in the European Union (EU), historically supplied by Russian gas (38%), which the USA seeks to supplant under the alleged objective of reducing its dependence on the Russians. This has materialized in recent sanctions (July 25, 2017) by the US Congress against Russia, Iran, and North Korea. These sanctions will prevent President Donald Trump from altering them without the approval of the US Congress since they constitute a bill. Although the sanctions are directed against Russia, its trade will actually be little affected because of its negligible importance. This is not the case for the EU and its companies, whose commercial invoicing is high, which means that they will be the ones to be truly affected, particularly Germany. Thus, its ministry of foreign affairs had declared that “We will not tolerate the imposition of US sanctions on European companies”.⁶⁹ Their displeasure has to do with the fact that the sanctions call into question the construction of the Nord Stream 2 gas pipeline that would deliver Russian gas to Germany and other EU countries. This would cancel seven more projects with the substantial participation of Russian companies (33%), such as Gazprom, Gazprom Neft, Surgeneft gaz, Rosneft and Lukoi, as well as private companies from Western countries like Shell, BP, ENI, and others from the EU.⁷⁰

Competition in the global LNG market has also affected Qatar, the world’s leading exporter of LNG. Its importance (77 MMTA)⁷¹ has been declining as the USA and Australia increase their production and their markets expand throughout the world. This expansion represented a surplus capacity of 32 MMTA in 2017 while major producers are expected to double total LNG trading capacity by 50% by 2020. In this context, Qatar is at a disadvantage, given the relative power of the other participants. The competition for markets partially explains diplomatic crisis in Qatar (June 28, 2017), between this country and the rest of the countries in the region led by Saudi Arabia. The incident was completely unexpected, but it can be

⁶⁹ Bensch, Fabrizio, “Alemania. No toleraremos la imposición de sanciones de EEUU a empresas europeas”, *Reuters*, July 28, 2017, available at: <https://actualidad.rt.com/actualidad/245536-sigmar-gabriel-sanciones-eeuu>.

⁷⁰ Duch, Juan Pablo, “Sanciones de EU abren nueva etapa de conflicto con Rusia”, *La Jornada*, July 27, 2017, p. 24.

⁷¹ MMTA = million tons per annum.

explained by the competing energy projects,⁷² such as the Saudi Arabia-Jordan and Israel oil pipeline, as well as another oil pipeline owned by Qatar-Iran-Syria and Turkey, all of which are competing for gas markets.

Compared to its competitors, Qatar holds an advantage in its production costs (it has the lowest in the world) and its trade routes. Its deliver cost is similar to the break-even price of Russia (\$5.20 MMBtu).⁷³ Here lies the competition for the USA, which can cover its marginal cost, but not the long-term break-even cost.⁷⁴ In the future, the competition for costs will be very important because it means diminishing the participation of Qatar and other producers in the world market.

3. *Mexico's northern border*

The energy reform facilitates the transfer of infrastructure and assets of private companies, strategic partnerships between PEMEX and transnationals, and public-private projects that have found a place along Mexico's northern border.

Pipeline interconnection occurs at the border between US, Canadian and Mexican companies. Pemex has ceded 70% of the natural gas marketing contracts to private companies.⁷⁵ CFE⁷⁶ will tender 26 gas pipelines, whereby the private sector will retain 60% of the country's installed gas pipeline capacity. By dismantling productive capacities and encouraging the transfer of State Productive Enterprise (EPE) assets, transnational trade has been left in the hands of private corporations, mainly foreign ones, as is the case of the Energy Transfer Partners gas company. Among its subsidiaries is the Mexican Energy Partners, one of whose shareholders is Carlos Slim's Carso Energy company.

⁷² Jalife-Rahme, Alfredo, "Bajo la lupa. Qatar epicentro de dos guerras: petróleo vs gas y, *remnimbí vs dólar*", *La Jornada*, June 28, 2017, available at: <http://www.jornada.unam.mx/2017/06/28/opinion/01401pol#texto>.

⁷³ MMBtu= Million Btus (British thermal units).

⁷⁴ Rogers, Howard, *Qatar Lifts Its LNG Moratorium*, Oxford Institute for Energy Studies, April 2017, available at: <https://www.oxfordenergy.org/wpcms/wp-content/uploads/2017/04/Qatar-Lifts-its-LNG-Moratorium.pdf>.

⁷⁵ At a later date, the CRE will announce when the other two tenders will be held to allocate the remaining 50% of PEMEX's commercialization capacity. The Federal Electricity Commission (DFE) will retain 40% of the capacity in the system for its industrial activities.

⁷⁶ Furthermore, it will transfer the transmission lines to the private sector through the FIBRA-E financial mechanism.

These projects connect Mexico (through its pipelines) to US gas pipelines. This position is important from a geopolitical point of view because it is strategic and critical infrastructure, and the CFE will be completely dependent on gas supplies from the USA from 2017 onwards.

Foreign companies will build the Comanche and Trans-Pecos, Waha-Presidio and Comanche Trail Pipeline with the operational involvement of Energy Partners. They will also transport natural gas from Texas to Encino, Chihuahua, where the CFE facilities with distribution points in Samalayuca are located.⁷⁷

The Mexican subsidiary will oversee bringing the natural gas near San Isidro, Chihuahua, and will be the supplier of the Texas gas to the rest of the country (central, northern, and western regions through the Waha-Presidio and Waha-San Elizario gas pipelines).

The delicate issue is not only the imports of a fuel as important as natural gas, the dependence of a State public company (CFE) on imported gas to generate electricity, and the rest of the country's reliance on imports made by primarily foreign private corporations, but also the infrastructure and the level of dependence on imported fuel. No less important is the Trump administration's hostility toward Mexico as a factor that heightens Mexico's energy security risks in the face of potential embargoes, blackmail, or retaliation. International experience has shown that risks do not arise from threats to pipeline infrastructure, but from economic disagreements and diplomatic and foreign policy conflicts between countries.⁷⁸

Other transnational projects are converging along the border, such as renewable energies to generate electricity for the State of California and, on the Texas side, there are electricity imports.

We also import 77.3% of our domestic gasoline, also from the USA. Moreover, as of 2018, we will create further dependency with the purchase of 50,000 b/d of oil for 3 years.

On the Gulf of Mexico side, the exploitation system prevailing in the USA extends to cross-border fields and to the Perdido Fold Belt area near US oil pipelines. Possible "shared" resources could be the underground aquifers on the northern border for shale exploitation on the Mexican side.

The obvious risks are related to energy security because of the foreign dependence on fuels that are so important for the national industry, because

⁷⁷ Carrasco Araizaga, Jorge, "Trump y Slim, más cercanos de lo que parece", *Proceso*, No. 2100, January 29, 2017, pp. 27-29.

⁷⁸ We can mention the case of Ukraine and the construction of the South Stream gas pipeline that had to be replaced by TurkStream after Bulgaria refused to accept the former from going through its territory.

of the costs their purchase will imply considering a possible devaluation in the exchange rate, the IEPS (tax) and the profitability pursued by the actors involved in the business that will affect the final user prices of fuel.

Less evident will be the greater control and/or militarization of Mexico's northern border, given the number of US projects there. As entire cities and towns along Mexico's northern border are emptied, the interest in controlling territories and resources in this region becomes apparent.

V. THE JOE BIDEN ADMINISTRATION AND THE GLOBAL ENERGY CRISIS (2022)

President Joe Biden began with a green agenda and a banner of the fight against climate change in order to recover and strengthen his international leadership. As his administration has passed, although the objective of giving priority to renewable energies continues to be important in the design of energy policy, the energy transition is showing difficulties in advancing, not only due to the difficulties of the energy system, in general, but by the global energy crisis that has resulted from the imposition of Western sanctions on Russia that has resulted in increases in energy prices throughout the world, thereby impacting the general increase in prices, so not only will it not move to fossil fuels in the US energy mix, rather everything points to their increase in the coming years. The foregoing does not mean that the importance of intermittent renewable energies is reduced, since its growth rate will continue to be the highest of all forms of energy, but fossil fuels from fracking production will continue to be the majority in absolute terms.

When Joe Biden became president of the US, the United States had become the largest oil producer in the world, which today reaches 12MMb/d (August 7, 2022)⁷⁹ and a net exporter of hydrocarbons. The energy transformation of the United States has had far-reaching implications for the country itself and for the world due to its geostrategy linked to its foreign policy. The US began exporting crude oil again for the first time in four decades, and in volume even greater than the peak of production in 1970. It now exports more crude than five of the OPEC member countries and its future production will be the most important of the non-OPEC countries, together with that of Canada under the concept of North America.

⁷⁹ U.S.DOE/EIA, Weekly U.S. Field of Production of Crude Oil, available at: <https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WCRFPUS2&f=W>.

At the beginning of his administration, President Biden (January 20, 2021), announced his commitment to achieve what he considered true energy independence: reduce oil consumption and production. Among his first actions was the cancellation of the Keystone XL pipeline and his moratorium on all new oil and gas drilling in the US.

Among his energy policy proposals, Biden announced big goals to increase energy efficiency and reduce costs for consumers. The Department of Energy opened applications for more than \$3 billion in new Bipartisan Infrastructure Law, ten times the historic funding levels of the Weatherization Assistance Program, for energy efficiency and electrification improvements in thousands of homes.⁸⁰

In addition, he issued a directive authorizing the use of the Defense Production Act (DPA) to secure US production of critical materials to support clean energy production and reduce its dependence on minerals and materials from China and other countries. Specifically, the DPA will be allowed to support the production and processing of minerals and materials used for high-capacity batteries, such as lithium, nickel, cobalt, graphite, and manganese, and will be implemented by the Department of Defense.⁸¹

Another of the proposals in energy matters is the Inflation Reduction Act approved by Congress⁸² in the first days of August of the current year, it has the support of the administration and groups that favor policies against climate change, however, other powerful groups have opposed it due to factors such as the following: 1) the US has reduced the growth of its Gross Domestic Product (GDP) in the last two quarters and is experiencing unprecedented inflation (rate growth of 9.1%); 2) there is a global energy crisis that tests the energy security of the US. Energy costs have increased by 40% in the last 12 months creating economic tension: 3) the economic groups want a reform for the hydrocarbon industry and consider that this is the one that has not happened. These include the American Petroleum Institute (API), American Exploration & Production Council, American Fuel & Petrochemical Manufacturers, Energy Workforce & Technology Council, Independent Petroleum Association of America, Permian Basin Petroleum Association, Plumbing-Heating-Cooling Contractors -National Association

⁸⁰ The White House, "FACT SHEET: President Biden's Plan to Respond to Putin's Price Hike at the Pump, March 31, 2022, available at: <https://www.whitehouse.gov/briefing-room/statements-releases/2022/03/31/fact-sheet-president-bidens-plan-to-respond-to-putins-price-hike-at-the-pump/>.

⁸¹ *Idem*.

⁸² On August 12, 2022, it was approved in the House of Representatives and passed to the Executive.

and the James Madison Institute, as well as the Industrial Association of Arkansas, West Virginia, Florida, Missouri, California, Illinois, Colorado, Florida, Iowa, Georgia, Kansas, Louisiana, Alabama, Michigan, Minnesota, New Mexico, North Carolina, North Dakota, Ohio, Pennsylvania, Wyoming, South Dakota, and Texas.

However, it is not only these interest groups that are pushing for a reform in favor of fossil fuels, the energy crisis itself related to the cancellation of Russian production in Western markets that has impacted prices upwards as well, just as it forms the difficulties for further progress in favor of renewable energies and, the goal of zero emissions (of greenhouse gases GHG), is being the opportunity to seriously reconsider energy strategies in light of the ravages that this crisis is causing.

This is reflected in the paths to increase the supply of hydrocarbons. The Department of Energy estimates a production volume of 12.7MMb/d for the year 2023,⁸³ a figure that although it does not reach the production peak of February 2020 with 12.9MMb/d, it is close to it. Proponents of the benefits of hydraulic fracturing consider that, given the flexibility of its production and the learning curve, there is no difficulty in recreating the boom. In addition to increasing the domestic production of oil and natural gas, the US strategy is to try to encourage an increase in supply in other latitudes and that is why President Biden visited Saudi Arabia and met with other oil producers (Venezuela and Iran) in order to arrange an increase in production. Given that the increase was only 100,000b/d, the US president put up for sale 1 million barrels a day from its strategic reserve for six months with the aim of reducing the international price of oil. It was clear that it will not be easy to increase the global supply of hydrocarbons, although as a producer of natural gas and in its form of liquefied natural gas (LNG), rising prices benefit it.

Unlike the European Union where several countries are already returning to implement various energy alternatives, even already rejected, such as coal, natural gas and nuclear energy, in the US the official narrative continues to favor the option of renewable energies and the strategy to deal with climate change in a vis-a-vis hydrocarbons, as it walks in favor of once again increasing the production of fossil fuels by increasing the tenders for exploration and exploitation activities on federal lands, without ceasing to favor hydraulic fracturing, especially for its most important strategic project

⁸³ U.S. DOE/EIA, Short Term Energy Outlook, August 9, 2022, available at: <https://www.eia.gov/outlooks/steo/>.

in the future: LNG, where the US has positioned itself in 2022 as the main exporter worldwide, displacing its rivals Australia and Qatar.

VI. CONCLUSIONS

Since the increase in its supply of hydrocarbons, the USA has an economic power capable of influencing the evolution of the prices in the international oil market and regional gas markets, which along with its financial power implies the possibility of amassing enormous profits and influencing the economic future of other hydrocarbon producing countries.

With the possibility of having a worldwide coverage for LNG gas exports, the USA can obtain significant economic gains. The changes are just beginning and promise to be many on the international scene.

As the USA discovers its potential, it has modified its geopolitical project and with it, pushed the strategy of the world energy balance in its favor. Looking to the world at large with its “America First” competitiveness strategy, President Trump’s administration intends to maximize energy production to compete with rival powers under the proposed Energy Dominance.

At the regional level, this is coupled with the creation of a North American energy bloc with Canada and Mexico to support energy integration and thus energy security in the USA by: I) accelerating the development of untapped energy resources; II) diversifying the energy supply, and III) supporting the growth of national energy industries.

The Mexican energy reform gives the USA the opportunity to gain access to Mexican energy industries and market to later expand its business to the rest of Latin America.

For the USA, Mexico becomes a productive space for the businesses emerging from the energy revolution, particularly from the transfer of PEMEX and CFE infrastructure and assets to energy corporations; from energy projects that include all sources of energy; with the granting of exploitation rights that allow them to take over Mexican oil reserves; with the opening of the million-dollar gasoline market in Mexico; with the public-private projects to develop renewable energies, and above all, as an importer of fuels derived from production that are on the rise from the use of fracking technology. The energy integration of North America creates a link between Mexico and the USA as an energy power.

While the USA has a strategic outlook, Mexico holds a predominantly commercial approach to energy reform, even in the instance of critical infrastructure that involves physical integration to the US gas pipelines that

supply natural gas to CFE. This integration will make us the main clients of the large refineries being built in the USA (11 on the Gulf Coast). This will mean more imports with few possibilities of building refineries in Mexico. It is quite clear that integration does not serve the Mexican economy and society, but only the economic groups that benefit from bilateral energy trade. Mexico binds itself as a dependent country and importer of practically all the types of energy produced in the USA, except for cross-border electricity.

It is also possible to see oil reserves, assets and critical infrastructure used by transnationals and financial speculation funds like Black Rock seeking short-term gains and financial speculation.⁸⁴ This stimulates the possibilities of financialization insofar as financial capital companies are involved in production processes and own assets and resources in Mexico.

The unfair-competition argument in this case has been useful for the gradual dismantlement of Pemex and CFE on losing their strategic activities, a situation that has also led to dependence on foreign fuel supplies dominated by a logic of short-term gain. The lack of long-term planning in Mexico is partly attributable to the fact that its oil and electricity industry has largely been stripped of its strategic nature and the energy sector has been commoditized. This has an impact on energy security and sovereignty in terms of policy design and the loss of eminent dominance with territorial implications.

The market is created for the purpose of avoiding monopolies. Nonetheless, limiting the monopolistic traits of several of these activities by partitioning them and thus introducing competition is a constrained construct and marginal investments in several of these activities may be expected from foreigners and domestic private parties. In fragmenting the industry, the possibility of cutting costs through economies of scale and vertical integration is lost for a real industry-wide competition. That is why transnational corporations do not give it up.

The Trump administration in fact establishes a corporate military regime which will deepen the structural and asymmetrical dependence in terms of energy integration with Mexico, as well as greater US production subordination through the implementation of Energy Dominance. This will bring significant risks to Mexico's energy security and the obliteration of

⁸⁴ The power of Black Rock ranges from controlling the majority of shares in the Pearson Group (dominating *The Economist* and *The Financial Times*) to large investments in mega-banks and oil companies in the USA and Britain, such as: Exxon-Mobil, Chevron, J.P. Morgan Chase, Wells Fargo/Wachovia, Shell, Apple, Google, and Microsoft. Just as importantly, Black Rock was a lobbyist for the 2013 Energy Reform.

national and energy sovereignty while the costs of market implementation will fall on Mexican society.

The expansion of US energy business into Mexico, the construction of hemispheric security, and the militarization of energy policy will lead to Mexico's further alignment with Washington's objectives. A different fate awaits us only by gaining an awareness of what is happening.

Although it is politically consistent and convenient for President Biden to continue with the banner of renewable energy and climate change, the energy transition is revealing its limits, not only because there are no technological conditions to displace fossil fuels yet, but because high international oil prices and a regionally insufficient supply (EU), lead the US to expand its role as provider and guarantor of the energy security of its allies as a producer of fossil hydrocarbons, in order to replace fuels displaced from Russia in the international market, lower the price of oil while taking advantage of the opportunity to place its LNG production on international markets. Strategy where you can find contradictory effects and limitations in your leadership to achieve success.

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PART SECOND
CONSTITUTIONAL FRAMEWORK ENERGY LAW

THE ENERGY REFORM AND THE TRANSFORMATION OF PUBLIC LAW

Jaime CÁRDENAS*

SUMMARY: I. *Introduction*. II. *The constitutional energy reform and its legal implications*. III. *Secondary energy reforms and their implications*. IV. *Conclusions*. V. *Bibliography*.

I. INTRODUCTION

Traditionally, public law has been viewed as contrasting with private law—from a dualistic standpoint—as the part of the legal system that makes it possible to regulate relations of subordination and superordination between the State and individuals, and where relations among State bodies may be one of subordination, superordination, or coordination. In contrast, private law has dealt with relations between individuals, of their rights in rem, inheritance, obligations, contracts, and agreements. Criticism aside, this distinction is longstanding and was advanced by authors like Rudolf von Jhering and Georg Jellinek, among many others. A distinctive feature of public law is that relations within the parties are not defined by the principle of autonomy of will, which is inherent to private law, but rather by the “*principio de imperio*” [meaning that in its relationship with individuals, the State does not have an equal position, but one that is differentiated and hierarchically superior]—mandatory mandates from the authority to individuals or other authorities, essentially through the law—.

Public law was born alongside the modern State, which started in the Renaissance. Throughout the evolution of each stage of the State—absolute, liberal, welfare, constitutional, neoliberal, or military police—the characteristics of public law are modified.¹ Thus, the hallmarks of the ab-

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¹ Cárdenas Gracia, Jaime, *Del Estado absoluto al Estado neoliberal*, Mexico, UNAM, 2017, pp. 21-35.

solute State —16th, 17th, and 18th centuries— are the absence of widespread human rights, as well as the non-existence of the principle of the division of powers and the principle of legality, as we now know it. In the 19th century liberal State, a product of economic changes that clamored for free market without State intervention, we find the following features: 1) human rights declarations; 2) division of powers; 3) principle of legality; 4) control of administrative proceedings through the principle of legality, and 5) the existence of independent judges. These legal categories, in turn, implied the presence of others, such as the existence of some representative authorities elected by citizens through political parties and the census vote, in addition to the principle of autonomy of will that allowed subjects or citizens, as the case may be, to carry out any legal actions deemed necessary and not prohibited by law.

The welfare State of the 20th century is based on precise legal categories: 1) constitutional and legal recognition of economic, social, cultural and, later, environmental rights, as well as other generations of rights, although with inadequate institutional guarantees; 2) growth of State public administration, bureaucracy and public spending to fulfil the recognized Economic, Social, Cultural and Environmental rights (ESCER); 3) the principle of legality tinged by regulatory administrative provisions with a delegation of powers granted by law and in favor of public administration; 4) the dawn of understanding the constitution as a regulatory framework, not just a conceptual or semantic one; 5) strengthening the control of constitutionality and constitutional judges; 6) new perceptions of legal science and legal validity; 7) greater weight given to human rights treaties in domestic law; 8) a pluralist democratic system 9) discussion on a constitution's capacity for transforming or reconciling the socio-economic system, and 10) the attainment of the Welfare State through tax and budgetary legislation.

In the constitutional State—a legal fiction, in my point of view, but very powerful in our time and which has been theoretically developed without any economic or political justification—, we find these characteristics:

1. Connections are found in different degrees, depending on the author or school of thought, between law and morality.
2. Human rights are the foundation and ultimate goal of the State and the law.
3. Constitutions express conflicting legal and political principles, none of which prevails *a priori* but in the application of concrete cases.
4. There is a perception that law is made up of a myriad of regulatory materials, mainly rules, principles, and values.

5. It is oriented towards a regulatory constitution, i.e., a fusion of what should be and of what actually is.
6. Law not only consists of a regulatory normative structure, but also of an argumentative, contextual, and procedural one.
7. Legality and the rest of the legal sources are tightly bound to convention and constitutionality.
8. Norms that are not rules cannot be interpreted by traditional methods.
9. The principle of proportionality and other forms of argumentation must be used to decide on conflicts between opposing principles.
9. The legal system is interpreted according to the constitution to maximize fundamental rights.
10. Legal certainty becomes more demanding and difficult; it mainly relies on the quality of the argumentation.
11. The constitution is directly applicable by all authorities and is unbending. There are principles that cannot be reformed using constitutional review proceedings.
12. A constitutional judge is the guarantor of the constitutional State and lacks original democratic legitimacy: he strives to make up for it through the argumentative quality of his rulings.
13. There is an unsuccessful attempt to globalize constitutionalism because the constitutional State does not have an economic or political theory that gives it any foundation.
14. Constitutional democracy does not originate in majority rule, but in the respect and guarantee of human rights. Majorities are but a “fragment” of popular sovereignty.
15. It is a State that is neither neutral nor supportive. Its ideology is one of conflicting principles and values which are contained in the constitution and human rights treaties.

However, these are not always met, mainly those that express economic social cultural environmental rights.

The neoliberal State (from the 1980s to our times) subjects the nation-State and public law to the economic, political, and legal demands of neoliberal globalization. We believe that the most important points of its internal order are: 1) unlimited national and transnational *de facto* powers and sufficient legal controls; 2) fundamental rights without full guarantees for their fulfillment, mainly in terms of economic, social, cultural and environmental rights; 3) weak democratization and transparency of transnational corporations; 4) the supremacy of international treaties, mainly those re-

lated to trade, investment and property, over national constitutions; 5) weak mechanisms of constitutional procedural law that do not sufficiently protect fundamental social and collective rights; 6) anti-corruption instruments compatible with the interests of large transnational corporations; 7) diminished participative, deliberative, and community democracy, and with it, the promotion of an electoral democracy that manipulates citizens' political rights; 8) handing over the assets of nations —their natural resources— and their exploitation to foreign interests; 9) inadequate defense of national sovereignty, and 10) implementation of the globalizing neoliberal economic model to bend the law and the national State to its advantage.

The constitutional and legal energy reform of 2013 and 2014 was enacted within the context of the neoliberal State. What was the previous legal paradigm like and how did it change? The structural energy reform entailed the definitive substitution of the development model implemented in Mexico after the 1938 oil expropriation.

For decades, first hydrocarbons and then electricity represented not only the main sources of tax revenue for the country, but also the sectors on which the rest of national industry and economy revolved, were nourished, were developed, and were strengthened. Hydrocarbons and electricity were also the main instruments underpinning national sovereignty. The energy sector was the economic basis on which Mexico proclaimed its sovereignty in the international arena and which for decades allowed the country to show itself, albeit only rhetorically, as a country outside the imperial grip of the United States.

In the above legal model, the Mexican State had almost complete control and administration of energy exploitation. In successive reforms, the constitution prohibited concessions (1940) and contracts (1960) and established exclusivity in the exploitation of energy through the concept of strategic area in 1983, prohibiting transnational and national private sector participation in the control and management of the core elements of the industry (individuals took on a secondary role through service contracts, and from the 1990s onwards they gradually gained influence in the industry —turnkey contracts and multiple service contracts) until the 2013 energy reform, which foreshadowed the last stage of the process in which the private sector recovered what it had lost in 1938. The 2013 energy reform changed the paradigm: The State abdicated its former exclusive powers to exploit the energy resources of both this and future generations of Mexicans.

The 2013 constitutional energy reform allowed all kinds of contracts, concessions, or licenses, and morphed the meaning of strategic area. It no longer entails the principle that only the State can, exclusively and directly,

exploit energy resources; it now implies that the energy sector is an important economic area where, according to transitory Article 8 of the 2013 constitutional energy reform, exploitation by the private or public sector is preferable to any other economic activity of the State itself, of individuals, of the social sector and even of indigenous peoples. The State will share the exploitation and profits with private, mainly transnational companies. In short, we are giving away a high percentage of the oil income that corresponds to the nation.

II. THE CONSTITUTIONAL ENERGY REFORM AND ITS LEGAL IMPLICATIONS

On December 13, 2013, the Chamber of Deputies approved the reform on energy matters to Articles 25, 27 and 28 of the Mexican constitution, in addition to 21 transitory articles. The head of the Federal Executive Branch enacted and published the reform in the Federal Official Gazette on December 20 that same year.²

The reform modified the fourth paragraph of Article 25 of the Constitution, and the sixth and eighth paragraphs of Article 25 of that precept were amended to include the criterion of sustainability in State economic activities.

The amendments to Article 25 contain³ the following innovations: 1) productive State enterprises were created to serve the so-called “strategic areas of the State”, a category that until that moment had not existed in Mexican statutory law; 2) the concept of strategic area of the State is watered down, given that previously, in the fourth paragraphs of Articles 25 and 28 of the Constitution, strategic implied the State’s exclusive power to plan, manage, exploit, and control the resources or activities and now the State can carry out even core activities —planning, control, transmission and distribution of electric energy— and the exploration and extraction of hydrocarbons through private individuals (mainly foreigners) by means of different types

² Bartlett Díaz, Manuel (coord.), *Estrategia urgente en defensa de la nación. Política energética para que México sea potencia económica en el siglo XXI*, Mexico, Talleres Gráficos del Partido del Trabajo, 2013; Cárdenas Gracia, Jaime, *Crítica a la reforma constitucional energética de 2013*, Mexico, UNAM, 2014; Grunstein, Miriam, *De la caverna al mercado. Una vuelta al mundo de las negociaciones petroleras*, Mexico, Centro de Investigación para el Desarrollo, 2010, and Instituto Mexicano para la Competitividad, *Nos cambiaron el mapa: México ante la revolución energética del siglo XXI*, Mexico, 2013.

³ *Constitución Política de los Estados Unidos Mexicanos*, Cámara de Diputados, 2018, available at: http://www.diputados.gob.mx/LeyesBiblio/pdf/1_270818.pdf.

of contracts and licenses; 3) productive State enterprises have special legal status based on the constitution, laws and best corporate practices, and 4) secondary legislation defines the constitutive rules for productive State enterprises and the activities that comprise strategic areas.

The intent of the sixth paragraph of Article 27 of the Constitution⁴ was transformed to: 1) establish that no concessions will be granted for radioactive minerals; 2) exclude hydrocarbons from the sixth paragraph of Article 27 of the Constitution for it to only regulate the electrical industry; 3) stipulate that no concessions will be granted in the planning, control, transmission and distribution of electric energy for public service, but that these activities will be subject to contracts and other types of legal instruments with individuals, and 4) indicate that in all other activities in the electrical industry, with the exception of those mentioned above, there may be both concessions and contracts.

A new seventh paragraph was added to Article 27 of the Constitution⁵ and the subsequent paragraphs of this precept were moved down. The seventh paragraph of Article 27 of the Constitution groups together hydrocarbon regulation, the objectives of which are: 1) to rhetorically prohibit concessions for hydrocarbons since they are allowed in transitory Article Four under the concept of licenses; 2) to indicate that the objective of the new hydrocarbon system is for the State to obtain revenues that will contribute to the development of the nation; 3) to point out that activities for the exploration and extraction of oil and other hydrocarbons will be carried out by assigning said activities to productive State enterprises or through contracts with these enterprises or with individuals; and 4) to rhetorically stress that hydrocarbons are the property of the Nation and that it should be so indicated in assignments and contracts.

The new seventh paragraph to Article 27 of the Constitution⁶ cannot be understood without its transitory articles, especially transitory Article 4 of the constitutional energy reform, which establishes the system of contracts and licenses in the hydrocarbon industry, as well as the system of considerations in favor of private companies.

As for the fourth paragraph of Article 28 of the Constitution,⁷ we can say that it aims: 1) to reduce the strategic areas that were once exclusive to the State, such as the entire production chain of the electric and hydrocarbon industries, while retaining a few activities in those industries, and 2) to state

⁴ *Ibidem*, p. 28.

⁵ *Idem*.

⁶ *Idem*.

⁷ *Ibidem*, p. 34.

that the electric and hydrocarbon industry activities that are kept as strategic represent a prevarication in the language because strategic must now be understood in accordance with the new sixth and seventh paragraphs of Article 27 of the Constitution, which imply that private individuals may carry out activities in the electric and hydrocarbon industries through concessions, contracts and licenses; that is, the electric and hydrocarbon industries are no longer exclusive functions of the State as they were before.

The new sixth paragraph of Article 28 of the Constitution creates the Mexican Petroleum Fund for Stabilization and Development and outlines the main characteristics of its legal design: a) forming a public trust; b) having the Bank of Mexico as the trust institution, and c) receiving the revenue from the assignments and contracts for hydrocarbon exploration and extraction, with the exception of taxes.

This constitutional amendment should be understood in light of the provisions of the fourteenth and fifteenth transitory articles of the constitutional energy reform⁸ which specify the legal characteristics of the Fund, its legal nature, its objectives, and the type of revenue that it will receive and cannot be taxes because the latter will continue to be managed and used by the Ministry of Finance and Public Credit. In other words, the Fund may receive rights and other types of contributions which are not taxes and which derive from assignments, contracts, and licenses from Pemex as a productive State enterprise and from private companies.

The new eighth paragraph of Article 28 of the Constitution⁹ is designed to highlight the importance of the “coordinating regulatory bodies in energy matters called the National Hydrocarbons Commission and the Energy Regulatory Commission”. Both agencies already existed in secondary legislation. There were at least two reasons to include these bodies in the Constitution: 1) to strengthen their authority, as occurs in the sixth, tenth, twelfth and thirteenth transitory articles of the constitutional energy reform, and 2) to respond to the fact that the PAN’s legislative initiative sought to transform both agencies into autonomous constitutional bodies, which means that the PAN was seeking to give the regulatory agencies greater weight and powers in the matter.

The legal nature of these agencies is also new in Mexican law. With the reform, they are considered “coordinated regulatory bodies in energy mat-

⁸ Secretaría de Gobernación, “Decreto por el que se reforman y adicionan diversas disposiciones de la Constitución Política de los Estados Unidos Mexicanos, en Materia de Energía”, *Diario Oficial de la Federación*, December 20, 2013, available at: http://dofgob.mx/nota_detalle.php?codigo=5327463&fecha=20/12/2013.

⁹ *Constitución Política de los...*, *op. cit.*, p. 35.

ters” although, as established in transitory articles and secondary law, their dependence on the Executive Branch is indisputable.

How did the government justify the 2013 energy reform? The explanatory statement of President Enrique Peña Nieto’s initiative defended the constitutional energy reform by pointing out that:

1. The participation of individuals is called for because Pemex and the Federal Electricity Commission need investments to grow their respective industries;
2. In the case of oil, hydrocarbons, and petrochemicals, it was argued that technology is needed because Mexico does not have the appropriate type;
3. It states that the initiative was inspired by the reforms proposed by General Lázaro Cárdenas and approved later on, which did not prohibit the participation of individuals through contracts or even through concessions in these industries;
4. It is noted that the Cardenist reforms established that compensation for contracts could be in cash or a percentage of the products obtained;
5. It mentions that the prohibition of oil industry contracts dates from the constitutional reform of January 20, 1960;
6. It was pointed out that the reform that incorporated the concept of strategic areas dates from February 3, 1983, and has nothing to do with Cardenism;
7. The model proposed in Enrique Peña’s initiative included two structures: a) exploration and extractions contracts —production and shared utility contracts— entered into with the Federal Executive, and b) permits for individuals to intervene along the entire industrial chain, for example, in refining, distribution, storage, first-hand sales, etc.;
8. The policy for hydrocarbon exploration and extraction activities would be dictated exclusively by the Federal Executive, which would enter into contracts with State agencies and companies, as well as with social and private sectors;
9. It proposed removing basic petrochemicals as a strategic area of the State;
10. It stated that the law shall determine the conditions under which contracts may be entered into and permits may be granted to individuals, as well as the regulation to which they shall be subject;
11. It proposed a more flexible and moderate tax regime;

12. It established that the reform would increase oil production from 2.5 million barrels a day to 3 million in 2018 and 3.5 in 2025, and
13. For the electric sector, it said that the intentions of the proposal are: to respond to the fundamental imperative of lowering the costs of electric service in the interest of the general public; to organize the electricity system on technical and economic principles; to propose the development of the sector based on the joint participation of the Federal Electricity Commission and individuals; and to strengthen State powers to regulate development in the sector and place inter-connection duties, rates, universal service and electrification obligations on the participants.

Peña Nieto's presidential initiative was based on a misrepresentation and distortion of Mexico's energy history. An energy reform was necessary, but it needed one that was different from the one published in the Federal Official Gazette on December 20, 2013. Without changing any of the fundamental political decisions provided for in the Constitution, the reform Mexico needed meant taking into account the following considerations:

1. To guarantee the principles in force in the Constitution before the December 2013 reform and keep hydrocarbons and electricity out of international free trade;
2. To defend national energy sovereignty and refrain from issuing exploration and extraction contracts for crude oil, and only allow service contracts;
3. To maintain total State control over the hydrocarbon and electricity industry;
4. Not to allow utility or production sharing contracts or licenses because these forms of contracting or authorization imply sharing oil revenues with foreign interests;
5. To rigorously fight corruption in Pemex and CFE, in both the contract area and the union;
6. To make Pemex and CFE Boards of Directors operations transparent;
7. To reduce oil exports abroad and grow the national petrochemical industry;
8. To build the refineries Mexico requires;
9. To promote national scientific and technological development in the field of energy;
10. To develop renewable energies using national resources;
11. To get society involved in Mexico's energy policy;

12. To make the energy industry the driving force behind national development;
13. To implement a tax reform that taxes large Mexican companies that are currently protected by tax privileges, credits, and write-offs;
14. To reform Article 28 of the Constitution so that part of the Bank of Mexico's reserves is allocated to national development and building infrastructure;
15. To reduce Pemex's tax burden, prior to a tax reform that levies taxes on large companies in the country, and to seek domestic sources to finance the national energy industry;
16. Not to use oil revenues to cover the government's current expenses but to underpin the growth of infrastructure, public works, national industry, and the domestic market;
17. To establish a national energy strategy that is publicly debated and directed towards ensuring Mexico's energy sovereignty;
18. To develop this strategy within the framework of sustainable development policies;
19. To exploit hydrocarbons while taking care of the environment holistically, and,
20. To maximize the recovery of hydrocarbons, including natural gas, on a mandatory basis.¹⁰

These and other nationwide measures could be carried out without having to hand over the country's energy wealth to foreigners. The federal government and the 2013 Permanent Legislature never explored the different nationalist, socially responsible and democratic alternatives to the constitutional one imposed by Enrique Peña Nieto and his allies through the Pact for Mexico.

III. SECONDARY ENERGY REFORMS AND THEIR IMPLICATIONS¹¹

The secondary energy reform contained the following provisions: The Hydrocarbons Law, the Electrical Industry Law, the Geothermal Energy Law;

¹⁰ Jiménez Espriú, Javier, *Análisis a la reforma energética 2013*, México, Innova, 2013, pp. 26-30.

¹¹ I refer to these issues in more depth in: Cárdenas Gracia, Jaime, "La nueva legislación secundaria en materia energética de 2014", *Boletín Mexicano de Derecho Comparado*, México, vol. 48, No. 143, May-August 2015.

the Mexican Petroleum Law, the Federal Electricity Commission Law, the Law on the National Agency for Industrial Security and the Environmental Protection for the Oil & Gas Industry, and the Law of the Coordinated Regulatory Energy Agencies. Likewise, the following provisions were amended and supplemented: The Foreign Investment Law, the Mining Law, the National Waters Law, the Public-Private Associations Law, the Organic Law of the Federal Public Administration, the Federal Law on Parastatal Entities, the Law of Acquisitions, Leasing and Public Sector Services, and the Law on Public Works and Related Services.

In addition to the above, the Hydrocarbons Revenue Law and the Law of the Mexican Oil Stabilization and Development Fund were issued. The Federal Law of Rights, the Fiscal Coordination Law, the Federal Budget and Fiscal Responsibility Law, and the General Public Debt Law were also amended and expanded.¹²

The main misgivings raised by the energy reform were not, nor have been, explained to society.¹³ The Mexican public has no answers about the consequences the reform will have on the environment and human health. Citizens are skeptical as to whether the sector's new regulatory agencies will be able to deal with the power of large global oil and electricity companies capable of destabilizing governments around the world. Much of society believes that corruption in the energy sector will increase, not only because of the role of labor unions, but also because of the million-dollar contracts that the government will sign with global energy companies. There are fears that the constitutional energy reform will mean more taxes and more foreign debt, going against the best interest of Mexicans. It is also not clear for society whether the alleged benefits of the reform will go to national development and not to the current expenditure of the three levels of government. And, in general, we are still not sure why Mexicans have to share oil revenue¹⁴

¹² *Diario Oficial de la Federación*, August 11, 2014, available at: <http://www.dof.gob.mx/index.php%3Fyear%3D2014%26month%3D08%26day%3D11>.

¹³ Specifically, there are doubts about the privatizing consequences of the reform. The *Diccionario de la Real Academia Española* defines “privatize” as “To transfer a public company or activity to the private sector”. Castaño Guillén defines privatization as follows: “We understand privatization as the economic, political and social process of restructuring that, through the legal transformation of the ownership of a company, a sector or an economic activity from public to private opens new spaces of private enrichment and profit”. Castaño Guillén, Julián, *La dirección de los resultados en las empresas privatizadas*, Tesis Universidad de Extremadura, 2006.

¹⁴ 20th century Mexican history was linked to the struggle for the nationalization of energy companies; history is now going in the opposite direction. To understand the historical

coming from a resource that belongs to Mexicans with others who are non-nationals.¹⁵

In the legal sphere, the energy reform is part of the new and currently dominant legal model, which can be called neoliberal.¹⁶ From our perspective, the hegemony of the neoliberal model in legal matters has meant, among other things, the following:

1. The dismantling of the unsatisfactory Welfare State that existed before the implementation of the model, *i. e.*, the constitutional and legal reform advocated that aims to lower the level of protection of Mexicans' economic, social, and cultural rights;¹⁷
2. The protection of private property over social and public property as is the case with the constitutional energy reform and is contained in the eighth transitory article;
3. The existence of a formal electoral democracy without quality or substance, which does not encourage participative and deliberative democracy, which defines the winners through the power of the media and money, and which prevents transcendent issues like constitutional reforms or trade agreements from being approved by Mexicans by means of a referendum;
4. A copy of Anglo-Saxon justice systems like the implementation of the accusatory criminal system and thereby the introduction of oral trials in Mexico;

process of the 20th century in terms of oil nationalization, see: Bassols Batalla, Narciso, *Las etapas de la nacionalización petrolera*, Mexico, Miguel Ángel Porrúa, 2006.

¹⁵ Cuarón, Alfonso, "10 Preguntas del ciudadano Alfonso Cuarón al presidente Enrique Peña Nieto", *La Jornada*, México, April 28, 2014, p. 9.

¹⁶ Jalife-Rahme, Alfredo, *Muerte de Pemex y suicidio de México*, México, Grupo Editor Orfila Valentini, 2014. This author points out that the fundamental intention of the 2013 constitutional energy reform is to safeguard the geostrategic interests of the USA and to benefit the large private oil companies of the world.

¹⁷ Lorenzo Meyer holds that the result of the neoliberal project in Mexico has been one of dismantling the State and returning to the old, historical tendencies toward social inequality. However, the extremists of the simple "laissez-faire" have not met, not by a long shot, the equivalent of their privatizing creed, which did take place in the United States: economic growth. Gerardo Esquivel's calculations of the real Mexican GNP growth between 1994 —the year in which the neoliberal crown jewel, NAFTA, took effect— and 2009 show an annual average increase of less than one percentage point (0.89%). Thus, North American neoconservatives were copied here in terms of the concentration of wealth in a few hands —those mentioned in Forbes— and in the weakening of the social protection network, but without fulfilling, however, the promise of increased employment. See: Meyer, Lorenzo, *Nuestra tragedia persistente. La democracia autoritaria en México*, México, Random House Mondadori, 2013, pp. 415 y 416.

5. Criminal populism that consists of raising the number of crimes and increasing the punishment in order to try to guarantee security that is not provided by the economic, political, and social model;
6. Many reforms on foreign investment, industrial and intellectual property legislation to protect foreign investment, such as the 1992 Mining Law or the 2013 constitutional reform on telecommunications that allows 100% foreign investment in these sectors;
7. Concentration of many constitutional and legal powers in federal branches, mainly in the executive branch, so that the external sector can negotiate more easily with the Mexican State;
8. Loss of legislative and jurisdictional sovereignty to the executive branch and supranational bodies, such as international agreements that are not ratified by the Senate or international arbitration bodies that resolve Mexico's main economic issues;
9. International agreements that do not pass the test of representation—such as the Merida Initiative or the SPP—that strip the country's public authorities (the Senate in this case) of their substance, and
10. The privatization of public law and the loss of state and nation outlooks to give way to a top-down imposed globalization that constitutes a genuine revolution by the world's rich for the world's rich.¹⁸
11. We will analyze the legal energy provisions, stressing the issues that are important in our opinion.

1. *The Hydrocarbons Law*

The new Hydrocarbons Law is, from my point of view, the most important one in the secondary energy reform package because it regulates the system of contracts, licenses, and permits that will authorize transnational oil and gas companies to explore and extract hydrocarbons in Mexico.¹⁹

The law contains secondary provisions that are openly unconstitutional, even with the constitutional reforms of December 2013.²⁰

¹⁸ Tello, Carlos and Ibarra, Jorge, *La Revolución de los ricos*, México, UNAM, 2012, pp. 45-103.

¹⁹ To understand the types of oil contracts, see: Johnston, Daniel, *International Petroleum Fiscal Systems and Production Sharing Contracts*, Oklahoma, Penn Well Publishing Company, 1994, and Johnston, Daniel, *International Exploration Economics, Risk and Contract Analysis*, Oklahoma, Penn Well, 2003.

²⁰ Rathbone, John Paul, "Peña Nieto Pledges Transformational Reform of Pemex", *Financial Times*, London, June 17, 2013. "Los cambios constitucionales (serían) necesarios para darle certeza a los inversionistas privados".

In general terms, I shall mention some of its unconstitutional aspects:

The law does not respect the current principles of the Constitution, including the one indicating that the State holds economic stewardship; the one stating that Nation retains the original, direct, inalienable and non-prescriptible ownership of natural resources (hydrocarbons); the one establishing that hydrocarbons in the subsoil are, under any circumstances, property of the nation; the one specifying that individuals can intervene in the strategic area of hydrocarbons, but without presiding over the hydrocarbon industry, or controlling and administrating productive State enterprises; the one stating that the modalities of property and intervention of individuals in strategic areas are dictated by the State and must respond to national development objectives; the one determining that hydrocarbon exploration and extraction activities are matters of social interest and public policy; in other words, that they are not or should not be subject to the market; the one alluding to the fact that upon leaving the subsoil, hydrocarbons belong to the nation because private participation in the industry is for the State to obtain income and thus contribute to the long-term development of the nation and not for private individuals to obtain benefits in the first place; and the one stating that hydrocarbons are resources for national development and, therefore, cannot be deemed simple commodities.²¹

Exploration and production contracts contravene the intent of the seventh paragraph of the new Article 27 of the Constitution.

That the State obtains revenues in order to contribute to the long-term development of the nation, while oil revenues will be shared with oil companies and the revenues for said development are to be shared with foreign economic interests.²²

Article 14 allows alliances or partnerships between productive State enterprises to be regulated by private law. Such an enterprise must be guided by the principles of public law because it belongs to the State. It is true that Mexican administrative law has allowed private companies to be part of the State —Article 46 of the Organic Law of Federal Public Administration or Article 28 of the Federal Law on Parastatal Bodies—, but never with such prominence as in the 2013 energy reform. Now these companies are allowed to run a strategic area of the State.

²¹ Criticism of the constitutional energy reform can be found in: Cárdenas Gracia, Jaime Fernando, *Crítica a la reforma constitucional en materia energética de 2013*, UNAM, 2014.

²² Jiménez Espriú, Javier, *Análisis a la reforma energética 2013*, México, Innova, 2013, p. 27.

Article 17 of the law allows foreign private companies to participate in cross-border sites, thereby violating the principle of eminent domain. Only Pemex should be entitled to such exploitation by the Mexican State.²³

The permits referred to in Article 48 and subsequent articles of the law violate Article 134 of the Constitution, as this administrative law mechanism is used to avoid tendering. Such permits will invite corruption because they will be granted discretionally.²⁴

The easements provided for in Article 100 and subsequent articles of the Hydrocarbons Law are the legal way to affect private, social, and indigenous community property for a non-public purpose and basically for private benefit—that of transnational companies—.

The fiscal terms in the exploration and extraction contracts alluded to in various legal provisions violate Article 31, Section IV, of the Constitution because there is a principle of reservation of law regarding tax issues:

Any contribution must be provided for by law. In the specific case of tax considerations that companies will pay to the State will depend on the autonomy of the will of the parties and not on the law. Moreover, the contributions must be general, proportional, and equitable. Negotiation between the parties breaches the principles of taxation provided for in the Constitution.²⁵

Articles 119 to 122 of the law do not establish the binding nature of the result of consultations with native peoples, and the consultation procedure diverges from ILO Convention 169 and the precedents of the Inter-American Court of Human Rights—for instance, an independent entity will not conduct the consultation or procedure for free, prior and informed consent. The law does not sufficiently foresee that native peoples should receive a percentage of the economic benefits that Pemex or private companies obtain through the exploitation of subsoil resources within the territories of these communities.²⁶

²³ Becerra Ramírez, Manuel, “Aspectos legales de los yacimientos transfronterizos de petróleo y gas”, in Almazán González, José Antonio (coord.), *Exclusividad de la nación en materia de petróleo*, México, Grupo Parlamentario del PRD en la LX Legislatura de la Cámara de Diputados del Congreso de la Unión, 2008, pp. 39-52.

²⁴ According to Mexican administrative legislation, a permit is an administrative act by which an obstacle or impediment that the law has established for an individual to exercise a right is lifted or removed. See Hernández Espíndola, Olga, “Permiso administrativo”, *Enciclopedia Jurídica Mexicana*, México, Porrúa-UNAM, Instituto de Investigaciones Jurídicas, 2008, t. V, pp. 532-535.

²⁵ *Constitución Política de los...*, *op. cit.*, p. 41.

²⁶ In the Inter-American Court of Human Rights Judgment of June 27, 2012, of the Case of the Kichwa Indigenous People of Sarayaku v. Ecuador, the Court outlined the scope

Regarding transparency, the law is *sui generis*. Article 32 refers to geological information, which must be considered of national security and so reserved under the terms of Article 6, paragraph A, Base I of the Constitution.²⁷ However, this information is made available to assignees and contractors for commercial use.

The provisions that refer to national content, supposedly to favor national suppliers, run counter to Article 1106 of the North American Free Trade Agreement which restricts the possibilities of establishing such obligations to foreign investors. They are, therefore, purely rhetorical.²⁸

In summary, the Hydrocarbons Law is a statute that violates the approved constitutional energy reform. It constitutes an act in which national sovereignty is lost.²⁹ It will not bring benefits of any kind to Mexico and will only yield advantages for transnational companies. Through this reform, we are helping ensure the energy security of the United States and not that of Mexico.³⁰

of the right to consultation: it must be prior; it must be in good faith; it must have the aim of reaching an agreement; it must be appropriate and accessible; it must assess the environmental impact and the indigenous culture in question and, it must be an informed consultation that respects all other fundamental rights. *Cf.* Inter-American Court of Human Rights, *Case of the Saramaka People v. Suriname*, Judgment of November 28, 2007, Series C No. 172, available at: http://www.corteidh.or.cr/docs/casos/articulos/seriec_172_esp.pdf. The Case of the Saramaka People v. Suriname, issued on November 28, 2007, also recognizes the right to consultation and the principles of free, prior and informed consent.

²⁷ *Constitución Política de los...*, *op. cit.*, p. 10.

²⁸ Witker, Jorge and Hernández, Laura, *Régimen jurídico del comercio exterior de México*, 3a. ed., México, UNAM, 2008; Witker, Jorge (coord.), *El Tratado de Libre Comercio de América del Norte. Evaluación jurídica: diez años después*, México, UNAM, 2005; López Velarde Estrada, Rogelio, “Energía y petroquímica básica”, in Witker, Jorge (coord.), *El Tratado de Libre Comercio de América del Norte. Análisis, diagnóstico y propuestas jurídicas*, México, UNAM, 1993, t. I, pp. 203-259, and Jiménez Vázquez, Raúl, “Consideraciones en torno al capítulo de compras gubernamentales del TLCAN y su eventual impacto en el derecho mexicano”, in Witker, Jorge (coord.), *El Tratado de Libre Comercio de América del Norte. Análisis, diagnóstico y propuestas jurídicas*, México, UNAM, 1993, t. I, pp. 261-281.

²⁹ Vargas Suárez, Rosío, “El contexto geopolítico y la iniciativa de reforma energética del PRIAN”, and Saxe Fernández, John, “Flexibilización constitucional y el reingreso a México de las petroleras nacionalizadas por Lázaro Cárdenas” in Cárdenas Gracia, Jaime (coord.), *Reforma energética: análisis y consecuencias*, México, UNAM-Tirant lo Blanch, 2015, pp. 169-205.

³⁰ Pascual, Carlos, *Written Testimony of Special Envoy and Coordinator for International Energy Affairs Carlos Pascual U.S. Department of State, Before the House Committee on Foreign Affairs, Subcommittee on the Western Hemisphere United States House of Representatives*, Energy and the Western Hemisphere, April 11, 2013. Kerry, John, “Oil, Mexico, and The Transboundary Agreement”, *A Minority Staff Report. Prepared for the use of The Committee on Foreign Relations*, United States Senate, One Hundred Twelfth Congress, Second Session, Printed for the use of The Committee on Foreign Relations, Washington, D. C., December 21, 2012.

2. *Electrical Industry Law*

In terms of content, the Electrical Industry Law proposes dismantling the national electrical industry.³¹ The tenth transitory article of the 2013 constitutional energy reform envisaged the legal partitioning of the electrical industry. The law goes even further and unconstitutionally establishes the operational separation of the electrical industry that until now has functioned as an integrated whole. The objectives of this disarticulation of the national electrical industry are: 1) the distribution of industry processes —generation, transmission, distribution and retailing— among the various private, mainly foreign, operators; 2) the increase in final prices in view of the participation of multiple operators in each stage in the electrical industry;³² 3) the potential for conflict between the various operators involved in each process in the industry, and 4) shortages caused by the participation of multiple operators in the industry.

Constitutionally, the Electrical Industry Law contains the following general shortfalls:

Congress is stripped of its powers. Congress has the power to legislate on matters of contributions —Article 73 Section VII and XXIX.5 a) of the Constitution, to legislate on matters of trade —Article 73 Section IX of the Constitution, and to legislate on matters of electricity —Article 73 Section X of the Constitution. However, the Electrical Industry Law contains provisions that unconstitutionally grant the Ministry of Energy or the Energy Regulatory Commission these kinds of powers since these agencies and bodies, according to the law, can issue general and abstract regulations on energy, trade, and contributions.

The rights of local authorities are violated; it is an anti-federalist law. Article 7 of the law does not give any power to any municipal or state authorities. The law has a clear anti-federalist slant since in contravention of Article 115 of the Constitution, Article 39 of the Electrical Industry Law empowers carriers and distributors to perform work in public spaces —streets, roads, gardens, squares— without first obtaining municipal authorization.³³

³¹ Beder, Sharon, *Energía y poder. La lucha por el control de la electricidad en el mundo*, México, Fondo de Cultura Económica, 2005, pp. 15-24.

³² Noceda, Miguel Ángel, “Las eléctricas disuaden al consumidor. El coste de las ofertas fijas anuales presentadas por las grandes compañías a la CNMC supera hasta en 100 euros anuales a la media de los últimos cuatro trimestres”, *El País*, Madrid, April 26, 2014, p. 15.

³³ Cámara de Diputados, “Ley de la Industria Eléctrica”, *Diario Oficial de la Federación*, August 11, 2014, available at: http://www.diputados.gob.mx/LeyesBiblio/pdf/LIElec_110814.

Rhetoric of national content. Various provisions of the law contain regulations to guarantee the minimum percentages of national content to supposedly benefit national industry—for instance Article 11 Sections XXI and XXX of the law. These provisions contravene Articles 1106 and 1110 of the North American Free Trade Agreement (the former prohibits percentages of national content between NAFTA countries and the latter establishes safeguards for foreign investment). International treaties have a higher hierarchy than the law.³⁴

Electric power transmission and distribution networks are privatized. Article 35 of the law allows individuals to contribute to works, expansions

pdf. On March 9, 2021, reforms to the Electricity Industry Law were published to increase the powers of the Federal Electricity Commission in the sector. The aforementioned legal amendment was challenged before the Supreme Court of Justice of the Nation. On April 7, 2022, the action of unconstitutionality 64/2021, promoted by the parliamentary minority of the Senate of the Republic against articles 3, section V; 3, section XII, 3, section XII bis; 3, section XIV; 4, section I; 4, section VI; 12, fraction I, 26, 35, 53, 108, fraction V; 108, section VI; 126, section II; fourth transient; and fifth transitory, reformed on March 9, 2021. None of the contested precepts was declared unconstitutional. In Mexico, for a legal norm to be declared unconstitutional, 8 votes of the 11 ministers that make up that Supreme Court are required.

³⁴ NAFTA estará en vigor hasta el 30 de junio de 2023. Durante el gobierno de Andrés Manuel López Obrador se aprobó un nuevo tratado en sustitución de NAFTA. En México lo conocemos como T-MEC. En el momento en el que se escribe esta nota, los gobiernos de Estados Unidos y Canadá han activado el mecanismo de consultas para reclamar de México la aprobación de la reforma de 9 de marzo de 2021 a la Ley de la Industria Eléctrica ya mencionada en la cita anterior. A juicio de esos gobiernos la modificación legal y las decisiones del gobierno de López Obrador en el ámbito eléctrico trastocan los principios que rigen las inversiones en los acuerdos de libre comercio y que son: trato nacional, trato de nación más favorecida y nivel mínimo de trato. La reforma a la Ley de la Industria Eléctrica de 9 de marzo de 2021 además de dar mayor peso a la Comisión Federal de Electricidad en la industria eléctrica busca eliminar el abuso que las empresas eléctricas privadas realizaron a través de los procedimientos de auto abasto y auto generación. Son relevantes los artículos reformados cuarto y quinto transitorio de la Ley de la Industria Eléctrica que señalan: “Cuarto transitorio. Los permisos de autoabastecimiento, con sus modificaciones respectivas, otorgados o tramitados al amparo de la Ley del Servicio Público de Energía Eléctrica, que continúen surtiendo sus efectos jurídicos, obtenidos en fraude a la ley, deberán ser revocados por la Comisión Reguladora de Energía mediante el procedimiento administrativo correspondiente. En su caso, los permisionarios podrán tramitar un permiso de generación, conforme a lo previsto en la Ley de la Industria Eléctrica; y, Quinto transitorio. Los Contratos de Compromiso de Capacidad de Generación de Energía Eléctrica y Compraventa de Energía Eléctrica suscritos con productores independientes de energía al amparo de la Ley del Servicio Público de Energía Eléctrica, deberán ser revisados a fin de garantizar su legalidad y el cumplimiento del requisito de rentabilidad para el Gobierno Federal establecido en los artículos 74, fracción IV, de la Constitución Política de los Estados Unidos Mexicanos, 32 de la Ley Federal de Presupuesto y Responsabilidad Hacendaria y 18 de la Ley Federal de Deuda Pública. En su caso, dichos contratos deberán ser renegociados o terminados en forma anticipada”.

or the distribution of the electric power network. The network is privatized, and government control is limited, among other things, because business-people will receive income from the sale of the works under the terms of market rules.

Violation of due process. Article 41 of the Electrical Industry Law allows, in some cases, carriers and distributes to suspend electrical power service to the end users without any prior intervention by the authorities. This violates, *inter alia*, Articles 14, 16 and 17 of the Constitution. There is no guarantee of due process.

Legal easement for private purposes. Article 42 of the Electrical Industry Law allows legal easements to benefit carriers and distributors. Private, public, social, or indigenous property is subordinated to energy-related activities.

Consultation with native peoples is not binding. Article 117 of the Electrical Industry Law establishes the right to consultation, in the event of land occupation or easements affecting the lands of indigenous peoples, but without guaranteeing the principles of ILO Convention 169. The law does not establish that the consultation is binding, it does not acknowledge free, prior and informed consent, nor does it sufficiently indicate that native peoples will receive a substantial percentage of the benefits that companies derive from their businesses. It unconstitutionally allows individuals who will affect the lands of native peoples to participate in the consultation.

The law will imply surrendering the electrical industry to foreign capital: US and Spanish. The Mexican State will lose control of the industry. The prices of electricity will not decrease and, due to the multiple agents in the industry participating in the differentiated segments, there is a high probability of shortages affecting consumers and the Mexican people.

3. *The Geothermal Energy Law and reforms to the National Waters Law*

The preferential nature of geothermal energy exploitation has no constitutional basis. Article 4 of the Geothermal Energy Law,³⁵ which regulates the preferential nature of the exploitation of geothermal energy, is unconstitutional because it has no basis in the Constitution. Transitory Article 8 of the constitutional energy reform —Federal Official Gazette of December 20, 2014— only awards preferential status to the exploration and extraction of

³⁵ Cámara de Diputados, “Ley de Energía Geotérmica”, *Diario Oficial de la Federación*, August 11, 2014, available at: http://www.diputados.gob.mx/LeyesBiblio/pdf/LEG_110814.pdf

hydrocarbons and to the public service of transmission and distribution of electrical energy. Therefore, there is no constitutional basis to consider the generation of electricity using geothermal energy as preferential.

The unconstitutional exploitation of by-products is allowed without a concession. Pursuant to Article 5 of the law, by-products discovered in the course of the activities provided for by the law may be used without a concession. In accordance with the sixth paragraph of Article 27 of the Constitution, the exploitation, use or development of natural resources in the subsoil may only be carried out through concessions. In other words, the use of the by-products of geothermal energy can only be done through concessions.³⁶

The permits and licenses regulated by the law contradict the sixth paragraph of Article 27 of the Constitution.³⁷ Articles 8 to 25 of the Geothermal Energy Law are contrary to the sixth paragraph of Article 27 of the Constitution, since the exploitation, use or development of natural resources in the subsoil may only be carried out through concessions and not through licenses or permits. It is true that transitory Article 10 of the constitutional energy reform of December 2013 gives the Energy Regulatory Commission the authority to issue permits for the generation of electricity. However, in the case of geothermal energy, this authority, according to the law, belongs to the Ministry of Energy, which reveals the unconstitutional nature of its competence in this matter.

Unconstitutional sale of concessions. Article 29 of the law allows the transfer of concession rights without obtaining a new concession—an authorization from the Ministry of Energy will suffice—. The provision will encourage the purchase and sale of concessions, which is moreover unconstitutional because the sixth paragraph of Article 27 of the Constitution stipulates that the exploitation, use or development of natural resources in the subsoil may only be carried out by means of concessions and not by means of authorizations.

³⁶ In Mexican administrative law, a concession is defined as: “the administrative act by which the public administration, as grantor, confers to individuals, concessionaires, the right to exploit a property owned by the State or to exploit a public service”. Nava Negrete, Alfonso y Quiroz Acosta, Enrique, “Concesión Administrativa”, *Enciclopedia Jurídica Mexicana*, México, Porrúa-UNAM, Instituto de Investigaciones Jurídicas, 2008, t. V, pp. 359-362.

³⁷ According to Mexican administrative legal theory, a permit represents an administrative act by which an obstacle or impediment established by law for an individual’s exercise of a right is lifted or removed. Hernández Espíndola, Olga, “Permiso administrativo”, *Enciclopedia Jurídica Mexicana*, México, Porrúa-UNAM, Instituto de Investigaciones Jurídicas, 2008, t. V, pp. 532-535.

The causes for terminating concessions do not include the violation of the rights of indigenous peoples or the effects on the environment or health. Article 38 of the law sets out the causes that give rise to the termination of a concession. However, despite their importance, the violation of the rights of indigenous peoples—in violation of ILO Convention 169—or effects on the environment and health are not grounds for termination of the concession, which is in violation of the national and conventional legal provisions on this matter.

The procedure for the revocation and the expiry of concessions violates due process. According to Article 40 of the law, the revocation and expiry of geothermal concessions are declared administratively by the Ministry of Energy. In other words, this is a procedure that is decided by the administrative authority and not by a judge, through the rules of due process. This violates Articles 14, 16 and 17 of the Constitution.

The principle *nulla poena sine lege* is violated. Article 62 of the law establishes that violations of the law and its regulations may be administratively sanctioned.³⁸ This provision violates the third paragraph of Article 14 of the Constitution since punitive sanctions can only be provided for by laws and not by regulations.

Privatization of public law. Article 66 of the law stipulates that commercial and civil law can be applied supplementarily, thus diluting the scope of public law in geothermal matters. This means the privatization of public law as occurs in the rest of the energy reform.

Violation of Article 81 of the National Waters Law to the sixth paragraph of the Constitution.³⁹ Article 81 of the National Waters Law regulates construction permits for exploratory wells. The sixth paragraph of Article 27 of the Constitution states that any use or exploitation of resources in the subsoil must be done through the figure of concessions and not of permits.

4. Mexican Petroleum Law and the Federal Electricity Commission Law

The 2013-2014 energy reform means razing Articles 25, 27, and 28 of the Constitution, which establish that the nation is the owner of hydrocar-

³⁸ Cámara de Diputados, “Ley de energía geotérmica”..., *op. cit.*, p.19.

³⁹ *Constitución Política de los...*, *op. cit.*, p. 28; Cfr. “Ley de Aguas Nacionales”, Cámara de Diputados, 2016, available at: http://www.diputados.gob.mx/LeyesBiblio/pdf/16_240316.pdf. The National Waters Law was amended on January 6, 2020, and May 11, 2022. Publications of the Official Gazette of the Federation of those dates. The modifications do not change the meaning of what is held here.

bons and that these should be exclusively exploited by the State through its public agencies. The concept of strategic area has changed meaning. Today, it does not imply the State's exclusive and direct exploitation of energy, but rather the prevalence of energy exploitation by private parties or by the State over the property rights of individuals, of *ejidos*, of communities and of the territories of native peoples as established in transitory Article 8 of the 2013 constitutional energy reform.

The reform proposes the elimination of any energy independence on behalf of our country, which will entail subjecting ourselves to the hegemonic US energy policy.⁴⁰

The privatizing and denationalization model of the reform recommended by the Organization for Economic Cooperation and Development (OECD) can be summarized in three components: 1) privatization of national energy industry objectives; 2) privatization of its structures, and 3) privatization of the instruments for operation.⁴¹

First. The objectives of the national energy industry are privatized because Pemex and CFE are assigned corporate characteristics like those of a private company.⁴² The public nature of Pemex and CFE is blurred and their objectives and those of other bodies in the sector are aligned with those of private companies—it is true that under Mexican public law there have been private companies to assist the public administration, but never in recent years have the State's main public bodies, Pemex and CFE, had the nature of a company. The objective is to extract and sell energy resources as quickly as possible so as to “maximize profit”. Pemex and CFE will no longer retain their strictly public nature in order to serve as drivers of national development, but rather quasi-private companies that will not be governed by the guiding principle of safeguarding the general interest, but of private law—the principle of autonomy of will—and by the provisions of trade and foreign investment treaties.

Article 4 of both laws state that the purpose of productive enterprises is to undertake business activities. In these laws, constitutional purposes are dispensed with, but are: The State holds economic stewardship; the Nation retains the original, direct, inalienable and non-prescriptible ownership of natural resources (hydrocarbons); hydrocarbons in the subsoil are, under

⁴⁰ Contrary to what is stated herein, see: *Nos cambiaron el mapa: México ante la revolución energética...*, *op. cit.*, pp. 103 and ss, and Grunstein, Miriam, *De la caverna al mercado. Una vuelta al mundo...*, *op. cit.*, pp. 232-236.

⁴¹ Bartlett Díaz, Manuel (coord.), *Estrategia urgente en defensa...*, *op. cit.*, pp. 128 and 129.

⁴² Bartlett Díaz, Manuel, *Reforma energética. Un modelo privatizador*, México, self-published, 2009, pp. 33 and 34.

any circumstances, property of the Nation; individuals can intervene in the strategic area of hydrocarbons, but without presiding over the hydrocarbon industry, or the control and administration of productive State enterprises —Article 25 paragraph 4—; the modalities of property and intervention of individuals in the strategic areas are dictated by the State and must respond to national development objectives —Article 26 of the Constitution—; hydrocarbon exploration and extraction activities are matters of social interest and public policy; in other words, they are not or should not be subject to the market; on leaving the subsoil, hydrocarbons belong to the Nation because the participation of individuals in the industry is intended for the State to obtain revenues and thus contribute to the long-term development of the nation and not for individuals to obtain benefits above all else —seventh paragraph of Article 27— and hydrocarbons are not commodities but resources for national development.

Second. The structures are privatized because the organization is privatized. The new laws of *Petróleos Mexicanos* and of CFE build a legal system of exception. Pemex and CFE will have a specific acquisition, budgetary, and asset system different from the rest of the national public sector. A Board of Directors is created in both productive enterprises, whose “independent board members” act under different rules than those for the rest of public servants —in terms of accountability, transparency, salaries, responsibilities, and immunity—. This structure is for the State and the government to lose control over the national energy industry and for it to be guided by business goals unrelated to the State’s public interest, although the Mexican President will retain his own personal control: partaking in the appointment of board members and the directors of Pemex and CFE.

The purpose of this special system —Article 1 of the Law of Pemex and of CFE— in terms of its legal nature, remunerations, acquisitions, assets, responsibilities, State dividend, budgetary autonomy, and debt, is to limit and reduce the controls that the other public administration institutions receive from other State institutions⁴³ (Chamber of Deputies or Federal Audit Office). Treating Pemex and CFE as institutions almost alien to the public administration under frameworks which are more in keeping with private law than with public law is to highlight their status as quasi-private companies.

⁴³ “Ley de la Comisión Federal de Electricidad”, *Diario Oficial de la Federación*, August 11, 2014, available at: http://www.diputados.gob.mx/LeyesBiblio/pdf/LCFE_110814.pdf; the latest reform was published on May 11, 2022, mainly to introduce the principle of gender parity in collegiate bodies provided for by law; and “Ley de Petróleos Mexicanos”, *Diario Oficial de la Federación*, August 11, 2014, available at: http://www.diputados.gob.mx/LeyesBiblio/pdf/LPM_110814.pdf.

The reform permits the creation of multiple subsidiaries and affiliates by the Boards of Administration, which will dismantle the national vision of an integrated energy industry.

The Pemex and CFE Boards of Administration assume anti-constitutional legislative powers. They are empowered to issue general energy regulations contrary to Article 73 Section X of the Constitution, which stipulates that these are the responsibility of Congress.

Third. The instruments of operation are privatized because the country's energy resources will be handed over to transnational companies by means of contracts, concessions, permits and authorizations, and these companies will obtain the main economic benefits. Energy revenues will no longer belong exclusively to the nation and will be shared with foreign interests.

The framework of the Pemex and CFE laws is to limit the importance of these institutions in the national economy, so that they can eventually disappear, and transnational companies can obtain the main benefits from the exploitation of energy resources.

5. Law on the Coordinated Regulatory Energy Agencies and the Law on the National Agency for Industrial Security and Environmental Protection for the Oil & Gas Industry

The coordinated regulatory agencies —the National Hydrocarbons Commission and the Energy Regulatory Commission— are very weak and will be unable to control the transnationals.

The Law on the Coordinated Regulatory Energy Agencies is the result of political corruption. It intends that the Ministry of Finance (SHCP) and the Chamber of Deputies lose their powers. Article 3 of the law establishes that the coordinated regulatory energy agencies may dispose of the income derived from the rights and uses, which implies that they will be exempt from paying these resources to the Federal Treasury.⁴⁴ This policy entails loss of control of the SHCP and will certainly be a source of corruption.

The appointment of commissioners to the coordinated regulatory energy agencies and the national agency for industrial security will also be a source of political corruption. The appointments are to hand out quotas among political parties.

⁴⁴ “Ley de los Órganos Reguladores Coordinados en Materia Energética”, *Diario Oficial de la Federación*, August 11, 2014, available at: http://www.diputados.gob.mx/LeyesBiblio/pdf/LORCME_110814.pdf. Last reform published on May 20, 2021.

The rules on conflicts of interest and anti-corruption measures contained therein are insufficient.

These agencies are endowed with powers that are unconstitutional because they encroach on the powers of public authorities. For example:

1. Section II of Article 22 of the Law on Regulatory Agencies empowers them to issue general administrative rules, which violates Article 89 Section I of the Constitution since regulatory power belongs to the Executive.
2. Section VI of Article 22 of the Law on Regulatory Agencies authorizes them to dispose of the income derived from the rights and uses established to finance their budget, which implies a violation of Article 74 Section IV of the Constitution since in Mexico it is the Chamber of Deputies that constitutionally determines expenditures.
3. Section XVIII of Article 22 of the Law on Regulatory Agencies enables them to issue regulations on professional service, which violates the powers of Congress —Article 73 Section X of the Constitution and Article 123 Section XIII of Paragraph B of the Constitution.

Regulatory agency commissioners are exceptional public servants who enjoy benefits that the other public servants do not have, not even the President of the Republic. These benefits violate Article 127 Section II of the Constitution.

It is contradictory that the regulatory agencies are part of the centralized public administration and at the same time are considered decentralized bodies with technical, operational, and administrative autonomy.

The Law on the National Agency for Industrial Security is part of the corruption and closed-door political agreements between the PRI and the PVEM. It is a law that will not prevent damage to the environment. The agency does not have the authority to terminate a hydrocarbons contract, license or permit for violating environmental laws.

6. *Fiscal and budgetary energy legislation*

The financial aspects of the energy reform were embodied in the decrees that were voted in Congress regarding: The Hydrocarbons Revenue Law, the reforms to the Federal Law of Rights and the Fiscal Coordination Law, the issuance of the new Law of the Mexican Oil Stabilization

and Development Fund, and the modifications to the Federal Budget and Fiscal Responsibility Law and the General Public Debt Law.

The Hydrocarbons Revenue Law contains two tax regimes: one for Pemex and another for private contractors.⁴⁵ The Pemex tax regime is very similar to the one that has been in effect until now because according to its regime, Pemex will continue to provide the Mexican treasury with significant amounts of tax revenue for the Federal Expenditure Budget. Moreover, this tax regime is disproportionate for Pemex compared to private companies and it is much more burdensome than the one the Hydrocarbons Revenue Law provides for private contractors, who will contribute paltry sums to the Mexican treasury.

Private contractors will not pay contributions to the Mexican treasury but rather considerations, which are to be determined as agreed *in the contracts* in each specific case. Additionally, income tax will be paid to the public treasury. However, their contributions are far from, and certainly far below, those that Pemex will have to pay.

The considerations private companies will pay to the State are not considered taxes or contributions but will be governed by the rules of private law. This legal principle, completely alien to Mexican law, violates the provisions of Article 31 Section IV of the Constitution since contributions cannot be the subject of agreements or contracts, but must be provided for by law and have at least the characteristics of generality and certainty.

The supervision of the financial aspects of the contracts regarding the considerations will not be monitored by citizens, and the terms of the audit will not be disclosed to the public during the audit process. In other words, the supervision of the administration of financial aspects of the contracts regarding the considerations will be carried out behind closed doors and will surely be a source of corruption and kickbacks.

Articles 254 to 261 of the Federal Law of Rights are repealed, and these provisions are transferred to Articles 38 to 62 of the Hydrocarbons Revenue Law. The difference now is that these contributions will not be passed on to the Federal Treasury but will be sent to the Mexican Petroleum Fund.

The Fiscal Coordination Law is amended to preserve the percentage of *ingresos por derechos* [a type of tax revenue in Mexico] assignable under the new oil revenue system. It is believed that 85.31% of the collections ob-

⁴⁵ *Diario Oficial de la Federación*, August 11, 2014..., *op. cit.*, first evening section, pp. 2-25. The quantities have been updated. The latest reform was published in the Official Gazette of the Federation on January 13, 2022.

tained from the sum of the ordinary right on hydrocarbons,⁴⁶ of the special right on hydrocarbons and the additional right on hydrocarbons will still be assignable. The difference is that the transfers will be paid into the Mexican Petroleum Fund and not to the Federal Treasury. The income tax generated by the contracts will be added to this amount, establishing an assignable coefficient of 79.73% in order to minimize the impact on the amount transferred to states for their participation in oil revenues.

The Mexican Oil Stabilization and Development Fund is a trust that will be managed by a committee comprised of federal government officials, but the provisions governing public trusts will not apply in this specific case.⁴⁷ This fund will be chaired by the Finance Minister. When this fund was established in the Constitution in 2013, the idea was to imitate the oil fund in Norway, which holds all the resources of the country's oil revenues as reserves for future generations.⁴⁸ Unlike the Norwegian case, under the Mexican secondary law of 2014, the resources that make up the Mexican Petroleum Fund will be predominantly used for current expenditure. These resources will not be assigned to guarantee the development of the nation's industrial and productive capacity and to support small and medium companies; nor will they be allocated to compensate for social and regional inequalities; and in the same way, they will not be used preferentially to finance the development of human capital.

The new 2014 Law of the Mexican Oil Stabilization and Development Fund specifies allocations to the fund on a priority basis, thus eliminating flexibility. The contributions to the fund are:

- Payment of allotments and contracts.
- Transfers to the Oil Revenue Stabilization and State Revenue Funds.
- Transfers to the Hydrocarbons Extraction Fund.
- Transfers of resources to the Federal Treasury so that oil revenues are kept at 4.7% of the Gross National Product
- Allocate resources to long-term savings.

⁴⁶ "Ley de Coordinación Fiscal", *Diario Oficial de la Federación*, January 30, 2018, available at: http://www.diputados.gob.mx/LeyesBiblio/pdf/31_300118.pdf.

⁴⁷ Ramírez de la O, Rogelio, *Fondo Mexicano del Petróleo para la Estabilización y el Desarrollo*, México, Friedrich Ebert Stiftung, 2014, pp. 1-24.

⁴⁸ Sovereign Wealth Funds based on the Norwegian model have been set up in various countries around the world. These funds are generally controlled by the central banks of the States and serve as an instrument for intergenerational income transfer. Except in the case of Norway, they are usually called into question because of their opacity and weak accountability mechanisms.

The law indicates that only when the balance of investments in long-term public savings is equal to or greater than 3% of the GNP of the year prior to the one in question, the resources in the fund can be used.⁴⁹ These resources will be allocated to:

- Universal pensions up to 10% of the increase from the previous year.
- Research and innovation, up to 10% of the increase from the previous year.
- Investment vehicles in oil projects (and if applicable in investments for national development, which means it is optional) up to 30% of the increase from the previous year.
- University and postgraduate scholarships, up to 10% of the increase from the previous year.

The Federal Budget and Fiscal Responsibility Law proposes to endow *Petróleos Mexicanos* and the Federal Electricity Commission with a special regime that grants them budgetary autonomy, removing the controls and rules associated with a budgetary process, debt management and spending control to which they had been subject.

Against the rights of workers and citizens, the General Public Debt Law establishes that Pemex's and CFE's so-called labor liabilities are to be paid from the budget. The labor liability argument has been misused to question Pemex's and CFE's financial viability, and to allude to the privileges and corruption of union leaders. However, although Pemex's and CFE's labor liabilities may be considered high compared to other public sector agencies and entities, they reflect workers' constitutional labor rights and represent relatively small amounts in comparison with, for instance, Pemex's oil revenues. As for corruption and privileges in Pemex and CFE, the solution is not to fight it by affecting workers' rights and benefits, but rather to confront it by charging union leader with any criminal acts they may have committed.

In terms of financing, it is proposed that productive State enterprises be granted additional flexibility (Section VII is added to Article 1 of the General Public Debt Law).⁵⁰ The liabilities of productive State enterprises—Pemex and CFE—are considered public debt, which implies that the

⁴⁹ *Diario Oficial de la Federación*, August 11, 2014..., *op. cit.*, first evening section, pp. 26-40. Last reform published on May 11, 2022, in the Official Gazette of the Federation.

⁵⁰ *Ibidem*, first evening section, p. 41.

large private transnational companies that enter the energy business by way of contracts will not share the risk, but only the profits, thus burdening the public treasury with Pemex's and CFE's liabilities as public debt and ultimately the Mexican people, who will pay Pemex's debt through higher taxes.

The financial aspects of the energy reform palpably show the most negative consequences of the energy reform. This consequence consists of handing over a very substantial percentage of oil revenues to foreign companies in detriment of national public finances, which will lead to an enormous fiscal void to be covered with debt, with cutbacks in public spending or with higher taxes to be paid by Mexicans.

IV. CONCLUSIONS

The main contents of the energy reform can be characterized, *inter alia*, by the following elements:

1. *Dismantling of the State.* The Mexican State is severed by the reform and reduced to a minimum so as to favor the international market. The main financing and operating instruments of the State are suppressed or limited: a) Pemex and CFE meet the corporate governance criteria set by the OECD and mainly consist of managing Pemex and CFE as private companies and not public entities under State stewardship; b) Pemex's and CFE's exception regime for budget, debt, responsibilities, transparency, oversight or acquisitions is to ensure that the instruments of parliamentary or government control no longer apply as in the case of the branches of government and government agencies and bodies, i.e., they are evidence of the transition of Pemex and CFE to the status of quasi-private companies; c) the fiscal void that the reform will create as a result of the special tax regime for contractors will deprive the public treasury of resources for public spending and force the State into debt, reduce public spending or increase taxes to compensate for the tax deficit that the reform will generate; d) the effect on the principle of direct rule of the nation over natural resources in the subsoil —by sharing oil revenue— will imply the loss of sovereignty; and e) the temporary occupation of private, public and social property by transnational companies *without binding consultation with native peoples or society* implies the end of Mexicans' right to property.

2. *Privatization of public law.* This is made evident in: a) the end of the Calvo clause because any disputes arising from the reform will not be resolved by national courts, but by international arbitration; b) the protection of foreign

investments over national ones —Articles 1103 and 1110 of NAFTA— implies that Mexican public law and the property of nationals is subordinated to international trade law; *c*) the supplementary application of private law in this matter; *d*) the tax regime of contracts is not applied as a tax contribution but as a consideration governed by private law; *e*) the Mexican Petroleum Fund which is not governed by the rules for public trust, but as a *sui generis* trust outside the State controls that apply to other trusts; *f*) simulated expropriations *without the binding consultation with the native peoples and society* under the figure of temporary occupation or easements that will be carried out not to ensure public good but to satisfy the private interests of contractors; *g*) the booking that allows the nation's hydrocarbon reserves to be offered as collateral to obtain loans from international banks; *h*) the securitization of national reserves in foreign stock markets; and *i*) subjecting *ejido* and indigenous property to the purposes of the energy reform, according to transitory Article 8 of the 2013 constitutional energy reform.

3. *Reduction of the Welfare State to its minimum levels.* This characteristic is seen in: *a*) considering the rights of Pemex and CFE workers as a labor liability and not as genuine human rights; *b*) denying the right to development of peoples as provided for in Article 1 of the UN Covenant on Civil and Political Rights and the UN Covenant on Economic and Social Rights by subordinating the latter to the interests of foreign investors; *c*) subordinating the rights of native peoples to private investments because the results of consultation proceedings are not binding should the communities refuse said investments; *d*) violating the rights to the social supply of electricity and hydrocarbons because public bodies —Pemex and CFE— will not be responsible for this supply and the State will not be able to guarantee it given the number of economic agents; and *e*) reducing the content of fundamental rights to social property because this is subordinate to the preferential nature of energy-related activities.

4. *Subordination of the Mexican State to the geostrategic interests of the United States.* The energy reform was designed from abroad —by the USA and international financial organizations— to hand over the nation's energy resources to foreign interests. With this reform, the nation loses part of its natural wealth and the State abdicates its former power to exclusively harness the energy resources of the Mexican people, both this generation and future ones. The reform has been imposed by the government to benefit foreign interests and was implemented without proper consultation with the society, but through the propagandistic apparatus of the television duopoly that drowned out or silenced the voices of opposition.⁵¹

⁵¹ Cabrera, Rafael, “Gastó gobierno de EPN \$1,181 millones para promover la reforma energética”, *Aristegui Noticias*, January 4, 2016, available at: <https://aristeginoticias.com/0401/mexico/gasto-gobierno-de-epn-1181-millones-para-promover-la-reforma-energetica/>.

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NEW ENERGY MODEL, MARKET FAILURES AS A BASIC PRINCIPLE OF REGULATORY LEGITIMACY

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SUMMARY: I. *Introduction*. II. *Regulatory policy as a response to energy market dysfunctions*. III. *Conclusion*. IV. *Bibliography*.

I. INTRODUCTION

The energy industry is a risky industry. Without a doubt, agents require strong technical, economic, and financial to be able to perform successfully in the markets ranging from hydrocarbon exploration and extraction activities to electricity transmission and distribution activities considered strategic and reserved exclusively for the State in the text of the Mexican Constitution, to the recently liberalized midstream and downstream activities like transportation, storage, distribution and commercialization of petroleum products, or the generation and commercialization of electricity. However, in this context, what role is left for the government? The answer to this question has much to do with the construction of an environment in which property rights are clearly defined, contracts respected and enforceable, and the public interest is considered in the face of investments that, by their very nature, seek to maximize private profits. It is in this last area where it is important to design regulatory policies and instruments with enough strength and adaptability to weather the ups and downs of a volatile industry and reconcile these different types of interests.

The situation acquires a particular dynamic when advances in technological and business processes in the energy industries give rise to increasingly complex markets, and where international experience has demonstrat-

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ed that they should not be allowed to operate in the kind of governmental vacuum typified by *laissez faire* attitudes.

Given this, it becomes imperative for the State to intervene, rather than withdrawal, with such a level of sophistication featuring the emission of quality regulations that meet the objectives of ensuring the public good without sacrificing the advantages of the entry and operation of new economic agents.

Specifically, the field of regulatory policy design is responsible for solving precisely these problems in markets where their structure leads to inefficient equilibriums, where there is the potential for abuses by predominant players, production restrictions or rent extraction from consumers, to mention a few issues.

Broadly speaking, just as the markets are in continuous evolution, the style of State intervention has also developed internationally to break away from high levels of State interference (nationalization being the most extreme expression of such behavior),¹ and give way to a regulatory policy that embodies four main criteria:

1. That there are clearly established principles and rules.
2. That these rules are contained in a high-level legal instrument, at least in one piece of legislation.
3. That their implementation is carried out by specialized, technically solvent agencies and designed to be resistant to the pursuit of political agendas.²
4. Strict adherence to the circumstances and contexts of the mechanisms intrinsic to market management are not enough to guarantee proper operation. These are well-known market failures and must be given priority attention.

Regulatory policy must first answer the question “why regulate?” It is a question of utmost importance primarily because different motivations for regulation must necessarily result in different institutions and regulatory designs. Secondly, the motivations will give us a scale by which we can evaluate regulatory policy and institutional design.³

¹ Foster, Christopher, *Privatization, Public Ownership, and the Regulation of Natural Monopoly*, New Jersey, Blackwell, 1992, pp. 70-95.

² Majone, Giandomenico, “Regulation and its Modes”, in Majone, Giandomenico (comp.), *Regulating Europe*, New York, Routledge, 1996, pp. 9-27.

³ Decker, Christopher, *Modern Economic Regulation. An Introduction to Theory and Practice*, Cambridge, Cambridge University Press, 2015, pp. 13-35.

In Mexico's case, the energy model designed in the second half of the 20th century began to present clear deficiencies that did not address the energy needs of the country. It was necessary, therefore, for the country to update it using the best international practices. The energy context that gave rise to the so-called Energy Reform, presented to Congress by the Federal Executive on August 12, 2013, can be found in the preamble of said reform. In summary, the 2013 landscape in the hydrocarbons sector was the following:

- A fall in oil production despite the increasing rate of investment. This is reflected in the depletion of the Cantarell oil field.
- The drawback of a single State-owned agency assuming all the risks inherent to the exploration and extraction of hydrocarbons, principally those in non-conventional fields such as those located in deep waters.
- The growing dependence on foreign forces to satisfy demand for natural gas.

The situation in the electricity sector in 2013 was as follows:

- An electrification rate of less than 93.5% for settlements with fewer than 2,500 inhabitants.
- Rising financial losses incurred by the State monopoly, the Federal Electricity Commission, which registered at 77 billion pesos in 2012 alone, notwithstanding the high rates, even considering government subsidies.
- The commitment made in the 2012 General Law on Climate Change to achieve a target of 35% of electricity generation from clean sources.

This context forced the Mexican government to consider alternative regulatory models that would make up for the shortfall in investment in the sector, with their respective risks, which would simultaneously allow: 1) to strengthen the public finances of Pemex and the Federal Electricity Commission; 2) by reducing production costs and not by merely hiking up the rates to the detriment of consumers; and 3) without this meaning an increase in subsidies, which were often regressive (benefitting the higher-income population more) and preventing those resources being used for other programs.

This reform implied that the regulatory scheme had to face the challenge of creating distinct incentive designs to correct the failures in the now liberalized markets, which, in the end, is the final technical justification that legitimizes any regulatory action. Given the background and objectives set out above, the option was to choose a reform that would transition from sectors with vertically integrated State monopolies along almost all of its production chain to a model that would allow private participation while preserving the State's stewardship in dealing with sectors of great importance. This made it possible to attract capital to cover the investment deficit and innovative cost-cutting technologies, as well as to convert sectors with subsidized monopolies into sectors with economic activity that provided revenues for the State through taxes, duties, fees, tariffs, and shared profits. And all this, while still preserving the government's ability to provide subsidies if deemed convenient or necessary. With the new energy model, Mexico changed the nature of its governmental presence in the energy industry from one of direct State control to one of regulation.

However, opening the sector to private participation should not mean that the State will abandon the sector. As already noted by Friedrich Hayek in his book *The Road to Serfdom*, “[p]robably nothing has done so much to damage to the liberal cause as the wooden insistence of some liberals on certain rough rules of thumb, above all the principle of *laissez faire*”.⁴ The energy sector is one in which various market failures can be found to justify State intervention, especially from the moment in which said market is being designed through laws and their corresponding administrative provisions. The goal of this paper is to define the principal failures in the current energy market and how these are being addressed by regulatory bodies.

II. REGULATORY POLICY AS A RESPONSE TO ENERGY MARKET DYSFUNCTIONS

The new model that Mexico adopted in 2013 gave greater authority to the Energy Regulatory Commission (CRE), the National Hydrocarbons Commission (CNH) and the National Agency for Industrial Safety and Environmental Protection (ASEA), which were given the power to regulate energy markets. This was done by elevating the first two to the constitutional level through the figure of Coordinating Regulatory Bodies in Energy Matters, a

⁴ Hayek, Friedrich A., *The Road to Serfdom. Texts and Documents*. Unión editorial, 1944, available at: <https://www.elcato.org/sites/default/files/camino-de-servidumbre-libro-electronico.pdf>.

provision established in the Decree that both amends and adds various provisions to the *Political Constitution of the United Mexican States*, in matters regarding energy, and in particular, Article 28 of the Constitution.

The CRE, the CNH and the ASEA now enjoy the necessary autonomy to implement the regulatory policies the energy markets need to achieve efficient results. The CNH and the CRE were even granted legal personality, the power to use the income derived from the contributions and considerations established by law, as well as a new way of appointing their Governing Body, with the participation of the Senate. Such changes were necessary to ensuring greater independence in their actions.⁵

With a view to applying the guiding principles of a regulatory State, the abovementioned bodies specialize in addressing the failures of a market as deep and complex as the energy market. Likewise, it was necessary to guarantee that these bodies would not respond to political interests but would generate a stable environment of healthy competition among market players, driven exclusively by technical criteria.

Although current legislation deals with these problems, the following shows how the coordinating regulatory bodies have responded and taken concrete actions to correct the main failures observed in the energy market, which can be grouped into four categories: monopolies, asymmetric information, negative externalities and insufficient supply.⁶ All this shows how the legal and regulatory machinery has evolved from the Constitution and federal laws to the regulations emanating from regulatory bodies and, step by step, has favored a more efficient and competitive national energy market.

1. *Presence of players with monopoly power or dominance*

Due to high risks and sunk costs, the old institutional design of the European model bundled all the sectors of an industry under the wing of State monopolies that were responsible for implementing energy policy and responding to economic development needs, among other goals subject to change according to the political priorities of the then current government.

⁵ This is established in the 12th and 13th provisional articles of the *Political Constitution of the United Mexican States*, and in Chapters II and III of the Law of the Coordinated Regulatory Bodies in Energy Matters published in 2014.

⁶ Majone, Giandomenico, "From the Positive to the Regulatory State: Causes and Consequences of Changes in the Mode of Governance", *Journal of Public Policy*, New York, num. 2, vol. 17, May-August 1997, pp. 139-167.

In Mexico's case, this model was embodied in the creation of the two most important State-owned companies: the Federal Electricity Commission (CFE) and the Mexican oil company Petroleos Mexicanos (Pemex).⁷

Consequently, one of the main concerns for the national energy market to function properly was regulating Pemex and CFE on changing their legal status to State Productive Enterprises (EPEs), which had to compete on equal terms with new private participants in the national market in the transaction of goods and services that had already been opened up to deregulation.⁸ It was therefore necessary to break up their previously vertically integrated divisions and agencies into different companies to encourage the participation of new actors competing with the EPEs.⁹ Some critics of the Energy Reform view these changes as excessive since they significantly limit EPEs' capacity to operate.¹⁰

All of this aimed at generating a competitive environment to promote innovation, efficiency and increase the number of market options where the users and customers can punish and reward economic agents according to their performance in the market. However, fragmenting the market and restructuring CFE and Pemex to be able to compete along their respective productive chains is insufficient to meet the goals of our new

⁷ To simplify the explanation given here, we are not delving into the creation of *Luz y Fuerza del Centro*, a State-owned electricity supply company that was liquidated in 2009 and whose responsibilities were turned over to the CFE.

⁸ The 2013 reform modified Articles 25, 27 and 28 of the Constitution, deregulating a series of activities, such as: a) storage, transportation, distribution and commercialization of oil and its derivatives; b) surface exploration, treatment and refining of oil, and c) generation and commercialization of electrical energy, among other activities. Meanwhile, strategic activities, which are exclusive to the State, are defined as: a) planning and control of the national electricity system; b) transmission and distribution of electricity, and c) hydrocarbon exploration and extraction. However, it should be emphasized that private participation on behalf of the State is allowed through contracts for items "b" and "c".

⁹ "La fortaleza de Pemex como eje rector de cualquier reforma energética", Cárdenas Gracia, Jaime (coord.), *Reforma energética. Análisis y consecuencias*, México, Tirant Lo Blanch, UNAM, 2015, pp. 207-221, a paper presented by Javier Jiménez Gutiérrez, in which he points out that there are risks for the national oil industry if Pemex is not strengthened. The author notes that improving the administration of the EPE would place the oil company on equal footing to compete with the new foreign arrivals entering the industry as a result of the liberalization of the oil industry.

¹⁰ Víctor Rodríguez Padilla points out that the Energy Reform implies major risks for Pemex. In particular, the author points out "that the government will not allow the public company to grow or prosper. It will become a marginal participant in the market, investing only where the private sector does not want to", in *Energy Reform in Mexico. Minimize the State to maximize private business*, Mexico, Cámara de Diputados, LXVIII Legislatura, pp. 264-267.

energy model. Consequently, the CRE has intervened by issuing administrative rules that, among other functions, seek to limit the pervasive interference of EPEs.

By way of example, it is worth noting that the regulation issued by the CRE stresses the prohibition of unduly discriminatory treatment. In the case of CFE, the General Administrative Provisions (DACG) regarding open access to the National Transmission Network and General Distribution Networks oblige carriers and distributors (CFE Transmission and the various companies of CFE Distribution, respectively) to grant, on receiving instructions from CENACE, “effective and not unduly discriminatory open access to provide service services in the National Transmission Network and the General Distribution Networks”. Likewise, one of the strongest regulatory powers that the CFE has to limit the market power of these EPEs is the approval of the costs and rates that can be imposed on their service users. Examples of these are approving maximum rates for transporting and distributing natural gas through the pipelines, the rates of transmission and distribution of electricity for CFE Transmission and CFE Distribution or the methodology used to determine the firsthand sale prices in storage terminals approved for Pemex Transformación Industrial.

It should be emphasized that the presence of monopolies is not limited to the influence CFE, and Pemex have over the market. Similarly, there may be monopolies, oligopolies or signs of them in other branches of the energy sector by companies other than EPEs, which are of prime concern for the regulatory bodies. For example, in the market for Liquefied Petroleum Gas (LPG), the CRE detected signs of collusion and unfair practices, which have been investigated and even been the subject of complaints to the Federal Economic Competition Commission (COFECE), which has already begun an investigation.

And in the pursuit of fragmenting concentrated structures, conditions have been created for new entrants into regulated activities. An interesting case under development is the business model of selling LP gas at convenience stores. Such permits seek to diversify the way gas is supplied, breaking possible monopolies and creating more and different options.

The described developments show the importance of creating an environment of economic competition that encourages the participation of a wide range of players, who are constantly trying to improve and gain ground in the market while empowering consumers with options and better services.

2. *The rise of negative externalities*

Externalities arise when the actions of producers or consumers have costs or benefits for themselves or for third parties, without them actually paying the price of the transaction. The simplest examples in the sector are negative externalities due to contamination in the production of hydrocarbons or electrical energy using fossil fuels or the network externalities that emerge on deploying a pipeline system to transport hydrocarbons, or the National Transmission Network and General Distribution Networks.

Not taking them into account will cause inefficiencies in the market since negative externalities translate into undesired costs but are assumed by agents who do not benefit from them. Consequently, the role of regulators is to impose such measures so that the negative externalities are shouldered by the market players. To do so, ASEA has taken on the fundamental role as regulator in the hydrocarbons sector so that the players will take on said risks.¹¹ This agency is in charge of ensuring industrial safety, operational safety and environmental protection as multidisciplinary areas aimed at

...preserving the integrity of personnel and facilities, as well as protecting the environment through technical guidelines to identify, reduce, evaluate, prevent, mitigate, control and manage risks in the Hydrocarbons Sector from the preliminary and design stages to the operational stage, as well as in the final stages of closure, dismantling and abandonment.¹²

Along these lines, ASEA must approve, at the technical-operational level, the projects of permit holders who wish to carry out regulated activities.

In addition to authorizing such projects, ASEA, as part of its operational strategy, supervises, inspects and verifies industrial designs and processes as well as projects already underway.¹³

¹¹ *Reforma energética y cambio climático*, cit., pp. 119-137. The speaker, Marisol Anglés Hernández, points out that the Energy Reform shows a total dissociation from and disinterest in the environmental and social implications for Mexico. Likewise, the author points out that the process of globalization has broken down the most solid structures of the rule of law through the co-optation of the top echelons of power, where big capital is the priority State issue and the interests of most of society have been expelled from the public sphere.

¹² Orellana, Alfredo, *GPS Energía*, Mexico, Tirant lo Blanch, 2018, p. 113.

¹³ Ricardo Massa Roldán points out that, despite the fact that the above-mentioned programs are robust in relation to international best practices, there is an asymmetry in the implementation of such programs. Therefore, the Agency should work on adapting them as regards the activities of exploration, extraction, transformation, production, transportation and storage of hydrocarbons in the Mexican hydrocarbons sector. See Elizondo, Alejandra

For authorization, ASEA needs a technical evaluation, and permit holders are required to implement the industrial safety, operational safety and environmental protection management system (SASISOPA).

The environmental impact of hydrocarbons is not limited to the productive chain of this sector but can also be extended to the electricity sector in the form of generation by conventional thermoelectric power plants. At present, in many cases there are greater incentives for producing and using fossil and polluting energies.¹⁴ This is important when determining the type of generation technology as a new and efficient natural gas power plant can release up to 60% less carbon dioxide into the atmosphere than a conventional coal-fired power plant.¹⁵ The environmental impact of renewable sources such as solar and wind is even less.

In this sense and with the aim of meeting the goal of consuming 35% of Mexican electricity from clean sources by 2024—as mandated in the General Ecological Balance and Environmental Protection Law—the Electrical Industry Law (LIE) created Clean Energy Certificates (CEL) which cover the production of 1 MWh of electrical energy coming from clean sources. This market, described in greater depth in the Market Rules, lays out the obligations of non-polluting consumption, committing large users and energy suppliers, including those who supply energy to public and private households, to acquire a certain proportion of their electricity from clean energies or by acquiring CELs.

This market creates incentives for clean electricity production since the generators offer their CELs in the market, thus earning additional income, while obligated participants¹⁶ pay the cost of the environmental externalities. It is important to point out that the CEL market opened in 2018 and by May 2018, the CRE had already granted close to 1.5 million CELs certifying production of clean energy.

and Dussauge Laguna, Mauricio I. (eds.), *ASEA: un nuevo modelo de institución del Estado mexicano*, México, CIDE, 2018, pp. 89-114.

¹⁴ Baron, Richard, “Renewable Energy: A Route to Decarbonisation in Peril?”, Organization for Economic Cooperation and Development, Paris, June 2013. Available at: <https://www.oecd.org/sdroundtable/papersandpublications/Background%20Paper%20RTSD%20June%202013.pdf>.

¹⁵ National Energy Technology Laboratory, “Cost and Performance Baseline for Fossil Energy Plants”, vol. 1; *Bituminous Coal and Natural Gas to Electricity*, DOE/NETL-2010/1397. United States Department of Energy, November 2010.

¹⁶ Article 123 of the LIE defines Obligated Participants as: Suppliers; Qualified Market Participant Users; End Users that are supplied by isolated supply; as well as the licensees of Legacy Interconnection Contracts that include Load Centers whose total consumption is not fully covered by Clean Energies, whether they are public or private.

One of the ways Basic Service Providers can acquire a CEL is through the electrical hedges they are obliged to sign through the Long-Term and Medium-Term Auctions organized by the National Energy Control Center (CENACE), pursuant to Article 53 of the LIE. Through the first three Long-Term Auctions held between 2015 and 2017, more than 20 million CELs have been awarded annually.¹⁷ This will contribute to increasing the consumption of energy that comes from clean sources, which in 2017 stood at 21.1% of total energy consumption.¹⁸

Sectoral regulation should not be limited to efficient use of resources and the creation of economic markets working in harmony but should necessarily incorporate social variables. Regulatory bodies, therefore, have an obligation to coordinate among themselves to create rules that put society and individuals at the center of their decisions.

3. *High level of asymmetric information*

For a competitive market to function and flourish properly, both consumers and suppliers of products and services must have within their reach the information necessary to make informed decisions. Consequently, the State must work to ensure that everyone has access to sufficient, complete and accurate information. But this raises two problems that are of particular concern to regulators.

First, it is necessary to empower the user and offer them as many tools as possible so that they can make informed and well-reasoned decisions. They must be aware of the different options as well as their prices. Given this need to democratize information, the CRE has implemented actions that go hand in hand with innovation and information technologies, including the creation of mobile applications like Gasoapp and AmiGas LP. These offer multiple services in real time such as: comparing prices among suppliers, comparing official prices and sale prices; filing complaints, making reviews, and finding nearby suppliers, among many other functions. All of this with the goal of generating greater awareness of our power as users. While the previous example shows an instance of asymmetry that users can actively resolve, the CRE is also responsible for solving problems of asymmetric

¹⁷ This can be gleaned from the outcomes of the three auctions, information for which is available for download on the National Energy Control Center microsite “Long-term auctions”, available at: <https://www.cenace.gob.mx/paginas/publicas/mercadooperacion/subastaslp.aspx>.

¹⁸ SENER, *Programa de Desarrollo del Sistema Eléctrico Nacional 2018-2032*, México, 2018, p. 23.

information that, because of their level of technicality, would be very costly for users to gather enough information. Hence, several technical guidelines that specify the quality of services have come into being. NOM-016-CRE-2016,¹⁹ for example, is the first technical standard issued for the open fuel market. It regulates the quality of petroleum products and establishes the verification requirements to ensure that consumers do not receive products that damage their vehicles or equipment. Similarly, the Grid Code²⁰ for the electricity industry, as its name indicates, contains the criteria for the efficiency, quality, reliability, continuity, safety and sustainability of the national electricity system. The obligations set out in several of these provisions are established for the suppliers and one of their objectives is precisely to avoid the damages that asymmetric information may cause consumers.

Another asymmetry that arises, but applying to suppliers of products and services, is lack of concrete knowledge of the size of the market. One of the most important tools to address this problem is the open season procedure. This is a process, sometimes obligatory, by which potential users are allowed input into the next infrastructure design for the transportation or storage of oil or natural gas since the high costs and economies of scale make it complicated and probably inefficient for each user to build their own. So, through this measure, users can learn beforehand of the development of a new project or the expansion of an existing one and request the use of the facilities by paying a fee for this.

In the case of new facilities, open seasons serve to resize the infrastructure, thereby allowing better use of economies of scale and avoiding incomplete markets. Likewise, this process should be carried out each time there is available capacity due to disuse, as well as for new projects and the expansion of existing projects.

It is through this process that in 2018 Pemex Logística offered storage capacity in terminals and transport pipelines in the North and North Pacific systems, by which the US company Andeavor was again awarded capacity on winning an open season for the second time. As a result of this

¹⁹ Secretaría de Gobernación, Acuerdo de la Comisión Reguladora de Energía que modifica la Norma Oficial Mexicana NOM-016-CRE-2016, Especificaciones de calidad de los petrolíferos, con fundamento en el artículo 51 de la Ley Federal sobre Metrología y Normalización, *Diario Oficial de la Federación*, México, June 2017.

²⁰ Secretaría de Gobernación, Disposiciones Administrativas de carácter general que contienen los criterios de eficiencia, calidad, confiabilidad, continuidad, seguridad y sustentabilidad del Sistema Eléctrico Nacional: Código de Red, conforme dispone el artículo 12, fracción XXXVII de la Ley de la Industria Eléctrica, *Diario Oficial de la Federación*, April 8, 2016.

process, Andeavor can currently use 16 storage terminals and 13 pipelines, which previously had been limited to use by State productive enterprises.²¹ These actions are aimed at optimizing the use of existing infrastructure by a greater number of users.

4. *Supply of services that would not be supplied by market, or if so, would not be supplied in a sufficient amount*

As noted before, the energy industry is characterized by a high degree of complexity, costs and risks. Consequently, the fourth and final failure observed in the energy market for the purposes of this paper is the possible exclusion of some social sectors facing low financial returns, which drives companies to focus their investments in more profitable sectors or regions, leaving certain users vulnerable.

This problem is handled in different ways. For example, in the electricity market, the State works under the principle of universal service, based on social rather than economic motivations, where the basic service provider is obligated, with few exceptions, to provide service to whoever requests it. Here too we can include the creation of the Universal Electricity Service Fund (FSUE), which will focus on taking this basic service to the 1.4% of Mexicans who still do not have access to electricity in their homes.

With an investment goal of 12 billion pesos by 2021, the FSUE has implemented important actions: at the end of 2017, it launched the first invitation to the CFE, allocating some 1.2 billion pesos to take electricity to more than 200,000 Mexicans in 27 states of the country. Following this was a second call for isolated systems with an investment of close to 1 billion pesos. The goal is to close the year with an electricity coverage of 99% of the population.²²

While this does not represent a dysfunctionality generated by market agents, it is in the State's interest for economic and industrial development to translate into benefits for society as a whole. Therefore, this type of gov-

²¹ Staff Oil & Gas Magazine, "Andeavor gana temporada abierta del norte y pacífico norte", *Oil and Gas Magazine*, Mexico, July 2018, available at: <https://oilandgasmagazine.com.mx/2018/07/andeavor-gana-temporada-abierta-del-norte-y-pacifico-norte/>.

²² SENER, "El Fondo de Servicio Universal Eléctrico (FSUE), tiene como objetivo alcanzar para 2018 el 99 por ciento de la cobertura eléctrica nacional", Secretaría de Energía, México, November, 2017, available at: <https://www.gob.mx/sener/articulos/el-objetivo-del-fondo-de-servicio-universal-electrico-es-alcanzar-para-2018-el-99-por-ciento-de-la-cobertura-electrica-nacional?idiom=es>.

ernment intervention is necessary in cases where the supply of basic services or services that are important to ensure social development in all regions of the country are not guaranteed.

III. CONCLUSION

To consolidate a new, effective and efficient energy model, it was necessary to anticipate the challenges that the energy industry posed. This meant developing Mexico's own vision of regulatory policy, which was achieved by strengthening technical and impartial institutions focused on repairing the flaws in the energy market. Five years on, the efforts have borne fruit.

We are already witnessing the entry of new competitors who are taking on the former State monopolies. We have the example of the fuel market, where mid-2018 saw more than 46 new gasoline service station brands in the country, and with even more positive projections, as more and more companies are looking forward to joining the Mexican market, thereby creating a competitive environment that brings greater confidence and power to consumers.

Similarly, in the fuel market, the opening of the market has allowed users to find ways of supplying themselves, in the absence of capacity to transport oil products. The permits granted to railroad companies are a successful example of this. It should be noted that between 2016 and 2017, the volume of fuel transported by the railroad system rose 22.5% in the case of diesel and 33.8% for gasoline. Kansas City raised its transportation fuel volumes in that period by 77% and 59% for diesel and gasoline, respectively.²³ Thus, railroad companies are competing with their networks against Pemex's pipeline networks.

The knowledge of the different features of the energy model has resulted in its wider use. It is worth noting that under the new Wholesale Electricity Market, one of these features encourages large consumers to enter into agreements with electricity suppliers with the aim of setting more competitive prices. To cite an example, this allowed the Mexico City's Mass Transport System (STC) Metro to save 100 million pesos in only one year, by signing an agreement with a clean energy supplier.²⁴

²³ Secretaría de Comunicaciones y Transportes, *Anuario Estadístico Ferroviario 2017*, Agencia Reguladora del Transporte Ferroviario, México, July, 2017, available at: https://www.gob.mx/cms/uploads/attachment/file/344646/ARTF_Anuario_Estadistico_Ferroviario_2017.vf.pdf.

²⁴ Gobierno de la Ciudad de México, "Adjudica STC, por primera vez, un contrato de suministro eléctrico para sus principales centros de carga; cumple con su compromiso...",

Lastly, in the same way, the social and environmental aspect is at the center of the discussions and regulations. The right to consultation of indigenous peoples implies taking their needs and concerns into account in the design of energy projects. From 2014 to 2017, 14 consultations were held in 83 indigenous communities in 11 states of Mexico. Today, in the state of Yucatan alone there are seven projects in the indigenous consultation phase, all of which are proceeding within the boundaries of the law.²⁵

The role played by the regulatory bodies has been fundamental to the implementation of the national energy model. The failures of such a complex market have been offset by strengthening institutions that are kept away from political tensions and private interests and are centered on the technical and legal application of the model. After five years of this new way of regulating the market, the results are plain to see, which shows the importance of these bodies as entities with technical, operational and management autonomy, charged with guaranteeing the rule of law, and monitoring the development of a competitive energy market that works for the benefit of the people and companies in Mexico.

Energy Reform forced the Mexican State to redesign its energy market. As mentioned above, this redesign has shown tangible results in the form of benefits to consumers, from the smallest households to the largest industrial companies. Likewise, the benefits have been seen reflected in the State Productive Enterprises. However, this does not mean that there is no room for improvement. As Nobel laureate in economics Alvin E. Roth notes, market design is not static. We need to understand how markets work in order to be able to intervene in them, redesign them and fix them when they do not work properly.²⁶

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²⁵ Moguel, Yoisi, “Parque eólico Dzilam, Yucatán iniciará operaciones en septiembre”, *El Financiero*, Mexico, July 2018, available at: <http://www.elfinanciero.com.mx/economia/parque-eolico-dzilam-yucatan-iniciara-operaciones-en-septiembre>.

²⁶ Roth, Alvin E., *Who Gets What—and Why?*, Boston, Mariner Books, 2016, pp. 217-231.

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PART THIRD

ELECTRIC SECTOR

THE ENERGY TRANSITION TO CLEAN TECHNOLOGIES: A DRIVING FORCE FOR MEXICO'S DEVELOPMENT

Guillermo Ignacio GARCÍA ALCOCER*

SUMMARY: I. *Introduction*. II. *A brief history of the energy transition in Mexico*. III. *The current state of the energy transition in Mexico*. IV. *Clean energy as a driving force for social development*. V. *What is missing?* VI. *Conclusions*. VII. *Bibliography*.

I. INTRODUCTION

Energy transition is a trend in the global energy sector, consisting of the gradual replacement of the use of fossil fuels by the use of clean sources of energy that are safe, reliable and affordable. In this sense, energy efficiency and renewable energy, the two fundamental pillars of the energy transition, provide an ideal path to achieve most of the greenhouse gas emission reductions required to mitigate climate change.¹

Understanding the socio-economic footprint of the energy transition is essential for analysis and decision-making. The energy transition cannot be considered an issue isolated from the socio-economic system in which it is deployed. According to the International Energy Agency (IEA), the socio-economic benefits of the transition go beyond an increased per capita Gross National Product (GDP) and even include numerous social and environmental benefits.²

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¹ IRENA, "Energy Transition", available at: <http://www.irena.org/energytransition>.

² IRENA, "Global Energy Transition: A Roadmap to 2050", p. 7, available at: http://www.irena.org//media/Files/IRENA/Agency/Publication/2018/Apr/IRENA_Global_Energy_Transformation_2018_summary_EN.pdf?la=en&hash=2335A542EF74D7171D8EC6F547C77395BDAF1CEE.

The required breadth of the transition is such that it can only be achieved through a collective process which involves society as a whole. Therefore, universal access to energy is a key component for a fair and equitable transition. Hence, the transition process will only be completed when energy services converge in each and every corner of the planet.³

II. A BRIEF HISTORY OF THE ENERGY TRANSITION IN MEXICO

For more than a decade, Mexico has joined the global efforts to build a low-carbon future. In this century, several actions have been carried out to bring about an energy transition to the use of clean energy.

First. The 2007-2012 Energy Sector Program was presented with the aim of fostering the use of technically, economically, environmentally, and socially viable renewable energy sources and biofuels.⁴

Second. The 2009-2012 Special Program for the Use of Renewable Energy was published to propitiate energy security and diversification, establish political policies for the incorporation of renewable energy into the national energy matrix, and reconcile society's energy consumption needs with the sustainable use of natural resources.⁵

Third. In 2010, the Energy Regulatory Commission (CRE) issued the methodology to calculate the rates of the transmission services provided by the Federal Electricity Commission (CFE) to permit holders with power plants using renewable sources or efficient co-generation.⁶ Known as "special renewable energy transport rates," these consisted of a single payment based on voltage (low, medium, or high), regardless of the distance between the point of generation and the point of consumption.⁷

³ *Ibidem*, p. 11.

⁴ INEEL, "El Programa Especial de Energías Renovables", November 2011, available at: https://www2.ineel.mx/proyecto fotovoltaico/FOROFV_2011/FOROFV_MEXICO_2011/JUEVES_10_NOV_2011/03_Lic_Ivan_Benicio_Michel_Duenas_SENER.pdf.

⁵ *Idem*.

⁶ Secretaría de Energía, "Resolución por la que la Comisión Reguladora de Energía expide la metodología para la determinación de los cargos correspondientes a los servicios de transmisión que preste el suministrador a los permisos con centrales de generación eléctrica con fuentes de energía renovable o cogeneración eficiente", *Diario Oficial de la Federación*, April 2010, available at: http://dof.gob.mx/nota_detalle.php?codigo=5139525&fec ha=16/04/2010.

⁷ INEEL, *Certificación de cogeneradores eficientes*, 2014, available at: <https://www.ineel.mx//boletin012014/breve02.pdf>.

Fourth. In late 2010, Cancun hosted the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 16). As a result, the Cancun Agreements were approved and established, among other things: i) a registry to correlate the mitigation actions of developing countries with the technical and financial support of industrialized countries; ii) a new 30-billion-dollar green fund in fast-start financing from developed countries; and iii) a process to design the Green Climate Fund, a mechanism to assist developing countries in climate change adaptation and mitigating practices.⁸

Fifth. That same year, the Mexican Accreditation Entity (EMA) launched a program to accredit greenhouse gas (GHG) verifying agencies, making Mexico the first country in Latin America to implement this measure.

Sixth. In 2011, Mexico became a member of the International Renewable Energy Agency (IRENA), an inter-governmental organization dedicated to promoting the adoption and sustainable use of renewable energy around the world. Currently, this organization is made up of 159 countries (including Mexico) and the European Union.⁹

Seventh. In 2012, Mexico chaired the G20 and hosted the Leaders' Summit at which the heads of State of the twenty largest economies in the world acknowledged the need to include green growth and sustainable development policies in their structural reform agendas, in addition to reiterating their commitment to rationalize and phase out inefficient fossil fuel subsidies that encourage overconsumption.

With these actions, 51,073 GWh of clean energy were generated in 2012, representing 17.3% of the country's total generation, where hydro-electric energy accounted for 10.8%, nuclear energy for 3%, geothermal energy for 2%, wind energy for 1.1%, biomass for 0.4% and solar energy for 0.0007%.¹⁰

Subsequently, a key milestone in triggering investment in clean energy projects that would contribute to the implementation of the energy transition and thereby ensure a low-carbon future for all was the approval of the Energy Reform between 2013 and 2014.

In this context, the Energy Transition Law (LTE) was passed in 2015 in order to regulate the sustainable use of energy, as well as obligations regard-

⁸ Centro Mario Molina, "Acuerdos de Cancún, COP16", available at: <https://centromariomolina.org/acuerdos-de-cancun-cop16/>.

⁹ International Renewable Energy Agency, "IRENA Membership", 2018, available at: <https://www.irena.org/irenmembership>.

¹⁰ Information from the CRE.

ing clean energy and reductions in polluting emissions from the electrical industry while upholding the competitiveness of productive sectors.¹¹

This law established the national goal of generating 35% of the country's energy from clean sources by 2024.¹² Additionally, the LTE ordered the drafting of a Transition Strategy to Promote the Use of Cleaner Technologies and Fuels as the guiding framework for the national policy on medium- and long-term clean energy obligations and sustainable energy use. The Strategy, published in December 2014, proposed clean energy generation goals of 37.7% by 2030 and 50% by 2050.¹³

In 2015, Mexico participated in the COP 21, which resulted in the Paris Agreement, ratified by the Mexican Senate on September 21, 2016. Through this instrument, Mexico pledged to meet the targets set out in its Intended Nationally Determined Contributions (INDC): a 25% unconditional reduction of its GHG and short-lived climate pollutant emissions by 2030, and an up to 40% conditional reduction subject to a global agreement establishing an international carbon price, access to financial resources and technological transfer.¹⁴

For Mexico to meet its national clean generation goals and multilateral emission reduction commitments, the Electrical Industry Law (LIE) published as part of the 2014 energy reform, created Clean Energy Certificates (CELs). Issued by the CRE, a CEL is a certificate that accredits the production of one megawatt-hour (MWh) from clean energy and serves to comply with the obligations established by the Ministry of Energy (SENER) associated with consumption in charging stations.

Between 2015 and 2018, the SENER and the National Energy Control Center (CENACE) held three long-term auctions in which CFE, and other suppliers purchased CELs, energy and power—at the most competitive prices worldwide—to fulfill their obligations. As a result, over the next three years, 70 new power plants were to be built in 19 states, adding 7,600 MW to Mexico's current generation capacity (Map 1). The risk of these

¹¹ Secretaría de Gobernación, Decreto por el que se expide la Ley de Transición Energética, *Diario Oficial de la Federación*, December 2015, available at: http://dof.gob.mx/nota_detalle.php?codigo=5421295&fecha=24/12/2015.

¹² *Idem*.

¹³ Secretaría de Energía, *Estrategia de transición para promover el uso de tecnologías y combustibles más limpios*, 2016, available at: https://www.gob.mx/cms/uploads/attachment/file/182202/20161110_1300h_Estrategia_CCTE-1.pdf.

¹⁴ Secretaría de Relaciones Exteriores, "México presenta su INDC para el periodo 2020-2030", March 2015, available at: <https://embamex.sre.gob.mx/hungria/index.php/es/noticias/7-noticias-de-mexico/238-mexico-presenta-su-indc-para-el-periodo-2020-2030>.

projects is assumed by the developer and the service is only paid until it is operational.

By October 2020, 74.6% of the capacity associated with the three long-term auctions have started operating in more than six Mexican states (together they represent an installed capacity of 5,049 MW).¹⁵

On July 31, 2019, SENER and CENACE announced the cancellation of the fourth long-term auction, which would have meant an estimated investment of 4 billion dollars and increased the current generation capacity to 3,800 MW. As of July 2022, the mechanism to replace auctions to promote large-scale deployment of clean energy in Mexico has not been disclosed.

On February 2021, the Executive Branch sent to Congress an initiative to amend the Electricity Industry Law giving preference to CFE fuel-based plants over new renewable plants in the dispatch of electricity. It was approved and later suspended by federal judges that same year.¹⁶ The constitutionality of the law was discussed by the Supreme Court in April 2022 and was one vote short from being expelled from the law Mexican system (it got 7 and not 8 out of 11 votes to be declared unconstitutional). Later, in June and July 2022 two federal competition judges suspended its effects for general purposes based on the 7 Supreme Justice votes that considered it unconstitutional for going against competition or the human right to have a clean environment. Therefore, the law that prevails as of August 2022, is the one that was approved in 2014.

Based on the actions implemented in the last decade, 65,299 GWh of clean energy were generated during 2018, which represented 19.5% of the country's electricity generation, where hydroelectric energy accounted for 9.4%, followed by nuclear energy with 4.1%, wind energy with 3.6%, geothermal energy with 1.6%, biomass with 0.6%, and solar energy with 0.2%.¹⁷

In the future, the challenge of consolidating a safe clean energy sector with a social focus continues; that is, by 2024, clean energy development and deployment in Mexico will reach every corner of the country.

¹⁵ Secretaría de Energía, "Avanza en 2 años la transición energética con el Gobierno de México en forma ordenada", December 2020, available at: <https://www.gob.mx/sener/articulos/avanza-en-2-anos-la-transicion-energetica-con-el-gobierno-de-mexico-en-forma-ordenada>.

¹⁶ A constitutional amendment was sent to Congress in October of 2021 to set the privilege of the state-owned company CFE in the electric sector not only as a supplier but also as a marketer. It also added to the then suspended law, the suppression of the independent regulators of electricity and upstream. The amendment had not enough votes and was discarded in April 2022.

¹⁷ A CRE preliminary estimate at the end of 2018.

III. THE CURRENT STATE OF THE ENERGY TRANSITION IN MEXICO

Although the energy sector in Mexico is known for historically having an oil-based tradition of which Mexicans should feel proud, under the perspective of energy security, Mexico needs to diversify its energy sources and identify the great opportunities that now exist in terms of clean energy.

As of April 2019, Mexico has almost 280 clean energy plants in 30 states, which represents an installed capacity of 24,000 MW, or 30% of the country's total (Map 2).¹⁸

Thus, most of the clean energy installed in Mexico comes from 100 hydroelectric plants representing 16%¹⁹ of the country's total capacity and 1% of the world's hydroelectric capacity.²⁰

Similarly, even though only 6% of Mexico's installed capacity today comes from 51 wind power plants, the country has a plant capacity factor ranging between 20% and 50%, which is competitive even when compared to leading countries like Argentina and New Zealand, which have plant capacity factors close to 50%.²¹

Moreover, despite having 5 geothermal power plants in operation, amounting to 1.3% of the country's installed capacity, Mexico is recognized worldwide as one of the countries with the highest geothermal energy potential, along with the United States, the Philippines, Indonesia, Turkey and New Zealand.²²

Meanwhile, nuclear energy has an 11% share in the world's electrical energy as a result of the 450 nuclear reactors currently in operation. The United States and France are the countries with the highest number of installed nuclear energy plants —99 and 58, respectively— while Mexico has just one plant located in the state of Veracruz, which represents 2% of the country's installed capacity.²³

¹⁸ Information from the CRE at the end of 2018.

¹⁹ CRE estimate.

²⁰ Secretaría de Energía, "PRODESEN Programa de Desarrollo del Sistema Eléctrico Nacional, 2018-2032", available at: <https://www.gob.mx/cms/uploads/attachment/file/331770/PRODESEN-2018-2032-definitiva.pdf>.

²¹ "Proceedings of the National Academy of Sciences of the United States America", available at: <http://www.pnas.org/content/106/27/10933/F7.expansion.htm>.

²² Secretaría de Energía, "PRODESEN 2018-2032", available at: <https://www.gob.mx/cms/uploads/attachment/file/331770/PRODESEN-2018-2032-definitiva.pdf>.

²³ *Idem*.

Likewise, although today merely 2% of Mexico's installed capacity comes from 44 photovoltaic power stations, some Mexican states have a higher average daily solar radiation than some of the European cities that pioneered this technology. For example, Leipzig, Germany, has an average daily solar radiation of 2.7 kWh/m²,²⁴ while Veracruz, one of the states with the lowest average daily solar radiation in Mexico, has 4.1 kWh/m². Furthermore, the solar radiation that 3.4% of the territory of Veracruz receives in one month could generate the energy needed to supply all of Mexico with electricity.²⁵

Last but not least, Mexico has 78 biomass power plants that represent 1% of its total installed capacity. However according to the IEA, bioenergy from liquid biofuels and biogas will spearhead the growth of renewable energy consumption worldwide by 2023, due to its expanding use in the heating and transportation sectors.²⁶

It should be noted that by 2021, it was expected that more than 200 new clean energy plants would be set up in 30 states in Mexico, providing an additional install capacity of 19,5000 MW,²⁷ which would help Mexico reach the national target of clean generation by 2024 (Map 3). This would depend on four factors: the consolidation of a transparent and functional wholesale electricity market; the development of sufficient transmission and distribution infrastructure; the massive deployment of distributed generation and the effective social management of infrastructure projects.

In this sense, the CRE, as the regulator of the entire electricity sector's value chain and the authority of the market, has overseen setting the regulatory bases required to achieve these objectives. On the one hand, the regulatory framework for transmission and distribution issued by the CRE seeks to minimize uncertainty by guaranteeing non-discriminatory open access and encouraging safe, long-term investments for the expansion and modernization of the electricity grid that will enable to free up congested corridors and the insertion of new, clean energy into the grid.

²⁴ European Commission, "Photovoltaic Geographical Information System", available at: http://re.jrc.ec.europa.eu/bvg_download/map_pdfs/G_hor_DE.pdf.

²⁵ CRE estimate with data from Solargis, "Download solar resource maps and GIS data for 180+ countries", available at: <https://solargis.com/maps-and-gis-data/download/mexico>.

²⁶ Reuters, "Bioenergy Leads Growth in Renewable Energy Consumption to 2023: IEA", available at: <https://uk.reuters.com/article/us-iea-renewables/bioenergy-leads-growth-in-renewable-energy-consumption-to-2023-iea-idUKKC1MH123>.

²⁷ Comisión Reguladora de Energía, Permisos de generación otorgados por la CRE, a partir de 2014, a centrales eléctricas que entrarán en operación antes de 2021.

On the other hand, in March 2017, the CRE updated the regulatory framework for distributed generation to encourage the deployment of this form of electricity supply for users.²⁸ By April 2019, there were 94,893 contracts for solar roof systems, which represents an installed capacity of 693 MW and an estimated investment of 1.17 billion dollars.²⁹ It is noteworthy that since 2012 the number of solar installations has practically doubled annually. If this trend continues, by 2023, there will be 600,000 solar roof systems. In other words, distributed generation in Mexico will have grown by 1000%.³⁰

The CRE has been one of the institutions driving the energy transition towards the use of clean technologies, whose continuity and consolidation are aligned with its long-term mission to guarantee the conditions required for the availability of quality and competitive-priced energy in Mexico.

IV. CLEAN ENERGY AS A DRIVING FORCE FOR SOCIAL DEVELOPMENT

As seen above, the 21st century energy model advocates the transition from the use of fossil fuels to the development and deployment of clean technologies. This change of paradigm in Mexico could have a positive impact on the population in the short and medium-term. Therefore, establishing policies, regulations or programs aimed at sustainable development and a low-carbon future is how clean energy emerges as an array of new opportunities for communities lagging behind socioeconomically.

This includes social participation by means of programs that promote universal access to energy, energy efficiency and consumer empowerment. Some examples are given below:

Access to solar energy by installing solar roof systems. In this way, users can reap several of its benefits, such as i) reducing emissions harmful to the environment and health; ii) favoring the household economy given that the regulatory framework makes it possible to reduce electricity consumption from

²⁸ A second generation of regulation for community distributed generation was approved in 2019 by the regulator. That piece of regulation was never published in the Official Gazette.

²⁹ Estimated data from the CRE at the end of 2018, based on information provided by CFE Distribution.

³⁰ García Alcocer, Guillermo, “El sol sale para todos”, *El Universal*, September 17, 2018, available at: <http://www.eluniversal.com.mx/cartera/el-sol-sale-para-todos>.

the CFE network while selling surplus, and iii) providing access to electricity in remote areas. To do this, electricity is being provided to rural communities and marginalized urban areas by extending the CFE grid and installing solar panels as part of the Universal Electricity Service Fund (FSUE), which was established in 2016.³¹

The 2014-2018 National Program for the Sustainable Use of Energy (PRONASE), designed by the SENER and the CONUEE, has a section devoted to Energy Efficiency Programs, which includes support programs for end users to encourage the replacement of low efficiency equipment and systems with those with better energy performance, such as the “*Ahórrate una luz*” program.³² This program is a SENER initiative, financed by the World Bank and operated by the Fideicomiso para el Ahorro de Energía Eléctrica [Trusteeship for Electrical Energy Saving] (FIDE) with the support of the CONASUPO [National Company for Subsidies for the Population] Commercial Distributor and Trade Promotion (DICONSA). Its goal is to deliver 14,000,000 energy saving lamps free of charge in DICONSA stores to the inhabitants of towns with fewer than 100,000 inhabitants as a way to help their household finances, reduce their energy consumption and contribute to protecting the environment.

The National Workers Housing Fund Institute (Infonavit) has made a Green Mortgage available to its beneficiaries.³³ This is optional and can be requested if the beneficiary wants to buy air-conditioning systems, solar water heaters, voltage optimizers and photovoltaic systems connected to the grid. With the savings obtained from installing these technologies, the loan is paid back in a way that does not affect household finances.

In the future, it is necessary to strive to strengthen the social dimension that not only incorporates the participation of the population in implementing small, medium and large-scale projects, but also makes communities aware of the benefits these can provide, such as citizen empowerment; the gradual reduction of their electrical consumption and, therefore, their light

³¹ Secretaría de Energía, “El Fondo del Servicio Universal Eléctrico FSUE, tiene como objetivo alcanzar para 2018 el 99% de la cobertura eléctrica nacional”, November 13, 2017, available at: <https://www.gob.mx/sener/articulos/el-objetivo-del-fondo-de-servicio-universal-electrico-es-alcanzar-para-2018-el-99-por-ciento-de-la-cobertura-electrica-nacional?idiom=es>.

³² The name of this program is a play on words in Spanish since “luz” can mean both “light” or “electricity” and “money”. Therefore, it is implied that the beneficiaries of this program will “save on electricity” and “save money”. Secretaría de Energía, “Concluyó el programa ahorrate una luz con la entrega de 39, 799, 447 lámparas ahorradoras”, December 22, 2017, available at: <https://www.gob.mx/sener/articulos/concluyo-el-programa-ahorrate-una-luz-con-la-entrega-de-39-799-447-lamparas-ahorradoras>.

³³ Infonavit, “Hipoteca Verde”, 2018, available at: http://portal.infonavit.org.mx/wps/wcm/connect/infonavit/trabajadores/cuido_mi_casa/hipoteca+verde.

bill; and a positive impact on people's health and the environment by replacing conventional sources like wood with photovoltaic energy through solar roof systems.

In this way, the transition to clean technologies with a social approach enhances energy security, supports economic growth and competitiveness, and reduces energy poverty in addition to contributing to mitigating climate change. Hence, this is a fundamental issue that must be an intrinsic part of any discussion on the future of the energy sector in Mexico.

V. WHAT IS MISSING?

Although significant progress has been made in the energy transition toward the use of clean energy in Mexico, much remains to be done.

One of the main challenges to be met is the variable or intermittent nature of renewable energies, like photovoltaic and wind. That is, unlike constant conventional technologies such as coal, gas, diesel and hydroelectric energy, intermittent technologies are characterized by being variable and strongly dependent on daily weather conditions. As these technologies reach higher levels of penetration, the intermittency associated with them can become important, thereby affecting the reliability of the electrical system and therefore the country's energy security.³⁴

In this sense, the incorporation of electrical energy storage systems would represent a way to solve the problem of intermittency and guarantee energy supply security while diversifying the energy matrix. The idea is that by storing the energy extracted from these renewable resources, it can be available when the user requires it. This presents the challenge of having the exploitable, socially sustainable, and sufficient reserves of materials such as lithium and cobalt, which are the basic raw materials for manufacturing storage batteries.³⁵

To understand the importance of consolidating an efficient storage market, it is enough to look at California. One of its main milestones evolved from an event taking place in October 2015, when a massive natural gas leak broke out at the Aliso Canyon terminal outside Los Angeles. This leak

³⁴ Pica, André, "Los desafíos de la utilización de energías renovables no convencionales intermitentes", Pontificia Universidad Autónoma de Chile, August 2015, available at: <https://politicaspUBLICAS.uc.cl/wp-content/uploads/2015/09/N%C2%B0-81-Los-desaf%C3%ADos-de-la-utilizaci%C3%B3n-de-energ%C3%ADas-renovables-no-convencionales-intermitentes.pdf>.

³⁵ A first generation of regulation for energy storage was approved in 2019 by the regulator but was never published in the Official Gazette.

put the state's energy and environmental security at risk, so the state regulator approved the installation of more than 100 MW in storage projects.³⁶ In other words, in the face of such emergencies, storage technologies have proven to be a fast and effective solution.

In this way, California has taken a leading role in the installation of large-scale storage projects. Proof of this is that it set a goal to have 1,325 MW of storage capacity by 2020. According to the US Department of Energy, California has high renewable energy standards and incentives for installation. In 2016 alone, more than 25,000 people worked in the energy storage industry in the state.³⁷

In Mexico, a growth potential of 2,333 MW has been identified in the storage market over the next ten years.³⁸ Given that storage is seen as a means to integrate renewable energies, this set of technologies can have a positive impact on its development and deployment in the country. Therefore, on January 29, 2019, the CRE adopted an agreement that defines and recognizes the various services that storage technologies can offer to the electricity system. This agreement is the first step towards the consolidation of a robust regulatory framework that will allow for the use of all the benefits storage can bring to the electricity system and for remuneration to be based on that value.

The fact that storage technologies are cheaper and more reliable not only leads to benefits for the electricity sector but will also revolutionize the transportation sector. With the lower cost of batteries and electricity, the prices of cars with electric motors have become increasingly more competitive.

It is estimated that by 2040, 33% of all the vehicles on the road worldwide will be electric. Moreover, with greater adoption of this type of vehicle, 7.3 million barrels of fuel will no longer be used for transportation every day.³⁹ It is worth noting that, in 2017 alone, more than 1 million electric cars were sold, with China leading with more than half of global sales.⁴⁰

³⁶ *The New York Times*, "A Big Test for Batteries", January 14, 2017, available at: <https://www.nytimes.com/2017/01/14/business/energy-environment/california-big-batteries-as-power-plants.html>.

³⁷ U.S. Department of Energy, "2017 U.S. Energy and Employment Report", available at: <https://energy.gov/downloads/2017-us-energy-and-employment-report>.

³⁸ Quanta Technology, "Feasibility Study for Large Scale Energy Storage Systems in Brazil, Colombia and Mexico", 2017, Project performed by Quanta Technology for ISA, under USTDA financial support.

³⁹ Bloomberg New Energy Finance, "Electric Vehicle Outlook 2018", 2018, available at: <https://bnf.turtl.co/story/evo2018?teaser=true>.

⁴⁰ IEA, "Global EV Outlook 2018", available at: <https://www.iea.org/gevo2018/>.

Since 2016, 692 electric vehicles⁴¹ have been sold in Mexico, while 1,894 electric vehicle charging stations have been installed in the country.⁴² Additionally, in order to facilitate their adoption, Mexico has various incentives to encourage the use of electric vehicles. At the federal level, the New Car Tax (ISAN) exemption has been implemented. Moreover, the CFE has made it easier to install a separate meter, which makes it possible to separate the vehicle's electricity consumption from that of the rest of the household (avoiding thus a significant increase in its electricity bill). At state level, incentives have been implemented, such as the exemption from paying *tenencia* [a special car tax], exemption from the smog check inspection, the "E" decal, green license plates and preferential parking with charging facilities.⁴³

In order to accelerate the deployment of this type of technology, in 2018 the CRE issued a regulation that makes it easier to install and run public electric vehicle charging stations nationwide.

VI. CONCLUSIONS

While Mexico is committed to a cleaner future, the energy transition is a trend that was gaining greater importance every day until 2019, and is part of not only a national effort, but of a global transformation.

Decarbonization must be achieved in a way that promotes continuous and sustainable economic growth. In other words, new investment in the energy sector can help drive growth. The aggressive pursuit of energy efficiency helps reduce energy poverty and improve access to energy. New technologies that enable marked improvements in energy efficiency are possible, even at the household level.⁴⁴

The social implications of decarbonization can be very promising insofar as there are opportunities for communities and individuals to become directly involved in developing suitable actions to reduce their energy consumption and, as a result, polluting emissions into the air.

In this way, governments play a critical role in bringing about this inclusion through targeted energy access programs for marginalized communi-

⁴¹ With information from the Asociación Mexicana de la Industria Automotriz, at the end of 2018.

⁴² Programa de Ahorro de Energía del Sector Eléctrico. Information as of July 2018.

⁴³ ChargeNow, "Beneficios para los vehículos eléctricos en México", available at: <http://www.chargenow.mx/incentivos-para-vehiculos-electricos-en-mexico/>.

⁴⁴ The Solutions Journal, "Decarbonizing the World Economy", May 2016, available at: <https://www.thesolutionsjournal.com/article/5698/>.

ties; regulations that democratize the adoption of clean energy for all kinds of users; tax credits or incentives that encourage the adoption of sustainable technologies in homes and buildings; energy efficiency programs to reduce energy consumption throughout the country; and communication campaigns to inform rural and urban populations of the benefits of the energy transition.

With the efforts carried out from 2000 to 2019, we can now say that the foundations have been laid, and the energy transition is underway if the authorities support it again. In the future, the government, industry, and society in general must work hand in hand to consolidate the development of a clean, safe energy sector with a social dimension, which will trigger investments and sources of employment that will benefit Mexican families and the national economy.

The 2018-2024 Federal Administration has publicly stated its intention to continue advancing Mexico's transition to clean energy. The National Development Plan (NDP) included a focus on low-carbon technologies among its priorities. Nevertheless, a discussion on the instruments state or market based, to achieve a significant pace is still needed.

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WIND ENERGY IN MEXICO: AN ANALYSIS OF THE TECHNICAL AND REGULATORY CHALLENGES

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SUMMARY: I. *Introduction*. II. *Renewable energies and the regulatory framework in Mexico*. III. *Technical challenges in incorporating wind energy into the electrical grid*. IV. *Administrative, environmental and social regulatory challenges*. V. *Conclusions*. VI. *Bibliography*.

I. INTRODUCTION

There is currently no doubt about the direct relationship between burning fossil fuels and the phenomena of climate change and global warming. The global and local risks of ecosystem destruction due to the emission of greenhouse gases (GHG) and other pollutants emanating from burning fossil fuels produce externalities that directly affect society, which implies economic costs that are currently not included in the final cost of energy. The serious environmental and social effects of climate change have led the world towards a process of decarbonization through the so-called energy transition that seeks to reduce GHGs and make greater and more efficient use of renewable energies.

During the previous administration, Mexico sought to take on the role of global player committed to the fight against climate change and the reduction of GHGs. Within the framework of COP21¹ held in Paris, all the parties (countries) were invited to generate Nationally Determined Contributions or INDCs² as part of the so-called “Paris Agreement”. Mexico has

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¹ The Conference of the Parties (COP) refers to the annual Paris Climate Change Conference.

² Prior to the ratification of the Paris Agreement on November 4, 2016, the Nationally Determined Contributions were “intended”, hence the name Intended Nationally Determined Contributions (INDCs).

actively fulfilled those commitments and set high goals for itself. To achieve the objectives proposed in its INDC,³ the principal mitigation measures established in Mexico are to generate 35% of energy through clean sources by 2024, 43% by 2030 and 50% by 2050. For these goals, clean energy includes renewable sources, efficient cogeneration with natural gas⁴ and thermoelectric plants with CO₂ capture⁵ to replace heavy fuels with natural gas, clean energies and biomass in the national industry; reduce methane leaks, venting and controlled flaring by 25%; and control black soot particles in industrial equipment and facilities.⁶

In addition, not only has Mexico pledged to fight climate change, reduce GHGs and use renewable energies, but it has also undertaken to attain universal access to electricity services. Currently, Mexico has a 98.75%⁷ electricity coverage and, according to the Federal Electricity Commission, the remaining 1.25% are households that have no access to electricity services. Ensuring universal access to these services is also a goal of the United Nations.

The goal of universal access in Mexico is set out in Articles 113, 114, 115, 116 and 166 of the Electrical Industry Law, which is the basis of the Universal Electric Service Fund and establishes that the federal government will promote the electrification of rural communities and marginalized urban zones.

One of the sectors most concerned with finding alternative sources of energy that lead to a reduction in GHG emissions is, precisely, that of electricity. Public policy in this area, technological development and the reduction of electricity generation costs using clean technologies have been especially important drivers for solar photovoltaic and wind energies.

In this global context that has led to the development of renewable energies, particularly wind and solar, governments have decided to intervene

³ The Intended Nationally Determined Contribution of Mexico, available at: <http://www4.unfccc.int/submissions/INDC/Published%20Documents/Mexico/1/MEXICO%20INDC%2003.30.2015.pdf>.

⁴ According to the description of the Electrical Industry Law to which the Energy Transition Law makes reference, this cogeneration is in terms of the efficiency criteria issued by the CRE and the emissions criteria established by the Ministry of the Environment and Natural Resources.

⁵ This technology is also included in the LIE description.

⁶ Gobierno de la República, *Compromisos de mitigación y adaptación ante el cambio climático para el periodo 2020-2030*, 2015, available at: https://www.gob.mx/cms/uploads/attachment/file/162974/2015_indc_esp.pdf.

⁷ SEGOB, *Electrificación por Entidad Federativa*, Comisión Federal de Electricidad, 2018, available at: <https://datos.gob.mx/busca/dataset/electrificacion-por-entidad-federativa>.

more actively in the energy sector because electrical energy and grid reliability are seen as a public good, since access and supply empower communities and generally benefit them, reason enough to justify regulating the sector.

However, the nature of the electricity sector and the complexity of regulating it must be considered. Josefina Cortés and Eduardo Pérez Motta note that the particular features of these give rise to a process of capitalization and recovery of long-term investment, and even exhibit the presence of natural monopolies (as in the case of transmission and distribution networks) resulting in the need for a regulatory framework that operates under conditions of stability, transparency and with goals consistent with the characteristics of the industry.⁸

In a broad sense, we can speak of the need for State intervention through the creation of legal provisions drafted by competent government authorities, to regulate industry performance in terms of the public interest and social good. That is to say, we are talking about the need for regulation and its continuity as crucial to guaranteeing the investment already made in the sector, as well as for those projected for the future.

There are, however, different approaches to that of State Regulator. Jorge Martínez questions the role of the State in energy production, and particularly in promoting renewable energies.⁹ He raises two possibilities that can even describe the dilemma the country is currently experiencing.

The first is the role of the State through minimal intervention where economic agents are allowed to act for themselves, that is to say that market forces are left to determine the participation of different types of energy in the sector—we could say based on the lowest prices and costs—. The second role is one in which the State is much more active and not only permits what is constitutionally and legally established, in this specific case, in the constitutional reform and secondary laws regarding energy, but also incentivizes energy production and energy use reduction through its public policies.¹⁰ This discussion is, however, not the subject of this article.

⁸ Cortés Campos, Josefina and Pérez Motta, Eduardo, “Competencia económica y sector energético: los mercados de la electricidad y del gas natural”, in Payan, Tony *et al.*, *Estado de Derecho y Reforma Energética en México*, México, Tirant lo Blanch, 2016, p. 199. On May 15, 2020, SENER publishes an updated document known as a “policy agreement”, which describes changes to the functions performed by CRE, CENACE and CFE to increase the influence over those entities. This agreement is suspended by a federal judge at the request of federal competition regulator COFEC.

⁹ Martínez, Jorge, *Política energética sustentable en México*, México, UNAM-Porrúa, 2017, p. 20.

¹⁰ Recently, in April 2022, Mexican Chamber of Deputies rejected an initiative sent by President Andrés Manuel López Obrador, this initiative established a very active role from

The intent of this article is to present a brief analysis of the regulatory framework for renewable energies, particularly wind energy, as well as to identify the regulatory and technical challenges that this type of energy presents for Mexico. This analysis will delve into topics such as the integration of renewable energies into the electrical system grid, the problems posed by the intermittent nature of this type of energy, and the environmental and social challenges arising from the deployment of wind farms for generating electricity.

II. RENEWABLE ENERGIES AND THE REGULATORY FRAMEWORK IN MEXICO

The search for diversification of the energy matrix has found renewable energies to be one of the best alternatives for sustainable development and growth, especially in a global scenario that tends towards greater electrification. From the perspective of this article and the new energy model, even its use contributes to achieving two essential pillars of the energy policy articulated by Mexico's new administration: energy security and sovereignty, powers that the Energy Ministry has under the current in Article 33, Section V of the Organic Law of the Federal Public Administration Law (LOAPF).¹¹ In that respect, Dr. Lorenzo Meyer argues that with the energy reform, the independence and sovereignty gained by the energy expropriation and nationalization will be lost, and the country will cease to be less of a State and will consolidate its dependence on the United States.¹²

International experience dictates that technology advances more rapidly than laws, and the case of technological development to harness renewable energies is no exception. For this reason, it is essential to have a regulatory framework that takes into account the inclusion of new technologies and provides the necessary incentives for the development, continuation and stability of the industry.

The energy model that arose from the 2013 constitutional reform defined a clear route to resuming growth in the electricity industry and is gen-

Mexican administration such as that electricity generation in Mexico may only have 46% private participation and the rest will be the obligation of the state-owned Federal Electricity Commission (CFE).

¹¹ Last reform published on November 30, 2018, in the *Diario Oficial de la Federación*.

¹² Meyer, Lorenzo, "Los referentes históricos de la electricidad y de los hidrocarburos en México (versión estenográfica)", in Cárdenas Gracia, Jaime (coord.), *Reforma energética. Análisis y consecuencias*, México, UNAM-Tirant lo Blanch, 2015, pp. 381-390.

erating elements for Mexico to regain its position as a global energy leader, through building competitive markets and a knowledge economy wedded to transparency and accountability.

From a public policy perspective, as Josefina Cortés and Eduardo Pérez Motta suggest, the diversification of energy sources should be encouraged in the electricity sector, ensuring that economic regulation enables the different actors to compete pricewise with the use of different technologies,¹³ including those with variable output throughout the day, like wind energy and its intermittent supply.

Alberto Montoya Martín del Campo, former undersecretary of energy and current Commissioner of the National Commission for Regulatory Improvement, argued at the time that with constitutional energy reform, Mexico would lose its independence and sovereignty and even be subordinated to the interests of the United States. In addition, he noted that the changes would lead to energy dependency and the economy would end up in the hands of transnational companies in the sector.¹⁴

It is worth noting that the new administration is currently focusing its energy policy more in line with the old model. An example of this approach is Raúl Armando Jiménez Vázquez's analysis, in which he describes it as a "regressive regulatory change that led to the dispossession of the Nation's historical rights over the energy assets of Mexicans, in order to transfer them to private investors".¹⁵

1. *Transition within the Regulatory Framework*

From its creation in 1937 and the enactment of the Electrical Industry Law in 1938, the Federal Electricity Commission (CFE) was under the exclusive control of the State as the sole provider of public electricity. This situation was fully consolidated in 1960 with the nationalization of the electrical industry as part of the growing State intervention in the sector.

Later and under Article 3 of the Public Electricity Service Law (LSPEE) published on December 22, 1975—which repealed the above-mentioned Electrical Industry Law—it was established that the generation of electric-

¹³ Cortés Campos, Josefina and Pérez Motta, Eduardo, *op. cit.*, p. 200.

¹⁴ Montoya Martín del Campo, Alberto, "Reforma Energética: Golpe de Estado contra la Constitución. Traición a México", in Cárdenas Gracia, Jaime (coord.), *Reforma energética. Análisis y consecuencias*, *cit.*, p. 285.

¹⁵ Jiménez Vázquez, Raúl Armando, *Valoración constitucional de la Reforma Energética*, Mexico, UNAM, 2016.

ity for self-supply, cogeneration or small production; generation by independent producers for sale to the CFE; and generation for export, derived from cogeneration, independent production or small production, among others, not considered public service activities.¹⁶ Amendments to the LSPEE on December 22, 1992, allowed for the participation of the private sector through the figure of Independent Energy Producers, known as PIEs.

Against the backdrop of these regulatory changes, it is important to note the creation of the Energy Regulatory Commission (CRE) a year later, on October 4, 1993, which at that time emerged as a decentralized administrative body of the then Ministry of Energy, Mining and Parastatal Industries (now the Energy Ministry). The creation decree set out that the CRE would be the technical body responsible for resolving issues on electrical energy arising from the application of the regulatory provisions of Article 27 of the Constitution.

By 2013, the CFE was still the State electricity monopoly although its role had been limited by the reforms of the 1990s that allowed private interests to participate in electricity generation in various legal ways: independent energy producer, cogeneration and self-supply.¹⁷ The LSPEE and its most recent amendment¹⁸ state that these new generators must be authorized by the CRE and are empowered to generate electricity for sale exclusively to the CFE.

The legal framework on renewable energies was structured and strengthened in 2008 when the Mexican Congress passed three laws on the issue: the Law for the Use of Renewable Energies and the Financing of the Energy Transition (LAERFTE),¹⁹ the Sustainable Use of Energy Law, and Law on Promotion and Development of Bioenergy.²⁰

¹⁶ Cámara de Diputados, Ley del Servicio Público de Energía Eléctrica, *Diario Oficial de la Federación*, December 22, 1975.

¹⁷ The figure of self-supply will gradually disappear over the following years, as its Legacy Interconnection Contracts expire, in accordance with current legislation. However, this has been the subject of discussion in recent years due to various regulatory and legal changes aimed at limiting its scope, and even revoking the issued permits in advance. This is evidenced by different CRE resolutions issued in May and October 2020, the reform to the LIE approved in March 2021, as well as the recently rejected constitutional Energy Reform initiative.

¹⁸ Cámara de Diputados, Ley del Servicio Público de Energía Eléctrica, *Diario Oficial de la Federación*, December 22, 1975.

¹⁹ Cámara de Diputados, Ley para el Aprovechamiento de las Energías Renovables y el Financiamiento de la Transición Energética, *Diario Oficial de la Federación*, December 28, 2008.

²⁰ Cámara de Diputado, Ley de Promoción y Desarrollo de los Bioenergéticos, *Diario Oficial de la Federación*, February 1, 2008.

The goal of the LAERFTE was to regulate the use of renewable energy sources and clean technologies to generate electricity for purposes other than provision of a public service, as well as to establish a national strategy and instruments to finance the energy transition, as well as to define renewable energies in Mexico as defined in its Article 30, Section II. The Law for the Sustainable Use of Energy²¹ contained only 33 clauses and, in its first article, established its objective of promoting the sustainable use of energies by optimizing their use in all processes and activities.

Finally, in 2013, the constitutional energy reform and its respective secondary laws complemented and formalized the opening of the electrical industry that had begun in the 1990s and modified the role of the State as the sole buyer and generator. As a result, the new 2014 Electrical Industry Law (LIE) regulates Articles 25, fourth paragraph; 27, sixth paragraph; and 28, fourth paragraph of the Political Constitution of the United Mexican States (CPEUM).

Full legal certainty for private investment was granted by definitively eliminating from the constitution any reference to State monopoly over the generation, distribution and supply of electrical energy intended for “providing a public service”, leaving the nation only with strategic control over planning and control over the national electrical system, and over the public services of transmission and distribution of electricity, deregulating the generation of electricity, with the exception of generating it through nuclear energy.

This opening of the electricity market, together with the clean energy goals to which Mexico has committed itself in the international arena, have led to an accelerated development of renewable energies, especially because of the economic incentives such as the electricity auction schemes in tandem with the best international practices,²² that have resulted in the lowest electricity prices globally, without forsaking the great potential the country has.

Within the framework of the 2013 constitutional reform, which was published by decree on December 20 of that same year, the 17th Transitory

²¹ Cámara de Diputados, Ley para el Aprovechamiento Sustentable de la Energía, *Diario Oficial de la Federación*, November 28, 2008.

²² On February 2019, the National Center for Energy Control (CENACE) canceled the 2018 Long-Term Auction (SLP-1/2018), which had been suspended since December 3, 2018. As indicated by the Ministry of Energy (SENER), the need to proceed with the cancellation of SLP-1/2018 was carried out in compliance with the current legal framework and technical, economic and energy planning considerations.

Article of the CPEUM stated that the amendments to the legal framework should establish the bases upon which the State would seek the protection and care of the environment in all processes related to the scope of the decree in question, among others, in terms of reducing the generation of greenhouse gases (GHGs) and compounds.

In 2014 the LIE was approved and in 2015 so was the Energy Transition Law (LTE), which repealed both the LAERFTE and the Sustainable Use of Energy Law. Its goal, set out in the first article, is “to regulate the sustainable use of energy as well as the obligations related to clean energies and the reduction of polluting emissions of the Electricity Industry”.²³ This law continues the same guidelines mapped out in the laws it repeals since the idea of a Transition Strategy to Promote the Use of Cleaner Technologies and Fuels is considered programmatic and organic and leads to a National Program for the Sustainable Use of Energy and a Smart Electrical Grid Program.

The LTE defines renewable energies as those whose source resides in natural phenomena, processes or materials that can be transformed into usable energy for humans, that regenerate naturally and are available continuously or periodically and that do not emit pollutants when generated.²⁴ Renewable energies recognized by Mexican legal framework are wind, solar, geothermal, hydroelectric, tidal and bioenergy.

Different countries have different definitions and categories of renewable energies, although they do not diverge much from one another. The U.S. Energy Information Administration defines renewable energy as that arising from sources that are naturally replenishing but flow-limited; they are virtually inexhaustible in duration but limited in the amount of energy available per unit of time.²⁵ Additionally, biomass,²⁶ ethanol, biodiesel, hydroelectric, and geothermal, wind and solar energy are all considered renewable energies.

With regard to strict technical and economic regulation, the 17th transitory article of the CPEUM mandates that on the issue of electricity, the law will establish clean energy and polluting emission reduction obligations for those participating in the electricity industry. In this sense, Chapter V of the

²³ Cámara de Diputados, Ley de Transición Energética, *Diario Oficial de la Federación*, December 24, 2015.

²⁴ Cámara de Diputados, Ley de Transición Energética, *op. cit.*

²⁵ IEA, *Renewable Energy Explained*, U.S. Energy Information Administration, 2018, available at: https://www.eia.gov/energyexplained/?page=renewable_home.

²⁶ This includes wood and wood waste, municipal solid waste, landfill gas and biogas.

Fourth Title of the LTE refers to Clean Energy Certificates²⁷ (CELs), stating in Article 68 that “with the goal of encouraging growth in Clean Energies referred to in [...] Law and under the terms set out in the Electrical Industry Law, [SENER] will establish prerequisites for acquiring Clean Energy Certificates”,²⁸ which, in accordance with Article 3rd, Section V of the same law, names the CEL as the title granted by the CRE in compliance with the guidelines of the LIE.

2. *Renewable Energies Development Potential for Mexico*

To date, it can be affirmed that Mexico has a solid legal and regulatory framework that allows strengthening and expanding the use of renewable energy to generate electricity. In spite of this, it must be noted that the renewable resources are not evenly distributed across the nation and are located in areas without infrastructure due to their topographical characteristics or due to possible social conflicts, making it difficult or technically and/or economically impractical to develop renewable energy projects.

José Juan González points out that it was not until recently that non-traditional energy sources such as wind power began to be used. He rightly adds that consequently, the judicial framework in this field is also young, which means it needs to be strengthened to accelerate the use of more environmentally friendly energy sources.²⁹ However, the regulatory framework just analyzed provides an important foundation upon which to develop these energies.

The geographic characteristics of Mexico mean that there is significant potential renewable energy, specifically in the case of wind power. According to INERE, Mexico has a proven wind generation potential of 25, 104 GWh annually and possibly 87,600 GWh per year.³⁰ Currently, Mexico has 45 wind power plants with an installed capacity of 4, 199 MW, or 6% of the total installed capacity.

An example of this great potential and growth is the Reynosa wind farm which, once finished, will be the largest in Latin America and with

²⁷ On October 28, 2019, the Ministry of Energy issued a regulatory change in the Official Gazette of the Federation (DOF) regarding the recognition criteria for CELs for generators. This change implies that a good number of clean power plants that have come into operation before the Reform will also be able to accredit CELs.

²⁸ Cámara de Diputados, Ley de Transición Energética, *op. cit.*

²⁹ González, José Juan, *Nuevo derecho energético mexicano*, México, UAM, 2017, p. 298.

³⁰ SENER, *Inventario Nacional de Energías Renovables*, México, SENER, 2017, available at: <https://dgel.energia.gob.mx/inere/>.

a capacity up to 424 MW. Wind farms in Mexico contributed with 10,620 GWh or 3% of the total national power generated in 2017.³¹

In comparison, Figure 1 shows information from the 2017 Global Wind Energy Council report, which depicts the worldwide cumulative wind generation capacity for that year.

According to the Mexican Wind Energy Association (AMDEE) by contrasting several methodologies it was possible to quantify Mexico's technical and economic wind energy potential, for which an installation goal of 12,000 MW was set for 2020,³² although it is mentioned that it could be higher. It should be noted that the auctions held in Mexico reached extremely competitive prices, demonstrating the economic feasibility of implementing wind projects in the country.

The countries with the largest installed capacity in wind farming are China, the United States of America, Germany, Spain and the United Kingdom, with which they produce 65% of the world's wind energy. These countries, too, have the highest percentage of research and knowledge generation regarding wind power generation and wind farm integration into the electricity system. Mexico is among the top 20 countries with the highest wind power generation.

According to data from the Renewable Energy Policy Network for the 21st Century (REN21), China, the United States and Germany are at the top of the list in terms of total clean generation capacity.³³ By the end of 2016, more than 90 countries were developing wind energy projects and, in the same year, at least 24 countries were meeting 5% or more of their annual electricity demand with wind energy and at least another 13 were covering more than 10% of their yearly demand.³⁴ According to the *Wind in Power 2017* report, Spain, Germany, and the United Kingdom accounted for 58% of Europe's accumulated wind energy installed capacity.³⁵

³¹ SENER, *Programa de Desarrollo del Sistema Eléctrico Nacional*, México, SENER, 2018, available at: <https://www.gob.mx/cms/uploads/attachment/file/331770/PRODESEN-2018-2032-definitiva.pdf>.

³² AMDEE, *El potencial eólico mexicano. Oportunidades y retos en el nuevo sector eléctrico*, available at: <https://www.amdee.org/Publicaciones/AMDEE-PwC-El-potencial-eolico-mexicano.pdf>.

³³ REN21, *Renewables 2018. Global Status Report*, Renewable Energy Policy Network for the 21st Century, 2018, available at: http://www.ren21.net/wp-content/uploads/2018/06/17-8652_GSR2018_FullReport_web_-1.pdf.

³⁴ REN21, *Avanzando en la transición mundial hacia la energía renovable*, Renewable Energy Policy Network for the 21st Century, 2017, available at: http://www.ren21.net/wp-content/uploads/2017/07/17-8399_GSR_2017_KEY-FINDINGS_Spanish_lowres.pdf.

³⁵ WindEurope, *Wind in Power 2017*. Annual combined onshore and offshore wind energy statistics, 2018, available at: <https://windeurope.org/wp-content/uploads/files/about-wind/statistics/WindEurope-Annual-Statistics-2017.pdf>.

The use of this renewable resource has spread rapidly throughout the world. The World Energy Outlook 2017 says that in 2016 alone generation assets based on renewable energy sources accounted for two-thirds of new capacity investment³⁶ worldwide. To transfer this technology to new markets, the theoretical knowledge and practical experience accumulated by the most advanced countries in this field are required.

In the field of wind energy, new markets continue to be opened across the globe and technological innovation is enabling accelerated development. The auction schemes adopted in several countries to boost renewable energies have been successful, as in the case of Mexico. Nevertheless, to avoid negative consequences when implementing winning projects, it is essential that there be a link between regulation, planning and the formulation of industrial development policies.

III. TECHNICAL CHALLENGES IN INCORPORATING WIND ENERGY INTO THE ELECTRICAL GRID

1. *Problems in the electricity grid associated with wind generation*

As mentioned before, wind generation has grown rapidly in importance as a means of producing electrical energy given that, although distinct from other conventional means and intermittent in nature, it is compatible with the current design of electricity systems. Now that private players can participate in generation, it is important to analyze the challenges and obstacles that they may face in Mexico.

One of the most important challenges of wind energy is its variability—intermittency—and uncertainty of the primary source of the energy.³⁷ Due to this uncertainty, wind energy generation entails operational problems in the delivery of electricity which could reduce the reliability of the electricity system, which is why electrical energy companies in countries such as the United States, Spain, China and Denmark, among others, are cooperating to find a solution to these problems.³⁸ To date, one of the alternatives proposed in different electricity markets globally is an energy back-up through storage, a subject that will be discussed later.

³⁶ OECD and IEA, *World Energy Outlook 2017*, International Energy Agency, 2017.

³⁷ Smith, J. C. *et al.*, *Utility Wind Integration and Operating Impact State of the Art*, IEE Transactions on Power Systems, vol. 22, núm. 3, 2007.

³⁸ Smith, J. C. *et al.*, *Wind Power Impacts on Electric Power System Operating Costs: Summary and Perspective on Work to Date*, NREL, 2004.

To help with alternative solutions to these challenges, several countries have established “Grid Codes” (Mexico included), which can basically be understood as a technical interpretation of national laws to create regulations, standards and minimum technical requirements for the interconnection of power plants (including wind farms) and loads on electricity grids.³⁹ In Mexico, the current Grid Code was issued by the Energy Regulatory Commission in 2016.⁴⁰

Abrupt departures from a large load center cause over or under voltage surges in the grid. Conventional power plants are perfectly capable of buffering these transient conditions (up to certain limits). However, wind turbines do not do so naturally, although techniques that can help them do so already exist.

In Mexico, in Sections 4 and 5 of the Regulatory Manual of Technical Requirements for the Interconnection of Power Plants to the National Electricity System, the Grid Code contemplates the regulation of asynchronous power plants—those whose rotation speeds are not coupled to the electrical frequency of the system (60Hz in Mexico) and of which much of the wind power technology is a part—therefore obliging them to support the recovery of the electrical system in case of imbalances in the grid caused by load or generation variations.⁴¹

Many studies on the effect that connecting wind farms has on the reliability of the system to which they are connected have already been published.⁴² Methods have also been analyzed to study the operational impact of the interconnection of wind generation on the grid,⁴³ as well as how it influences the quality of the grid’s energy,⁴⁴ understanding energy quality as the minimum standard that the electrical energy supplied to the user must meet in terms of voltage level, frequency and availability, among other things.

³⁹ Ackermann, Thomas, *UWIG Short Course on the Integration and Interconnection of Wind Power Plants into Electric Power Systems, Session 10, Grid Codes*, 2009, pp. 14-17.

⁴⁰ Comisión Reguladora de Energía, “Disposiciones administrativas de carácter general que contienen los criterios de eficiencia, calidad, confiabilidad, continuidad, seguridad y sustentabilidad del Sistema Eléctrico Nacional: Código de Red, conforme dispone el artículo 12, fracción XXXVII de la Ley de la Industria Eléctrica”, *Diario Oficial de la Federación*, December 31, 2021.

⁴¹ Código de Red, conforme dispone el artículo 12, fracción XXXVII de la Ley de la Industria Eléctrica, *op. cit.*

⁴² Larsson, Åke, *Power Quality of Wind Turbine Generating Systems and their Interaction with the Grid, Technical Report No. 4R*, Chalmers University of Technology, 1997.

⁴³ Parsons, B. *et al.*, *Grid Impacts of Wind Power: A Summary of Recent Studies in the United States*, European Wind Energy Conference and Exhibition, 2003.

⁴⁴ Bialasiewicz, J. T. and Muljadi, E., *The Wind Farm Aggregation Impact on Power Quality*, 2nd Annual Conference of the IEEE Industrial Electronics Society (IECON’06), 2006.

All these analyses have led to successful integration of these technologies in different electrical systems around the world. Although it has its peculiarities that distinguish it from other systems, the Mexican one is no exception. In general, the impact that wind power generation has on the electrical system to which it is connected can be divided into global impact (in the system as a whole, the National Interconnected System, in the case of Mexico) and the local effect (on the electrical installations close to the interconnection node of the wind farm).⁴⁵

A. *Global impact on the grid*

Connecting wind generation sources has an effect on the overall grid in aspects like voltage stability, which can be compromised. Since wind turbine construction is different from that of conventional generators and reacts differently to disturbances that may occur in the electrical grid, it can alter the voltage level to the point of exceeding the Grid Code parameters established in Section 2.2.2 of the Regulatory Manual of Operating States of the National Electricity System.⁴⁶

Countries such as the United Kingdom, Germany, Denmark, Australia, Ireland, the United States and Belgium already have their grid codes. Although the specifications of these codes vary significantly in form and detail,⁴⁷ there are several common elements to them:

Low Voltage Ride Through (LVRT).

Power factor, most grid codes agree to maintain a power factor of ± 0.95 .⁴⁸

Providing data to the grid operator, which implies the inclusion of SCADA systems, *i. e.*, supervisory control and data acquisition to monitor wind farms.

B. *Local impact on the grid*

In the vicinity of a wind farm, this type of generation can mainly impact the following aspects:

⁴⁵ Anaya-Lara, Olimpo *et al.*, *Wind Energy Generation: Modelling and Control*, John Wiley & Sons, Ltd, 2009.

⁴⁶ Código de Red, conforme dispone el artículo 12, fracción XXXVII de la Ley de la Industria Eléctrica, *op. cit.*

⁴⁷ Ackermann, Thomas, *op. cit.*, pp. 115-142.

⁴⁸ Johnson, Gary L., *Wind Energy Systems*, Manhattan, KS, 2001.

Increase in voltage level. This phenomenon is typically associated with variable speed wind turbines, which have electronics associated with local increases in voltage level. These increases are mainly due to the fact that the electronic components that make up the turbines can produce an effect known as harmonic distortion, which is a modification of the sinusoidal waveform of electrical voltage or current. This alteration can cause voltage increases. Another case of voltage increases that can occur in the presence of harmonic distortion and that can cause many problems is the case of wind generators installed at sea, far from the coast (offshore).⁴⁹

Protection strategies. Protection strategies aim to safeguard the integrity of operating personnel, as well as the devices connected to the electrical system in the event of failure. Normally, the protection device is an integral part of the turbine control system.

Due to the sensitivity of the electronic devices installed in the wind turbines, they must be disconnected quickly from the grid if there is a failure that causes a current surge, so as not to damage these devices. This could become a problem if the applicable guidelines established in the Grid Code need the turbine to remain connected for a certain period of time in the event of a failure,⁵⁰ as established by in Section 5 of the Regulatory Manual of Technical Requirements for the Interconnection of Power Plants to the National Electricity System of the Mexican Grid Code.⁵¹

Currently, wind turbine technology makes it possible to comply with the provisions of the Grid Code without damaging the equipment. This is an example of how technology can also evolve to comply with regulations.

2. Pending regulatory issues. Energy storage

The variable, intermittent and difficult (though not impossible) to predict nature of the wind resources used today to generate electricity means that energy storage systems are being considered as a response to power fluctuations (and the well-known problems of quality of energy delivered) that, as a result of the variability of the resource, can occur at the interconnection points of the generating plants that are considered clean. This

⁴⁹ Johnson, Gary L., *op. cit.*

⁵⁰ Smith, J. C. *et al.*, *op. cit.*

⁵¹ Código de Red, conforme dispone el artículo 12, fracción XXXVII de la Ley de la Industria Eléctrica, *op. cit.*

phenomenon could spread throughout the electricity grid increasing the number of the affected elements and users.

We must remember that, from a very simple perspective, a transmission system carries energy through physical space; that is, it supplies energy where it is needed, moving it from where it is abundant to where it is scarce. Conversely, an energy storage system (understood here to mean any system that stores energy in electromagnetic, electromechanical, kinetic, chemical or any potential form that can be later released as electrical energy) supplies energy when needed; that is, moving it in time from when it is abundant to when it is scarce.

Transmission has been considered a part of the value chain of the electrical industry since the market was conceived; storage is beginning to be a part of this value chain in several electricity markets around the world, and Mexico should consider including storage in its regulations, not only technical, but also economic, if it intends to efficiently achieve its goal of 35% penetration of clean energies in the National Electricity System. One of the regulatory challenges that storage raises is whether it is defined as a transmission, distribution or even generation asset.

We face a very important technical challenge, since clearly, integrating more than 30% of clean energy generation into Mexico's electricity system will have an impact on it, hence the need to prepare the way from a regulatory standpoint. In this sense, the Energy Regulatory Commission is already working on general administrative provisions on electrical energy storage⁵² and on regulating auxiliary services that do not form part of the Wholesale Electricity Market.

IV. ADMINISTRATIVE, ENVIRONMENTAL AND SOCIAL REGULATORY CHALLENGES

1. Administrative processes and project location

Long and complicated processes can be seen as obstacles or barriers for wind project developers to enter the market. These processes, generally related to the approval and scope of environmental and social impact assessments, local

⁵² On January 29, 2019, the plenary session of the Energy Regulatory Commission approved the “Acuerdo por el que la Comisión Reguladora de Energía establece de manera enunciativa más no limitativa, los productos y los servicios que pueden ofrecer los integrantes de la industria eléctrica que desarrollen actividades de almacenamiento de energía”.

land use permits, the number of players and authorities involved and issues such as social acceptance of the projects can even result in the death of a project. However, the issues of administrative processes and the location of wind projects are an area of opportunity for local governments to push the development of generation projects using this type of energy, aligning local legislation with federal objectives. Facilitating land use processes and institutionalizing planning for renewable projects can aid in generating greater social acceptance.

Cities around the world face economic, social and environmental challenges caused by the impact of global warming. In Mexico, local governments have no clear instruments to integrate their actions into the national goals of fighting climate change and increasing renewable energy generation. However, some of them have taken the initiative to introduce energy-related measures to address both the administrative and environmental challenges.

One such example is what happened in the states of Morelos and Sinaloa where certain laws were amended to regulate the operations of service stations (gas stations) and thus respond to the new regulatory framework on energy.⁵³ Morelos amended, among others, the Land-Use Planning and Sustainable Human Development Law and the Public Works and Related Services Law, while Sinaloa changed its Environmental Law and Urban Development Law.

In the same vein, Mexico has also seen progress at the local level with the creation of state energy agencies that seek to promote, attract and consolidate investment in their states, as in the cases of Tamaulipas, Veracruz, and Campeche.

2. Wind project interconnection process for wind projects

In Mexico, the administrative process for wind project interconnection has exposed some obstacles. The flexibility of the energy matrix, the proper functioning of the electricity market, the geographical distribution of wind resources, transmission capacity (including the issue of bottlenecks and the

⁵³ In the case of the state of Morelos, the Municipal Organic Law, the Ecological Equilibrium and Environmental Protection Law, the Land-Use Planning and Sustainable Human Development Law and the Public Works and Related Services Law were amended. In the case of the state of Sinaloa, amendments were made to the Environmental Law and the Human Development Law.

size of the control areas) are features that exert significant influence over the integration of wind energy generation into the grid.

Any electricity generating plant that intends to sell its energy to the Wholesale Electricity Market must pass through an interconnection process which, broadly speaking, consists of a request on behalf of the wind project to interconnect to the system operator, in this case, the National Energy Control Center (CENACE). This interconnection request is made once the project has already complied with issues such as project location, ensuring there are sufficient wind resources, and land use permits, among others.⁵⁴

CENACE carries out various studies to determine if the project has the necessary characteristics for interconnection as well as if the proposed interconnection point is capable of receiving the energy coming from the turbines. If the existing conditions within the grid adjacent to the requested interconnection point are inadequate, CENACE must present the technical evidence proving the impossibility of interconnection and propose the necessary modifications or reinforcements in the grid, or suggest a new interconnection point so the project can be interconnected.

Among the criteria that establish the specific characteristics of the infrastructure required for interconnecting power plants and connecting load centers, Interconnection Studies are defined as the set of studies carried out to determine the necessary works for interconnecting a power plant.⁵⁵ CENACE may request reinforcement works; however, it is still unclear as to what can be considered technically and economically feasible works. This may extend the interconnection process beyond the original time estimates.

⁵⁴ On March 30, 2022, the Energy Regulatory Commission (CRE), through the Official Gazette of the Federation (DOF) issued the ["Acuerdo Núm. A/006/2022 de la Comisión Reguladora de Energía por el que se expiden las Disposiciones Administrativas de Carácter General (DACG) que establecen los términos para presentar la información relativa al objeto social, capacidad legal, técnica y financiera, así como la descripción del proyecto, y el formato de la solicitud de permisos de generación de energía eléctrica"], which requires, in the event of interconnection of the power plant, digitized original of the document issued by CENACE indicating the result of the Impact Study or quick version impact as appropriate with the procedure for the attention of the Request for Interconnection of Power Plants or Connection of Load Centers, among other new requirements. Available at: https://www.dof.gob.mx/nota_detalle.php?codigo=5647325&fecha=30/03/2022#gsc.tab=0.

⁵⁵ Secretaría de Gobernación, "Criterios mediante los que se establecen las características específicas de la infraestructura requerida para la Interconexión de Centrales Eléctricas y Conexión de Centros de Carga", *Diario Oficial de la Federación*, June 2, 2015.

Among the recommendations collected by Ana Lilia Moreno,⁵⁶ is one proposed by José María Lujambio⁵⁷ in which he notes that although the regulatory framework has promoted, to some extent, the development of the renewable energy industry, there are still barriers hindering the complete adoption of these energies. Therefore, Lujambio continues, bureaucratic barriers must be urgently eliminated, in the areas of electricity generation permits and interconnection contracts.

In many electricity markets, the cost of grid access is considered a barrier to entry, a long interconnection process that generally goes hand in hand with an unnecessarily complex and inefficient administrative procedure. In the European Union, for example, the administrative cost associated with an *onshore* wind project represents on average 2.9% of the total, and for *offshore* projects, 14%.⁵⁸ In Mexico, streamlining the applicable regulation should be a priority to accommodate emerging projects and prevent administrative processes from becoming entry barriers to these projects.

3. *Environmental impact*

Although wind energy is presented as one of the best alternatives for reducing GHGs and replacing fossil fuels in electricity generation, if Environmental Impact Manifestation processes—for determining environmental viability—and Social Impact Assessment and their respective community consultations are not carried out correctly, wind projects can have negative impacts both socially and environmentally.

One example of the environmental impact is the noise produced by wind turbines, which is caused by four main factors: the first is the rotation of the turbine rotor; the second is the wind friction with the wind turbine support structure (nacelles, tower, etc.); the third is the turbulence produced in the air between the tower and the blade every time one of the blades passes near the tower; and fourth, the power train of the wind turbine.

This is an issue that has not been directly addressed in Mexico, but it is under discussion. It can be seen in Mexico that wind farms are located far

⁵⁶ Moreno González, Ana Lilia, “El nuevo marco jurídico y regulatorio del sector eléctrico mexicano: posibilidades de inclusión para PyMES”, *Estado de derecho y Reforma Energética en México*, México, Tirant lo Blanch, 2016, p. 261.

⁵⁷ For more information see: Lujambio, José María, “Sobre la Agenda Verde”, *Mexican Energy Law*, 2015, pp. 2, 13-18.

⁵⁸ EWEA, *Wind Barriers. Administrative and grid access barriers to wind power*, The European Wind Energy Association, 2010, available at: http://www.ewea.org/fileadmin/files/library/publications/reports/WindBarriers_report.pdf.

from residential areas, but it is expected that this will change in the future. Two examples of this possible problem are found in Wales and Scotland, two countries that have even regulated the distance between wind farms and residential areas in order to avoid noise pollution.

The World Health Organization recommends that for people noise exposure should be kept below 85 decibels (dB) for a maximum of 8 hours per day.⁵⁹ In Mexico, the wind turbines are found at an average height of 100 m, and a wind turbine operating at a height of 84 m generates 51.4 dB, compared to an airplane take-off, which emits 150dB, and a horn, 90 dB. Therefore, despite the debate around noise pollution from wind turbines, the noise levels found can still be considered permissible.

Another issue linked to environmental impact is the death of birds due to colliding into wind turbines. In December 2006, SEMARNAT published in the Federal Official Gazette (*DOF*) the Official Mexican Standard (NOM) project, PROY-NOM-151-SEMARNAT-2006,⁶⁰ which sets out the technical specifications for the protection of the environment during the construction, operation and abandonment of wind power installations in agricultural, livestock and wasteland areas. However, on February 19, 2014, the cancellation of PROY-NOM-151-SEMARNAT-2006 was published in the same medium because in response to comments received in the public consultation process, it was determined that more information was needed on synergistic and cumulative environmental impacts, as well as the monitoring of birds and bats and their migratory routes, in order to issue a regulatory instrument with the necessary environmental specifications. This same NOM project made reference to NOM-081-SEMARNAT-1994, which establishes the maximum permissible noise emission limits for fixed sources and their method of measurement. In this NOM, the maximum permissible noise level limits are 68 dB during the day and 65 dB at night.

It must be mentioned that no energy authority participated in drafting this last Official Mexican Standard. Neither this NOM nor any other has been taken up again, and if they were, energy agencies should be involved since the growth and development of wind energy in Mexico is on an upward trend.

Some of the above problems associated with conventional wind energy generation by using turbines with blades (horizontal axis), like the level of

⁵⁹ WHO, *Escuchar sin riesgos*, World Health Organization, available at: http://www.who.int/pbd/deafness/activities/MLS_Brochure_Spanish_lowres_for_web.pdf.

⁶⁰ Semarnat, PROY-NOM-151-SEMARNAT-2006, *Diario Oficial de la Federación*, December 28, 2006.

noise and visual pollution and environmental impact, as well as the maintenance costs of these machines, the effects that friction of the rotating components have on generator efficiency, and the mechanical fatigue the blades experience, have driven the technological development of new means for harnessing wind to generate electricity.

The result of this technological development is the vortex wind turbine, which consists of a linear generator (non-rotating) that uses permanent magnets and coils to transform the vibration produced by a pendulum made of a tube or hollow cone that vibrates in the wind.⁶¹ This type of wind generator uses neither blades nor rotating elements (which lowers maintenance costs) and has been built and tested on a small scale at low heights (usually on building roofs),⁶² making it ideal for microgrids in the distributed generation mode.

This relatively new technology has some disadvantages such as low efficiency, low power output levels, mechanical structure instability (which limits its ability to scale up to higher capacities) and noise.⁶³ Even so, in its current state of development, the technology qualifies for installation along highways and roads with heavy motor vehicle traffic or in places where the terrain is too limited for conventional turbines (on rooftops for example). However, in Mexico, according to CRE data, requests for interconnection of small and medium-scale wind power plants (all with capacities below 500kW), still do not exceed 0.024% in this power scale and interconnection mode. Solar technology continues to be dominant, as shown in Chart 2.

Another environment-related regulatory challenge are the issues in the Escazú Agreement,⁶⁴ access to information, public participation and access to justice on environmental matters. The aim of this agreement is to fight against inequality and discrimination, as well as to guarantee the rights of all people to a healthy environment and sustainable development. In addition, the agreement gives special importance to vulnerable people and groups.

⁶¹ Salvador, C. S. *et al.*, “Design and Construction of Arc Shaped and Disc Shaped Pendulum for Vortex Bladeless Wind Generator”, *2017 25th International Conference on Systems Engineering (ICSEng)*, Las Vegas, NV, 2017, pp. 363-369.

⁶² El-Shahat, A., M. Hasan and Wu, Y., “Vortex Bladeless Wind Generator for Nano-Grids”, *2018 IEEE Global Humanitarian Technology Conference (GHTC)*, San Jose, CA, 2018, pp. 1 and 2.

⁶³ Prasanth, V. *et al.*, “Green Energy Based Inductive Self-Healing Highways of the Future”, *2016 IEEE Transportation Electrification Conference and Expo (ITEC)*, Dearborn, MI, 2016, pp. 1-8.

⁶⁴ Adopted on March 4, 2018, in Escazú, Costa Rica.

The Escazú Agreement has an innovative approach, as it seeks to guarantee the “right to access”, understood as the right to access environmental information, the right to public participation in environmental decision-making processes, and the right to access to justice in environmental issues. In Mexico, this continues to be an underexplored field and its regulation is almost non-existent. However, it should be considered that the rights to a healthy environment, sustainable development, and health protection, among others, have already been taken into account. If we consider that as defined by the National Commission on Human Rights (CNDH), human rights are “the set of prerogatives based on human dignity, whose effective implementation is essential for the full development of the person”, we can also conclude that renewable energies provide a key element in the search to guarantee these rights.

4. *Social Impact*

Wind projects are more linked than ever to the issue of human rights. It is worth recalling that on June 11, 2011, the reform on human rights went into force. These rights, recognized in international treaties signed by the Mexican State, were elevated to constitutional rank, thus establishing “the State’s obligation to promote, respect, protect and guarantee human rights; the universality, interdependence, indivisibility and progressiveness of rights”.⁶⁵

Mexico is a signatory to International Labor Organization (ILO) Indigenous and Tribal Peoples Convention No. 169 and the United Nations Declaration on the Rights of Indigenous Peoples. Both instruments speak of the right of indigenous peoples to be consulted and taken into account when making decisions that can affect their way and quality of life. Likewise, the General Assembly of the Organization of American States (OAS), to which Mexico belongs,⁶⁶ adopted Resolution 2888 on the Rights of Indigenous Peoples,⁶⁷ which has three key articles. Paragraph 1 of Article XIX on the right to protection of a healthy environment establishes that “indigenous peoples have the right to live in harmony with nature and to a healthy, safe,

⁶⁵ Constitución Política de los Estados Unidos Mexicanos, reforma de junio de 2016, available at: <http://www.diputados.gob.mx/LeyesBiblio/htm/1.htm>.

⁶⁶ Mexico voted in favor of this declaration.

⁶⁷ American Declaration on the Rights of Indigenous Peoples, approved on June 14, 2016, at the plenary session of the OAS, available at: <https://www.oas.org/es/sadye/documentos/res-2888-16-es.pdf>.

and sustainable environment, essential conditions for the full enjoyment of the rights to life and to their spirituality, cosmovision and collective well-being”. As such, we see that Mexico has not only a commitment to guarantee a healthy environment in general terms, but also a very special obligation to indigenous peoples, which takes on special significance when conducting consultations.

The second article is XXV, which speaks of traditional forms of property and survival. Paragraph 4 of this article stipulates that States must give legal recognition and protection to these lands, territories and resources, within a framework of due respect to their customs, traditions and land tenure systems. Lastly, Article XXIX on the right to development establishes in paragraph 4 that “States shall consult and cooperate in good faith with the indigenous peoples concerned...”.

The 2013 constitutional reform took up those principles and laid down some guidelines to guarantee the environmental and social viability of renewable projects. Articles 120 of the Hydrocarbons Law⁶⁸ and 119 of the Electrical Industry Law⁶⁹ state that SENER must implement the necessary free, prior and informed consultation procedures⁷⁰ in order to ensure that the interests and rights of the communities and indigenous peoples in whose territories energy sector projects are being developed are taken into account. The purpose of these consultation procedures is to reach agreements or, where appropriate, obtain the free, prior and informed consent of the indigenous peoples. Both secondary laws also establish the obligations of public and private infrastructure projects of the industry, in this case the renewable energy projects, to present a Social Impact Assessment (SIA) in the process of obtaining a permit or authorization to conduct a project.⁷¹ This assessment must include the identification, characterization, prediction and assessment of the social impacts that could arise from proj-

⁶⁸ Cámara de Diputados, Ley de Hidrocarburos, *Diario Oficial de la Federación*, August 11, 2014.

⁶⁹ Cámara de Diputados, Ley de la Industria Eléctrica, *Diario Oficial de la Federación*, August 11, 2014.

⁷⁰ The legal basis for the right to consultation is found in Articles 1 and 2 of the CPEUM; 6, 7 and 15 in ILO Indigenous and Tribal Peoples Convention No. 169; 1, 21 and 23 of the American Convention on Human Rights; 19 and 32, paragraph 2 of the United Nations Declaration on the Rights of Indigenous Peoples; Articles 119 of the LIE and 89, 90, 91 and 92 of the Regulations of the Electrical Industry Law, as well as Article 120 of the Hydrocarbons Law.

⁷¹ SENER, “Disposiciones administrativas de carácter general sobre la Evaluación de Impacto Social en el Sector Energético”, *Diario Oficial de la Federación*, April 2018.

ect activities, as well as the corresponding mitigation measures and social management plans.

And so, José Juan González's observation stands out in the sense that energy reform not only sought to open up the sector to private investment, but also had the double goal of granting legal certainty to private investments by guaranteeing that landowners or organizations would not oppose the project and would make these players feel like part of the decision-making process,⁷² applying all the mechanisms and based on the aforementioned international law issues. However, the challenge in Mexico remains great. Communities are burdened by various factors, including the issue of private property for developing renewable energy generation projects. The social, cultural and environmental consequences that wind generation projects present to these communities are a constant challenge in spite of the regulations and mechanisms established to carry out consultations and assessments that judge the feasibility of these projects.

There are instances of projects that successfully integrate the population through labor incentives and economic development for the community. There are also projects in which, despite having carried out prior and informed consultations, operations are halted or hindered for economic or political reasons in an attempt to obtain other incentives, different from those originally agreed upon. This has caused companies to mull over investment in some regions of Mexico.

There is also criticism on human rights aspects of the energy reform. Raúl Jiménez Vázquez, for example, argues that "the human rights of indigenous peoples to prior, informed and good faith consultations, established in Article 6 of ILO Convention 169 are restricted". However, as stated before, these rights are enshrined in several secondary laws of the reform.⁷³

V. CONCLUSIONS

Legal certainty and the stability of a regulatory framework are some of the main concerns for investors. So, in this context, which seeks to promote the development of clean energies, the regulatory framework plays a crucial role in attracting new investments and achieving a significant level of penetration for this type of energy. The same regulatory framework with simple permit and interconnection processes and the removal of possible barriers to entry are essential to promoting the progress of such projects.

⁷² González, José Juan, *op. cit.*, p. 403.

⁷³ Jiménez Vázquez, Raúl Armando, *op. cit.*, p. 40.

The standardization of local and federal laws is necessary as many of the energy projects are hindered by local legislation, whether municipal or state, particularly in the area of land use and collecting fees for construction licenses and their requirements, which can be very onerous and administratively complex due to time and compliance requirements. This discourages investment.

Any electricity system with a high penetration of renewables will face problems different from those of a conventional system. The technical study of these is sufficiently advanced so as not to be a major limitation for renewables to be successfully integrated into the National Electrical System.

From a regulatory perspective, it is necessary to consider and anticipate the implementation of storage systems to back up intermittent generation in the different segments of the electricity system, fine-tuning and clarifying the rules and calculation methods for remuneration.

The right to consultation and to free, prior and informed consent for wind power projects resonate internationally because of the tensions and confrontations that have erupted between communities and the projects. The existence of pertinent regulations does not guarantee that they will be fully complied with, which is why it is necessary to create mechanisms to monitor compliance with the Social Impact Assessment process, as well as Environmental Impact Manifestations.

Finally, the new administration has a great challenge ahead, as access to electrical energy has a direct impact on the quality of life of the population as a whole. The national and international debate on whether the right to electricity a human right is will have to be taken into account since it is an essential resource on which we depend to have access to other fundamental rights such as education, health, communication, food, free transit, and work, among others, as well as to cover basic needs in our homes, offices, factories and hospitals.

The current new political context in Mexico offers an area of opportunity to advance in a transformation that is necessary but must be accompanied by respect for the rule of law. In addition, it must ensure respect for the current legal framework, which provides certainty to both investors as well as citizens that their rights are guaranteed. Lack of this kind of legal certainty has led several investors to reevaluate their expectations of growth in the country.

It is worrying to note that in spite of the statements made by the new administration on the importance of continuing the drive for private investment in energy projects, mainly in the electrical sector, the decisions and

actions carried out point to a drift towards criticism of energy reform, since these have implied cancelling out market mechanisms and energy projects. Such is the case of the fourth long-term auction and the bids for the direct current transmission lines from the Isthmus of Tehuantepec to the center of the country and the interconnection of the Baja California system with the rest of the country. All this despite the country having received nearly 8,600 million dollars in investments as a result of 3 long-term auctions.

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CONSIDERATIONS ON A COMPREHENSIVE REGULATORY FRAMEWORK FOR ENERGY STORAGE IN MEXICO

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SUMMARY: I. *Why talk about energy storage?* II. *The added value of energy storage.* III. *Existing and missing pieces in mexican legislation.* IV. *Conclusions.* V. *Bibliography.*

I. WHY TALK ABOUT ENERGY STORAGE?

By now, the consensus among the scientific community is that climate change is a real phenomenon caused by human activity, primarily the concentration of greenhouse gases (GHG).¹ In light of this problem, many countries have adopted various commitments to reduce their emissions and mitigate the effects of climate change, including both individual strategies and international agreements. Among the latter, one that stands out is the 2015 Paris Agreement, in which Mexico committed itself —unconditionally— to reduce 22% of the nation's GHG emissions by 2030.²

Since the energy sector accounts for almost two-thirds of global GHG emissions,³ it has a responsibility to come up with innovative solutions in this sector to address the problem of global warming. The growing incorporation of renewable energies into the energy matrix has made it possible to gradually displace the use of contaminating fossil fuels in power generation and is one of the most popular strategies to mitigate GHG in the energy industry.

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¹ Intergovernmental Panel on Climate Change, *Summary for Policy Makers*, in *Climate Change 2013: The Physical Science Basis*, Cambridge, Cambridge University Press, 2013, pp. 2 and 17.

² Gobierno de la República, *Compromisos de mitigación y adaptación ante el cambio climático para el periodo 2020-2030*, México, Gobierno de la República, 2014, p. 9.

³ International Energy Agency, *Energy and Climate Change*, France, OECD, 2015, p. 18.

Mexico has enormous renewable potential due to its geographical location. There are high levels of sunlight across the entire country, as well as many areas with strong and constant winds, such as Tamaulipas or the Isthmus of Tehuantepec. However, the penetration of renewable energy resources is still low. In 2017, wind and solar energy technologies contributed less than 5% of the country's generation.⁴ This situation, nonetheless, is rapidly changing due to three factors: i) the clean energy goals⁵ that Mexico established in its Energy Transition Law and are part of its climate commitments: 25% by 2018, 30% by 2021 and 35% by 2024;⁶ ii) the success of three electricity auctions held between 2015 and 2017, which will bring 20 wind projects and 40 solar power plants into operation to increase the percentage of power generation from Intermittent Renewable Energy Sources (IRES) to 11%,⁷ i.e., whose production depends on natural forces that cannot be controlled by man, such as solar radiation and wind intensity, and iii) sustained growth in distributed generation that, if the current trend continues, could reach 6.7 GW in 2023, mainly from photovoltaic resources.⁸

Notwithstanding its potential to mitigate GHG emissions in electricity generation, the variability of the IRES can jeopardize the reliability and safety of the electricity system, as well as negatively affect energy prices if the proper strategies are not applied to address it.⁹ Hence, a climate action policy that prioritizes the use of renewable energies, especially intermittent ones, should not overlook the creation of regulatory and market instruments that make it possible to use existing options for dealing with this issue.

In this context, electrical energy storage (EES) is a promising tool to incorporate higher proportions of IRES by giving system operators more

⁴ Secretaría de Energía, *Programa de Desarrollo del Sistema Eléctrico Nacional 2018-2032*, México, SENER, 2018, pp. 19 y 22.

⁵ Clean energy includes solar, wind, hydro, geothermal, nuclear and efficient cogeneration resources, among the other technologies described in Article 8 of the Energy Transition Law.

⁶ Secretaría de Gobernación, Ley de la Transición Energética, *Diario Oficial de la Federación*, artículo tercero transitorio, México, December 24, 2015, available at: http://dof.gob.mx/nota_detalle.php?codigo=5421295&fecha=24/12/2015.

⁷ Gobierno de la República, *En la tercera Subasta Eléctrica se obtuvo uno de los precios más bajos internacionales: PJC*, November 21, 2017, available at: <https://www.gob.mx/cenace/prensa/en-la-tercera-subasta-electrica-mexicana-se-obtuvo-uno-de-los-precios-mas-bajos-internacionalmente-pjc-141671>.

⁸ Energy Regulatory Commission estimates.

⁹ World Energy Council, *Variable Renewables Integration in Electricity Systems: How to Get It Right*, United Kingdom, WEC, 2016, pp. 31-38.

room to maneuver in order to balance generation and demand even when the energy is not generated at the very instant it is required. In general terms, EES encompasses various technologies (lithium batteries, pumped storage, compressed air, flywheels, and supercapacitors, among others) that enable to capture the energy produced at a given moment for later use.¹⁰

EES systems are not the only technological solution to contend with the variability of IRES and thus reap its benefits. Improved wind and solar resource forecasting, greater flexibility in generation, transmission and distribution grid expansion, increased visibility of distributed generation resources, and the implementation of demand response programs are other well-known options.¹¹

EES detractors point to cost as the greatest disadvantage of this technology. For now, it is true that EES is still an expensive option for many players in various markets, so its development has focused primarily on advanced economies like those of California or Germany. However, their costs are becoming more and more affordable. In fact, between 2010 and 2017, the price per kWh of lithium batteries went from approximately \$1000 USD to \$200 USD; by 2030, it is expected to drop even further, down to \$70 USD per kWh.¹² Additionally, there are already specific business models and applications for which EES makes economic sense.

This article is not intended to promote EES as a unique alternative to deal with the variability of IRES, but to highlight the benefits this technology could bring to the Mexican electricity system and its young market, as just one more option available, always leaving the final decision to the market players as to which one would make the most economic and technical sense for each specific case. In addition, it aims to provide an overview of the current state of the existing regulatory framework for EES in Mexico and a comparison with the most dynamic market in this regard, California.

Building a regulatory framework for EES is needed so that projects of this type can flourish in cases where they are the most viable option. In the 2017-2031 National Electrical System Development Program (PRODESEN), the installation of a 20 MW battery bank was first proposed in order to improve operational flexibility and enable the incorporation of IRES

¹⁰ Deloitte, *Energy Storage: Tracking the Technologies that Will Transform the Power Sector*, United States of America, Deloitte, 2015, p. 4.

¹¹ *World Energy Council...*, *op. cit.*, pp. 44 and 45.

¹² Bloomberg New Energy Finance, *New Energy Outlook 2018 Report*, United States, Bloomberg Finance L. P., 2018, available at: <https://bnef.turl.co/story/neo2018?teaser=true>.

into the National Electric System (specifically in Baja California Sur).¹³ In the last edition, the project had disappeared. Without a clear understanding of the remuneration mechanisms and operating rules for such systems, it will be impossible for any of them to materialize, even when they are a leading option in cost-benefit analysis processes, such as PRODESEN.

II. THE ADDED VALUE OF ENERGY STORAGE

Due to its physical and operational characteristics, energy storage can provide a wide range of services along the entire value chain of the electrical sector: enhancing energy security by reducing dependence on fossil fuels; improving generation efficiency and facilitating the incorporation of renewables; improving grid operation and allowing investments to expand transmission and distribution infrastructure to be deferred; reinforcing the grid by providing greater flexibility; and providing an effective alternative for end users to manage their electricity bills.

The following discusses the ways in which EES can generate value to both grids and users, as well as to the economy and society.

1. *Incorporation of renewable energies*

Perhaps the most promising side of EES is its potential to incorporate more and more clean technologies to the generation matrix since storage is particularly well equipped to handle both the short- and long-term variability of energy produced from IRES and the possible negative effects these may have on the quality of electrical service.

The ability to store energy at one point in time for later use is an essential feature of EES technologies. This service, known as arbitrage or time shifting, is very valuable for IRES whose generation depends on uncontrollable factors like the weather and therefore cannot be timed to coincide with demand. To give an example, solar generation takes place during the day when energy demand is not very high; but by adding a storage system to a photovoltaic power plant, it is then possible to store the energy produced during the day and later inject it into the grid when there is higher demand.

¹³ Secretaría de Energía, *Programa de Desarrollo del Sistema Eléctrico Nacional 2017-2031*, México, SENER, 2017, pp. 113 and 114.

Moreover, sudden changes in weather conditions (*e. g.*, cloud accumulation or lighter winds) can cause sudden fluctuations in solar and wind energy generation levels that must be counterbalanced by other resources on the grid. EES systems can handle these “ramps” because they can be programmed to rapidly neutralize IRES variability and can do so much more efficiently than conventional combustion plants.

Another way EES contributes to the integration of renewables is by ensuring their generation levels are kept at a certain level (“firm” capacity), which allows them to deliver high-power products and services.

2. *Advantages of the system*

The most important advantages of storage are the flexibility it can give the overall system. Flexibility is the ability to maintain continuous electrical service despite sudden changes that may occur on either the supply or demand side. As IRES participation increases, flexibility is an issue that becomes more pressing since, on the one hand, these sources displace the conventional generators that provide flexibility and, on the other hand, increase the need for additional flexibility due to their intermittent nature, creating a “flexibility gap” that must be covered by other resources.¹⁴

Because of their ability to time-shift supply and demand and their unique technical characteristics, EES systems can provide a wide range of services that —alone or combined— offer valuable flexibility alternatives for the system. Some ways in which EES can contribute to electricity grid flexibility are analyzed below.

Time-shift. As mentioned above, the most basic function of EES is to store energy during periods of low demand when its price is relatively low to be used or sold later when the demand is high and so is the price. In addition to the possibility of generating profits through this type of price arbitrage, this function of EES decreases the need for dedicated power plants to meet peak demand (plants that tend to be more costly and polluting), which can lead to significant savings in the total cost of energy.

Capacity. EES makes it possible to “firm up” generation from IRES and, consequently, offer capacity. Traditionally, this type of product is provided by more inefficient fossil fuel-fired power plants, which is why this use of

¹⁴ ECOFYS, *Flexibility Options in Electricity System*, Germany, European Copper Institute, 2014, available at: <https://www.ecofys.com/files/files/ecofys-eci-2014-flexibility-options-in-electricity-systems.pdf>.

EES could reduce the cost of operating and maintaining obsolete power plants, as well as that of installing new generation equipment. However, many markets still have placed hurdles for EES to effectively supply power as conventional plants are required to operate for open or long enough periods of time so that storage cannot participate.¹⁵

Ancillary services. A stable, reliable and efficient electrical grid requires various support services for electricity to flow smoothly from power generation plants to the loads. Some of these services are frequency regulation, operating reserves, rolling reserves, voltage regulation, emergency start-up and island operation, among others.

Different EES technologies can provide most ancillary services more efficiently than conventional fossil-fuel fired generating plants. This advantage is due to the fact that storage has shorter response times than most existing generators because its start-up time is very fast. Some EES technologies can respond in a fraction of a second while a fast-start combined cycle plant needs at least 10 minutes and conventional thermal power plants take about 20 minutes to start up.

A further advantage over conventional plants is that EES can serve as both a generation source and a load. Hence, it can provide ancillary services by either modifying its energy delivery (discharge mode) or changing its demand patterns (load mode) and as mentioned above, can do so very rapidly.

The use of EES systems for ancillary services can streamline and simplify system operators' planning and operation processes. In fact, in late 2016, the UK grid operator held an auction for enhanced frequency regulation services, which privileged bids from faster response generation resources like those of EES systems. The auction was successful in securing fairly competitively priced allocations (\$9.9 USD per MWh).¹⁶

Transmission and distribution backup (T&D). EES systems can also add value to T&D networks in several ways. First, it reinforces power lines, substations, transformers and other equipment so that the same unit working with EES can handle higher amounts of energy. EES can also mitigate T&D equipment overloads, decreasing wear and tear and thus prolonging its lifespan.

Second, if installed downstream of a congested section of the grid, EES can ease congestion by storing energy during periods of low congestion

¹⁵ In Mexico, the Capacity Market Balance Manual establishes a minimum of six consecutive hours for EES plants to demonstrate firm power.

¹⁶ Manghani, R. and McCarthy, R., *Global Energy Storage: 2017 Year-in-Review and 2018-2022 Outlook*, GTM Research, April 2018, available at: <https://www.greentechmedia.com/research/report/global-energy-storage-2017-year-in-review-and-2018-2022-outlook#gs.ImD43tk>.

(overnight or weekends) to later be released during periods of peak demand. This application would allow users to avoid congestion charges.¹⁷

A third benefit comes from the fact that EES integrated into T&D systems can increase the use of grid assets and, therefore, improve their cost-benefit ratio. For instance, when more energy is transmitted for storage during off-peak periods, more energy (kWh) is transported over the same T&D capacity (kVA). In turn, greater asset use may lead to lower T&D rates that would benefit users.

To the extent that EES relieves grid congestion, mitigates equipment overload and extends equipment lifespan, storage makes it possible to defer or even avoid costly investments to modernize and expand the grid. This application of EES has already proven successful in Queensland, Australia, where batteries were used to support an outdated distribution network and maintain reliable electricity service.

3. *Advantages for end users*

Behind-the-meter EES systems also have considerable potential benefits: they empower consumers and allow them to take a more active role in their consumption decisions and, as a result, can generate savings in the cost of energy consumed. The main ways in which end users, whether homes or businesses, can benefit from implementing EES solutions are discussed below.

Backup power. Storage systems can help with power supply during outages caused by natural disasters or grid failures. This application can be particularly important for commercial and industrial users for whom a sudden power outage can result in significant monetary losses. Moreover, these types of users tend to invest in costly, polluting backup generation equipment, such as diesel plants. So, EES provides a useful electricity backup alternative with the potential to save money through other applications, such as those discussed below.

Quality of service. In cases where the energy delivered by the grid is poor quality, EES can prevent cost and losses caused by this type of deficiency, such as voltage variations and interference caused by lightning or other equipment connected to the grid. The use of EES systems can improve the quality of the energy received and protect sensitive equipment.

¹⁷ Energy Storage Association, *Grid Infrastructure Benefits*, Energy Storage Association, n.d., available at: <http://energystorage.org/energy-storage/energy-storage-benefits/benefit-categories/grid-infrastructure-benefits>.

Distributed generation. EES contributes to the penetration of IRES. This is also true for behind-the-meter EES systems as they allow consumers to keep the surplus energy generated throughout the day for later consumption, thus reducing their spending on electricity. Some studies argue that residential storage could increase the share of self-consumption of energy from 30% to 65-75%,¹⁸ adding value to distributed solar energy resources and boosting their profitability. Furthermore, higher consumption of on-site generation contributes to grid stability since most existing distribution networks cannot handle high volumes of electricity backfeed.

One possible disadvantage of this application is that if more and more users become self-sufficient by installing EES systems, there may be significant load-shedding—and even grid defection—affecting the revenues of system operators and traditional generators and increasing the cost for users who remain connected.

Consumption management. There are at least two ways in which EES allows end-users to optimize their demand and reduce their spending on electricity. On one hand, for customers subject to demand charges (electricity tariffs based on consumers' peak demand during specific periods), EES allows them to automatically respond to a peak load on their facilities by replacing their demand for grid energy with stored energy and, consequently, lowering their electricity bill. On the other hand, for customers subject to hourly tariffs, this application of EES can also generate significant savings by substituting consumption from the grid at times when the tariff is higher.

Controllable demand. Another way consumers can lower electricity spending is by participating in demand control programs, which is much easier with EES systems since these make it possible to reduce energy consumption from the grid during peak hours without affecting consumers' processes.

4. *Energy security*

A country's energy security depends to a large extent on the degree of diversification of its energy sources which in most cases calls for reducing dependence on hydrocarbons. Energy storage can become a promising ally in this effort; one simple example is the growing penetration of electric vehicles.

¹⁸ European Parliament, *Energy Storage: Which Market Designs and Regulatory Incentives Are Needed?*, October 2015, available at: [http://www.europarl.europa.eu/RegData/etudes/STUD/2015/563469/IPOL_STU\(2015\)563469_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2015/563469/IPOL_STU(2015)563469_EN.pdf).

In Mexico, natural gas is the main fuel for generating energy. In fact, in 2017, combined cycle plants served 50% of the total demand.¹⁹ However, national production of this hydrocarbon has been falling steadily since 2009 and now the country depends on imports, which today equal 55% of the total natural gas demand, with 87% of these coming from the United States.²⁰

In this scenario and in light of the recent changes in the US political and trade agenda, concerns have arisen about Mexico's energy security. As mentioned before, by favoring the incorporation of renewables, EES can reduce Mexico's dependence on US gas and strengthen its energy security.

On the other hand, EES can also play a key role in responding to attacks on the power grid, which are not implausible in a context of increasing digitalization. In the event of a cyberattack causing a massive blackout, EES systems could provide backup power for essential activities, like medical or military facilities, or help restore the power supply after the attack has been neutralized (emergency start-up), thus improving system security.

5. Other benefits

Economic benefits. As a market, EES is set to continue its growth. In fact, some projections predict a 12-fold increase in the global storage market by 2030, reaching a capacity of 125 GW or 305 GWh and investments of USD \$103 billion.²¹ This optimism reflects the huge economic potential of EES in the market, particularly for the manufacturing industry, and especially in the chemical batteries sector. This industry is now largely confined to the United States and, to a lesser degree, Germany, but there are opportunities for countries like Mexico that already have competitive value chains for products with electronic components.

Other ways in which storage promotes economic growth include the development of new industrial networks; job creation during the production, installation and operation of EES systems; export of storage equipment and components; research and development —and potential innovation— to increase competitiveness in the industry; greater reliability of electricity supply; and externalities to other EES-related industries, such as transportation, software, telecommunications and finance.

¹⁹ Secretaría de Energía, *Programa de desarrollo...*, *op. cit.*, p. 22.

²⁰ Secretaría de Energía, *Prospectiva de Gas Natural 2017-2031*, México, SENER, 2017, p. 16.

²¹ Bloomberg New Energy Finance, *Global Storage Market to Double Six Times by 2030*, November 2017, available at: <https://about.bnef.com/blog/global-storage-market-double-six-times-2030/>.

Environmental benefits. EES allows higher percentages of renewable energy to be incorporated, which will eventually lead to lower GHG emissions. Storage systems do not produce emissions during operation, so they do not have negative impact on air quality or climate change. Thanks to their versatility, storage systems can also help optimize the operation of traditional combustion generators and reduce their emissions by saving fuel.

Social benefits. More than one billion people in the world do not have access to electricity, according to data from the International Energy Agency.²² In Mexico, half a million homes, predominantly indigenous and rural ones, are in this same situation.²³ Mini-grids that combine EES systems and renewable technologies are an alternative to serve this population and replace the diesel generators and kerosene lamps they usually use. These systems reduce greenhouse gas emissions and provide a quality supply, similar to that provided by an electrical grid.

III. EXISTING AND MISSING PIECES OF MEXICAN LEGISLATION

Since the 2013 reform, Mexico has worked on the liberalization of its energy markets. Secondary laws, regulations and other regulatory instruments essential for market operations were published in only two years, and there are still several issues pending to be resolved.

One of the missing pieces is the regulation for the EES, even though some progress has been made in this regard. For example, the Energy Transition Law establishes that the National Energy Control Center (CENACE), the independent system operator, must prepare a Smart Grid Program every three years that considers, *inter alia*, the integration of advanced EES technologies.²⁴ The first of these programs was published in 2016, and already recognized storage as a preferred technology because of its potential to reduce grid voltage variation and energy costs, promote renewable

²² International Energy Agency, *Energy Access Outlook 2017. From Poverty to Prosperity*, France, OECD/IEA, 2017, p. 40.

²³ Cámara de Diputados, “En México, hay 500 mil viviendas sin electricidad, principalmente en comunidades indígenas y rural”, Boletín, No. 1343, April 14, 2016, available at: <http://www5.diputados.gob.mx/index.php/esl/Comunicacion/Boletines/2016/abril/15/1343-En-Mexico-hay-500-mil-viviendas-sin-electricidad-principalmente-en-comunidades-indigenas-y-rurales>.

²⁴ Secretaría de Gobernación, Ley de la Transición Energética, *Diario Oficial de la Federación*, Article 39, Mexico, December 24, 2015, available at: http://dof.gob.mx/nota_detalle.php?codigo=5421295&fecha=24/12/2015.

energy integration and prevent blackouts.²⁵ Furthermore, the Ministry of Energy has already deemed EES projects a solution to grid needs in the 2017-2031 PRODESEN.²⁶ However, in order to develop the potential of EES in Mexico, specific regulations are needed to provide greater certainty to the activities these assets can perform and their remuneration mechanisms. Even the 2017-2018 Special Energy Transition Program concedes that the current regulatory framework restricts the use of EES systems in certain market segments.²⁷

Potential investors have expressed their interest in participating in storage projects in Mexico to the Energy Regulatory Commission (CRE) but have not undertaken any due to the lack of clear rules. Filling this regulatory void, clarifying the role of storage in the different markets and the permissible remuneration schemes is indispensable to develop the potential of EES in Mexico and access its manifold benefits.

1. *Everything starts with a definition*

The current regulatory framework does not contain a specific legal definition for EES systems—for the time being they must be registered under the figure of Power Plant and be represented by a Generator—and is limited in terms of the activity that such assets may engage in. Base 3.3.21 of the “Electricity Market Bases”,²⁸ establishes that:

- a) These Generators may make offers for the sale of all the products the storage equipment is capable of producing, under the same terms of any other Power Plant Unit.
- b) Likewise, in order to operate the storage equipment, these Generators may make all the purchase offers that correspond to the Load Centers, assuming to this effect all the responsibilities that correspond to the Load Serving Entities.
- c) When a piece of storage equipment is part of the National Transmission Grid or General Distribution Grid, strict legal separation must

²⁵ Centro Nacional de Control en Energía, *Programa de Redes Eléctricas Inteligentes*, Mexico, SENER, 2016, pp. 26-36.

²⁶ SENER, *Programa de Desarrollo...*, *op. cit.*, pp. 113 and 114.

²⁷ Secretaría de Energía, “Programa Especial de la Transición Energética 2017-2018”, *Plan Nacional de desarrollo 2013-2018*, Mexico, SENER, 2017, pp. 27 and 28.

²⁸ Secretaría de Energía, Bases del Mercado Eléctrico, *Diario Oficial de la Federación*, Article 3.3.21, 2015.

be maintained between the Generator that represents the equipment in the Wholesale Electricity Market and the Transporter or Distributor that uses the equipment to provide the Public Transmission and Distribution Service, under the terms established by the Ministry of Energy. Likewise, these Generators, Transporters and Distributors shall adhere to the tariff regulations established by the CRE.

These provisions partially recognize the multipurpose nature of energy storage but create obstacles by placing EES within existing categories that are not necessarily applicable, relevant or flexible enough to take advantage of its full potential. One example is that the way in which EES would be charged for transmission service is unclear since there are different tariffs for Generators and for Load Centers. Nor is it clear how the different services EES assets can provide will coexist, which generates uncertainty about the possibility of receiving different revenues and, therefore, about the economic viability of these projects.

Success stories like the California power market show the importance of having a specific and suitable definition for storage that also recognizes its multipurpose nature. In this case, the EES market exploded with the publication of Assembly Bill 2514 of 2010,²⁹ which specifically defines EES systems without limiting different technologies or restricting asset ownership alternatives. An EES system can be owned by a Load Serving Entity, a State-owned company, an end user, a third party or any combination of these. This framework offers flexibility to different business models and provides clarity on the remuneration schemes available to EES.

This legislation was a milestone for the EES industry since it also required the California Public Utilities Commission (CPUC) to analyze the potential benefits and economic viability of EES and identify the appropriate targets for increasing storage capacity through bidding processes. CPUC set a goal of contracting 1,325 MW of EES capacity by 2020; by late 2017, it had already tendered 488 MW.³⁰ This mechanism —unique in the world— created a dynamic market in which new business models were built, research and development was strengthened, and an innovative regulatory framework was created.

²⁹ California Legislative Information, *AB-2514 Energy Storage Systems (2009-2010)*, 2010, United States of America, Legislative Counsel's Digest, available at: https://leginfo.ca.gov/faces/billNavClient.xhtml?bill_id=200920100AB2514.

³⁰ The Climate Group, *How California is Driving the Energy Storage Market through State Legislation*, United States of America, The Climate Group, 2017, pp. 2-5, available at: https://www.theclimategroup.org/sites/default/files/downloads/etp_californiacasestudy_apr2017.pdf.

Subsequently, the California independent system operator (CAISO) adopted the figure of “non-generating resources” for resources that can operate as generation and load and can be dispatched at full capacity, such as batteries or flywheels to electric vehicles.³¹

Following the example of California, the US Federal Energy Regulatory Commission (FERC),³² published Order 841 in early 2018. This order obliges all electric system operators in the country to establish a participation model for EES in the market, recognizing its technical and operational characteristics. Moreover, it specifies that this model must ensure that EES systems are eligible to provide all technically feasible capacity, energy and ancillary services. Order 841 also asks that an explicit definition be established for EES systems to clarify their eligibility to participate in different market segments.³³

2. *Regulating for multipurpose assets*

In addition to a proper definition, it is necessary for the regulator to establish a set of rules and contractual models so that EES can efficiently provide different services. The absence of clear rules could affect the operation of the system: for instance, if two services are required at the same time, which one should the asset give priority to? Who decides which of the two is a priority —the system operator or the asset owner?— How would this operation be coordinated?

In California, after allowing the participation of EES in different markets and collecting multiple revenues, in early 2018 the CPUC published eleven rules to facilitate the simultaneous participation of EES in different activities. One of the main contributions of these rules is the classification of services in different areas, which makes it possible to prioritize these services and determine which can be offered simultaneously, which cannot, and which are a priority.³⁴

³¹ California Independent System Operator, *Storage Technologies Provide Flexible Resources in the Market*, s. f., available at: <http://www.caiso.com/participate/Pages/Storage/Default.aspx>.

³² Federal Energy Regulatory Commission, *Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators (Order 841)*, February 2018, available at: <https://www.ferc.gov/whats-new/comm-meet/2018/021518/E-1.pdf>.

³³ *Idem*.

³⁴ *California Public Utilities Commission, Decision on Multiple-Use Applications*, January 2018, pp. 11 and 12, available at: <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M206/K462/206462341.PDF>.

These rules also address a frequent concern related to collecting multiple revenues: preventing double compensation. To this end, the CPUC clarifies that compensation is only permitted for incremental, distinct and measurable services. The same service must only be counted and compensated once.³⁵

It is still too early to judge whether California's eleven rules will deliver on their objective and overcome the difficulties of operating EES systems in parallel markets. Nonetheless, California's experience has the longest track record and achievements in the world, so it is important to take into account its contributions, particularly in terms of service differentiation and hierarchization.

3. A market for ancillary services that includes storage

It has already been mentioned that due to its characteristics, EES is capable of providing ancillary services more efficiently than traditional generators, especially because of its fast response speeds. Recognizing this factor in the compensation of ancillary services can be an incentive to deploy EES, as well as to contribute to greater system stability, a particularly important issue in the current context of a growing participation of IRES.

In Mexico, the gamut of ancillary services is divided in those that are included in the market and those that are not (Table 1). The former are traded in the short-term market (a day ahead and real time) and their price is defined by the interaction of supply and demand. The latter consist of regulated services with tariffs regulated by the CRE (currently being developed). One of the main impediments for EES in the current scheme is that the plan does not include compensation for the primary regulation service—a service that requires greater speed and that in other parts of the world has been an attractive niche for the deployment of EES systems—which is considered a mandatory service that must be provided by all electricity generation units.³⁶

In order to make providing ancillary services in Mexico more appealing for technologies like EES that are more efficient for this task, it is necessary for the Market Bases to allow the compensation of primary regulation and develop tariff methodologies for the compensation of ancillary services

³⁵ *Idem*.

³⁶ Secretaría de Energía, Bases del Mercado Eléctrico, *Diario Oficial de la Federación*, Article 1.2.9, 6.2.1, 6.2.5 and 6.2.6, September 8, 2015, available at: http://www.dof.gob.mx/nota_detalle.php?codigo=5407715&fecha=08/09/2015.

not included in the market. Clearly establishing the compensation to be received for providing ancillary services is essential for the financial viability of EES projects, especially if such payments can be combined with revenues from other items like energy, capacity, transmission and distribution.

TABLE 1. CLASSIFICATION OF FEE-BASED ANCILLARY SERVICES IN MEXICO

<i>Included in the market</i>	<i>Not included in the market</i>
1) Secondary regulation reserves	1) Emergency start-up
2) Rolling reserves (10 minutes)	2) Island operation
3) Non-rolling reserves (10 minutes)	3) Dead bus connection
4) Operating reserves	4) Voltage and reactive power control
5) Supplementary reserves (30 minutes)	

SOURCE: prepared by the author with information from the “Electricity Market Bases”.³⁷

4. *Monetizing value in transmission and distribution*

The value of EES as a T&D service provider has already been recognized by regulators, system operators and grid operators. California has already implemented EES applications as a grid asset with a defined compensation model. However, the combination of these —regulated— revenues with other revenues from the market is uncharted territory, even in advanced markets like California’s (CAISO is already working on a proposal to be published in November 2018).³⁸

Mexico has the potential to be a pioneer in this area as it is in the initial phase of setting up its markets and regulatory framework. For EES regulation to be successful and incentivize the deployment of these technologies, it is necessary to allow the collection of multiple —regulated and market-based— revenues from the outset. This would make it possible to leverage the myriad benefits of EES and pass them on to the system and to end users.

To better understand the challenge involved, it is worth looking again at the case of California. The following sections examine models that allow

³⁷ *Idem.*

³⁸ California Independent System Operator, *Storage as a Transmission Asset: Enabling Storage Assets Providing Regulated Cost-Of-Service Based Transmission Service to Access Market Revenues*. Revised Straw Proposal, August 2018, p. 7, available at: <http://www.caiso.com/Documents/RevisedStrawProposal-Storage-as-TransmissionAsset.pdf>.

revenue recovery through regulated tariffs and their potential bundling with market revenues (Table 2). The purely merchant model, *i. e.*, which only receives revenues from the market, will not be discussed as it is beyond the scope of this paper.

TABLE 2. A SUMMARY OF EES PARTICIPATION MODELS
IN THE CALIFORNIA POWER MARKET

Model	<i>Merchant</i>	<i>Grid asset</i>	<i>Hybrid</i>
Description	Projects aimed at providing services in the energy, capacity and ancillary services markets.	Projects designed to meet a specific need in the transmission or distribution grid.	A project that mainly provides grid services, but also participates in the electricity market.
Project origen	Submitted by a public company or regulatory institution, or by a private company that assumes all the risk.	Submitted as part of the power grid planning process.	<i>Proposal</i> : Submitted as part of the power grid planning process.
Compensation	Bilateral contracts, market revenues or both of the above.	Regulated tariffs	<i>Proposal A</i> : Regulated tariffs cover the full cost of the project; market revenues are deducted from the tariff. <i>Proposal B</i> : Regulated tariffs partially cover the cost of the project; market revenues are additional.

SOURCE: prepared by the author with information from CAISO.³⁹

A. *The key to regulated tariffs lies in the planning process*

In 2013, CAISO developed a methodology to systematically consider EES assets in its grid planning process, which is a requirement to access regulated tariffs. During this process, the EES system must prove that it is the best option to solve a grid need using a cost-benefit assessment. This methodology was partly driven by California’s energy policy, which identifies EES as a priority resource (energy efficiency, controllable demand and re-

³⁹ *Ibidem*, pp. 16, 17, 24-28.

newable energy also fall under this category).⁴⁰ Previously, the EES projects were considered on a case-by-case basis, making approval difficult. Under the new methodology, two storage projects were approved in the 2017-2018 planning process.⁴¹

In Mexico, the National General Transmission and Distribution Grid Expansion and Modernization Program (PAM) is the instrument used to identify the projects that will meet the grid needs. The methodology used in these documents is not as sophisticated as that of California, partly because until 2013 these activities were carried out by a vertically integrated company (CFE). In the 2018-2032 period, the PAM evaluates only two alternatives for each identified need and chooses the one with the lowest cost based on an assessment by the grid operator. At this point in time, the PAM does not consider any alternatives to traditional grid technologies.⁴²

Given that PAM results are used to prepare the PRODESEN⁴³—which lists the projects to be undertaken in the next 15 years—it is necessary to include an EES alternative in the PAM so that these assets can access regulated tariffs as part of the grid.

Although the 2017-2031 PRODESEN considered the implementation of a storage system as an alternative to manage congestion in the Baja California grid,⁴⁴ Mexico still does not have a systematic assessment of this type of project. The inclusion of a battery bank for Baja California in the 2017-2031 period was the exception and not the rule. Thus, it is important to develop a methodology that ensures that EES is included in the range of potential grid solutions, which can lead to more efficient solutions for the grid that result in lower costs for users.

Moreover, it is necessary to define whether the system operator, CENACE, can own storage assets. In USA, the FERC had already rejected a proposal to consider EES as a transmission asset because the developer,

⁴⁰ California Independent System Operator, *Consideration of Alternatives to Transmission or Conventional Generation to Address Local Needs in the Transmission Planning Process*, September 2013, available at: <http://www.caiso.com/Documents/Paper-Non-ConventionalAlternatives-2013-2014TransmissionPlanningProcess.pdf>.

⁴¹ CAISO *Storage as a Transmission...*, *op. cit.*, p. 7.

⁴² Centro Nacional de Control en Energía, *Programa de Ampliación y Modernización de la Red Nacional de Transmisión y Redes Generales de Distribución del Mercado Eléctrico Mayorista 2018-2032*, Mexico, SENER, 2018.

⁴³ Secretaría de Energía, *Programa de Desarrollo del Sistema Eléctrico Nacional*, May 31, 2018, available at: <https://www.gob.mx/sener/acciones-y-programas/programa-de-desarrollo-del-sistema-electrico-nacional-33462>.

⁴⁴ Secretaría de Energía, *Programa de Desarrollo del Sistema Eléctrico Nacional 2017-2031*, Mexico, SENER, 2017, p. 113.

Nevada Hydro Company, suggested that the system operator should have control over it. FERC and the operator itself feared that this would compromise its independence, so the project was rejected.⁴⁵ Mexico does not have a defined position on the issue, but if a third party is allowed to own an EES asset, specimen contracts and rules of operation should be drafted to clarify the relationship between operator and owner.

*B. Combining regulated and non-regulated revenues:
The big challenge*

In January 2017, FERC defined its position on EES participation in various activities. FERC noted the benefits of EES participation in various activities, whether regulated or market-based, and highlighted the importance of developing regulations that prevent adverse market impact, avoid double charges and protect the independence of the system operator.⁴⁶

CAISO is the first operator to devise a proposal to combine multiple revenues (under discussion). This proposal states that EES projects that wish to access regulated tariffs must go through the grid planning process, even if their objective is to combine these tariffs with other market revenues.⁴⁷

The proposal also includes a methodology to identify the conditions under which an EES project receiving regulated revenues for T&D services can offer other services to the market. CAISO suggests using the degree of predictability of grid needs to solve the dilemma: EES systems operating in low predictability contexts will not be able to participate in the market, while those where there is a high predictability will be eligible. In both cases, CAISO reserves the right to analyze case by case, and adjust the period where services can be provided to the market according to the existing conditions in the system.⁴⁸

For those EES assets that can offer products to the market, CAISO puts forward two compensation mechanisms that reconcile regulated (fixed) revenues with market (variable) revenues, thus avoiding the duplication of costs.⁴⁹

⁴⁵ CAISO, *Storage as a Transmission Asset...*, *op. cit.*, p. 30.

⁴⁶ Federal Energy Regulatory Commission, *Utilization of Electric Storage Resources for Multiple Services when Receiving Cost-based Rate Recovery*, January 2017, available at: <https://www.ferc.gov/whats-new/comm-meet/2017/011917/E-2.pdf>.

⁴⁷ CAISO, *Storage as a Transmission Asset...*, *op. cit.*, pp. 16-18.

⁴⁸ *Ibidem*, pp. 21-23.

⁴⁹ *Idem*.

Proposal 1: The project will recover the full cost of the investment plus a reasonable return through regulated tariffs. The revenues obtained from the market will be deducted from the regulated tariff.

Proposal 2: The Project will recover part of the investment through regulated tariffs, and the rest will be recovered through the market. The developer will assume the merchant risk. The full recovery of investment costs is not guaranteed.

Proposal 1 has the advantage of ensuring the full cost recovery and making it easier to compare the project against other options in the grid planning process. However, it offers little or no incentive for EES assets to participate in the market. The second mechanism solves this disadvantage but instead leaves developers exposed to greater risk.⁵⁰

In both cases, CAISO recognizes the importance of developing new contractual models for projects receiving regulated and market revenues. Additionally, one priority is to provide the operator with visibility in real-time operations of EES assets, including a path to operate the system when needed.⁵¹ Therefore, the contractual model must be very clear on the circumstances under which the operator can take control of the assets and when it can operate freely to offer its services to the market.

Avoiding the duplication of costs and ensuring efficient coordination between the operator and EES assets are also concerns in the emerging Mexican storage market. Decision-makers can surely benefit from studying the ground already covered by California and should seriously consider including EES systems in the PAM and the PRODESEN.

IV. CONCLUSIONS

The decarbonization of the energy industry is key to addressing climate change. An important part of this strategy is increasing generation from renewable sources, especially in countries with high potential like Mexico. However, the expansion of these sources causes some concern since the fastest growing ones (solar and wind) are also intermittent and their incorporation complicates grid operation.

Fortunately, EES costs are going down in giant steps, by leaps and bounds, turning it into a viable solution to handle the voltage and frequency variability caused by higher percentages of IRES in the grid. EES also

⁵⁰ CAISO, *Storage as a Transmission Asset...*, *op. cit.*, pp. 24-28.

⁵¹ *Ibidem*, p. 17.

has proven valuable for other purposes: increasing Mexico's energy security, empowering end users and encouraging the adoption of distributed generation (renewable in most cases). Storage also provides valuable ancillary services, especially those that require rapid response speeds.

One of the least recognized but highly valuable services is the use of EES as a transmission or distribution asset. These systems can reinforce existing grid infrastructure, prevent stress and thermal overloads on lines and avoid congestion. This way, EES can defer —and even avoid— investments in new T&D infrastructure, thereby cutting costs for the operator and end-users.

The viability of EES projects depends to a large extent on receiving multiple revenues from the different activities and services that it is technically capable of providing. However, this has not been easy because of the current structure of electricity markets. California —the most advanced EES market in the world— has made significant progress although there are still issues to be resolved, especially in the simultaneous compensation for market and T&D services.

Following the example of California, Mexico has a long way to go for the EES market to grow:

Create a new definition of EES that acknowledges its multipurpose nature. This new definition should avoid confining EES to existing concepts like Generator or Power Plant since storage has unique characteristics that do not necessarily match those of other types of assets.

Build the methodology for considering the ancillary services not included in the market; consider the inclusion of products that recognize the response speed of the asset at faster levels (included and not included in the market) and recognize that primary frequency regulation has a financial compensation.

Liaise with CENACE and the Ministry of Energy so that EES is considered in the electricity grid planning process (PRODESEN), a necessary step for EES to receive regulated tariffs for providing T&D services.

Design a methodology to identify the best alternatives for providing T&D services that are technologically neutral, as well as the circumstances under which EES systems used as grid assets can provide services to the market without compromising the efficient operation of the grid (this includes a fair compensation mechanism that prevents double charges).

Classify and categorize the services EES can provide as a basis for drafting operating rules so that different services can be provided simultaneously without compromising system operations or market performance.

Review the existing market instruments and modify those that are necessary.

The implementation of these actions requires collaboration between the players involved, especially between the regulator (CRE), the independent system operator (CENACE) and the policy maker (SENER).

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UNIVERSAL ACCESS TO ELECTRICITY AS A STRATEGY TO CLOSE SOCIOECONOMIC GAPS IN MEXICO

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Thank you Mau, Judith, Chava and Kenia

SUMMARY: I. *Introduction*. II. *Socioeconomic gaps*. III. *Regulatory framework*. IV. *Current strategies*. V. *Areas of opportunity (topics for thought)*. VI. *Conclusions*. VII. *Bibliography*.

I. INTRODUCTION

The new energy model has brought significant changes to Mexico. However, it is useful to examine the strategies aimed at meeting basic energy needs at the regional level and consolidate the programmatic instruments for carrying them out efficiently.

To date, the most notable advances in the energy sector usually tend to translate into large infrastructure projects, committed investments and the development of open markets, perhaps the most significant of which are those related to energy efficiency and the persistent inclusion of renewable energy in the national energy matrix. In this sense, according to Prospective of Renewable Energies 2016-2030, it is expected that 40% of energy generation will be from renewable sources by 2028,¹ resulting in an increased energy production from renewable sources and greater energy efficiency measures that will boost economic growth and social inclusion.

This paper seeks to show that Mexico's new regulatory framework for energy is not only designed for large projects and capital, but also offers

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¹ Secretaría de Energía, *Prospectiva de Energías Renovables 2016-2030*, México, 2016, available at: https://www.gob.mx/cms/uploads/attachment/file/177622/Prospectiva_de_Energ_as_Renovables_2016-2030.pdf.

specific alternatives that contribute to the country's reducing its ecological footprint (decarbonization) and boosting its economic development.

This paper is divided into 6 parts: the first one provides a conceptual description of the state of poverty in Mexico and Latin America, outlining the current panorama and the direct relationship that has been found between poverty and the absence of electric service.

The second part gives a brief description of the regulatory framework for energy, including the most important aspects of the electricity sector, as well as the new instruments for the energy transition.

The third point shows how this regulatory framework has been used, the progress made in the implementation of the new energy model and the existing tools to address shortcomings in energy competencies and education.

Point four presents the areas of opportunities that exist on this issue and the way in which the inequalities that persist throughout Mexico can be addressed by presenting the reader with some food for thought.

Lastly, some conclusions and reflections are drawn on the critical decisions that should be analyzed and the regulatory channels to advance the country's energy development and implementation of the new energy model, so that the benefits of this model can permeate the poorest sectors of the country and effectively contribute to narrowing the socioeconomic gaps.

Fuel poverty² regards the social deprivation of access to electricity and to the type of fuel needed for cooking (electricity or gas) as an element that latently contributes to poverty in a country, which is why poverty studies often highlight proposals associated with improving energy services (safe, clean, and accessible), as an indispensable factor in eradicating it.

II. SOCIOECONOMIC GAPS

From an energy point of view and according to the World Bank, 1.06 billion people around the world do not have access to electricity and hundreds of millions more have insufficient or unreliable access.³ In Mexico, the Federal Electricity Commission (CFE) estimated, at the end of 2018, 98.75% of the

² García, Rigoberto, *Pobreza energética en América Latina*, Chile, United Nations, 2014. The term was originally coined by Brenda Boardman and incorporated into UK legislation in 2000 with the passage of the Warm Homes and Energy Conservation Act, which formally spread the concept throughout Europe.

³ World Bank, *Acceso a la energía*, 2017, available at: <https://datos.bancomundial.org/indicador/EG.ELC.ACCS.UR.ZS?end=2014&start=2014&view=map>.

national population had access to electricity, so there were around 2 million inhabitants without access to it.⁴

Although universal access is on the verge of being achieved in the country, the remaining 1.25%, serving some 1,549,781 people, is probably the most difficult area to cover as it is located in marginalized urban areas or rural zones.⁵ In addition to this number, there are millions of inhabitants who, despite having access to electricity, do so insufficiently, interruptedly, at restricted hours and unreliably, risking the electronics and household goods that they have managed to acquire with great effort.

The geographic location of the population significantly defines the opportunities for energy services to which it can access and the economic and social problems stemming from their absence. For example, the index of the average duration of distribution outages for the southeast division was 50 minutes per outage in 2016 and about 70 minutes in 2017. The average frequency rate of distribution outages for the center/south division, the area with the highest average frequency of outages, was 1.07% in 2016 and 0.7% in 2017. The index of the average duration of distribution outages for users was 67 minutes in the Central Gulf area in 2016 and more than 100 minutes in 2017, followed by the southeast zone with 44 minutes in 2016 and 80 minutes in 2017.⁶ According to the 2020 Reliability Report, the average duration of interruptions index shows that it remains at acceptable values, and presents mostly a trend of reduction in the last five years, which represents an improvement of the index. However, the North Gulf, Central Gulf, Central East and Southeast Gulf Divisions recorded slight increases in 2020 indicating an increase in events per user.⁷

According to Gerardo Esquivel,⁸ 46.5% of the Mexican population lives in poverty. However, 1% of Mexicans amass 21% of the country's wealth.

⁴ Secretaría de Energía, *Programa Sectorial de Energía 2020-2024*, México, 2020, available at: https://www.dof.gob.mx/nota_detalle.php?codigo=5596374&fecha=08/07/2020#gsc.tab=0.

⁵ The National Development Plan 2019-2024 establishes that the new energy policy of the Mexican state will promote sustainable development by incorporating populations and communities to the production of energy with sources renewables, which will be essential for provide electricity to small communities isolated.

⁶ Comisión Reguladora de Energía, *Reporte de Confiabilidad del Sistema Eléctrico Nacional 2016-2017*, Mexico, 2018.

⁷ Comisión Reguladora de Energía, *Reporte de Confiabilidad del Sistema Eléctrico Nacional 2020*, Mexico, 2020, available at: https://www.gob.mx/cms/uploads/attachment/file/693799/RCSEN_2020_VF.pdf.

⁸ Esquivel, Gerardo, *Desigualdad extrema en México, concentración del poder económico y político*, Mexico, Oxfam, 2015, available at: https://www.oxfamMexico.org/sites/default/files/desigualdad-extrema_informe.pdf.

The wealthy class grew 32% between 2007 and 2012. Between 2018 and 2020, the percentage of the population in poverty increased from 41.9% to 43.9%, while the number of people in this situation went from 51.9 to 55.7 million people. The percentage of the population in extreme poverty increased from 7.0% to 8.5% between 2018 and 2020 and the number of people in extreme poverty increased from 8.7 to 10.8 million people.⁹

According to the National Council for the Evaluation of Social Development Policy (CONEVAL), poverty and extreme poverty in Mexico have historically had a rural mien.¹⁰ However, the country is now predominantly urban and the demographic concentration in cities and metropolitan areas has given rise to phenomena of exclusion, inequality, unemployment, and poverty. In any case, poverty does not have the same characteristics in urban and rural areas, so the solutions to address the issue should be different.

The CONEVAL states that a person is in a situation of poverty when their income is not enough to acquire the goods and services required to meet their food and non-food needs, and when they have at least one social deprivation of the six indicators: educational lag, access to health services, access to social security, housing quality and space, access to basic housing services, and access to food.¹¹

The General Law on Social Development establishes that the CONEVAL is to define and measure poverty using a multidimensional approach. Income poverty consists in comparing people's income with the monetary values of different items: food, capabilities, and assets.¹²

- Food poverty: Inability to obtain the basic food basket, even if the entire household income were used to buy only the goods in said basket.
- Capability poverty: Insufficient available income to afford the cost of the basic food basket and to make the necessary outlays for

⁹ Consejo Nacional de Evaluación de la Política de Desarrollo Social, *Estimaciones de pobreza multidimensional 2018 y 2020*, México, 2020, available at: https://www.coneval.org.mx/SalaPrensa/Comunicadosprensa/Documents/2021/COMUNICADO_009_MEDICION_POBREZA_2020.pdf.

¹⁰ Consejo Nacional de Evaluación de la Política de Desarrollo Social, *Pobreza urbana y de las zonas metropolitanas en México*, Mexico, 2014, available at: https://www.coneval.org.mx/Informes/Pobreza/Pobreza%20urbana/Pobreza_urbana_y_de_las_zonas_metropolitanas_en_Mexico.pdf.

¹¹ Consejo Nacional de Evaluación de Política de Desarrollo Social, *Medición de la pobreza*, Glosario, Mexico, 2017, available at: <https://www.coneval.org.mx/Medicion/Paginas/Glosario.aspx>.

¹² Cámara de Diputados, Ley General de Desarrollo Social, *Diario Oficial de la Federación*, Mexico, 20 de enero de 2004, available at: http://www.diputados.gob.mx/LeyesBiblio/pdf/264_250618.pdf.

health and education, even if the entire household income is used only for such purposes.

- Asset poverty: Insufficient available income to afford the basic food basket, or to make the necessary outlays for health, clothing, housing, transportation and education, even if the entire household income were used exclusively to acquire these goods and services.

Fuel poverty in Mexico and Latin America is marked by insufficient electrical services and the limitations they pose for the population.

1. *Poverty in Mexico*

Measuring poverty in Mexico is based on the social rights defined in the Constitution as: access to education, access to health services, access to food, access to social security, housing quality and space, and access to basic services (water, drainage, fuel for cooking and electricity).¹³

According to the Congress, poverty is aggravated or alleviated if any of these factors worsen or improve.

In the Ministry of Energy's 2013-2027 National Energy Strategy,¹⁴ two strategic goals are established, namely, the growth of the GNP and social inclusion. The strategic areas of social inclusion are related to access to energy as an indispensable way to improve the quality of life of the population and the importance of considering it a priority for the advancement of every Mexican.

2. *Poverty in Latin America*

The Economic Commission for Latin America and the Caribbean (ECLAC) report, Social Panorama of Latin America 2017, indicates that poverty and extreme poverty levels have increased in Latin America. In

¹³ Consejo Nacional de Evaluación de Política de Desarrollo Social, *Metodología para la medición multidimensional de la pobreza en México*, 3a. ed., Mexico, CONEVAL, 2018, available at: <https://coneval.org.mx/InformesPublicaciones/InformesPublicaciones/Documents/Metodologia-medicion-multidimensional-3er-edicion.pdf>.

¹⁴ Secretaría de Energía, *Estrategia Nacional de Energía 2013-2027*, Mexico, available at: http://info.senado.gob.mx/sgsp/gaceta/62/1/2013-02-28-1/assets/documentos/ESTRATEGIA_NACIONAL_ENERGIA.pdf. On February 7, 2020, the most recent update of the Transition Strategy to Promote the Use of Cleaner Technologies and Fuels was published in the Official Gazette of the Federation.

2016, the number of poor people reached 186 million, or 30.7% of the population in the region, while extreme poverty affected 61 million people.¹⁵ The year 2020 was characterized by a widespread increase in extreme poverty and poverty in the region; 33.0% of the population of Latin America was in a situation of poverty and 13.1% lived in conditions of extreme poverty, so that approximately 204 million people did not have enough income to cover their basic needs and that, of these, 81 million people lacked the resources even to acquire a basic basket of food.¹⁶

ECLAC and the United Nations Development Programme (UNDP) have carried out joint work to show the importance of access to quality energy services as a fundamental factor in reducing poverty and improving the environmental conditions of the most socially vulnerable groups.

In Latin America and the Caribbean, poverty reduction strategies and national development plans linked to the energy sector have not yet been fully addressed. There are factors that contribute to the emergence of economic and disparities in access to energy sources under equitable conditions: low income, absence of resources for building infrastructure, the unavailability of appropriate technologies, legal and institutional frameworks, and even the lack of political initiatives in the countries of the region.

Despite being part of the broader objective of achieving greater social inclusion, access to quality energy services as a fundamental factor in reducing poverty and improving the environmental conditions of the most socially vulnerable groups, is an issue that has little relevance in the official policies of Latin American and Caribbean governments.

Therefore, even though access to energy for the poor is not one of the Millennium Development Goals, it is a vital prerequisite for meeting said goals.

III. REGULATORY FRAMEWORK

1. *New energy model*

The Constitutional Energy Reform in Mexico was a major transformation in the structure and operation of the energy sector in our country, since it

¹⁵ Comisión Económica para América Latina y el Caribe, *Panorama Social de América Latina 2017*, Santiago, 2018, available at: https://repositorio.cepal.org/bitstream/handle/11362/42716/7/S1800002_es.pdf.

¹⁶ Comisión Económica para América Latina y el Caribe, *Panorama Social de América Latina 2021*, Santiago, 2022, available at: https://repositorio.cepal.org/bitstream/handle/11362/47718/1/S2100655_es.pdf.

gave way to the involvement of the private sector in the exploration, development, production, transformation and marketing of hydrocarbons, as well as in the generation, transmission, distribution and marketing of the electrical industry.

The aim of the new model is to raise productivity in Mexico and increase the quality of basic services, as well as to have a direct effect on Mexico's economic growth through greater availability of oil, natural gas and their derivatives, along with a better quality public electric service, greater coverage and more competitive prices.

2. *Electricity sector*

The Mexican electricity sector is a key component for the country's development and re-structuring since the new energy model contributes to it growth. The Electrical Industry Law (LIE) comes out of this process, with the aim of allowing transparent regulation in the planning and control the Mexican Electrical Sector, the Public Electrical Energy Transmission and Distribution Service and other activities related to the electrical industry, as well as to promoting the sustainable development of the electrical sector and guaranteeing its continuous, efficient, and safe operation for the benefit of the users.

The Energy Transition Law (LTE), published along with the new energy model, aims to regulate the use of sustainable use of energy, the fulfillment of clean energy obligations, and the reduction of polluting emissions from the electrical industry, while maintaining competitiveness in the productive sectors and providing the gradual increase in clean energy participation and obligations in terms of sustainable use and energy efficiency.¹⁷

It also encourages signing conventions and coordination agreements with state governments, and where appropriate, with municipalities, to boost actions supporting social and industrial development for the use of clean energy, facilitate access to areas with high potential, and encourage the compatibility of land use for such purposes that establish land-use and construction regulations.

¹⁷ Secretaría de Gobernación, Ley de Transición Energética Mexico, *Diario Oficial de la Federación*, December 2015, available at: http://dof.gob.mx/nota_detalle.php?codigo=5421295&fecha=24/12/2015.

3. *Social impact*

The LIE and the hydrocarbons law contain provisions on the social impact of public and private sector infrastructure projects, which will in all cases address sustainability and respect for human rights in the communities and peoples of the regions in which such projects are to be built, as well as implement the actions necessary to respond to the interests and concerns of such communities and safeguard their rights.¹⁸

The legislation imposes the obligation to conduct a social impact study of the areas object of the respective projects, and to present an appraisal containing the identification, characterization, forecast, and assessment of the social impacts that could stem from their activities, as well as the corresponding mitigation measures and management plans for the Ministry of Energy (SENER) to issue the corresponding decision.

IV. CURRENT STRATEGIES

1. *Universal Electric Service Fund*

Since May 2017 and to date, the SENER envisaged the expansion of electrification in rural communities and marginalized urban areas where there is no access to this basic service.¹⁹

The Universal Electric Service Fund (FSUE)²⁰ contemplates the expansion of the CFE distribution network in locations where it is technically and economically viable. Meanwhile, in areas where it is not feasible, electrification will be carried out by means of individual systems with different technologies, such as, photovoltaic panels.

The FSUE announced that its first phase would focus on isolated electrification systems for rural communities and marginalized urban areas, benefitting around 180,000 Mexicans.

¹⁸ Cámara de Diputados, Ley de Hidrocarburos, *Diario Oficial de la Federación*, 2014, Capítulo V, Título Cuarto, artículos del 118 al 121, and Cámara de Diputados, Ley de la Industria Eléctrica, *Diario Oficial de la Federación*, 2014, Capítulo II, Título Cuarto, artículos del 117 al 120.

¹⁹ Secretaría de Energía, *Programa Sectorial de Energía 2020-2024*, México, 2020, available at: https://www.dof.gob.mx/nota_detalle.php?codigo=5596374&fecha=08/07/2020#gsc.tab=0.

²⁰ Fondo de Servicio Universal Eléctrico, Datos y Recursos, México, available at: <https://datos.gob.mx/busca/dataset/fondo-de-servicio-universal-electrico>.

It is believed that the plan for rural communities is a viable option in economic terms to supply electricity on a small scale that also represents an environmentally friendly solution.

The FSUE's goal is to reach 99% of the national electrical coverage by 2018 and to provide all isolated communities with electricity in order to reach the goal of having the country illuminated in its totality.²¹

2. *Electrification works*

In 2015 and 2016, CFE participated in the National Crusade Against Hunger in the basic services for housing campaign, which consisted of carrying out 2,202 electrification works in 385 municipalities in 27 states, benefitting more than 242,665 inhabitants in urban areas. In this same period, CFE undertook electrification works in rural communities that benefitted 80,020 people belonging to the indigenous population.²² In 2019, the General Directorate of the CFE, in conjunction with CFE Distribution, defined the National Program for the Development of Electrification (PRONADEEL), which prioritizes the localities with the largest number of inhabitants pending electrification and with the highest rate of extreme poverty, according to the results of CONEVAL. Previously, rural communities and marginalized urban areas were electrified, based on the applications received, without a prioritization. In 2020, a coverage of the electric energy service of 99.08% was reached with the execution of 1,528 electrification works, benefitting 1,025 localities and 221,023 inhabitants.²³

3. *Energy efficiency*

As of 2010, a collaboration agreement between SENER, the National Commission for the Efficient Use of Energy (CONUEE), the CFE and the National Bank of Public Works and Services (Banobras) marked the start

²¹ Fondo del Servicio Universal Eléctrico, *Convocatoria para el Concurso Público Nacional*, Mexico, 2017, available at: https://www.gob.mx/cms/uploads/attachment/file/227056/PRIME-RA_CONVOCATORIA_FSUE_31_DE_MAYO_2017.pdf.

²² Comisión Federal de Electricidad, *Informe anual 2016 de la Comisión Federal de Electricidad*, Mexico 2017.

²³ Comisión Federal de Electricidad, *Informe anual 2020*, México, 2020, available at: <https://www.cfe.mx/finanzas/reportes-financieros/Informe%20Anual%20Documentos/CFE%20Informe%20Anual%202020.pdf>.

of the National Project for Energy Efficiency and Public Municipal Lighting.²⁴

This project aims to promote energy efficiency by replacing inefficient municipal public lighting systems and reducing electricity consumption, as well as advancing in the transition to more efficient technologies and making better use of electrical energy. To date, 412,000 public lighting systems have been installed, using predominantly LED technology.

Similarly, the Energy Saving Program for the Electricity Sector (PAESE), targeted at CFE personnel and facilities, reported 63,669 people benefited from the IT activities on energy saving and its efficient use in 2016.²⁵ In 2020, the PAESE began the development of projects that truly result in energy efficiency processes within the CFE, parallel to the one promoted in the sector, through the evaluation of technologies, advice and dissemination of information.²⁶

The PEASE implements four main activities, which include energy efficiency projects that consist of replacing old inefficient equipment in CFE facilities with new equipment and re-engineering projects in order to make better use of it; assessment of energy saving technologies; training in energy efficiency and information activities on saving and the efficient use of energy.

Implementing energy efficiency policies is a very important strategy; a less costly solution to energy supply issues is to conserve it through efficient use. In this way, the energy saved translates into less pollution and energy investment. In other words, it is more viable to save than to generate energy, which should be every energy regulator's mantra.

4. *Strengthening regulations*

The new energy model has stimulated private sector investment in various activities, including those related to increasing electrical coverage and diversifying the supply of energy for the population.

Through its Strengthening Economic Competition and Regulatory Improvement for Competitiveness initiative, the Ministry of Economy seeks to

²⁴ Secretaría de Energía, *Proyecto Nacional de Eficiencia Energética en Alumbrado Público Municipal*, Mexico, 2017, available at: <https://www.gob.mx/sener/documentos/proyecto-nacional-de-eficiencia-energetica-en-alumbrado-publico-municipal-proyecto-nacional>.

²⁵ Comisión Federal de Electricidad, *Programa de Ahorro de Energía del Sector Eléctrico*, Mexico, 2017, available at: <https://www.cfe.mx/productos/EvaluacionTecnologiasAhorradoras/Paginas/PAESE.aspx>.

²⁶ Comisión Federal de Electricidad, *Informe anual 2020...*, *op. cit.*

improve the business environment by enabling companies to open and grow, generate discussions on proposals to promote the country's development, boosting productivity, economic growth and the generation of higher quality products and services at better prices.²⁷

In this sense, it is necessary to design, improve and strengthen electricity systems, as well as to continue with the development, implementation, and monitoring of the reliability criteria of the systems using institutional mechanisms that provide legal certainty.²⁸

5. *Promoting cleaner technologies and fuels*

Currently, there are several tools that the SENER has made available as part of the initiatives stemming from the LTE, which seek to strengthen the operation and scope of the country's electricity sector.

The Transition Strategy to Promote the Use of Cleaner Technologies and Fuels, published on December 19, 2014, calls for the sustainable use of energy, improvements in energy productivity, and the economically viable reduction of pollutant emissions. To this end, four working groups are established: energy production, energy consumption, energy efficiency, and energy storage.²⁹

The 2017-2031 Energy Sector Outlook, drafted by the SENER, predicts that by 2050, 50% of total energy generation will be clean. The SENER reported that in 2017, the installed capacity to generate electricity through clean energies represented 29.5%.³⁰

²⁷ Secretaría de Economía, *Competencia y Mejora Regulatoria para la Competitividad*, Mexico, 2015, available at: <https://www.gob.mx/se/acciones-y-programas/competitividad-y-normatividad-iniciativa-para-el-fortalecimiento-de-la-competencia-y-mejora-regulatoria-para-la-competitividad?state=published>.

²⁸ The current National Development Plan 2019-2024 (PND) has as its objectives the "Rescue of the energy sector", based on the impulse provided by the Federal Government to Petróleos Mexicanos (Pemex) and the Federal Electricity Commission (CFE), which develop strategic activities in energy matters, so that they are the lever of national development, in such a way as to stimulate competitiveness, the promotion of economic growth and employment.

²⁹ Secretaría de Energía, *Estrategia de Transición para Promover el Uso de Tecnologías y Combustibles más limpios*, Mexico, 2014, available at: https://www.gob.mx/cms/uploads/attachment/file/182202/20161110_1300h_Estrategia_CCTE-1.pdf. On February 7, 2020, the most recent update of the Transition Strategy to Promote the Use of Cleaner Technologies and Fuels was published in the Official Gazette of the Federation.

³⁰ Secretaría de Energía, Press Release, Mexico, 2017, available at: <https://www.gob.mx/sener/prensa/electrificacion-de-comunidades-rurales-y-zonas-urbanas-marginadas-beneficiara-a-180-mil-mexicanos?idiom=es>.

Clean energy certificates (CEL) are requirement that accredit the production of a given amount of electrical energy from clean energy. These certificates are an instrument to promote new investments in clean energy and help turn an individual obligation into national goals for the generation of clean electricity more efficiently and at a lower cost for the country.

In 2015, SENER established a CEL requirement equivalent to 5% of total energy consumption for 2018. In 2016, it set a percentage of 5.8% for 2019. Finally, in March 2019 the requirements for 2020, 2021 and 2022 were determined at 7.4%, 10.9% and 13.9%, respectively.³¹

On the other hand, in accordance with the National Electricity System Development Program 2019-2033 (PRODESEN), investment needs are observed mainly in projects to meet demand, giving priority to projects that are related to the reactivation of CFE power plants, the incorporation in the medium term of combined cycle, geo-thermoelectric plants, efficient cogeneration and the rehabilitation and modernization of hydroelectric plants in operation. In this sense, it is estimated that between 2023 and 2024 2,557 MW of clean generation projects will be integrated by the CFE, mainly geo-thermal generation projects.³²

6. LP gas strategies

On April 19, 2017, the Ministry of Social Development and the SENER signed an agreement to encourage the replacement of firewood and charcoal with LP gas in the most vulnerable areas of the country.

The agreement involves delivering gas stoves to more than 13,000 households living in extreme food poverty. According to data provided by the Ministry of Social Development, in 2017, more than 16 million Mexicans still used firewood and charcoal on open fires for cooking, and so this agreement aims to reduce the use of these fuels and avoid the health risks to which people are exposed.³³ According to data from the 2020 Population

³¹ Comisión Federal de Competencia Económica, *Transición hacia mercados competidos de energía: Los Certificados de Energías Limpias en la industria eléctrica mexicana, Mayo 2021*, México, COFECE, 2021, p. 30.

³² Secretaría de Energía, Programa de Desarrollo del Sistema Eléctrico Nacional 2019-2033 (PRODESEN), México, available at: <https://www.gob.mx/sener/articulos/prodesen-2019-2033-221654>.

³³ Secretaría de Bienestar, Sedesol and Secretaría de Energía, *Convenio para impulsar la sustitución de leña y carbón por gas licuado en zonas marginadas*, Mexico, 2017, available at: <https://www.gob.mx/bienestar/prensa/firman-la-sedesol-y-la-sener-convenio-para-impulsar-la-sustitucion-de-leña-y-carbon-por-gas-licuado-en-zonas-marginadas>.

Census, 13% of households in Mexico still used firewood or charcoal for cooking.³⁴

It is important to promote greater access to sources of energy, as well as the availability of decent housing, protecting family finances and health, and the environment in the most vulnerable areas of Mexico.

V. AREAS OF OPPORTUNITY (TOPICS FOR THOUGHT)

Some current initiatives that set the path for medium- and long-term strategies to achieve a reduction in socio-economic gaps have been mentioned. However, there is still a long way to go to ensure that 100% of the country has effective access to energy.

It is worth reviewing these strategies to double their impact, so it is important to consider the following: What information is available to quantify the energy needs of the poor or to identify energy poverty throughout the country? What are the trends in the evolution of energy poverty in urban and rural areas? What impact have regulatory reforms in the energy sector had on poverty and equity?

According to information provided by ECLAC, although the poorest strata consume less energy, they spend a significantly higher proportion of their income on energy than the rest of the population does.

1. *An increase in Universal Electric Service Fund actions*

In its first stage and during the presentation of the FSUE on May 22, 2017, it was estimated that 45,000 Mexicans living in energy poverty would receive help from the first call for isolated systems with a 438-million-peso budget.³⁵

On November 13, 2017, the FSUE ordered the allocation of almost 1.2 million pesos for the benefit of 200,000 Mexicans in remote and inaccessible areas. Likewise, for the FSUE's second call which was published on April 5, 2018, one billion pesos were earmarked for awarding projects

³⁴ Instituto Nacional de Estadística y Geografía, *Censo de Población y Vivienda 2020. Resultados complementarios*, 2020, available at: https://inegi.org.mx/contenidos/programas/ccpv/2020/doc/Censo2020_Resultados_complementarios_ejecutiva_EUM.pdf.

³⁵ Secretaría de Energía, Press Release, Mexico, 2017, available at: <https://www.gob.mx/sener/prensa/electrificacion-de-comunidades-rurales-y-zonas-urbanas-marginadas-beneficiara-a-180-mil-mexicanos?idiom=es>.

under the module for the installation of isolated electrification systems for rural communities and marginalized urban areas to benefit 74,000 people.³⁶

The FSUE intends to meet the needs of 180,000 Mexicans, a goal to be achieved between 2017 and 2021. On July 28, 2020, two Resource Allocation Agreements were formalized with the Universal Electric Service Fund (FSUE), for the execution of 757 electrification works through extensions of the general distribution networks and individual solar modules, for an investment of 627.38 MDP, to benefit 67,710 inhabitants in 5 States of the Country.³⁷

2. *Solar irrigation*

The Rural Energy Law is aimed at stimulating the country's rural development by establishing actions to boost productivity and competitiveness, as support measures to reduce disparities with other countries. The incentive prices and rates granted to producers must promote productivity and the undertaking of agricultural and livestock activities.

The Ministry of Finance and Public Credit (SHCP), along with the SENER, the then Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (Sagarpa),³⁸ and the Ministry of the Environment and Natural Resources (Semarnat), oversee establishing the incentive prices and rates for energy for agriculture and livestock, considering the economic and social conditions prevailing nationally and internationally.

The solar-based irrigation project is a plan that seeks to optimize the irrigation of agricultural crops through photovoltaic solar energy. Both the electrical power generated by photovoltaic panels and the water needs of crops are governed by the same variable, solar radiation; the greater the exposure to sunlight, the greater the need for crop water, but also the greater the capacity to produce photovoltaic energy.

For agricultural solar-based irrigation to be an efficient system, improvements must be made in water use at the plot level in the rural agricultural economic units by establishing modern irrigation systems that increase the technical and productive efficiency and save irrigation water drawn from wells.

³⁶ Secretaría de Energía, Press Release, Mexico, 2017, available at: <https://www.gob.mx/sener/prensa/99-por-ciento-de-cobertura-electrica-nacional-en-2018-pjc>.

³⁷ Comisión Federal de Electricidad, *Informe anual 2020*, ..., *op. cit.*, p. 216.

³⁸ Currently, Ministry of Agriculture and Rural Development (SADER).

The Special Energy Program for the Countryside regarding Electrical Energy for Agricultural Use establishes that those who carry out agricultural activities and use electricity for pumping and re-pumping water for agricultural irrigation will be beneficiaries of a 9CU energy quota (a service fee for pumping water for agricultural irrigation at low or medium voltage at a single rate).³⁹

This fee is linked with a government contribution with the possibility for a farmer to cover the difference between the rate paid and the cost of supply from the CFE.

The farmer contribution plan and the corresponding entry are included in the Federal Expenditure Budget. The subsidy for electricity rates amounts to \$50.18 billion Mexican pesos.

Promoting agricultural solar irrigation is an action that addresses more than one important problem. On the one hand, there is agricultural development in Mexico and electrification in rural communities that can benefit from energy generation. On the other hand, it could represent the possibility for the CFE to stop supplying electricity to a sector that generates significant financial losses while for the SHCP it is a possible way to reduce the aforementioned budget entry since farmers would be self-sufficient in terms of generating electricity for irrigation and other agricultural uses.

3. Promoting the use of renewable energy sources for electricity generation

Producing energy with renewable sources has the attraction of registering reduced, no or even positive environmental externalities. Therefore, implementing investment projects should receive adequate incentives to compete on equal terms with the existing conventional energy sources and related subsidies, and to drive supply and demand in today's electricity consumption market.

In 2015, the Semarnat published the "Guidelines for Programs Promoting the Generation of Renewable Energy", which explains the importance of the use of renewable energy compared to the use of fossil fuels.⁴⁰ These guidelines focus on disseminating public policies and programs to increase the participation of renewable resources in energy generation.

³⁹ Secretaría de Agricultura Ganadería, Desarrollo Rural, Pesca y Alimentación, *Programa Especial para el Campo en Materia de Energía Eléctrica de Uso Agrícola*, Mexico, 2016, available at: <https://www.gob.mx/sader/acciones-y-programas/programa-especial-de-energia-para-el-campo-en-materia-de-energia-electrica-de-uso-agricola>.

⁴⁰ Secretaría de Medio Ambiente y Recursos Naturales, *Guía de programas de fomento a la generación de energías renovables*, 3a. ed., Mexico, 2015, p. 13.

Renewable energy sources can be divided into two categories: non-polluting or clean sources and polluting sources. The former includes the sun (solar energy), wind (wind energy), rivers and freshwater streams (hydro-power), the Earth's heat (geothermal energy), the seas and oceans (tidal energy, thermal gradient, salinity gradient), and waves (wave energy).⁴¹

Polluting sources are those obtained from organic matter or biomass and used directly as fuel. They are considered renewable energy because the carbon dioxide released will be used by the next generation of organic matter.

The production of energy from renewable resources has great environmental, economic, and social advantages. Mexico has a wide range of renewable energy sources.⁴²

The CFE has established a series of general criteria that provide a common language to identify the real potential for the use of renewable resources, under the following categories:

Proved. This is the capacity identified by technical and economic studies to prove the feasibility of its use.

Probable. This is the capacity recognized through direct and indirect field studies but lacking sufficient information to determine its economic or technical feasibility.

Possible. This is the theoretical value of installable capacity and associated generation derived from indirect studies based on assumptions. It does not include field studies to prove its technical or economic feasibility.

Some of the economic advantages obtained from generating electricity with renewable resources include lower rates; the creation of direct employment; the creation of indirect employment, such as in agriculture through the expansion of irrigation systems, in livestock and poultry farming through the installation of electrified stables; in commerce and in services.

Another important advantage is the reduction in the cost of municipal electric power services (street lighting, water pumping and public buildings) since the consumption of electricity accounts for a high percentage of their operating expenses, while the social advantage could be achieved by taking electricity to remote communities and encouraging the development of these communities.

⁴¹ Biblioteca de Publicaciones Oficiales del Gobierno de la República, *Guía de programas de fomento a la generación de energía con recursos renovables*, Mexico, June 2018, available at: <https://www.gob.mx/publicaciones/articulos/guia-de-programas-de-fomento-a-la-generacion-de-energia-con-recursos-renovables-142904?idiom=es>.

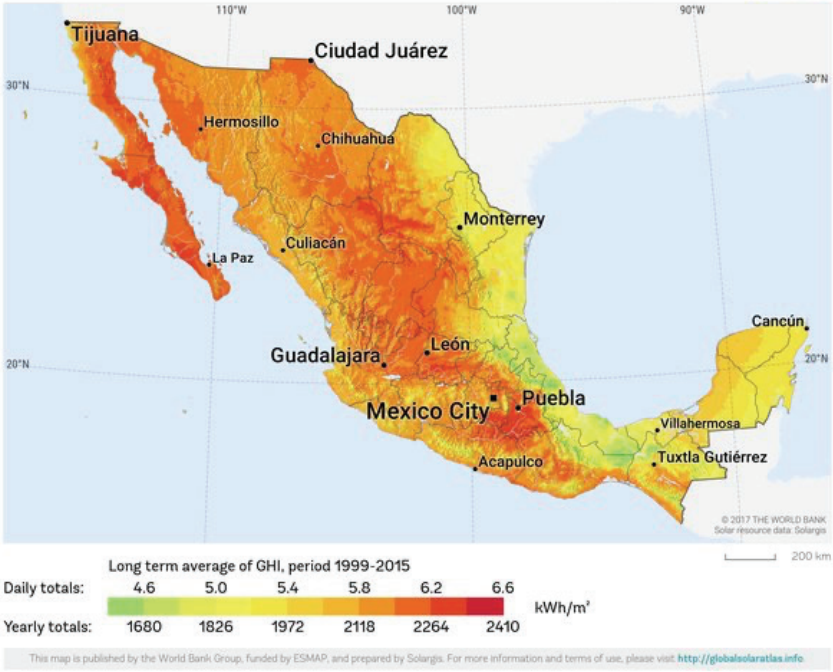
⁴² Secretaría de Energía, *Acuerdo por el que la Secretaría de Energía emite el Programa Especial de la Transición Energética*, Mexico, 2017, available at: http://www.dof.gob.mx/nota_detalle.php?codigo=5484916&fecha=31/05/2017.

It is worth pursuing strategies to stimulate the use of renewable energy in the medium- and long-term, focused on the use of Mexico's natural resources. The following are two examples of energy use.

A. *Harnessing solar energy*

Mexico is a privileged region in solar resources. The solar energy potential that exists in a country or territory is measured by its solar radiation, which in Mexico averages 5.6 kWh/m.⁴³

The map below shows that the northwest of the country is located in an area with greater potential. However, the highest points of demand are in the center of the country, which would imply the electrification of areas without access to electricity near this area or an opportunity to improve the infrastructure of transmission to the center of the country.



FUENTE: © 2017 The World Bank, Solar resource data: Solargis.

⁴³ Limón, Alejandro, *Energía solar en México: su potencial y aprovechamiento*, Centro de Investigación Económica y Presupuestaria, 2017.

The use of renewable energy for electricity generation is increasingly evident and has opened the area for the study of new alternatives. According to the above-mentioned in the LTE, Mexico not only has to satisfy the growing demand for energy consumption, but to do so with clean energy-based means that represent an economic advantage for the country.

B. *Harnessing wind energy in Mexico*

Another viable source of energy to be exploited in the country is wind energy, which is obtained from the kinetic energy of the wind and is directly related to the movement of air masses that move from areas of high air pressure to areas of low air pressure. February 15, 2018, saw the inauguration of the first stage of the “Mexican Wind Atlas” project coordinated by the National Institute for Electricity and Clean Energy (INEEL), with the participation of SENER, CFE and the National Autonomous University of Mexico.⁴⁴

According to the information published in the SENER newsletter, the Mexican Wind Atlas received an investment of 34.6 million pesos. This investment consisted of the installation and operation of seven 80-meter-high towers equipped with anemometers, pyrometers, lightning rods, photovoltaic solar panels, and satellite link equipment to send accurate temperatures and wind speed data.⁴⁵

By generating wind databases and high-resolution wind maps, developers and investors will have a free and accessible platform on the wind resources available in Mexico, which will generate interest and investment in the development of wind farms in the country.

4. *Renewable microgenerators that can sell energy*

Mexico seeks to build a reliable energy sector that attracts investment in electricity generation projects through clean energy, such as the installation of solar panels in homes and small- and medium-sized companies, thereby contributing to meeting the 50% target of integrating clean energy in electricity generation by 2050 and 100% of the country's supply.

⁴⁴ Secretaría de Energía, *Atlas eólico mexicano*, Mexico, February 2018, available at: <https://www.gob.mx/sener/prensa/se-pone-en-marcha-el-atlas-eolico-mexicano>.

⁴⁵ Secretaría de Energía, *Boletín de prensa*, Mexico, 2018, available at: <https://www.gob.mx/sener/prensa/se-pone-en-marcha-el-atlas-eolico-mexicano>.

Taking control of its own electricity generation or “democratizing the sector” reduces the possibility the CFE will not be able to supply the entire country in the short-term, in addition to the fact that investment in infrastructure to generate and transmit energy will be lower and will benefit from the decline in the use of fossil fuels.

The Energy Regulatory Commission published the regulatory instruments applicable to distributed generation power plants, in order to allow open access to the electricity grid, simplify procedures, facilitate the generation and sale of electricity on a small scale following the preferred system and incorporate clean energy into the Mexican electricity system.⁴⁶

The development of distributed generation was limited. The electrical energy generated by solar panels was destined for self-consumption, without the possibility of selling it.

Distributed generation provides a viable alternative for those who do not have electrical energy. However, it is necessary to work on the obstacles it faces and rethink strategies in such a way that it works and is used to its full potential. Three strategies are given below.

A. *Electricity subsidy for residential rates*

This poses an obstacle to adopting distributed generation since it significantly and artificially lowers the cost of electricity for users whose light bills do not justify, in certain cases, the installation of photovoltaic equipment in their homes.

Studies carried out by the Mexican Institute of Competitiveness (IMC) and the Center for Economic Research and Teaching (CIDE) mention solar bonds as an instrument to finance or subsidize photovoltaic equipment on a one-time basis to users so that they can become self-sufficient and the energy they consume is no longer permanently subsidized.⁴⁷

The economic variables of a solar bonus program would be advantageous for the State, the environment, and users. However, there are administrative impediments to its implementation, so it is undoubtedly an issue that merits further analysis and consideration.

⁴⁶ Comisión Reguladora de Energía, *Instrumentos regulatorios aplicables a centrales eléctricas de generación distribuida*, Mexico, 2017, available at: <https://www.gob.mx/cre/prensa/la-cre-aprueba-instrumentos-regulatorios-aplicables-a-centrales-electricas-de-generacion-distribuida-paneles-solares>.

⁴⁷ Instituto Mexicano de la Competitividad, *Por una agenda climática con visión de estado*, Mexico, 2018, available at: https://imco.org.mx/wp-content/uploads/2018/03/AgendaClim%C3%A1tica_23-03-2018.pdf.

B. *Financing mechanisms*

The financial feasibility of panels in many cases requires credit mechanisms to be made available to the communities in which distributed generation is possible, but the initial investment may not be affordable for all.

The Fund for the Energy Transition and Sustainable Energy Use (FOTEASE), managed by the SENER, is developing a financial mechanism so that both bank and non-bank financial intermediaries can offer favorable conditions for solar roof financing. This mechanism is currently being integrated and is critical to overcome the problem of the lack of financing.⁴⁸

C. *Network capability*

Photovoltaic energy has an impact on the behavior of medium and low voltage electrical grids used to distribute energy to end users. The demand for electrical energy varies during the day, depending on the region in question. In hot regions, the time of peak consumption coincides with the increase in ambient temperature and the use of air conditioners in the summer. By contrast, in temperate regions, solar energy collected in the middle of the day is mostly fed into the grid, from where it is redistributed to homes and businesses without solar roofs.

Simply put, a limit could be put on the percentage of houses with solar roofs, but technology offers solutions, one of which is intelligent inverters that modulate the energy output of solar panels to regulate the low voltage circuit. Such technical and economic issues should be analyzed to find more appropriate sustainable solutions.

The potential of solar energy and the sustained cost reduction of photovoltaic panels is a great area of opportunity for supplying power to isolated communities. At the end of 2020, 63,402 services were interconnected in the Distributed Generation modality, which represents an increase of 14.56% compared to 2019 (55,346), with the Jalisco Division having the highest number of interconnected services (12,867) and the North Division with the highest growth of interconnected services (48%), comparing 2019 and 2020.⁴⁹

⁴⁸ Secretaría de Energía, *Fondo para la transición energética y el aprovechamiento sustentable de la energía*, Mexico, 2018, available at: https://www.gob.mx/cms/uploads/attachment/file/249307/Reglas_de_Operaci_n.pdf.

⁴⁹ Comisión Federal de Electricidad, *Informe anual 2020*, ..., *op. cit.*, p. 253.

5. *Strategic planning*

Market mechanisms alone cannot effectively and efficiently solve energy policy issues. An evaluation should be made of the goals that take into account rural electrification and the problems that exist in terms of access for all sectors of the population.

Quantifying the energy needs of populations living in poverty and urban poverty is key to designing a clear policy framework to eradicate energy poverty by region, bearing in mind the existing diversity.

Achieving energy efficiency in the country is the most economical and accessible response to the need to supply all communities and guarantee long-term energy supply. This should be the basic premise of any strategic planning in the sector.

6. *Analysis and tailoring energy access to meet the needs of rural and urban populations*

In terms of policies for rural areas, it is necessary to define mechanisms that will guarantee the continuity and expansion of supply to households, as well as to advance developing programs to ensure an energy supply that is sufficient to improve the productivity of the economic activities of rural communities to truly fight poverty.

In the case of urban communities, it is necessary to increase the number of energy efficiency policies ranging from the general to the particular; to find a way to regulate or determine energy efficiencies in appliances that, statistically speaking, are responsible for more than half of household electricity consumption, such as televisions, refrigerators, and washing machines, among others; and to set basic consumption standards.

An updated list of communities without electricity must be created in order to prioritize the objectives and come up with a strategy that adds these communities to the existing ones so as to possibly ensure that 100% of the population has electricity, while considering which energy requirements cover their basic needs and thus prioritize them.

Given that the fight against poverty and extreme poverty will not be won in the short-term, the efficient use of energy must be actively promoted, and a transition period must be established so that marginalized communities can gain access to modern, clean, and efficient energy sources.

7. *Public policies designed for energy access*

Designing public policies is a task that requires knowledge in various fields, like economics, politics, statistics, public administration, and communication, among others.

It is advisable to carry out a problem analysis to establish objectives and analyze actions and best practices with a view to create an energy access action plan in terms of quality, quantity, and prices.

Drafting public policies from a sustainability perspective should be nourished from local and regional realities.

8. *Energy subsidies*

A subsidy is defined as the difference between the retail unit price of an energy product and the reference price, which represents the real cost.⁵⁰ In the case of electricity, the reference price is the cost of production.

With the deregulation of rates, as of 2019 users will be able to contract the basic electricity supply service with the company that offers them the best price or service. However, since the subsidy is currently proportional to consumption, the population that uses more energy is the one that benefits the most from a subsidy. Therefore, it is believed that subsidies should be properly targeted if they are to benefit the population lacking electricity services.

9. *Success stories in Mexico and Bolivia*

A. *Puertecitos, Baja California, Mexico*

The Puertecitos community consisted of 20 families, a school and shops. It was isolated from the national power grid with the closest one 40 km away.

As part of a project between the Autonomous University of Baja California (UABC) and the Conacyt-Sener-Hydrocarbons Fund, a solar/wind/diesel power plant with a battery bank was designed and built. It is made up

⁵⁰ Secretaría de Energía, *Prospectiva del sector eléctrico 2013-2027*, Mexico, 2013, available at: https://www.gob.mx/cms/uploads/attachment/file/62949/Prospectiva_del_Sector_El_ctrico_2013-2027.pdf.

of a solar farm with 184 panels of 300 Watts (12 strings of 13 panels and 2 strings of 14 panels) and an installed capacity of 55.2 kW; a 5kW wind turbine with a 6 m blade diameter located at a height of 20 m; a 75 kVA diesel generator and 174 maintenance-free 2 Volt batteries connected in series (1500 Ah).⁵¹

The system has a medium voltage distribution network that provides energy to 20 homes in the fishing and tourist town of Puertecitos, near Ensenada, Baja California. It is important to empower rural communities so that they can manage electrification projects, and for this type of project to moreover serve as a trigger to access other services like drinking water and drainage. Furthermore, they can enhance their productive activities by living in an organized and united community; families now have air conditioning equipment and other appliances that allow them to have fresh food.

B. *El Espino, El Carmen and Itayovai in Charagua Norte, Bolivia*⁵²

The OLADE (Latin American Energy Organization) implemented various electrification projects in rural communities in 2017, most notably in the communities of El Espino, El Carmen and Itayovai in Charagua Norte, Bolivia, where a pilot program was started.

In these communities, photovoltaic panels were installed so that poultry farms could sell their products to businesses in the region. In addition, the Native Indigenous Municipal Government of Charagua has been prompted to set up other productive enterprises that would enable the sustainable development of the region.

The established farms are run by women. This decision was made by the members' assembly and is in line with the local Guaraní population, which has a very complete organizational system where women are well represented. The group of women running the farms were trained in management, project marketing and even farm production management taught by a zootechnician.

The objective of this kind of project is to improve the living conditions of the inhabitants of rural communities. Energy is used as a tool to achieve long-term comprehensive rural development by establishing an

⁵¹ Velázquez, Nicolás, *Microrred Puertecitos*, Mexico, Centro de Estudios de las Energías Renovables, 2016, available at: <http://ceener.mx.l.uabc.mx/microrred-puertecitos/>.

⁵² Organización Latinoamericana de Energía, "Olade finaliza implementación de Proyecto Inclusivo de Energización Rural", 2018, available at: <http://www.olade.org/noticias/olade-finaliza-implementacion-proyecto-inclusivo-energizacion-rural/>.

alliance among various actors, especially with organized communities that have seen their capabilities strengthened to manage the electricity supply project for their own consumption with a focus on sustainability and the creation of productive enterprises, as well as local socioeconomic growth of the energy system that has already been installed.

VI. CONCLUSIONS

Access to energy is essential to reduce poverty. From a financial perspective, it may seem that supplying marginalized and isolated rural communities is not cost-effective. However, there are social benefits arising from access to energy supply that afford these communities the opportunity to incorporate energy-efficient technologies, as well as decentralized renewable energy sources.

Access to efficient and effective energy sources is linked to strengthening human rights. Energy scarcity limits people's opportunities and their quality of life in terms of economic productivity, as well as access to education, food, and health.

The electricity sector in Mexico is currently in the process of growth and modernization. Today, there is greater investment in the expansion of the national transmission and distribution network, which could lead to greater growth in the country's economy by meeting the country's energy needs.

Energy poverty is different in rural zones and urban ones. Therefore, policy making to improve access to energy services should deal with rural and urban areas differently, bearing in mind geographic, cultural and climate diversity.

Energy is an essential aspect for the quality of life of humankind and is a very widespread input in all productive activities.

The use of renewable sources of energy is an opportunity for generation and cooperation that improves supply in rural areas. The uses of renewable sources along with electricity coverage is an indicator of sustainability, both of which must guarantee sufficient supply, access to clean energy, improved air quality and reduced greenhouse gas emissions.

The new energy model is working. However, it could have a more inclusive approach and become a tool to improve living conditions for many Mexicans. Mexico's productivity growth increased in the sectors that have benefited from the energy reform (electricity, oil and gas).

It would be advisable to comprehensively plan the design and implementation of public policies that promote meeting the country's energy

needs, quality and reliability in the coverage of services, as well as the efficient use of energy. It is also necessary to look at long-term global and sectorial planning to ensure that energy consumption in our country is sustainable.

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PART FOURTH OIL & GAS SECTOR

THE TAXONOMY OF UPSTREAM CONTRACTS IN MEXICO'S HYDROCARBONS INDUSTRY

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SUMMARY: I. *Introduction*. II. *The internationality of contracts*. III. *Legal nature*. IV. *Structural elements*. V. *Minimum necessary regulation*. VI. *Conclusions*. VII. *Bibliography*.

I. INTRODUCTION

The structural energy reform implemented in Mexico¹ has marked a new constitutional and legal stage in the protection of the country's hydrocarbons. According to the current text of the constitution and although they are regarded as strategic for the nation,² the exploration and extraction of these non-renewable resources, as well as the economic benefits resulting from these activities, may be carried out and shared with national or foreign collective legal entities through various contractual arrangements,³ making a systematized analysis of their structures and nature essential, due to their legal, economic and social implications.

Thus, we pose the hypothesis that contracts for hydrocarbons exploration and extraction in Mexico are hybrid figures in that they are protected by a special regime, they are mainly regulated by administrative law and their fulfillment is governed by private law, but under a common international framework, requiring interpretation from an interdisciplinary per-

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¹ Published in the *Diario Oficial de la Federación*, on December 20, 2013.

² *Constitución Política de los Estados Unidos Mexicanos*, Article 28, paragraph IV, published in the *Diario Oficial de la Federación* on February 5, 1917.

³ Transitory Article 4 of the Constitutional Energy Reform, published on December 20, 2013.

spective that confirms their *sui generis* legal nature, framed within energy law as an independent branch of legal science.

The general aim of this paper is to analyze the characteristics and aspects related to hydrocarbons exploration and extraction contracts so as to establish their legal nature, components and structures because although the international scope does not have a predominant specific legal framework of protection and configuration of such contracts, it is possible to delve into their generally accepted structures and components by the parties in the industry.

II. THE INTERNATIONALITY OF CONTRACTS

Globalization has led to the economic interdependence of nations and the creation of an international policy geared toward entering into treaties that facilitate regional or bilateral trade agreements, which in turn allows the creation of contractual relationships between individuals from different nationalities or between these individuals and nations themselves. At the same time, the legal field has adapted to such fast-paced changes brought about by the so-called “global village”.

While it is true that the phenomenon of globalization primarily revolves around economic issues, in the legal sphere it has caused legal provisions, i.e., constitutional, commercial, civil, criminal, tax, social security, labor, etc., to be influenced by the geopolitical, economic, social and technological rearrangements generated especially in the last decade of the 20th century and in the years that have passed since then. In the formal order, there is evidence of the breaking down of political constraints with the loosening of social and economic systems so as to facilitate the implementation of commercial practices around the world that break with the formal patterns traditionally conceived by national legal systems and such a break has been encouraged. In the legal order, this has been brought about through the action of international bodies that prepare the non-formal legal and economic development frameworks to regulate such practices.⁴

As a result, multilateral agreements become more complex because their characteristics and content must be organized according to several variables, such as the national legal framework, the type of business involved, the nationality of the contracting parties, the origin of the economic resources, and the volume of the capital, among many other aspects. This is why Darío Lamanna states that “from the legal point of view, industry

⁴ Castrillón y Luna, Víctor M., *Contratos mercantiles*, Mexico, Porrúa, 2014, p. 67.

activities are characterized by the presence of complex contractual systems between the various actors”.⁵

On the subject of international contracts, Jorge Oviedo highlights one of the more controversial points, centered on the fact that “we can find with different legal answers for the same factual situation, as in the rules related to capacity, the validity and making of contracts, the execution of obligations and resulting effects, among others”.⁶

Precisely because of this author’s statement, there has been an attempt to strengthen the standardization of principles and international trade contracts. Hence, the need arises to have consistent rules that can be applied to the transaction, regardless of the nature and nationality of the person involved in the act, or the location of the goods concerned of the business, or even the different political-economic systems. In this way, the legal problems caused by trying to find the applicable law of the contract, as well as the court and the applicable law to regulate any eventual legal conflicts that may arise, are avoided.⁷

Likewise, contracts known as “oil contracts”, entered into between States and companies to compete for oil and other hydrocarbons concessions or contracts in countries where investments are made:

...are a challenge for international law, from which the theories that form part of the study of this branch of law emerged and which has been accompanied by the mechanisms for dispute resolution that give rise to international arbitration and many other significant changes in the world oil market.⁸

For this reason, the international community has also undertaken the task of creating clusters of countries in the form of economic and political blocs, including *a*) the European Union (EU); *b*) the Southern Common Market (MERCOSUR); *c*) the Andean Community (CAN); *d*) the Carib-

⁵ Lamanna, Darío G., *Aspectos jurídicos y contractuales de la industria petrolera*, Mexico, Lid Editorial Mexicana, 2017, p. 31.

⁶ Oviedo Albán, Jorge, “La unificación del derecho privado: UNIDROIT y los principios para los contratos mercantiles internacionales”, a presentation given at the Seminario Internacional “Compraventa Internacional”, Bogota, Colombia, Pontificia Universidad Javeriana, Colombia, Aula Mutis del Colegio Mayor de Nuestra Señora del Rosario, May 16, 2002.

⁷ Vásquez del Mercado Cordero, Óscar, *Contratos mercantiles internacionales*, Mexico, Porrúa, 2011, p. 289.

⁸ Arroyo Chacón, Jennifer Isabel, *Retos del Derecho Internacional del Petróleo frente a la preocupación ambiental y las nuevas fuentes de energía en Centroamérica*, p. 20, February 2017, available at: http://www.oas.org/es/sla/ddi/docs/curso_derecho_internacional_2017_materiales_lectura_jennifer_Isabel_Arroyo_Chacon_1.pdf.

bean Community (CARICOM); United States-Mexico-Canada Agreement North American Free Trade Agreement (USMCA).

These are instruments whereby States agree on the clearest possible rules to regulate commercial interactions between their own countries and individuals of different nationalities, as well as the mechanisms for interpreting contracts and settling any disputes that may arise.

1. *International contractual principles*

The contracts with elements of internationality are normally based on the general principles of most contracts and protected by national legal systems. However, due to their complexity and the dynamics of world trade, they are also based on principles that must be accepted by the other members of the international community and that contribute to the better functioning of these legal relationships. These principles are set out below:

A. *Consent*

As Sarmiento and Florez point out, this principle is known as the aptitude or moral disposition to do something. In unilateral legal acts we speak of will; in bilateral acts, it is more precise to speak of consent, which tends to establish some kind of legal effect.⁹

In other words, based on this principle, the persons who enter into the contract act must and may bind themselves in the way they so decide as the most important premise is full knowledge and understanding of the scope of the legal consequences of the expression of their will, beyond the form in which their converging wills are expressed.

On this principle, it is important to stress the words of Carmen Otero, who said that “the limits on the autonomy of conflictual will, which will indirectly condition those that exist for the autonomy of material will, shall depend on the rule for determining the applicable law used by the entity for settling disputes arising during the life of the contract”.¹⁰

⁹ Sarmiento Bejarano, Roberto and Flórez Aristizabal, Eduardo, *Principios rectores de los contratos civiles y mercantiles*. Professor Level Research Work for a Law Degree, Colombia, Universidad de la Sabana, 2002, p. 71.

¹⁰ Otero García-Castrillón, Carmen, “Consideraciones sobre la ley aplicable a los contratos petrolíferos internacionales”, *Revista di Diritto Internazionale Privato e Processuale*, Italy, April-June 2009, p. 356, available at: <https://eprints.ucm.es/9223/1/Commenti-Otero.pdf>.

To illustrate the above statement, we can evoke Clause 26 of the Contract for the Exploration and Extraction of Hydrocarbons under the Deep-water License Modality, entered into by the Mexican Government through the National Hydrocarbons Commission (CNH) and the China Offshore Oil Corporation E&P Mexico, S.A.P.I. de C.V. company,¹¹ in which number 26.1 states that the applicable regulations shall be governed according to Mexican laws, but this does not prevent it from being aligned with the provisions of subsequent 26.5 where the parties agreed that any controversy arising from or related to this contract shall be resolved through arbitration in accordance with the United Nations arbitration rules on trade laws.

B. *Custom*

Custom can be defined as “a set of legal provisions arising from the more or less constant repetition of consistent acts”.¹² And it is precisely this habitual nature that makes custom used and accepted as a rule governing legal relations. In order to be considered a contractual principle and a source of law, the custom must be:¹³ consistent, public, repeated and specific.

C. *Clausula rebus sic stantibus*

The term of reference has been accepted by doctrine and national legislations, most of which have accorded it a letter of acceptance because although every contractual agreement must be fulfilled in the form and terms agreed upon by the parties, it is also possible that social, economic or political circumstances suffer changes after the signing of the contract. This may cause disproportionate obligations for one party, thus making compliance much more onerous than the real motivation and expectations had at the time of expressing their will. On this subject, Valencia Zea has said that:

Contracts must be executed in the manner agreed upon by the contracting parties. But it may be that in the interval between the signing of a contract and

¹¹ Contract number: CNH-R01-L04-A1.CPP/2016. There is currently the CNH resolution.E.29.002/2021, concerning the procedure for early termination of a part of the committed contractual area, issued on 22 April 2021.

¹² Torres, Abelardo, *Introducción al derecho*, 5th ed., Buenos Aires, Abeledo-Perrot, 1965, p. 21.

¹³ Sarmiento Bejarano, Roberto and Flórez Aristizabal, Eduardo, *Principios rectores...*, *op. cit.*, p. 96.

its execution, an unforeseen event may occur that significantly alters the balance that existed between the benefits at the time of celebrating said contract. A similar situation may present itself in supply contracts and in contracts for successive or recurring services. In this respect, since time immemorial people have defended the idea that the balance of benefits existing at the time of the contract must be upheld during its execution, which indicates that when, due to extraordinary circumstances, such balance is broken and one of the contracting parties is significantly affected, said party has the right to have the benefits reviewed in name of the basic principles of equity.¹⁴

Hence, it bears mentioning that the Mexican Federal Judiciary has issued the following interpretation: “Article 78 of the Code of Commerce does not demand any formality or requirement for commercial contracts to be valid since it only establishes that these must be fulfilled in the form and terms that the parties wished to bind themselves”. Therefore, it is clear that said legal provision embodies the principle of *pacta sunt servanda*, which implies that what was stipulated by the parties, however established, must be carried into effect. Therefore, it is indisputable that, in the case of commercial acts, it is not possible to apply the theory of unforeseen contingencies, which holds that the courts have the right to suppress or modify contractual obligations when the conditions of execution have been changed by the circumstances, without the parties having been able to foresee this change that medieval canonists enshrined in the *clausula rebus sic stantibus* since such principle is contrary to that enshrined in the aforementioned precept.¹⁵ Nonetheless, it is true that there are contracts or legal relationships that, due to their particular characteristics or origin, are more susceptible to present drastic variations that may be excessively onerous for some of the parties, such as the contracts related to fossil resources. For such cases, the *clausula rebus sic stantibus* is a way to make these agreements more flexible for the sake of the preservation of the business and trade relationships.

D. UNIDROIT principles

Hernany Veytia poses a crucial question: How is it possible to avoid that, in different parts of the world, rules conceived in the international sphere are interpreted differently? The author points out that the answer is

¹⁴ Valencia Zea, Arturo, *Derecho civil. Parte general y personas*, Bogota, Temis, 1996, pp. 167 and 168.

¹⁵ Tesis III.2o.C.13 C, Aislada (Civil), *Semanario Judicial de la Federación y su Gaceta*, Novena Época, t. VIII, September 1998.

found in the principles of the International Institute for the Unification of Private Law (UNIDROIT), which are being widely accepted in academic circles and in practice among lawyers and businesspeople.¹⁶

In contrast, there is a school of thought that questions the judgments and opinions on the efficiency and enforceability of the UNIDROIT principles,¹⁷ arguing that these are not issued by a national authority, much less by a legislative body, thus making their enforcement uncertain.

On this last point of criticism, Jorge Oviedo Albán argues:

The source of the binding nature of the UNIDROIT principles is found in the autonomy of the will of the parties as a guiding principle of contract law, although it also notes that some international courts have found them applicable to contracts because they constitute general principles of international trade contracts recognized in various legal systems throughout the world.¹⁸

It is precisely the extraterritoriality of international contracts, the distance normally found between the contracting parties, the current information and communications technologies used to make the agreement and the different legal frameworks that may be related, which makes this type of legal acts even more complex in its composition, execution and interpretation. However, as Kozolchik states, the effectiveness of these figures depends on the analysis carried out by the authority since within the legal framework of nations, the legislative principles governing the interpretation of trade contracts are few, and their wording is so general that their application requires serious analytical effort by the contracting authority and the legal doctrine.¹⁹

III. LEGAL NATURE

Considering the structure of the hydrocarbon's contracts celebrated and the national and international legal framework in which they are framed, studying them from a single specific branch of law would have a limited scope, which

¹⁶ Veytia, Hernany, "El capítulo uno de los principios del UNIDROIT. Disposiciones Generales", *Contratación internacional: comentarios a los principios sobre los contratos internacionales del UNIDROIT*, Mexico, UNAM-Universidad Panamericana, 1998, pp. 36-38.

¹⁷ Principios del UNIDROIT, available at: <https://www.UNIDROIT.org/spanish/principles/contracts/principles2010/blackletter2010-spanish.pdf>.

¹⁸ Oviedo Albán, Jorge, "Los Principios UNIDROIT para los Contratos Internacionales", *Dikaion. Revista de actualidad jurídica*, Colombia, Year 16, No. 11, 2002, p. 101.

¹⁹ Kozolchik, Boris, *La contratación comercial en el derecho comparado*, Madrid, Dykinson, 2006, p. 252.

would not fully cover their study or their characteristics. To uphold this stance, we address the following branches of law, whose principles and institutions contribute to the essence, purposes and protection of contracts for the exploration and extraction of fossil resources, subject of this academic paper.²⁰

1. *Administrative law*

Referring to the study in this field of law, Miguel A. López Olvera notes: “A distinction must be made between the fundamental principles that form the basis of the legal system and are found in the Constitution as well as in supranational sources, and those institutional principles that derive from a given institution based on its organizing idea”.²¹

Following the abovementioned author, administrative law is governed by the following principles.²²

Supremacy of the law: which expresses the subordination of the administration to the existing laws and means that it must act according to these laws and must not adopt any measures contradicting them.

Of legal reserve: according to this principle, the administration may only act if it has been so empowered by a law.

Within the framework of the doctrine of this branch of law, there is the need to clarify what an administrative contract is and what it consists of. Miguel A. Bercaitz holds that administrative law contracts are understood as those that:

...are entered into by the public administration for a public purpose, a circumstance by which they can confer rights and obligations to an individual contracting party with regard to third parties, or that, in their execution, may affect meeting a collective public need, which is why they are subject to rules of Public Law exceeding those of Private Law, which place the contracting party of the public administration in a situation of legal subordination.²³

²⁰ For more details see: Lázaro Sánchez, Iván, *Los contratos petroleros. Un nuevo paradigma constitucional en México*, México, IUP-UJAT, Tirant lo Blanch, 2019.

²¹ López Olvera, Miguel Alejandro, “Los principios del procedimiento administrativo”, Cienfuegos Salgado, D. and López Olvera, M. A. (coords.), *Estudios en homenaje a Don Jorge Fernández Ruiz*, t. I, *Derecho administrativo*, Mexico, UNAM, 2005, p. 178.

²² *Ibidem*, pp. 113 and 114.

²³ Bercaitz, Miguel Ángel, *Teoría general de los contratos administrativos*, 2nd ed., Buenos Aires, Depalma, 1980, pp. 246 and 247.

The Federal Judiciary makes a distinction between administrative contracts and contracts governed by other branches of the law, clarifying that:

To determine the nature of an administrative contract as opposed to a civil or commercial one, certain factors must be taken into account. In private contracts, the will of the parties is the supreme law and their object is private interests, while in administrative contracts, social interest is paramount and their object is public services. In private contracts, there is equality of the parties; in administrative ones, there is inequality between the State and the contracting party. In private contracts, the clauses are those that naturally correspond to the type of contract; in the administrative ones, exorbitant clauses are given. In private contracts, the jurisdiction to settle disputes lies with ordinary courts; in administrative ones, special jurisdiction intervenes, either in administrative courts, if any, or at the administrative seat itself, according to the procedures established by law or as stipulated in the contract itself. In summary, in order to have the distinctive characteristics of an administrative contract, the following elements must exist: 1) social interest and public service; 2) inequality between the parties, of which one must necessarily be the State; 3) the existence of exorbitant clauses; and 4) special jurisdiction.²⁴

It is necessary to point out that the perspective of a solely local administrative law has been changing as government administration and individuals have been increasingly interacting through legal relations that require standardization. On many occasions, this has led to blurring the distinction between public and private activity.

Despite the peculiarities of national administrative systems, it is very difficult at present to question the existence of a global administrative law, as well as its far-reaching impact on national administrative systems. One of the areas that best reflects the process of creation, development and consolidation of this global administrative law is undoubtedly that of public procurement.²⁵

2. *Civil law*

While it should be stressed that civil law is the branch that provides the conceptual content to institutions in other areas of law, it is also true that, given the scope and diversity of this subject, it is very difficult to arrive at

²⁴ Tesis VI.30.A.50 A, Aislada (administrativa), *Semanario Judicial de la Federación y su Gaceta*, Novena Época, t. XIV, October 2001, p. 1103.

²⁵ Moreno Molina, José A., *Derecho global de la contratación pública*, Mexico, Ubijus, 2011, p. 1.

a universal definition of civil law. Even so, all or almost all legal scholars agree in that it is: “The branch of private law, common to all men, which governs their relations as human beings, members of a family and subjects of an estate, including the regulation of their property and interpersonal relationships of a pecuniary nature, as well as the liquidation of their estate after death”.²⁶

One important civil law institution connected with the study and protection of individuals and their property is obligations, defined as “the legal need of a person, called debtor, to render to another, called creditor, an obligation to give, to do or not to do”,²⁷ which are essentially based on the ownership and dispositions of personal rights and rights *in rem*.

Personal rights are the power to obtain a behavior from another person, which may consist of doing something, in not doing something or in giving something.²⁸

Jorge A. Domínguez Martínez defines rights *in rem* as “the legal power that a person exercises directly or immediately over a thing, which allows the person to take full or partial advantage of said thing in a legal sense and is enforceable before third parties”.²⁹

Hence, such contractual figures are instruments created and based on the autonomous will of individuals and their free decision, by means of which they dispose of their property and rights within the limitations imposed by the law itself.

Based on the above, emphasis is placed on the fact that the essential components of contracts protected under civil law are the will of the intervening parties, and the only limits are not to pact anything unlawful or contrary to morality and good customs.

3. Trade law

Trade law is a complex branch stemming from the increasingly dynamic exchange of goods and services in line with the development and competitiveness of a globalized society. In the specific case of the Mexican legal system, there are legal activities and acts that are protected by special fed-

²⁶ Baqueiro Rojas, Edgard y Buenrostro Báez, Rosalía, *Derecho civil. Introducción y personas*, 2nd ed., Mexico, Oxford, 2010, p. 10.

²⁷ Bejarano Sánchez, Manuel, *Obligaciones civiles*, 6a. ed., Mexico, Oxford, 2010, p. 4.

²⁸ *Ibidem*, p. 2.

²⁹ Domínguez Martínez, Jorge Alfredo, *Derecho civil. Parte general, personas, cosas, negocio jurídico e invalidez*, Mexico, Porrúa, 2000, p. 323.

eral laws, but that establish the supplementary application of commercial and common law, as in the case of the Hydrocarbons Law which states that “Contracts for exploration and extraction shall be governed by the provisions of said law and its regulations. For the effects of their execution, commercial and common law shall be applicable in a supplementary way and if it does not oppose this law and its regulations”.³⁰

In this way, in the energy industry, special and general provisions come together for its protection, such as the Hydrocarbons Law, its regulations, the Federal Law of Economic Competition and commercial law. It is precisely due to such plurality where it is clearly observed that it is impossible to frame or protect contractual acts for the exploration and extraction of hydrocarbons in Mexico on an independent or specific basis since none of the branches of law analyzed so far fully covers its study and protection because it is perceived, on the one hand, as a strategic activity and, on the other, as a commercial activity with an international scope.

4. *Lex Mercatoria*

The legal framework and regulation of this industry in general and that of contracts for the exploration and extraction of hydrocarbons in particular are connected with public law and, in turn, with private law, without clearly knowing whether their nature is framed in one specific framework or the other.

The truth is that contracts of this type are governed according to their own characteristics and are conceived as bilateral legal acts of an onerous and protected nature, not only by national laws on the specific matter, but also by other complementary customary legal frameworks, such as the new *Lex Mercatoria*, which Oscar Vásquez defines as: “A new law with its customs and practices, which constitutes a spontaneous law, a new autonomous system, created by traders themselves for the fundamental purpose of avoiding the always conflicting application of the local laws of their respective countries in their international transactions”.³¹

As Silvana Grande points out, *Lex Mercatoria* is not autonomous, as can be inferred at least from the fact that it is not applied exclusively, but as a complement to local law, or alongside trade customs and practices,

³⁰ Article 22, Ley de Hidrocarburos, Cámara de Diputados, *Diario Oficial de la Federación*, August 11, 2014. Last reform published May 20, 2021.

³¹ Vásquez del Mercado Cordero, Oscar, *op. cit.*, p. 106.

the general principles of the most widely recognized conventions or the UNIDROIT principles.³²

It is precisely on the effectiveness of this self-regulating framework for commercial contracts that Konradi and Fix-Fierro ask: Does the *Lex Mercatoria* exist as an autonomous corpus of transnational rules, separate from national law? And, if so, to what extent are said rules used in international legal practice? To the extent that they exclude national law? Or are they used concurrently with national law? Much of the debate on *Lex Mercatoria* revolves around these questions.³³

That said, the above is a reality of the current context that, beyond the arguments for or against:

...the *Lex Mercatoria*, enriched, perfected and consolidated, with its particular customs and practices, is cast as a spontaneous, autonomous and standardized law that naturally tends to distance itself from State regulations, in its attempt to provide a definitive solution to the new conflicts inherent to international trade.³⁴

5. *Lex Petrolea*

Strategic in contemporary macroeconomy and of great importance due to the legal relationships that are established as a result of the agreements reached between States and the collective private entities hired or the alliances created to perform one, several or all of the aspects of the value chain of the energy industry, hydrocarbons have led organizations like the OECD, the IMF and the WB,³⁵ among others, to work on building a regulation to be integrated into a transnational legal ecosystem for the standardization and possible dispute resolution. This in turn would establish parameters and principles generally accepted by industry components as customs, practices and constitutive elements essential to their synergies and alliances.

In this sense, there is already talk of a *Lex Petrolea*, which somehow emerges as a particular branch of the new *Lex Mercatoria* and is also still being consolidated as an international standard of protection for the oil business.

³² Grande, Silvana, “La *Lex Mercatoria* en los Laudos de la Cámara de Comercio Internacional”, *Dikaion. Revista de fundamentación jurídica*, Colombia, Year 22, No. 17, 2008, p. 241.

³³ Konradi, Wioletta and Fix-Fierro, Héctor, “La *Lex Mercatoria* en el espejo de la investigación empírica”, *Boletín Mexicano de Derecho Comparado*, No. 117, 2006, p. 699.

³⁴ Vázquez del Mercado Cordero, Oscar, *op. cit.*, p. 109.

³⁵ These are the acronyms for the Organisation for Economic Co-operation and Development, the International Monetary Fund and the World Bank, respectively.

According to Tom Child, “*Lex Petrolea* should be understood as the continuing development of customary law relating to international oil and gas exploration and development”.³⁶ For Talavera and Ferreyros, *Lex Petrolea* “is a species within the broader genus of *Lex Mercatoria*. In other words, it is defined as the set of rules that regulate the commercial practices of the international oil industry in its various forms”.³⁷

On the creation and initial development of the *Lex Petrolea*, Timothy Martin says that the term *Lex Petrolea* entered the lexicon of oil and gas legal literature more than a quarter of a century ago. The term first emerged in a landmark international arbitration case in 1982 when it was argued that international law applied to the oil industry in its disputes had led to a customary rule applicable to the industry which was called *Lex Petrolea* and began to be considered a type of particular branch derived from a more general one known as the new *Lex Mercatoria*.³⁸

For John Bowman, four possible sources of that *Lex Petrolea* can be currently identified: a) national oil laws; b) international oil contracts; c) trade customs, and d) practices in the international oil industry.³⁹

In addition to this, we agree that the international arbitration awards linked to the hydrocarbons industry are also an important source of *Lex Petrolea*.

One of the most important sources from which we can draw the principles that make up *Lex Petrolea* is international arbitration case law since, in recent decades with the proliferation of transnational oil activities around the world, a greater number of arbitral awards have been issued in disputes arising from investment contracts in oil activities. This makes it possible to study the rules and principles that arbitral courts have adopted and applied, and, therefore, to outline those precepts that can be considered part of the common customs and practices of the arbitration.⁴⁰

³⁶ Childs, Tom, “*Lex Petrolea*”, *The International Energy Arbitration Newsletter*, available at: <https://studylib.net/doc/8379649/lex-petrolea---king-and-spalding>

³⁷ Talavera C. Andrés and Ferreyros, Manuel, “Alcances preliminares para la aplicación de la *Lex Petrolea* en el Perú”, *Forseti. Revista de Derecho*, Lima, 2015, No. 1, available at: <http://forseti.pe/revista/derecho-ambiental-y-recursos-naturales/articulo/alcances-preliminares-para-la-aplicacion-de-la-lex-petrolea-en-el-peru>.

³⁸ Martin, Timothy, “*Lex Petrolea* in International Law”, 2012, p. 1, available at: <http://timmartin.ca/knowledge/publications/>.

³⁹ Bowman, John, *Lex Petrolea: Sources and Successes of International Petroleum Law*, available at: <https://www.kslaw.com/blog-posts/lex-petrolea-sources-successes-international-petroleum-law>, 2015.

⁴⁰ Talavera C., Andrés and Ferreyros, Manuel, *op. cit.*, available at: <http://www.forseti.pe/revista/derecho-ambiental-y-recursos-naturales/articulo/alcances-preliminares-para-la-aplicacion-de-la-lex-petrolea-en-el-peru>.

If we examine the international construction of the customary framework, we can point to the 1987 ruling issued by an arbitral court in the case of *Mobil Oil Iran Inc. v. Islamic Republic of Iran and the NIOC*,⁴¹ where it was found that the legality of the disputed expropriation should be considered from the standpoint of international law. Moreover, it was clarified that a contractual clause stated that the contract should be interpreted according to Iranian law, which the Court applied to the letter, arguing that this law is used to resolve issues of interpretation, but the principles of commercial and international law are the ones that govern all the other issues.⁴²

In this regard, the arguments against this Latin definition, known as *Lex Petrolea*, which implies an extraterritorial system for oil business, must not be overlooked. As Terence Daintith points out:

Since 1998, there has been a small but steady flow of articles employing the concept of “*lex petrolea*” to evoke the existence of a distinct, and distinctive, group of rules that govern—or might govern—international petroleum transactions and relationships, alongside applicable national and international law. This article argues that we should dispense with this concept, on the grounds that it is ill-defined, that there is little or no evidence to support the claims made for it, that it lacks any sound theoretical basis, and that it may be capable of employment in a way that damages legitimate interests of petroleum host states. We should certainly continue to look for common elements in international industry, state and arbitral petroleum practice that might guide future policy, agreements and dispute settlement in the field, but these can be adequately described in ordinary English (“transnational petroleum law”) instead of bad Latin.⁴³

However, the importance of the model contracts the industry has been using is undeniable in this design and development of the so-called *Lex Petrolea*. Said contracts are drafted and proposed by professional or specialized associations and are used more as guides since their content tries to reflect practices and terms commonly accepted by the oil community.

There are internationally recognized organizations with experience in the hydrocarbons sector that have prepared draft model or standard con-

⁴¹ The National Iranian Oil Co (NIOC) is the national oil company of the Islamic Republic of Iran.

⁴² *Mobil Oil Iran Inc. v. Islamic Republic of Iran*, *The American Journal of International Law*, vol. 82, No. 1, January 1988, pp. 136-143, available at: https://www.jstor.org/stable/2202887?readnow=1&seq=5#page_scan_tab_contents.

⁴³ Daintith, Terence, “Contra la *Lex Petrolea*”, *World Energy Law & Business*, pp. 1-13, available at: <https://academic.oup.com/jwelb/article-abstract/10/1/1/2807096?redirectedFrom=fulltext>.

tracts for each legal relationship to be used separately or combined into a single document in oil agreements, and that in general may refer to confidentiality, farmout, joint operation, dispute resolution, accounting procedures, and unitization, among others.

These practices are observed in the Mexican case, as in the Hydrocarbons Exploration and Extraction Contract in the form of a deep-water license signed between the Mexican government, executed through the CNH, and the legal entities known as Shell Exploración y Extracción de México, S. A. de C. V. and QPI México, S. A. de C. V. The clauses of this contract include agreements on change of operator (2.6), accounting reporting of benefits (2.7), unification procedures (9.1), applicable law and dispute resolution (26), and confidentiality (29).⁴⁴

Among the specialized bodies that have advocated these contractual parameters, the following stand out.

The American Association of Petroleum Landmen (AAPL):⁴⁵ a US organization established in Fort Worth, Texas. This was one of the first bodies to develop model contracts for the hydrocarbon industry.

Petroleum Joint Venture Association (PJVA):⁴⁶ A body established in Calgary, Alberta, Canada. It provides a multidisciplinary forum for issues related to common projects linked to the development and extraction of hydrocarbons in Canada. It predominantly specializes in infrastructure.

Association of International Petroleum Negotiators (AIPN):⁴⁷ This organization brings together more than 1,500 members in 65 countries who represent themselves or represent national or international companies in the sector.

American Petroleum Institute (API):⁴⁸ This organization based in Washington D. C. was founded for oil and gas marketing. It has developed standards, industry statistics and contract models.

IV. STRUCTURAL ELEMENTS

From its initial stages, the energy industry requires a series of complex agreements and synergies that permit the location and commercial extraction of

⁴⁴ Contract number: CNH-R02-L04-AP-PG07/2018. Contract active and in progress.

⁴⁵ American Association of Petroleum Landmen, available at: <http://www.landman.org/>.

⁴⁶ Petroleum Joint Venture Association, available at: <https://pjva.ca/>.

⁴⁷ Association of International Petroleum Negotiators, available at: <https://www.aipn.org/>.

⁴⁸ American Petroleum Institute, available at: <http://www.api.org/>.

hydrocarbons. Each project must build, operate and finance a numerous group of joint contracts around the original or main contract, which is the actual oil contract.

The OpenOil study⁴⁹ indicates that a wide range of public and private parties may be involved in the contracts, such as:

- Governments and their national oil companies.
- International oil companies.
- Private banks, mutual fund companies or other regulated or non-regulated financial institutions.
- Specialized exploration, drilling and maintenance services companies.
- Transportation, refining or trading companies.

It should also be considered that in shaping these agreements, the location of the place where exploration and extraction activities are planned to be carried out has a decisive influence as said places can be *a)* onshore; *b)* in shallow water and *c)* in deep and ultra-deep water.

It is highlighted that the components underpinning these agreements aim to reconcile the interests and perspectives of the contractual parties, which, in summary, are:⁵⁰

a. Governments:

- Maximization of State revenue.
- Guaranteeing national supply.
- Technological development of the domestic content industry.
- Environmental protection.
- The contractor's fulfilment of the minimum work commitments.

b. Contractors:

- Proportionality between project risk and reward.
- Booking reserves.
- Contractual flexibility and regulatory stabilization.
- Ability to recover investment costs.

⁴⁹ OpenOil UG, *Contratos petroleros, cómo leerlos y entenderlos*, Berlin, 2012, p. 11, available at: http://openoil.net/wp/wp-content/uploads/2014/03/OilContracts_ESP.pdf.

⁵⁰ Grunstein, Miriam, *De la caverna al mercado, una vuelta por el mundo de las negociaciones petroleras*, 2nd ed., Mexico, Tirant lo Blanch, 2015, pp. 32 and 33.

- Minimal administrative control of the contract.
- International arbitration.

In this sense, delving further into the items that make up the content of upstream contracts, it can be said that the *specific structure* consists of the legal instruments normally organized according to a certain structure and content. The contractual parties involved in a hydrocarbons industry contract are the State and the contractor, both of which are described in detail below.

The State. The country that, through its competent government entity and subject to the internal rules of minimum necessary regulation, enters into a contract to carry out the first phase of the activities in the hydrocarbons industry.

The contractor. Who, for the effects of this legal relationship, must be a legal entity that, besides complying with the technical and financial requirements, specifically or primarily engages in the exploration and extraction of oil and other hydrocarbons.

The special law for the Mexican State oil industry considers the contractual parties to be Petróleos Mexicanos and any other State productive enterprise or private entity that enters into a contract with the National Hydrocarbons Commission (CNH) for exploration and extraction, whether individually or as a consortium, under the terms of the law.⁵¹

It must always be kept in mind that these legal relationships usually involve multiple individuals or groups with different scopes, participation and responsibilities, such as in the case of consortiums made up of operating companies and investment groups or partnerships, which essentially participate with the financial leverage of the initial economic obligations of the operating contractor.

1. *Terms and definitions*

This section, a common feature in the structure of contracts, has an important function as it serves to describe and analyze the conceptual and semantic scope of the technical, every day or official terms arising from the obligations established for the duration of the contractual agreements. This helps prevent confusion as to the responsibilities of each party, as well as the role of government bodies, thus saving time and money for those involved in legal relationships of this type.

⁵¹ Article 4, Section X, of the Ley de Hidrocarburos.

2. *Essential purpose: Investment in exploration and development*

The main object of these contractual arrangements are the commitments assumed by national or foreign private collective legal entities, regarding their obligations to do (explore, appraise and extract), times or deadlines to do so, the specific place or field where they will do so, the techniques and ways of carrying out the work, the technology to be used, as well as the information on the costs and amounts of the investment.

Concerning the specification of the area or the field where the exploration, development and extraction works are to be carried out, countries through their governmental entities indicate in the contractual agreements the express commitment of the minimum works per period or phase of the contract in the specifically demarcated areas and detailing the geological and geophysical activities to be carried out.

Concretely, these clauses must establish:

The demarcation and specification of the area or field where the exploration, development and extraction works must be carried out; the obligation of having a work and investment plan; the terms in which each phase must be carried out and its costs; the agreement to return to the State the areas that will no longer be used or required in the event that the search for the resource is not successful; the regular assessment and evaluation of any hydrocarbon discoveries and the plan for field development, as well as the contractors' obligation to provide the government with data and reports on a regular basis or when required in order to furnish information that facilitates decision-making processes.⁵²

Government decisions regarding the size of the blocks or contractual fields to be put up for tender that are directly related to the probability or lack thereof of finding oil fields since the larger the area of the contract, the greater the probability of finding hydrocarbons resources.

The size and definition of the contractual area or concession that the government makes available to oil companies for potential exploration activity is of paramount importance in many aspects. One of the most important reasons is that contractual rights, as granted to oil companies, are limited to the specific area set out in the contract. This means that whatever has been agreed in the contract is only applicable in the area defined therein and nowhere else.⁵³

⁵² OpenOil UG, *op. cit.*, p. 41.

⁵³ *Idem.*

3. *Discovery of deposits and development plans*

The contracts addressed in this paper usually refer to this topic in clauses with terms like *commerciality decision*, *discovery*, *development* and *production*, or similar ones.⁵⁴ However, it is common for countries with more detailed regulations, as in the case of Mexico,⁵⁵ to stipulate in the clauses or in a special law itself that the contracting parties must inform the regulatory or technical bodies of the contracting State, so that these can in turn give their opinion and a decision can be taken consensually between the parties.

4. *Disclosure and reporting on data resulting from the contractual activities*

These clauses indicate the type of information to be provided to the host or contracting government while also ensuring that the latter has the right to inspect such data.

Each country has different regulations on the delivery or disclosure of the data gathered by the companies when exploring or extracting their hydrocarbons, which influences whether the disclosure of said data for the contractor's own business purposes outside the contractual relationship can be agreed upon or not.

5. *Applicable law*

As Daniel Casal notes, the contract models are based on the premise that the legal system at the place of operations allows the application of a foreign law to be agreed upon since it is common for parties of different nationalities to try to ensure that the applicable law is not that of any of them.⁵⁶

In this regard, it must be said that in the use of their sovereignty, countries usually determine the legal framework the contracting parties must abide by, which is why the above-mentioned author recommends that:

If the agreement is made under the law of a third country, it is advisable for the parties to inquire as to: *i*) the provisions of that law; *ii*) the advisabil-

⁵⁴ *Ibidem*, p. 47.

⁵⁵ Articles 43 to 47 of the Ley de Hidrocarburos.

⁵⁶ Casal, Daniel, "Panorama de los contratos de operación para la actividad hidrocarburífera", *Revista Argentina de Derecho de la Energía, Hidrocarburos y Minería*, Buenos Aires, Year 1, No.1, May-July 2014, p. 12.

ity of waiving renvoi, and iii) the existence of conventions that may make the law of one country the same as that of the other.⁵⁷

6. *Environmental and health protection clauses*

More than a private agreement, these clauses are an international obligation that must be included in contracts concerning fossil resources and their exploitation, due to the potential damage or impact that this industry's activities can cause to the environment and to people in general.

In most nations, precautionary measures for environmental impacts are a matter of human rights, as well as a fundamental part of the minimum necessary regulation that must be defined in the body of extraction contracts given that through these clauses, which must coincide with national legislation and international treaties, the preventive actions of oil companies regarding the conservation of the other natural resources is also agreed upon. In this part of the contract, the importance of the concept now known as *corporate social responsibility* is evident, as it is based on the assertion that “organizations that respect this social awareness are legitimized for performing their activities. Therefore, it must be understood that the organization also has a social purpose”.⁵⁸

7. *Financial considerations*

It is undeniable that the complexity of the numbers in modern contracts coincides with the complex political and economic relationships in the oil industry. The rise of resource nationalism, the increased number of State-owned oil companies and the volatility of the oil prices indicate that governments are trying to keep as much money as possible while continuing to encourage investors to put their money into projects that might fail through no fault of their own.⁵⁹ But the basic premise in agreeing on these clauses is directly related to the risks that the contractor intends to assume in the search, development and extraction of hydrocarbons in the area, block or field contracted with the State. As explained above, the execution of a hydrocarbon-related contract implies the disbursement of large amounts of

⁵⁷ *Ibidem*, p. 13.

⁵⁸ Navarro García, Fernando, *Responsabilidad social corporativa: teoría y práctica*, 2nd ed., Mexico, Alfaomega Grupo Editor, 2012, pp. 52 and 53.

⁵⁹ OpenOil UG, *op. cit.*, p. 62.

money over an extended period of time, and the probability of unforeseen contingencies occurring and making the execution of the project even more onerous or, in the worst-case scenario, resulting in the loss of the invested capital.

Consequently, these calculations are roughly made in the oil industry, estimating the price at which oil can be sold, considering the time in which the oil will probably be extracted, whether the marketing will be handled by the State or directly by the contractor, which will depend on the type of contract signed, and which deductions should be made for *a)* the costs and expenses incurred by the contractor to carry out the project and *b)* the payments to the contracting State under the concept of *Government take*.⁶⁰

It follows from the foregoing that, considering the different components that make up the contractual instruments in this financial sector, it is imperative to fully evaluate the objectives that the parties freely define, which must be adapted to the requirements and clauses that necessarily arise from the special or general rules of each nation.

V. MINIMUM NECESSARY REGULATION

Since most nations consider hydrocarbons strategic natural resources, the forms and dynamics for conducting the first stage of the hydrocarbons industry, known in the sector as “upstream” and where the exploration and extraction of hydrocarbons takes place, are governed by the Constitution, as well as by special, general or supplementary commercial and civil laws. Accordingly, in its formulation, the minimum necessary regulation imposed by the national legal system must be observed, whereby the individual and specific objectives of the parties must be taken into account.

As a result of the reform to Articles 25, 27 and 28 of the CPEUM,⁶¹ Mexico has established the following:

...the Congress of the Union shall make the necessary adjustments to the legal framework in order to make the provisions in this Decree effective, including the regulation of contract modalities which shall be, *inter alia*: of services, of shared profits or production, or of license to carry out, on behalf of the Nation, the exploration and extraction of oil and solid, liquid or gaseous hydrocarbons, including those carried out by State-run productive companies

⁶⁰ *Idem*.

⁶¹ Reform published in the *Diario Oficial de la Federación* on December 20, 2013. Constitutional text currently in force.

with private individuals, in the terms of Article 27 of this Constitution. In every case, the State shall define the contract model that best suits to maximize the Nation's income.

The law establishes the modes of consideration the State shall pay to its productive companies or to individuals for the exploration and extraction of oil and other hydrocarbons said companies may carry out on behalf of the Nation. Among other forms of compensation, the following must be regulated: I) in cash, for service contracts; II) with a percentage of the profit for shared profit contracts; III) with a percentage of the output obtained, for shared production contracts; IV) with the onerous transfer of hydrocarbons once they have been extracted from the subsoil, for licensing contracts; or V) any combination of the above. The Nation chooses the mode of consideration always with a view to maximizing revenues to ensure the greatest benefit for long-term development. The law also establishes the considerations and contributions to be paid by the State's productive enterprises or individuals and regulates the cases in which these parties are required to pay to the Nation for the extracted products transferred to them.⁶²

As seen in the above precept, a minimum necessary regulation is set for the modes the State may choose or adopt to carry out exploration and production activities for its hydrocarbons by contracting private parties or its own productive enterprises.

Furthermore, as a result of the amendments to the Mexican constitution, the Hydrocarbons Law was enacted.⁶³ Article 19 of this law establishes the minimum stipulations that must be included in any type of contract entered into by the State through its competent public entity.⁶⁴

⁶² Transitory Article 4 of the Reforma Constitucional. Published on December 20, 2013.

⁶³ LH, published in the *Diario Oficial de la Federación* on August 11, 2014.

⁶⁴ Exploration and Extraction contracts must at least include clauses on: I. The definition of the Contractual Area; II. The Exploration and development plans for Extraction, including the time limit to submit them; III. The minimum work and investment program, if applicable; IV. The Contractor's obligations, including the economic and tax conditions; V. The effective term, as well as the conditions for its extension; VI. The procurement of guarantees and insurance; VII. The existence of an external audit system to oversee the effective recovery, if any, of the costs incurred and any other accounting involved in the execution of the contract; VIII. The grounds for terminating the contract, including early termination and administrative rescission; IX. The transparency obligations that enable access to the information contained in the contracts, including the disclosure of the considerations, contributions and payments contemplated in the contract itself; X. The minimum percentage of national content; XI. The conditions and mechanisms for the scaling down or return of the Contractual Area; XII. Dispute resolution, including alternative means of conflict resolution; XIII. The penalties applicable in the event of non-compliance with the contrac-

Hence, it follows that this minimum regulation in the drafting of hydrocarbons contracts, especially those related to exploration and production, is mandatory, making it essential to anticipate and understand it in order to duly define these legal relationships.

VI. CONCLUSIONS

As expressed and demonstrated in this paper, on it having been constitutionally established in Mexico, the participation of the private sector in the primary activities of the hydrocarbons industry value chain through the adoption of the contractual system has made it advisable to carry out a scientific study of the characteristics, scopes and repercussions of the current legal framework by which the Mexican State can create commercial ties with private, national or foreign collective entities so that as contractors they can explore and extract the fossil resources belonging to the Mexican State.

Considering that this study and analysis must be approached from the standpoint of energy law, seen as an independent branch of legal science, with its own principles and institutions that allow the effective and efficient protection of the relationships created within this globally important economic and strategic sector.

The legal treatment of international oil contracts is usually determined by a set of regulatory systems that in most cases are applied simultaneously and jointly. Beyond the fact that the parties use their contractual independence to set their respective material commitments by resorting to trade usages in the sector (*Lex Petrolea*), it is common for the choice of governing law clauses to opt for a combination of regulatory packages, which in most cases include the law of the forum and international law and/or its principles.⁶⁵

Although contracts for hydrocarbons exploration and extraction emerged during the 20th century and are now widely used internationally, they are a new form of governance in 21st century Mexico, as has been pointed out by prominent researchers, such as Cárdenas Gracia, as a way of destabilizing the national economy and shifting it to the market economy.

Regardless of the above, it is a fact that as of 2013, Mexico is facing a new constitutional and legal paradigm where structural changes have been

tual obligations; XIV. The Contractor's and the operator's liability pursuant to international best practices. In the event of an accident, the Contractor's or operator's liability shall not be limited if fraud or fault is proven against them, and XV. The observance of international best practices for the operation of the Contractual Area.

⁶⁵ Otero García-Castrillón, Carmen, *op. cit.*, p. 386.

made regarding the oversight of these activities, the very essence of which is the eligibility of private investment to participate, speculate and obtain economic benefits for locating, extracting and harvesting the nation's hydrocarbons, which is currently carried out through a contractual system in which private parties can participate without restrictions of nationality.

In this sense, we would like to point out that at the time of concluding this paper, the Mexican State has awarded and signed 107 contracts with national and foreign companies and consortiums for the exploration and extraction of oil and gas from Mexican fields through the tender processes known as *Rondas Mexico*. It should be highlighted that in the agreements signed up until the last tender held, *Ronda 3.1*, the Mexican government has decided to use only two types of contracts: Shared Production (31) and License (76).

From the above, it can be noted that there will undoubtedly be a gradual readjustment of the structure and types of contracts chosen by the government in accordance with the current economic and energy policies implemented. This, in turn, has allowed us to posit the theory that the contracts for the exploration and extraction of hydrocarbons in Mexico are figures that although with special regulation, their protection is framed in both administrative law and private law, but under an international customary framework. Therefore, their structure and interpretation require an interdisciplinary perspective, allowing us to affirm their *sui generis* legal nature, protected within energy law as an independent branch of legal science.

We conclude by contributing our opinion that, in order to ensure efficiency in choosing the type of contract for an exploration and extraction area or block, it should be done from a multidisciplinary, public, clear, accessible, objective, scientific and responsible approach, reflecting the underlying premises on which the contractual instrument chosen by the Mexican State was built.

Contractual figures must incorporate the eminently financial objectives of the contracting companies, but above all and most importantly, Mexico's sovereigns' interests since the country's development and stability are at stake.

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HYDROCARBONS CRIMES: AN ANALYSIS OF THE LAW

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To my mother with love

SUMMARY: I. *Introduction*. II. *Federal Law to Prevent and Punish Hydrocarbons Crimes*. III. *Criminal-legal analysis of hydrocarbons crimes*. IV. *Hydrocarbons crimes in the Accusatory Criminal System*. V. *Conclusions*. VI. *Bibliography*.

I. INTRODUCTION

The issue of energy in Mexico is one of the most sweeping reforms in the country. So, to understand the implications of this issue, it is necessary to move away from the prevailing idea that *it privatizes oil* and replace it with the idea that *it maximizes the profitability of Mexican oil*. This is not easy, but private industry, in one way or another, has actually always collaborated with the government in the use and extraction of hydrocarbons. For example, the energy issue was initially included in the 1917 Constitution in the form of the Nation's ownership of all minerals. However, secondary legislation of this provision empowered the Federal Government to grant concessions, allowing private parties to extract oil and other hydrocarbons for their use.¹

In 1938, State ownership and control of hydrocarbons was guaranteed, but the private sector was also allowed to participate in various industry activities, though not under the concept of concession but under

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¹ Article 27 of the Constitución Política de los Estados Unidos Mexicanos of 1917, regarding Ley Reglamentaria del Artículo 27 Constitucional en el Ramo del Petróleo published on December 31, 1925. The possibility of granting concessions to individuals can be deduced from these concordant ordinances.

contract.² It was not until 1958 when a new law regulating Article 27 of the Constitution was issued in the oil industry, one that would eliminate the possibility of entering into contracts with private parties and restrict all oil industry activities to Petróleos Mexicanos (Pemex).³

With the 1958 reform, all responsibility for exploration and extraction of oil was entrusted to Pemex, a situation that brought to the organization an endless number of obligations and responsibilities that would later overwhelm it. This situation led to the constitutional reform of February 3, 1983, which established that the State could rely on the agencies and companies required for the efficient management of strategic areas and priority activities; that is, Pemex could get help from private parties.⁴

In this vein came the most recent reform in this field, that of December 20, 2013, which is the one that currently takes center stage as regards hydrocarbons.⁵ Accordingly, the obligation of the Mexican Congress to legislate the secondary laws regulating the constitutional statutes was established as a natural consequence. As a result, 12 laws were modified and nine were created, which implies an unprecedented and completely new system in energy law—from types of contracts, international laws, public administration and, regarding the topic of this paper, criminal definitions and the creation of the Federal Law to Prevent and Punish Hydrocarbons Crimes of January 12, 2016.⁶

Thus, with the Constitutional reform and the secondary reforms, the Mexican energy sector is being organized, created and consolidated from an avant-garde and innovative perspective. Among the most important changes, it is worth noting that an Energy Sector Coordinating Council (CCSE) was created on September 6, 2016.⁷ Its purpose is to bring together the

² Presidencia de la República, Ley Reglamentaria del Artículo 27 Constitucional en Materia de Petróleo, *Diario Oficial de la Federación*, November 9, 1940.

³ Presidencia de la República, Ley Reglamentaria del Artículo 27 Constitucional en Materia de Petróleo, *Diario Oficial de la Federación*, November 29, 1958.

⁴ Presidencia de la República, Decreto de reforma constitucional que reforma y adiciona los artículos 16, 25, 26, 27, fracciones XIX y XX; 28, 73, fracciones XXIX-D; XXIX-E; y XXIX-F de la Constitución Política de los Estados Unidos Mexicanos, *Diario Oficial de la Federación*, February 3, 1983. Specifically, Article 25 establishes the possibility of having the private sector participate in strategic areas.

⁵ Presidencia de la República, Decreto por el que se reforman y adicionan diversas disposiciones de la Constitución Política de los Estados Unidos Mexicanos, en Materia de Energía, *Diario Oficial de la Federación*, December 20, 2013.

⁶ Presidencia de la República, Ley Federal para Prevenir y Sancionar los Delitos Cometidos en Materia de Hidrocarburos, *Diario Oficial de la Federación*, January 12, 2016.

⁷ Article 20 of the Ley de los Órganos Reguladores Coordinados en Materia Energética. Its duties include issuing sector policy recommendations to be integrated into the annual

Coordinated Energy Regulatory Bodies, the Ministry of Energy and other federal government agencies to facilitate coordination between the national and international industrial sector with the public policy objectives of the hydrocarbons sector, the National Development Plan, and the Energy Sector Program (PROSENER).

In the hierarchical structure, the coordinated regulatory agencies for the energy sector subordinate to the Council are the National Hydrocarbons Commission (CNH) and the National Energy Commission (CNE), which assist the Federal Executive branch in exercising its technical and economic regulatory authority over electricity and hydrocarbons. The agencies have technical, operational and procedural autonomy, as well as their own legal personality, and can avail themselves of the revenues derived from the fees and charges established for the services they provide based on their attributions and powers.⁸

The CNH is in charge of regulating, overseeing and evaluating hydrocarbon exploration and extraction activities in the country. To do so, it may sign and handle hydrocarbon exploration and extraction contracts on behalf of the Mexican State. It is also responsible for establishing and managing the National Hydrocarbon Information Center.⁹

The CRE is charged with transparently, impartially and efficiently managing the activities of the energy industry under its jurisdiction in order to generate certainty that stimulates productive investment, fosters healthy competition, provides adequate coverage and ensures the reliability, quality and security of supply and the provision of services at competitive prices that will benefit society.

With this new energy framework in Mexico, along with the Five-Year Plan that contains strategic information on the areas for tendering, new investment opportunities for the Mexican hydrocarbons industry will arise. Therefore, it is important to provide legal certainty and security in the field of criminal law by means of the Federal Law to Prevent and Punish Hydrocarbons Crimes.

work programs of the Energy Regulatory Commission (CRE) and the National Hydrocarbons Commission (CNH).

⁸ Presidencia de la República, Ley de los Órganos Reguladores Coordinados en Materia Energética, *Diario Oficial de la Federación*, August 11, 2014.

⁹ The National Hydrocarbons Information Center will consist of, at least, information on seismic surveys and rock cores obtained from exploration and extraction work. The Center will also safeguard, preserve and handle rock cores, drill cuttings and hydrocarbon samples deemed necessary for the historical and future knowledge of Mexico's hydrocarbons production.

II. FEDERAL LAW TO PREVENT AND PUNISH HYDROCARBONS CRIMES

In view of the need to respond to criminal issues potentially arising from the energy reform, the Federal Law to Prevent and Punish Hydrocarbons Crimes was published in the Federal Official Gazette on January 12, 2016. This law effectively deals with various criminal behaviors so as to truly prevent them from happening and punish them if they do.

The bill stated that one of the biggest problems the theft of hydrocarbons posed was that they could be stolen very easily through the so-called “illegal taps” along the approximately 68,000 kilometers of pipelines owned by Petróleos Mexicanos.¹⁰ Proof of this were the alarming figures reported and which have increased over the years. The bill noted that in addition to theft by means of “illegal tapping”, theft was also carried out in the oil extraction and distribution in oil fields, storage and distribution facilities, maritime terminals, refineries and in the loading of large vessels by tampering with gauges, weights, invoices and seals, among others.¹¹

In light of criminal law, these behaviors yielded data indicating that 95% of these cases did not result in arrests and only 5% reflected acts of detention *in flagrante delicto* at the time of transporting the illegally obtained product. The offense of possession was considered meriting a caution, but not a serious crime. In the few cases of arrests of persons *in flagrante*, the main issue was the operatively complex situation for an arrest since illegal tapping generally takes place in isolated areas.¹²

Given this scenario, it was imperative for the State to act severely against behavior related to the theft, as well as the unlawful storage, trans-

¹⁰ Senado de la República, *Gaceta Parlamentaria del Senado*, November 11, 2014, No. LXII/3PPO-50/51278. Iniciativa con proyecto de decreto por el que se expide la Ley General para Prevenir y Sancionar los Delitos Cometidos en contra del Patrimonio Nacional en materia de Hidrocarburos, se adiciona la fracción XXIII, se deroga el inciso 19 y se reforma el inciso 25 de la fracción I, todos del artículo 194 del Código Federal de Procedimientos Penales, se reforma el artículo 254 ter, se adiciona la fracción VI y se derogan el inciso j de la fracción I del artículo 253, las fracciones VII y VIII del artículo 254, y el artículo 368 Quater del Código Penal Federal y se reforma la fracción I y adiciona la fracción VIII al artículo 20. de la Ley Federal contra la Delincuencia Organizada. Del senador Omar Fayad Meneses del grupo parlamentario del Partido Revolucionario Institucional (suscrita también por el senador Miguel Romo Medina), available at: <http://www.senado.gob.mx/index.php?ver=sp&mn=2&sm=2&id=51278>, p. 7.

¹¹ Morales, Alberto and Zavala, Misael, “Detectan robo de combustible en buque tanques”, *El Universal*, January 31, 2019, available at: <https://www.eluniversal.com.mx/nacion/seguiridad/detectan-robo-de-combustible-en-buques>.

¹² *Ibidem*, p. 8.

portation, sale, supply and distribution, of hydrocarbons and other associated behaviors.

In addition to this, at the time it was said that Mexico had had a limited legal framework to punish the various behaviors related to the theft of hydrocarbons. This was because only the Federal Criminal Code (CPF) contemplated crimes committed against national consumption and wealth; the description of these, however, was very basic and the punishment minimal.¹³

Thus, the review committees decided that passing an additional law on the matter and the above-mentioned amendments would provide greater legal certainty to the productive companies, permit holders and assignees in carrying out their activities.

The bill was passed in the Senate on March 10, 2015, with 87 votes in favor.¹⁴ It was sent to the Chamber of Deputies where it was approved by 340 votes on December 14, 2015,¹⁵ and was finally published in the Federal Official Gazette on January 12, 2016.¹⁶

The first title of the Federal Law to Prevent and Punish Hydrocarbons Crimes (LFPSDCMH)¹⁷ establishes the generalities about jurisdiction, origin and proceedings, stressing that the object is to establish the crimes and punishment applicable regarding offenses involving hydrocarbons, oil derivatives or petrochemicals and other assets. The second title specifically regulates criminal offenses, penalties and fines. The third title provides for increased penalties depending on the nature of the active subject who com-

¹³ Senado de la República, *Gaceta Parlamentaria*, Tuesday, March 10, 2015, No. LXII/3SPO-100/53343. Dictamen de las Comisiones Unidas de Justicia, Seguridad Pública y de Estudios Legislativos que aprueba con modificaciones la iniciativa con proyecto de decreto por el que se expide la Ley para Prevenir y Sancionar los Delitos cometidos en Materia de Hidrocarburos, se adiciona la fracción XXIII, se deroga el inciso 19 y se reforma el inciso 25 de la fracción I, todos del artículo 194 del Código Federal de Procedimientos Penales, se reforma el artículo 254 Ter, se adiciona la fracción VI del artículo 254 y se derogan el inciso j de la fracción I del artículo 253, las fracciones VII y VIII del artículo 254 y el artículo 368 Quater del Código Penal Federal y se reforma la fracción I y se adiciona la fracción VIII al artículo 2o. de la Ley Federal contra la Delincuencia Organizada, available at: <http://www.senado.gob.mx/index.php?ver=sp&mn=2&sm=2&id=53343>.

¹⁴ Senado de la República, *Gaceta Parlamentaria*, March 12, 2015, No. LXII/3SPO-102/534, available at: <http://www.senado.gob.mx/index.php?ver=sp&mn=2&sm=2&id=53431>, accessed in August 2018.

¹⁵ Cámara de Diputados, *Gaceta Parlamentaria*, año XIX, núm. 4423, LXIII Legislatura. Versión estenográfica de la sesión ordinaria del 10 de diciembre de 2015.

¹⁶ Presidencia de la República, Ley Federal para Prevenir y Sancionar los Delitos Cometidos en Materia de Hidrocarburos, *Diario Oficial de la Federación*, January 12, 2016.

¹⁷ Presidencia de la República, Ley Federal para Prevenir..., *op. cit.*

mits the crime, and the fourth title regulates the law's second main purpose: the prevention of the act which the law establishes as a hydrocarbon's crime.

In terms of prevention, it regulates federal coordination with local and municipal institutions, public security institutions, energy sector authorities, assignees, permit holders, contractors or distributors to prevent and detect related acts or operations, for which any of the following public policies might exist:

- To design and implement permanent programs to ensure the proper surveillance of pipelines, facilities and the equipment belonging to assignees, permit holders, contractors or distributors.
- To conduct studies on structural causes, crime mapping,¹⁸ statistics, historical trends and behavioral patterns that enable updating and improving preventive measures.
- To obtain, process and interpret crime mapping information by analyzing the factors that produce the behaviors described in this law with the aim of identifying high-risk areas, sectors and groups, as well as associated protection factors.
- To provide and exchange information.
- To carry out campaigns aimed at preventing and averting the factors and causes that give rise to this type of crime.
- To enter into general and specific collaboration agreements to enforce preventive measures.

One example of this is that President Andrés Manuel López Obrador presided over the presentation of the Mexican government's Joint Plan to Combat the Theft of Hydrocarbons from Pemex. This strategic plan involves the participation of 15 Mexican government agencies, including the Ministries of the Interior, of Public Security, of Public Administration, of Labor and Social Welfare, of Finance and Public Credit, and of Energy; the Legal Counsel of the Federal Executive Branch, the Office of the Federal Attorney General, the Tax Administration Service, and the Federal Consumer Protection Agency.¹⁹ Additionally, every public policy concerning this

¹⁸ This is understood as the relationship between geography and crime rates based on situational indicators like location, population and social needs.

¹⁹ López Obrador, Andrés Manuel, "Anuncia presidente plan contra robo de hidrocarburos" at *Sitio Oficial de Andrés*, December 27, 2018, available at: <https://lopezobrador.org.mx/2018/12/27/plan-conjunto-del-gobierno-de-mexico-para-combatir-el-robo-de-hidrocarburos-de-pemex/>.

issue is regulated by a corresponding law and is considered national security information for its effective implementation.

III. CRIMINAL-LEGAL ANALYSIS HYDROCARBONS CRIMES

For imposing punishment on criminal behaviors related to hydrocarbons crimes, it is important to professionalize the prosecuting authorities in substantive criminal law; that is, for them to perfectly identify how hydrocarbons crimes are analyzed. This would prevent impunity resulting from poorly prepared arguments by the defense.

Moreover, it should be noted that with the oral criminal system, accusations regarding hydrocarbons issues will not only be the responsibility of the Office of the Public Prosecutor, but also of the affected individuals who may participate in the process through the victims' legal counsel (lawyers of assignee companies or contractors).²⁰ Therefore, a dogmatic analysis of the relevant criminal types is urgent as a way for academia to participate in the prevention, prosecution and administration of justice in this area.

Such dogmatic analysis²¹ would be based on the legal definition as the first part of the criminal legal analysis; illegality understood as contrary to the law; culpability in its concept of blameworthiness;²² the forms of criminal intervention; the degrees of perpetrating the act, and the concurrent offenses to be punished.

Analysis of behaviors regulated by the General Law to Prevent and Punish Hydrocarbons Crimes

The law regulates a variety of criminal scenarios in Articles 8 to 21, each of which has unique elements in the classification of criminal behavior. Therefore, a general analysis of the different behaviors is given below, followed by a specific opinion of each type of regulated offense.

²⁰ The criminal justice system reform created the role of Legal Counsel for Victims, who becomes party to the process on behalf of the victim and can therefore participate in the proceedings, take part in the trial and file any appeals deemed necessary. *Cfr. Constitución Política de los Estados Unidos Mexicanos*, Article 20, Section C.

²¹ Quintino Zepeda, Rubén, "Dogmática penal para principiantes", *Cuaderno de Trabajo*, Mexico, MaGister, 2006, pp. 7-11.

²² Reinhard, Frank, *Sobre la estructura del concepto de culpabilidad*, Buenos Aires, Julio César Faira, 2000, p. 19.

Regarding the typology, the behavior in most of these crimes is that of action,²³ as specifically stated in Articles 8-20, and of omission,²⁴ as mentioned in Articles 13, 15 and 17. The active subject is the one who engages in the behavior and the passive subject is the one who recently engaged in the behavior, which could be the assignees, contractors, permit holders, distributors or whoever may have access to the hydrocarbons, according to the law. These are entitled to legal counsel to be represented in a proceeding with the individual or collective claims deemed appropriate.

As to the qualities of the subjects required by law,²⁵ an analysis of the various descriptions shows that only Article 13 refers to a specific quality for the active subject of the crime, establishing that they must be a public servant.

The issue of legally protected interests is one of the most difficult because the possibility of a diversity of victims means that the legal interests can be diverse. For instance, if the victim is Pemex, a productive State enterprise, then the legal interests would be supra personal because it affects the natural resources of society at large, but if the victim is a contractor, the legal interests would be personal because it affects its assets.²⁶

On the other hand, in the study of the material object, this depends on the result of the behavior, given that it can be determined by the amount of the petroleum hydrocarbons or petrochemicals stolen, exploited, modified, or sold, among others.²⁷ The above gives way to one more element of

²³ Action is a voluntary body movement. *Cfr.* Porte Petit Candaudap, Celestino, *Apuntes de la parte general de derecho penal*, 17a. ed., Mexico, Porrúa, 1998, p. 237.

²⁴ *Ibidem*, p. 239. Both theory and criminal legislation differentiates between simple inaction that fails to comply with a given rule and inaction that by failing to comply with a rule is associated with an actual outcome attributed to the perpetrator. This is precisely why crimes are classified into: crimes of omission (in which only the terms of the rule are breached) and crimes of commission by omission (in which non-compliance with the rule is also linked to the attribution of a corresponding material outcome).

²⁵ Certain criminal behaviors require the subject to have a specific capacity, like a public servant. These behaviors are referred to as special crimes. *Cfr.* Mir Puig, Santiago, *Derecho penal. Parte general*, 7th ed., Barcelona, Reppertor, 2004, p. 206.

²⁶ Birnbaum may have introduced the concept of “interests” into criminal-legal issues in 1834, but it was Binding who gave rise to the concept of “legal interest” in our field. Hence, the term legal interest stems from Binding’s contribution that a legal interest is “anything that the legislature considers and the undisturbed retention of which it therefore must ensure through norms”. *Cfr.* Cancio Meliá, Manuel, *El bien jurídico en los análisis dogmáticos y políticos criminales*, Argentina, Facultad de Ciencias Jurídicas y Sociales, Universidad Nacional del Litoral, 1999, p. 33.

²⁷ The material object is the person or thing upon which the legal action is based.

analysis, which are circumstances of place, manner or time. In the case at hand, Article 10 of the law establishes a specific circumstance by stating that to establish the criminal offense, it is necessary for it to be committed on platforms and other offshore facilities; and Article 11 refers to the commission of the act in a vessel exclusion zone. Therefore, in order to determine criminal behavior under these hypotheses, it is necessary to consider the verification of the specific place required by the provision.

The means of commission²⁸ are regulated only in Article 12, which states that if the behavior is carried out with violence, rules of accumulation will be applied, but they are not established as an aggravating circumstance. The casual nexus is the legal element closely tied to the proof since the active and passive subject should determine whether or not there was a right for the extraction or use, thereby achieving a result which in any case will be material.²⁹

Following the analysis of the behaviors regulated by law, the different descriptions yield willful misconduct and a strong need to resort to the interpretation of the regulatory elements in legal or cultural interpretations of the law since typical descriptions uses concepts like hydrocarbons, oil products, petrochemicals, platform, assignee, contractor, permit holder, distributor, exclusion area on board a vessel, markers, measuring systems, pipelines, and damage to natural resources, among others.³⁰

A second level of the study concerns unlawfulness, a criminal legal category that in the light of the defense is quite complicated because proving justifiable grounds is not very likely. However, the Office of the Public Prosecutor and/or the victim's legal counsel must perform the analysis *ex officio* to avoid due process violations.³¹ A viable example is that "if the ac-

²⁸ These involve the way in which the behavior is performed, which can be expressed as physical or moral violence.

²⁹ Offenses defined by their result are subdivided into proper and improper offenses. To use a different terminology, proper and improper offenses are known as: material crimes (when they cause a change in the outside world) and formal crimes (when they do not produce a change in the real world), respectively. *Cf.* Hirsch, Hans-Joachim, "La problemática de los delitos cualificados por el resultado", trans. Leire Escajedo San Epifanio, *Derecho Penal, Obras Completas, Libro Homenaje*, t. II, Argentina, Rubinzal-Culzon, 2000, p. 319.

³⁰ Strictly legal concepts, as well as terms referring to an assigned value and those referring to a certain meaning, are regulatory criminal elements. *Cf.* Jakobs, Günther. "Sobre el tratamiento de las alteraciones volitivas y cognitivas", *Crónicas Extranjeras*, Italy, Facultad de Derecho de la Universidad de Siena, 1989, p. 215 *et ss.*

³¹ Unlawfulness implies a behavior that goes against the law, and this is precisely what the Public Prosecutor must prove. On the other hand, the defense can argue causes for justification. *Cf.* López Betancourt, Eduardo, *Teoría del delito*, Mexico, Porrúa, 2001, p. 149.

tive subject demonstrates that they have the corresponding right or permission, the exercise of a right or the fulfillment of a duty could be argued”.

As the analysis is being done from the angle of the Office of the Public Prosecutor and/or the victim’s attorney, the elements of guilt will thus be addressed, but not their mitigating or excluding circumstances. Therefore, it could be said that if the active subject is of legal age and is aware of their unlawful act, the subject merits punitive judgment from a judge and consequently the deserved and necessary punishment.³²

Thus, at the time of studying the form of criminal intervention, it would seem that it depends on the specific case to determine whether they are the author or participant of the act that the law defines as a crime. However, the first premise of Article 10 regulates the punishment of the behavior of a participant, instigator or accomplice of the criminal act; and Articles 18 and 19 regulate the actions and punishment in cases of perpetration-by-means to prevent the crime from being considered self-inflicted, which seems an exceptional and plausible move on the part of legislators.³³

Lastly, concurrent crimes depend on each specific case since it must be analyzed whether diverse or combined behaviors produce different results and thus determine punishability, mentioned in each description and increased depending on the specific case. But this is independent of the corresponding punishment under the Federal Law of Administrative Responsibilities of Public Servants, when said law is applicable, the revocation of the respective permit, and if necessary, the dissolution and liquidation of the company will be imposed as punishment if the responsible party is a franchisee, assignee, contractor, permit holder, or distributor.³⁴

³² Guilt includes both blameworthiness and deservedness, as well as the need for punishment; all this according to the political-criminal decisions of general prevention and special prevention. This way of explaining guilt currently has greater consensus. For instance, Jescheck has said, “guilt is not reproach; guilt is responsibility”. Jescheck, Hans-Heinrich, “El significado de don Luis Jiménez de Asúa en el desarrollo de la dogmática española en el campo de la teoría jurídica del delito”, *Revista de la Facultad de Derecho de la Universidad Complutense Madrid*, 1986, p. 406.

³³ In self-inflicted crimes, it is the perpetrator himself who performs the typified action; these crimes cannot be committed by a third party.

³⁴ There is actual concurrence when several crimes are committed through multiple behaviors. Ideal concurrence exists when several crimes are committed through a single behavior. There is no concurrence in the case of a continuing offense under the terms of the applicable legislation. *Cfr.* Código Nacional de Procedimientos Penales, Article 30.

IV. HYDROCARBONS CRIMES IN THE ACCUSATORY CRIMINAL SYSTEM

The creation of the Law to Prevent and Punish Hydrocarbons Crimes is not the only new element in the field; we also must analyze the so-called accusatory and oral criminal system in the prosecution and administration of these crimes, as the system which regulates alternative justice in a way that resolves disputes without going to trial.

In other words, when there is a case related to a hydrocarbon's crime, in addition to an oral trial, there is also the possibility of solving the dispute by means of alternative justice. This must be regulated by law under diverse possibilities, but in criminal matters it is always a requirement to ensure the redress of damage and to establish the cases of legal supervision.

Alternative justice solves the conflict by different means than the traditional one. This is the basis on which the accusatory system works since it is anticipated that only a small percentage of cases will reach an oral trial. It has even been estimated that only 10% of the cases should be resolved at this stage.³⁵ With the above information, where is the remaining percentage? Precisely in the various options for alternative justice.

To understand alternative justice as a way to solve controversies related to the criminal legal analysis of hydrocarbons crimes, I will use a highway as a metaphor.³⁶ Hence, it is necessary to imagine that there are possible off-ramps for resolving disputes in a different way, in addition to the fact that in order to take such off-ramps, it is necessary to know the minimum required elements of the legal classification of the crime, for instance, whether it is intentional, negligent, perpetrator, participant, consummated or instantaneous. A comparative and imaginative exercise is presented below.

Alternative justice

In the adversarial criminal system, our metaphorical highway has many off-ramps, such as: criteria of opportunity; reparatory agreements; conditional suspension of the proceedings, and the abbreviated procedure. On

³⁵ Fromow Rangel, María de los Ángeles, head of the Secretaría Técnica del Consejo de Coordinación para la Implementación del Sistema de Justicia Penal (SETEC), de la Secretaría de Gobernación, *El asalto a la razón*, September 24, 2015, available at: <https://www.milenio.com/policia/uno-de-cada-10-casos-llegara-a-juicio-oral>.

³⁶ Bardales Lazcano, Erika, *Medios alternos de solución de las controversias vs justicia restaurativa*, 2a. ed., Mexico, Flores Editor, 2017, Chap. 1.

this imaginary highway, each of the off-ramps implies a toll which depends on the type of crime and the consequences for the parties. Each one will be explained below in ascending order in the decision-making process.

A. *Criteria of opportunity*

These criteria are the first off-ramp on the highway. They imply discretionary powers of the Office of the Public Prosecutor to preside totally or partially over criminal prosecution. These may be granted from the beginning of the investigation and even before the order to open an oral trial is decreed. For them to be granted, the conditions of each case must be evaluated. These would never proceed in cases of crimes against the free development of the personality, domestic violence or tax crimes, or those that seriously affect public interest, and we even believe that they should not proceed in hydrocarbons crimes.³⁷

In this case, the *toll* implies three requirements: 1) the consent of the public prosecutor as the social representative; 2) the reparation of damage, whenever applicable, and 3) the analysis of each specific case, since it does not proceed for certain crimes, but rather for legislative assumptions; that is, for the specific circumstances of the act. For instance, in cases of hydrocarbons, it could be granted if the accused provides essential and effective information for the prosecution of a more serious crime than the one of which they are accused, and commits to appear in court, as long as the victim agrees.³⁸ In these cases, even when there is a complete analysis of the crime of the prohibited behavior, it can be granted when it is intentional, a direct perpetrator and consummated instantaneously.

But what happens if the Public Prosecutor does not want to grant a criterion, or the specific case does not allow it? Nothing, we continue driving along the highway and the next exit would be:

³⁷ Article 21 of the Constitución Política de los Estados Unidos Mexicanos, 2019, available at: <http://www.diputados.gob.mx/LeyesBiblio/index.htm>.

³⁸ Article 256 of the Código Nacional de Procedimientos Penales, 2019, available at: <http://www.diputados.gob.mx/LeyesBiblio/index.htm>. “Casos en que operan los criterios de oportunidad: Iniciada la investigación y previo análisis objetivo de los datos que consten en la misma, conforme a las disposiciones normativas de cada Procuraduría, el Ministerio Público podrá abstenerse de ejercer la acción penal con base en la aplicación de criterios de oportunidad, siempre que, en su caso, se hayan reparado o garantizado los daños causados a la víctima u ofendido. La aplicación de los criterios de oportunidad será procedente en cualquiera de los siguientes supuestos... V. Cuando el imputado aporte información esencial y eficaz para la persecución de un delito más grave del que se le imputa, y se comprometa a comparecer en juicio...”.

B. *Reparatory agreements*

The reparatory agreements are those celebrated between the victim or offended party and the accused that, once approved by the Office of the Public Prosecutor or the due process judge and their terms fulfilled, have the effect of dismissing criminal charges. They are the second highway off-ramp and can be made from the beginning of the investigation until the order to open a trial is issued. They can be presented:

Pretrial. These take place before the proceedings, that is, during the investigation stage, during the initial phase, prior to the indictment. These agreements are in the hands of the Public Prosecutor who may invite the parties as of the first intervention, in applicable cases.

During the trial. These take place during the process, that is, from the initial hearing until the moment before issuing the order to open an oral trial and are implemented by the due process judge at a hearing.

Out-of-court. These are agreements made outside the procedural sphere, “outside” understood as referring to the Center for Alternative Justice before a mediator. They can be made from the moment charges or complaints are filed until the order to open a trial is issued.

Mediation, conciliation and restoration boards are the most appropriate means to reach a reparatory agreement, which, once approved and fulfilled in its terms, have the effect of dismissing the criminal lawsuit.³⁹

The *toll* at this off-ramp is: 1) the will of the parties to resolve the controversy, which can be for individuals or legal entities, verbally or in writing, and 2) the type of crime. In this case, they only apply to crimes that can be prosecuted by complaint, with an equivalent requirement of the offended party, that admit the forgiveness of the victim or the offended party, crimes of negligence and property crimes committed without violence against persons, with the exception of domestic violence. In the case of hydrocarbons crimes, a large number of them could be solved thus since they are generally property crimes committed without violence against persons, regardless of whether the dogmatic analysis of the crime has been proven, because the main consideration is the will of the parties.

What happens if either party does not want or accept an agreement, or it does not proceed due to the type of crime? Nothing, we continue down the highway and the next off-ramp would say.

³⁹ Presidencia de la República, Ley Nacional de Mecanismos Alternativos en Materia Penal, *Diario Oficial de la Federación*, December 29, 2014.

C. *Conditional suspension of proceedings*

Conditional suspension of proceedings is a new legal practice in Mexican law that consists of allowing persons accused of a criminal act to suspend proceedings, as long as the following requirements are met: 1) the payment of damages, and 2) an obligation to do or not to do the preventive or disciplinary measure ordered by the due process judge, provided that effective protection of the rights of the victim or the offended party is ensured since the above may result in the dismissal of the criminal case.⁴⁰

At the third off-ramp on our metaphorical highway, the *toll* consists of: 1) a payment plan for the reparation of damage; 2) the commitment to comply with an obligation to do or not to do the preventative or disciplinary measure imposed by the due process judge, and 3) the issuance of the criminal indictment for a crime for which the arithmetic mean of the prison sentence does not exceed five years.⁴¹

The possibility of the conditional suspension of proceedings depends on each specific case; this off-ramp is used for several hydrocarbons cases as a right of the accused, given the issue of punishment and their arithmetic mean. In this way of solving controversies, we observe that punishment for hydrocarbons issues is very low, so the defense could solve a significant percentage of cases this way.

Thus, in its resolution, the due process judge will establish the conditions under which the process is suspended, approve the plan proposed to repair the damage, notify the accused of the possibility of revoking the suspension if they fail to comply and prohibit the use of the information generated from the agreements if the criminal proceedings were to continue.⁴²

Let us continue imagining this highway and the possibility of not exiting at any of the aforementioned off-ramps. What possibility is left? Yet another off-ramp is explained below.

⁴⁰ Article 191 of the Código Nacional de Procedimientos Penales, 2019, available at: <http://www.diputados.gob.mx/LeyesBiblio/index.htm>. Conditional suspension of proceedings should be understood as the proposal presented by the Office of the Public Prosecutor or by the accused, which must contain a detailed plan for the payment of reparations for the damage and the accused's compliance with one or more of the conditions referred to in this Chapter, that guarantee the effective protection of the rights of the victim or offended party and which, if complied with, may lead to the dismissal of the criminal lawsuit.

⁴¹ *Ibidem*, Articles 192 and ss.

⁴² Valadez Díaz, Manuel, *Acuerdos reparatorios y suspensión condicional del proceso*, Mexico, Flores Editor, 2018, p. 60.

D. *Abbreviated procedure*

The form of early termination contemplated in the National Code of Criminal Procedures is the abbreviated procedure, which is a non-standard way of terminating an ordinary proceeding. For this to occur, the accused must acknowledge their participation in the crime before the judicial authority, voluntarily and with knowledge of the consequences. In addition, the Office of the Public Prosecutor must have sufficient evidence to justify a judge's summons to a hearing.

In this procedure, the accused will have the benefits granted by law, such as a reduction of the sentence.⁴³

This is the last exit on the highway before the off-ramp to the oral trial. It comes when the defendant is indicted until the order to open the oral trial is decreed. It should be mentioned that this off-ramp is the widest of all since it applies to all crimes. In other words, in hydrocarbons-related issues, all behaviors can opt for an abbreviated procedure and thus reduce a sentence, even to the extent of commuting the sentence.

The *toll* is: 1) that the accused persons expressly waive the oral trial; 2) that they admit their responsibility for the crimes for which they have been charged; and 3) that the person accepts to be judged based on the means of conviction presented by the Office of the Public Prosecutor on filing the indictment. But, in exchange for this, the sentence will be reduced according to the following rules:

⁴³ Article 202 of the Código Nacional de Procedimientos Penales..., *op. cit.* The Office of the Public Prosecutor shall be able to request the opening of the abbreviated procedure after the indictment has been issued and until before the order to open an oral trial has been issued. All the parties must be summoned to the hearing. The failure of the victim or the affected party to appear after having been duly summoned shall not prevent the due process judge from ruling on the matter. When the accused has not been previously convicted of an intentional crime and the crime for which the abbreviated procedure is punishable by a prison sentence whose arithmetic mean does not exceed five years, including its mitigating or aggravating circumstances, the Office of the Public Prosecutor may request a reduction of up to half of the minimum sentence for intentional crimes and up to two thirds of the minimum sentence for non-intentional crimes, of the prison sentences corresponding to the crime in question. In either case, the Office of the Public Prosecutor may request a prison sentence reduction of up to one third of the minimum sentence for intentional crimes and up to half of the minimum sentence for non-intentional crimes. If at the time of said request there is already a written accusation, the Office of the Public Prosecutor may verbally change it at the hearing where the abbreviated procedure is being decided and, if applicable, request a reduction of the sentence so as to allow the case to be processed under the rules set forth in this Chapter. In requesting the sentence under the terms provided for in this article, the Office of the Public Prosecutor shall observe the Agreement issued to that effect by the Prosecutor.

When there are precedents of the accused having previously been convicted of an intentional crime or the crime for which the abbreviated procedure is punishable by a prison sentence whose arithmetic mean does not exceed five years, including its mitigating or aggravating circumstances, the reduction can be up to half of the minimum sentence for intentional crimes and up to two thirds of the minimum sentence for non-intentional crimes.

When the accused has no prior record, the sentence reduction will be up to one third of the minimum sentence for intentional crimes and up to half of the minimum sentence for non-intentional crimes.

Now let us imagine a case in which the accused citizen did not want to take any of the alternatives to the oral trial but wants to defend their innocence. Here it is important to highlight the right to taking the last off-ramp on this procedural highway, which is the oral trial, the moment that determines a person's guilt or not, and consequently, if applicable, the punishment and reparation of damages.

In this sense, our metaphor of a highway shows that the off-ramps and tolls must work in order to consolidate the criminal justice system reform. If estimates calculate that 80% or 90% of the cases are resolved by alternatives to the oral trial, indicators are needed to measure the proper functioning of each of the possibilities for streamlining the process to prevent them from turning into mechanisms for impunity.

Analysis of each type of crime

With that stated in the above paragraphs regarding the new energy law framework, the creation of a law that contains the types of related crimes, the dogmatic analysis of the crimes contained in the law and the various possibilities of resolving disputes in the procedural system, the following describes each type of crime in the law in question so that the reader may form an opinion based on their description, punishability and relationship with an accusatory criminal justice system:

Article 8. A sentence of 15 to 25 years of prison and a fine of 15,000 to 25,000 days of minimum wage in force at the place of the acts will be imposed on whoever:

I. Steals petroleum or petrochemical hydrocarbons from pipelines, vehicles, equipment, facilities or assets, without the right to do so and the consent of assignees, contractors, permit holders, distributors or whoever may dispose of them in accordance with the law.

II. Makes use of petroleum or petrochemical hydrocarbons without the right to do so and without the consent of assignees, contractors, permit holders, distributors or whoever may dispose of them in accordance with the law.⁴⁴

In this provision, the behavior is mainly one of action; the active subject is the one who engages in the behavior and the passive subject is the assignees, contractors, permit holders, distributors and whoever may dispose of them in accordance with the law. The typical description does not stipulate a specific condition for the active subject, but it does for the passive subject because in order to be a victim or offended party, it is necessary to determine who has the right.

The legal good protected is the right of the nation over oil or petrochemical hydrocarbons and the patrimonial right of assignees, contractors, permit holders, distributors or whoever may have access to them in accordance with the law. It must be stressed that the legal right is supra-personal.

The material object is the amount of petroleum or petrochemical hydrocarbons stolen or exploited. The description does not require a specific circumstance of time, place or situation, nor does it mention means of physical or moral violence.

The causal nexus is the legal aspect closely linked to the evidence since the active and passive subjects must determine whether or not there is a right to the extraction or exploitation. The result is deemed material because of the change in the factual world.

Lastly, it would be a behavior of a mainly intentional nature. It would be necessary to interpret what a hydrocarbon, oil or petrochemical is, as well as the place required by the criminal offense, such as pipelines, vehicles, equipment, facilities or assets, by means of the regulatory elements.

As to the accusatory criminal system, this behavior can be judged through an abbreviated procedure⁴⁵ or an oral trial:

Article 9. Punishment shall be imposed on whoever:

I. Purchases, disposes of, receives, acquires, sells or negotiates hydrocarbons, oil products or petrochemicals without the right to do so and the consent of assignees, contractors, permit holders, distributors or whoever may have access to them in accordance with the law.

II. Safeguards, transports, stores, distributes, possesses, supplies, or conceals hydrocarbons, oil products or petrochemicals without the right to do so

⁴⁴ Article 8, Ley Federal para Prevenir..., *op. cit.*

⁴⁵ Article 202 of the Código Nacional de Procedimientos Penales..., *op. cit.*

and without the consent of assignees, contractors, permit holders, distributors or whoever may have access to them in accordance with the law.

III. Alters or adulterates hydrocarbons, oil products or petrochemicals without the right to do so and without the consent of assignees, contractors, permit holders, distributors or whoever may have access to them in accordance with the law.

The behaviors described in these articles shall be punished as follows:

a) When the amount is less than or equal to 300 liters, 2 to 4 years of prison and a fine of 2,000 to 4,000 days of minimum wage in force at the place of the facts shall be imposed.

b) When the amount is greater than 300 liters, but less than or equal to 1,000 liters, 4 to 8 years of prison and a fine of 4,000 and 8,000 days of minimum wage in force at the place of the facts shall be imposed.

c) When the amount is greater than 1,000 liters but less than 2,000 liters, 8 to 12 years of prison and a fine of 8,000 to 12,000 days of minimum salary in force at the place of the facts shall be imposed.

d) When the amount is equal or greater to 2,000 liters, a prison sentence of 10 to 15 years and a fine of 10,000 to 15,000 days of minimum wage in force in the place of the facts shall be imposed.

For the purpose of the conditions indicated in Section II, paragraphs a), b) and c) this article, a complaint must be filed by the regulating agency or the injured party.

If it is not possible to quantify the volume of hydrocarbons, oil products or petrochemicals, object of the behaviors described in Sections I, II and III, a prison sentence of 10 to 15 years and a fine of 10,000 to 15,000 days of minimum wages in force at the place of the facts shall be imposed, provided that it is proven that given the conditions in which said volume is contained, it is presumed that it is a matter of quantities greater than 2,000 liters.⁴⁶

Article 9 has a list of several qualifying verbs that defines the behavior, in addition to specific procedural requirements, such as a complaint filed by the victim or *ex officio*. In this crime, the punishment is directly related to the number of hydrocarbons, oil products or petrochemicals.

This description shares the main analysis of the crime, but it is worth noting that it is considered a procedural requirement for filing a complaint, including the premises contained in Section III and paragraphs a, b and c, which implies that in the accusatory criminal system, they can be resolved

⁴⁶ Article 9, Ley Federal para Prevenir..., *op. cit.*

by means of a reparatory agreement;⁴⁷ a conditional suspension of proceedings if the sentence does not exceed the arithmetic means of five years of the punishment;⁴⁸ an abbreviated procedure;⁴⁹ or an oral trial:

Article 10. Whoever aids, facilitates or assists, by any means, in engaging in the behaviors provided for in Articles 8 and 9 of this Law, shall be subject to up to three quarters of the corresponding punishments.

Likewise, up to one half more of the corresponding sentence shall be imposed on whoever commits such behaviors when:

a) It is carried out on platforms or other offshore facilities owned or used by assignees, contractors, permit holders or distributors, or

b) It uses illegally obtained information or data on the operations, facilities, activities, personnel movements or vehicles of assignees, contractors, permit holders or distributors.⁵⁰

Article 10 specifically regulates the issue of participants, instigators and accomplices, to identify the distinctive elements that allow the Office of the Public Prosecutor or the legal counsel of the victims to make any type of indictment or investigation of the act established by law as a crime related to oil and petrochemical hydrocarbons. The analysis of this crime is similar to that of Articles 8 and 9, its distinctive feature is that in this description of the crime circumstances of place are required, thus aggravating the punishment.

The accusatory criminal system could be used to resolve the complaints filed by means of a reparatory agreement;⁵¹ a conditional suspension of proceedings if the sentence does not exceed the arithmetical mean of five years;⁵² an abbreviated procedure;⁵³ or an oral trial.

Article 11. A prison sentence of 5 to 10 years and a fine of 5,000 to 10,000 days of minimum wage in force at the place of the facts shall be imposed on whoever invades the exclusion areas on board a vessel and uses an apocryphal flag or registration simulating ownership by an assignee, contractor, permit holder, distributor or shipowner.⁵⁴

⁴⁷ Article 187 of the Código Nacional de Procedimientos Penales..., *op. cit.*

⁴⁸ *Ibidem*, Article 192.

⁴⁹ *Ibidem*, Article 202.

⁵⁰ Article 10 of the Ley Federal para Prevenir..., *op. cit.*

⁵¹ Article 187 of the Código Nacional de Procedimientos Penales..., *op. cit.*

⁵² *Ibidem*, Article 192.

⁵³ *Ibidem*, Article 202.

⁵⁴ Article 11 of the Ley Federal para Prevenir..., *op. cit.*

Article 11 describes the course of action, but it is necessary to point out the circumstances of place for the crime to be committed, which are the exclusion areas on board a vessel. The provision also describes the use of an apocryphal flag or registration. At the time of performing the dogmatic study of the crime, the above will be complicated since the requirements will be a matter of proof and concurrence of crimes.

The general analysis of the classification of the crime coincides with that indicated in the above articles regarding classification, unlawfulness, blameworthiness, type of intervention, concurrence of crimes and punishability.

The accusatory criminal system could be used to resolve them by means of a reparatory agreement;⁵⁵ a conditional suspension of proceedings if the sentence does not exceed the arithmetic means of five years;⁵⁶ an abbreviated procedure;⁵⁷ or an oral trial.

Article 12. Whoever steals without the right to do so or without the consent of whoever may dispose of them in accordance with the law, movable property essential and specific to the operation of the oil industry, susceptible of being used in any of the behaviors classified by this law, property of assignees, contractors, permit holders or distributors, shall be subject to the following punishment:

I. A prison sentence of up to 3 years and a fine of up to 150 days of minimum wage in force in the place of the facts when the value of what was stolen does not exceed 100 times minimum wage.

II. A prison sentence from 3 to 6 years and a fine of 150 up to 270 days of minimum wage in force in the place of the facts when the value of what was stolen exceeds 100 times minimum wage, but not 500.

III. A prison sentence from 6 to 15 years and a fine of 270 up to 750 days of minimum wage in force in the place of the facts when it exceeds 500 times minimum wage.

If committed with violence, the rules of accumulation shall apply.⁵⁸

This article clearly regulates the theft of various types of movable assets that serve or may serve to commit the behaviors indicated by law. However, it seems to us that the punishment is quite lenient since under the new accusatory criminal justice system the accused could get out through a repara-

⁵⁵ Article 187 of the Código Nacional de Procedimientos Penales..., *op. cit.*

⁵⁶ *Ibidem*, Article 192.

⁵⁷ *Ibidem*, Article 202.

⁵⁸ Article 12 of the Ley Federal para Prevenir..., *op. cit.*

tory agreement;⁵⁹ a conditional suspension of proceedings if the sentence does not exceed the arithmetic means of five years;⁶⁰ or an abbreviated procedure,⁶¹ which implies not having a criminal record and therefore not having any type of crime prevention under this hypothesis.

The analysis will continue examining the legal good of the asset in terms of theft, the behaviors of willful misconduct, with the material result of what was stolen and with clear evidence of unlawfulness of the act, so that the determination of guilt and punishability is imminent.

Article 13. Any public servant who, in the performance of their duties or in connection therewith, becomes aware of the probable commission of a crime covered by this Law and does not report it to the competent authority, shall be subject to a sentence of 1 to 5 years of prison and a fine of 4,000 to 7,000 days of minimum wage in force at the place of the facts.

The foregoing, regardless of the punishment applicable under the Federal Law of Administrative Responsibilities of Public Servants.⁶²

This article regulates the possible punishment for public servants who, in performing their duties, do not report any of the crimes covered by this law to the authorities. In other words, it regulates a specific characteristic of the active subject of the criminal act. Legislators clearly wanted to regulate good government services, but they were very condescending since the sentence is a maximum of 5 years. In our opinion, this is a mockery because a public servant is the person who should be penalized the most, on one hand, for their special status and, on the other, for not allowing acts of corruption in behaviors of commission by omission.

Under this characterization of the crime, public servants would be allowed a conditional suspension of proceedings,⁶³ as long as the arithmetic mean does not exceed 5 years, in addition to the fact that it would not go on their record and could thereby continue exercising their functions. These public servants are also allowed the option of an abbreviated procedure.⁶⁴

In a dogmatic analysis, we would specifically see behaviors of action or commission by omission, both of which are premeditated, and the type of crime requires the active subject to meet specific characteristics.

⁵⁹ Article 187 of the Código Nacional de Procedimientos Penales..., *op. cit.*

⁶⁰ *Ibidem*, Article 192.

⁶¹ *Ibidem*, Article 202.

⁶² Article 13 of the Ley Federal para Prevenir..., *op. cit.*

⁶³ Article 192 of the Código Nacional de Procedimientos Penales..., *op. cit.*

⁶⁴ *Ibidem*, Article 202.

Article 14. A sentence of 6 to 10 years in prison and a fine of 6,000 to 10,000 days of minimum wage in force at the place of the facts shall be imposed on whoever sells or transports hydrocarbons, oil products or petrochemicals that do not have the markers or other specifications established by the competent authority for such products, as determined in the corresponding documentation.

The same punishment shall be imposed on whoever without the right to do so or the consent of assignees, contractors, permit holders, distributors or whoever may have access to them in accordance with the law steals, alters, modifies or destroys the markers referred to in the preceding paragraph.⁶⁵

The article contains two typical classifications. The first contains the words selling or transporting while the second has the words stealing, altering, modifying and destroying markers. In this classification, the regulatory elements used to describe the type of crime are required to define what a marker is and then consider the unlawfulness of the act.

As to the other elements of the legal analysis, these are mainly through willful misconduct, but it depends on each specific case.

In the accusatory criminal justice system, these cases can be resolved through an abbreviated procedure⁶⁶ or an oral trial.

Article 15. A sentence of 4 to 6 years of prison and a fine of 4,000 to 6,000 days of minimum wage in force at the place of the facts shall be imposed on the lessee, owner or possessor, or whoever claims to be such, of any property where there is a clandestine bypass or tapping and has knowledge of this situation and does not report it to the corresponding authorities.

A sentence of 9 to 16 years of prison and a fine of 9,000 to 16,000 days of minimum wage in force shall be imposed on whoever, with knowledge that a crime covered by this Law is being committed, facilitates, collaborates or consents to it being committed on their property or does not report it to the corresponding authorities.⁶⁷

This article expressly addresses the behavior of citizens who knowingly allow a clandestine tap on their property, but why punish a citizen with a more severe punishment than the authority? This gives way to corruption since public servants should be more severely punished for being a representative of society.

⁶⁵ *Ibidem*, Article 14.

⁶⁶ Article 202 of the Código Nacional de Procedimientos Penales..., *op. cit.*

⁶⁷ *Ibidem*, Article 15.

However, under the rules of the accusatory process, this type of behavior could be resolved in the first case by means of a conditional suspension of proceedings⁶⁸ and in the second by means of an abbreviated procedure⁶⁹ or an oral trial.

Article 16. A sentence of 3 to 6 years in prison and a fine of 3,000 to 6,000 days of minimum wage in force at the place of the facts, shall be imposed on whoever:

I. Distributes or supplies gasoline or diesel fuel with the knowledge of delivering an amount less than 1.5 percent of the amount registered by the metering instruments used for its sale or supply.

II. Distributes or supplies liquified petroleum gas with the knowledge of delivering an amount less than 3.0 percent of the amount registered by the metering instruments used for its sale or supply.

III. Distributes or supplies natural gas with the knowledge of delivering an amount less than 3.0 percent of the amount registered by the metering instruments used for its sale or supply.

For the purposes of the cases described in this article, a complaint must be filed by the regulatory body or the offended party.⁷⁰

Article 16 contains three hypotheses: knowingly selling or supplying a smaller amount of gasoline, diesel, liquified petroleum gas and natural gas hydrocarbons than the amount sold (it is a kind of theft or fraud) would be subject to a sentence of 3 to 6 years, which is absurd since this kind of crime mainly applies to gas stations. However, the article also regulates the admissibility of a lawsuit, thus making it impossible for citizens to file a complaint since it would be much easier to change gas stations. Therefore, it is considered that the procedure should be done *ex officio* or by an equivalent requirement from the competent authority.

This type of behavior in the accusatory criminal system can be resolved by means of a reparatory agreement,⁷¹ a conditional suspension of proceedings if the sentence does not exceed the arithmetic mean of five years;⁷² an abbreviated procedure;⁷³ or an oral trial.

⁶⁸ Article 192 of the Código Nacional de Procedimientos Penales..., *op. cit.*

⁶⁹ *Ibidem*, Article 202.

⁷⁰ *Ibidem*, Article 16.

⁷¹ Article 187 of the Código Nacional de Procedimientos Penales..., *op. cit.*

⁷² *Ibidem*, Article 192.

⁷³ *Ibidem*, Article 202.

Article 17. A sentence of 10 to 18 years of prison and a fine of 10,000 to 18,000 days of minimum wage in force at the place of the facts shall be imposed on whoever:

I. Tamper with the metering systems owned by or at the service of assignees, contractors, permit holders or distributors, knowing that this will cause damage or affect the normal operations of said systems.

The same punishment shall apply to whoever engages in the behavior set forth in the preceding paragraph and causes risk of damage or impairs the normal operation of the metering systems.

II. Allows or carries out the exchange or substitution of other substances for hydrocarbons, oil products or petrochemicals without the corresponding authorization of assignees, contractors, permit holders or distributors.

III. Removes or tampers with oil industry pipelines, equipment, facilities or assets without the right to do so or the consent of the person who can legally authorize it.⁷⁴

This behavior is primarily aimed at the workers of assignees, contractors, permit holders or distributors since they are the ones who can tamper with the metering systems or allow or carry out the substitution of the substances.

The third hypothesis is more general because anyone could remove or tamper with industry pipelines, equipment or facilities. The punishment here is considerable and can therefore only be prosecuted through an abbreviated procedure⁷⁵ or an oral trial in the accusatory criminal system:

Article 18. A sentence of 15 to 25 years of prison and a fine of 15,000 to 25,000 days of minimum wage in force at the place of the facts shall be imposed on whoever directly or indirectly receives, collects or contributes financial funds or resources of any kind knowing that they shall be used to commit any behavior typified by this Law.⁷⁶

This article is a masterpiece, dogmatically speaking, because it regulates the responsibility of the perpetrator-by-means or the perpetrator behind regardless of whether the perpetrator uses another person to commit the crime. In other words, it regulates the fact that the crimes are not by direct perpetration.

According to the accusatory criminal system, the established punishment can be reached through an abbreviated procedure⁷⁷ or an oral trial.

⁷⁴ *Ibidem*, Article 17.

⁷⁵ Article 202 of the Código Nacional de Procedimientos Penales..., *op. cit.*

⁷⁶ *Ibidem*, Article 18.

⁷⁷ Article 202 of the Código Nacional de Procedimientos Penales..., *op. cit.*

Article 19. A sentence of 10 to 14 years of prison and a fine of 10,000 to 14,000 days of minimum wage in force at the place of the facts shall be imposed on whoever forces or intimidates by means of coercion, threat or any type of violence anyone who renders their services or performs an activity for assignees, contractors, permit holders, distributors or regulatory bodies, for the purpose of carrying out any behavior described in this law.⁷⁸

Once again, it regulates the perpetrator-by-means when a person's will is manipulated in order to commit a crime. "Article 20. The punishment corresponding to the crime in question shall be increased by up to one half for whoever willfully commits any of the behaviors described in this law and thereby cause damage to natural resources, flora, fauna, ecosystems, water quality, soil, subsoil or environment".⁷⁹

The type of crime regulates concurrent crimes where the protected legal good is nature, with which the punishment shall be increased.

In the accusatory criminal system, the corresponding increase in the punishment would be one solution; however, in general, it can be resolved through an abbreviated procedure⁸⁰ or an oral trial.

As seen, this law is not easy to analyze, but it is essential to know so as to be able to fulfill its purpose of preventing and punishing hydrocarbons crimes.

V. CONCLUSIONS

The Federal Law for the Prevention and Punishment of Hydrocarbons Crimes was created to address crimes related to the energy reform and one of its greatest challenges is to effectively achieve protection through geopolitical projects.

I deem it a wise move that the accusatory criminal system creates the figure of legal counsel for the victims to represent them as parties in the proceedings, namely the assignees, contractors, permit holders, distributors or whoever may dispose of resources in accordance with the law since it is now not only the Office of the Public Prosecutor that will investigate and punish these crimes.

On the issue of punishment, i believe the creation of alternative justice has been a good way to streamline the process, but we must ask ourselves

⁷⁸ *Ibidem*, Article 19.

⁷⁹ *Ibidem*, Article 20.

⁸⁰ Article 202 of the Código Nacional de Procedimientos Penales..., *op. cit.*

about the punishments and whether they address the general and special prevention of the law since it seems that the law fails in one of its objectives, which is prevention, especially if the punishment for public servants is so low that it encourages corruption.

As a public policy, it is proposed that the law be revised from the standpoint of a dogmatic analysis of the crime to further the punitive powers of the State and avoid impunity, specifically by regulating the objective, subjective and statutory elements clearly since the way it is drafted does not even espouse the name of the law, which is to prevent and punish hydrocarbons crimes.

Regarding the accusatory system, although it is true that the system regulates outlets to streamline the process, it is also true that these outlets must ensure the general and special prevention of the provision, which is why more severe punishments have been proposed, especially when public servants are involved.

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LIMITS ON THE IMPLEMENTATION OF THE PRINCIPLE OF LEGITIMATE EXPECTATIONS IN THE FIELD OF HYDROCARBONS

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SUMMARY: I. *Introduction*. II. *Conceptual framework*. III. *Legitimate expectations under European Community Law*. IV. *Legitimate expectations in Mexico*. V. *The position of the Mexican Supreme Court of Justice*. VI. *The principle of legitimate expectations in legislative acts versus administrative acts*. VII. *The implementation of the principle of legitimate expectations in the field of hydrocarbons*. VIII. *Conclusions*. IX. *Bibliography*.

I. INTRODUCTION

In the exercise of its duties, the Mexican Congress established that the Political Constitution of the United Mexican States and Transitory Article 13 of the Hydrocarbons Law would act as the regulatory framework for the Energy Regulatory Commission to issue a ruling that would set the methodology to determine the maximum prices of natural gas object of first-hand sale,¹ and which was published on February 15, 2016, and made effective on the first day of the month following its publication. Therefore, the regulations issued in the exercise of said authority is applicable to the facts and acts carried out

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¹ “This is understood as the first transfer in national territory undertaken by Petróleos Mexicanos, its subsidiaries and any other State productive enterprise, or legal entity, on behalf of and by order of the State. Such sales are to take place upon leaving the processing plants, refineries, injection points of imported product, domestic pipelines, or injection points of hydrocarbons coming indirectly from production fields”. *Cfr.* RES/998/2015. <https://core.ac.uk/download/pdf/230558638.pdf>.

as of its entry into force, as in the case of RES/998/2015. All this is aimed at attaining a greater participation of economic agents in the natural gas market and arguing that this way first-hand sales of this hydrocarbon would reflect the conditions of an international competitive market and where the product would be sold, thus avoiding price arbitrage between different parts of the country while promoting the national production of gas.

However, the promoter company LEO, S.A. de C.V. filed an indirect *amparo* lawsuit for violations to Articles 14 and 16 of the Constitution, arguing that, as a sub-guarantee of the principle of legal security, legitimate expectations were violated because the new methodology for establishing the maximum prices of natural gas, object of first-hand sales, was substantially modified without any transition rules. Therefore, it had a negative impact on the cost projection the company had made since they had reasonably well-founded expectations on which the authorities should act.

Thus, the question that arises is whether contractors have a legally protected right to the immovability of the regulations applicable to them, inherent to the principle of legitimate expectation. In the light of this approach, we argue that were it intended to establish that the authority is obliged not to alter the regulatory conditions to protect a sector, in this case hydrocarbons contractors, then it would harm the collective and would not respond to the social reality because the regulation would then be set in stone.

Therefore, we will begin by discussing the origin of the principle of legitimate expectation, the position of the Mexican Supreme Court of Justice on this matter, and its application in other countries, with special emphasis on European Community law where more pronouncements have been made.

II. CONCEPTUAL FRAMEWORK

Throughout history, societal coexistence and the evolution of the organization of the State are, among other factors, those that have made it possible to build principles that tend to ensure the stability and safety of the governed.

One of these legal principles stands out, not only because of its scope and transcendence, but because it is a pillar for peace of mind, certainty, and the fair and equal freedom of the people who make up the State. We are referring to the principle of legal security, which has its etymological origin in the Latin word *securitas*, from *securus* which means “to be free from care,” that is, to be safe from danger.

It is confidence in the law itself and its impartial and fair application, serving as a guideline or reference for action, with three elements: legal security, effectiveness of the law and the absence of arbitrariness, since the actions of public authorities, especially the Judiciary, must be fully justified by an enabling law.²

Therefore, this principle can be applied in two ways: objectively and subjectively. The first represents the existence of a just and effective social order whose compliance is ensured by public coercion. The subjective dimension represents the certainty an individual has that his property will be respected.³

This principle is enshrined in the Mexican Constitution, specifically in Article 16. Along this vein, the country's highest court considers this the basis of the Mexican legal system, to the extent that it protects the rights of the governed not to be placed in a situation of legal uncertainty and, consequently, in a state of defenselessness.

The above has two implications: on the one hand, it grants certainty to the governed and on the other hand, it grants access to means of defense.

Regarding the first one, it is still necessary to implement and enforce better administrative practices to safeguard the rights of the governed, which is why authorities must incorporate such practices in their acts and decisions in order to avoid infringing fundamental rights. This can be achieved, for instance, by minimizing the margin of discretion and even avoiding the use of intimidating language, rights that are already set forth in Article 2 of the Federal Taxpayer Rights Law.⁴

As to the second aspect, the means of defense are the mechanisms granted by legislators so that individuals can fight for State conduct they deem serious, authoritarian or illegal. In other words, it is the instrument that allows placing the interest of the governed in opposition to the arbitrariness of the monarch or whoever represents the power of the State. It also addresses the premise of "knowing what to expect" from the content of the laws, the actions of the authority itself and legislative acts, which undoubtedly implies giving certainty to the governed.

In this context, one of the principles that has emerged in the reiterated interpretation of legal certainty is that of legitimate expectations. It is worth

² Regueros de Ladrón de Guevara, Sofía, "La seguridad jurídica en el derecho tributario", *Lecciones de derecho tributario inspiradas por un maestro*, Bogotá, Universidad del Rosario, 2010, Colección Institucional, vol. I, 250.

³ *Diccionario Jurídico Mexicano*, *op. cit.*, p. 3429.

⁴ Procuraduría de la Defensa del Contribuyente, criterio sustantivo 7/2015/CTN/CS-SASEN, 2015, available at: http://www.prodecon.gob.mx/buscador_c/buscarcrit/166.

mentioning that this principle was once thought to have appeared only recently in Mexican law, but it is not so.

This principle of the protection of legitimate expectations, as such, has its origins sixty-three years ago in post-war Germany.

1. *Legitimate expectations in the “Berlin Widow” case*

In the German system, the principle of protection of expectations can be traced back to the mid-19th century, but its exact definition and form is found after World War II, specifically in the case tried by the German Federal Administrative Court on October 28, 1959, which upheld a decision of the Berlin Superior Administrative Court, and which is better known as the “old widow’s case”.⁵

The case centered on the validity of revoking the widow’s pension of a Berlin widow “living in the eastern part of the city who applied to the authorities of the western part of the city to receive her pension in that part of the city and, once this possibility was approved, she moved there and began to receive her pension payments”.⁶

But having already settled in her new home and borne the expenses of relocating there, the German authorities reviewed the pension application again, even after her having received pension payments. From this second review, the authorities decided to revoke the authorization and not only stopped covering it, but also demanded the return the pension already paid. In other words, the affected party had made a key decision that would be difficult to revoke in the expectation of the legality of administrative action.

Therefore, this woman appealed before the Berlin Administrative Court of Appeals, which found that even though, after a second review, the requirements for obtaining the pension had not been met, the authority’s actions undoubtedly instilled a sense of stability and confidence in the validity of the pension; even more so when the court had instructed the woman to change her place of residence in order for her pension application to be admissible. In view of this, we hold that the authority violated the expectations of the governed in the legality of administrative action.⁷

⁵ Santamaría Pastor, Juan Alfonso, *Los principios jurídicos del derecho administrativo*, Madrid, La ley, 2010, p. 1179.

⁶ *Idem*.

⁷ Malvaez Pardo, Gabriela, “El principio de la protección de la confianza legítima en México”, *Ars Iuris. Revista del Instituto Panamericano de Jurisprudencia*, Mexico, No. 51, December 2016, pp. 75 and 76.

In Germany, this principle was called *Vertrauensschutz*, which literally translates as “protection of trust”. Later and with the everyday judicial activities in Europe, the adjective “legitimate” was added since it was deemed that it could not be applied to any expectation of rights, but only to those in which the actions of the authorities were such and sufficient to be presumed to have generated enough certainty in the governed.⁸

Legitimate expectations are then a subprinciple which stems from: “... legal certainty ...the sum of certainty and legality, hierarchy and regulatory disclosure, the non-retroactivity of the unfavorable, the interdiction of arbitrariness... legal certainty is the sum of these principles, balanced in such a way as to promote justice and equality in freedom throughout the legal system”.⁹

But the principle of legal certainty does not protect the need to indefinitely uphold the legal system established at a given historical moment. In German law, the principle of protection of expectations is used as a limit to the legislative power on the retroactivity or non-retroactivity of laws, *i. e.*, it is the trust of the governed in observing the law in force.

Hence, we agree that the principle of legal certainty in one rule of law aims to protect the governed from arbitrary acts and wayward changes done by the ruling class as it recognizes that the actions of the authority may generate people’s legitimate expectation of rights, and when this is violated, it transgresses the sub-principle of legitimate expectations. However,

The regulations that by law exclusively affect the future appearance of legal situations, rights or relationships do not clash with the principle of the protection of expectations. Citizens cannot rely on the fact that laws enacted at a given time will remain unchanged. Much less can legislators be expected to act in a certain way if they have to react to new developments or evolutions, admit new knowledge and impose new political (and we would also add economic and geopolitical) concepts.¹⁰

⁸ According to the Mexican Supreme Court of Justice, the expectation of rights is understood as the intention or hope that a given situation will occur and subsequently result in a right. It is a forward-looking situation that is different from an acquired right, which is one that has come into the individual’s possession, ownership or legal assets, or that implies that an asset, power or benefit has been introduced into an individual’s possession or legal assets. But it should be remembered that in tax matters, we can only invoke the expectations of rights. *Cfr.* Tesis 2a. LXXXVIII/2001, *Semanario Judicial de la Federación y su Gaceta*, Novena Época, t. XIII, June 2001, p. 306.

⁹ García de Enterría, Eduardo, *La responsabilidad patrimonial del Estado legislador en el derecho español*, Navarra, Thomson Civitas, 2005, p. 30.

¹⁰ García de Enterría, Eduardo, *La responsabilidad patrimonial del Estado...*, *op. cit.*, p. 34.

2. *Legitimate expectations in the “Barracas slaughterhouses” case*

It should be pointed out that while most scholars in the field find the origin of legitimate expectations in the “Berlin widow case”, this is not actually the case. In the late 19th century, the Supreme Court of Justice of Argentina had already alluded to the idea of legitimate expectations in its judgments, as in the case of the “Barracas *saladeristas*” case (a case filed by drysalters Mr. Santiago, Mr. José and Mr. Podestá, Mr. Guillermo Betram, Mr. Guillermo Anderson, Mr. Casimiro Ferrer, Mr. Jerónimo Rocca, Mr. Constant Santa María, Mr. Juan Smith and Mr. Jerónimo Soler *v.* the Province of Buenos Aires for compensation for damages) in which the *saladeristas*¹¹ challenged a provincial ordinance that suspended their operations for discharging waste into the Riachuelo river. The plaintiffs argued that they did so by official permission and that they could freely work where they had installed themselves, invoking legitimate expectations to those to who invested their capital in the salting business. The Supreme Court ruled that the “Barracas *saladeristas*” could not invoke their permit to claim acquired rights because it was granted to them under the implicit condition of their operations not harming the general interests of the community because no one can have an acquired right that compromises public health¹²

This shows that by the end of the 19th century, the expectation of rights legitimated by government actions was already recognized and, therefore, they demanded the protection of legitimate expectations.

3. *The figure of legitimate expectations in Britain*

The British system assumes a different position through a figure called estoppel, which is applied in a similar way as the principle of protection of legitimate expectation in civil law countries and recognizes common elements like trust in the acts. Hence, the contracting parties must not perform acts that undermine the trust they generated by their actions or previous practices by other parties.¹³

¹¹ In Argentina, *saladeristas* is the name given to the workers who cure meat with salt. *Cfr.* Leyes, Rodolfo, “Del saladero a la fábrica de extracto de carne: Transformaciones de los procesos de trabajo en la industria de la carne. Entre Ríos, 1864-1935”, *Trabajo y Sociedad*, Argentina, No. 26, 2016, available at: <https://www.redalyc.org/pdf/3873/387343599020.pdf>.

¹² López Mesa, Marcelo J., *Presupuestos de la responsabilidad civil*, Buenos Aires, Astrea, 2013, p. 569.

¹³ The estoppel is primarily procedural in nature. *Cfr.* Jiménez García, Francisco, *Los comportamientos recíprocos en derecho internacional: a propósito de la aquiescencia, el estoppel y la confianza legítima*, Madrid, Dilex, 2002, p. 49.

The figure of estoppel revisits the general legal principle of *venire contra factum proprium non valet* (to come against one's own fact is not allowed), which consists in that individuals have the legal duty not to contradict past acts since the interpretation of said behavior must be made under clear criteria that include the following elements: a) a past, valid and legal binding act, which enables a party to identify that it would act thus in the future; b) in contrary intent, the subject who engendered expectation through the action has an intent contrary to that which was initially conceived; c) recognizing harm to third parties, which refers to the binding behavior that has modified its condition; and d) identity of the parties in that prior and subsequent behavior must be attributed to the same party. In other words, the core of the theory of estoppel lies in the legitimate expectations vis-à-vis third parties and that are justified based on legal reasons.

The United Nations Terminology Database defines the concept of “estoppel” as “a legal bar that prevents one from asserting a claim or right that contradicts what one has said or done before or what has been legally established as true”¹⁴ *i. e.*, whoever has induced another to act in a certain way cannot deny what has been said or done; therefore, the person cannot retract their statement when it is unfavorable to them. In this respect, in the case of “Abrill Alosilla *et al.* v. Peru” of March 4, 2011, the Inter-American Court of Human Rights ruled on the express statement of the government of Lima that the plaintiffs had complied with the requirement of exhausting the internal remedies and had subsequently turned to the Inter-American Commission of Human Rights, which expressly stated that, under the principle of estoppel, the Peruvian State could not change its position by arguing that the defendants had not exhausted domestic legal remedies. In our opinion, this theory applies in procedural and regulatory aspects of contracts, but differs in meaning from that of legitimate expectation, *i. e.*, it is one of the parties seeking to modify the content or meaning of the contract without bringing into play the actual content of the regulation.

Thus, without discussing who is responsible for the origin of this principle of legitimate expectations, it is clear that the principle stems from the legal certainty that the governed must be able to foresee any State interference that could affect them, and that the authority must act within the law, always prioritizing public interest.

¹⁴ The United Nations Terminology Database, Estoppel, available at: <https://unterm.un.org/UNTERM/Display/Record/UNHQ/NA?OriginalId=e0e12b3d9a92d47a852569fd00029aa9>.

III. LEGITIMATE EXPECTATIONS UNDER EUROPEAN COMMUNITY LAW

Given the dynamism of the economic reality of the European Community and the nature of the abovementioned principle, the criteria have focused on economic law and on the temporary validity of the provisions.

Thus, through the General Court of Justice, the European Community has issued various criteria on the principle of the protection of legitimate expectations which, coupled with the structural principle of loyal cooperation or community loyalty established in the Amsterdam Treaty, makes Community institutions accountable to the Community agents or operations who have placed their trust in them.¹⁵

Community stakeholders' indiscriminate invocation of this principle, as well as the elusiveness of a precise definition of the baseline for legitimate expectations, the nature of which requires a case-by-case assessment, have made it difficult for the Court of Luxembourg to establish the specific aspects for applying the principle of protection of legitimate expectation.

On this point, European Community case law has consistently held that the principle of the protection of legitimate expectation may be invoked by any economic operator when a Community institution has generated well-founded expectations.¹⁶ However, recognizing that this principle is accessible to any Community operator also implies establishing the three requirements that must be jointly observed:

- The Union's administration must provide the interested party with specific and consistent assurances from authorized and reliable sources.¹⁷
- These guarantees must be such as to raise a legitimate expectation in the mind of their intended target.¹⁸

¹⁵ Jiménez García, Francisco, *Los comportamientos recíprocos en derecho internacional: a propósito de la aquiescencia, el estoppel y la confianza legítima*, Madrid, Dilex, 2002, p. 66.

¹⁶ See the judgment of March 11, 1987, Van den Bergh in Jurgens y Van Dijk Food Products (Lopik)/CEE, 265/85, EU: C: 1987:121, apartado 44, available at: <https://eur-lex.europa.eu/legal-content/ES/TXT/?qid=1549046495742&uri=CELEX:61985CJ0265>.

¹⁷ See the sentence of June 30, 2005, Branco/Comisión, T-347/03, EU: T: 2005:265, apartado 102, available at: <http://curia.europa.eu/juris/celex.jsf?celex=62003TJ0347&lang1=en&type=TEXT&ancre=>.

¹⁸ See the judgment of February 23, 2006, Cementbouw Handel & Industrie/Comisión, T-282/02, EU: T: 2006:64, apartado 77, available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:62002TJ0282_SUM&from=MT.

- The guarantees given must be in accordance with the applicable provisions.¹⁹

Upon fulfilling these requirements, the prudent and diligent economic operator will be in a position to foresee the adoption of the measure that may affect its interests since otherwise this principle could not be invoked to their benefit.²⁰

Thus, the principle of protection of legitimate expectations is part of the fundamental principles of the European Community; its application is rationalized in the Community interest. Suffice to revisit Community case law, which states that Community agents cannot legitimately trust that an existing situation will be maintained since limiting the capacity of Community institutions to modify legal situations based on variations of reality would harm the Community,²¹ invalidating the possibility of invoking an acquired right to maintain an advantage.

What is noteworthy is that the Court has recognized that the principle of legitimate expectations also applies to cases in which Community authorities, by modifying their behavior, cause damage to economic agents even when the modification is legally justified. But if a transitory provision was not issued, in which it a reasonable term was given for its implementation, it must be evaluated according to the nature of each case.²²

From the above, we can infer that its application in the exercise of the regulatory power to control a situation to benefit the Community, whether in the administrative or legislative sphere, is temporary in order to allow Community stakeholders to adapt to the new reality so that they can take the necessary precautions and not be negatively affected by it.

Thus, Community case law has repeatedly analyzed the concept of foreseeability that amendments must have so that the actors can adjust their actions. In this regard, in order to determine whether a rule is foreseeable, the following should be considered:

¹⁹ See the judgement of June 30, 2009, CPEM/Comisión, T-444/07, EU: T: 2009:227, apartado 126, available at: <http://curia.europa.eu/juris/celex.jsf?celex=62007TJ0444&lang1=en&type=TEXT&ancre=>.

²⁰ See the judgment of Di Leonardo Adriano Srl y Dilexport Srl, Asuntos acumulados C-37/02 y C-38/02, apartado 70, available at: <https://eur-lex.europa.eu/legal-content/ES/TXT/?qid=1549049278095&uri=CELEX:62002CJ0037>.

²¹ *Idem*.

²² Sentencia de LVM, Elf Atochem, Shell y DSM y DSM Kunststoffem, T-305/94, T-306/94, T-307/94, T-313/94, available at: <http://curia.europa.eu/juris/document/document.jsf?docid=44539&doclang=ES>.

- The new law resulting from the change in the public authority's the point of view is not normally foreseeable.
- A new rule resulting from a change in circumstances may be foreseeable for a prudent operator.
- A provision that solves pre-existing problems is foreseeable for all operators.²³

As seen, legitimate expectation operates in favor of the economic agents when an unforeseen alteration affects their usual operation. Since these modifications are usually duly justified in favor of the Community, legitimate expectations then operate by safeguarding the existence of a reasonable period for the entry into force of the new regulations or by guaranteeing the existence of transitory provisions. However, the latter will only be granted on a particular basis since it cannot be considered a generality.

IV. LEGITIMATE EXPECTATIONS IN MEXICO

The concept of legitimate expectations alludes to the situation of a subject endowed with a justified expectation of obtaining a benefit, an abstention or a statement favorable to their interests from another, arising from the latter's behavior, in the sense of fostering such an expectation. In Mexico, the relationship that gives rise to legitimate expectation generally involves the Administration.²⁴ All the above allows us to affirm that legitimate expectations are the certainty created in the governed by the government authority and constitutes a legitimate expectation of rights, whose evaluation is left to the discretion of the judges who must determine whether the positive and negative elements of the actions were sufficient to legitimize said expectation since not all expectations of rights are legitimate. These can be simple because they do not have any protection whatsoever since granting them would imply a paralysis in the evolutionary development of the law and would lead to multiple parallel regulations and, hence, chaos.

In other words, there are two aspects in which this principle can be invoked in the administrative and even the legislative spheres. When ap-

²³ Sanz Rubiales, Íñigo, "El principio de confianza legítima limitado del poder normativo comunitario", *Revista de Derecho Comunitario Europeo*, Spain, Year 4, No. 7, January-June 2000, p. 114.

²⁴ Rondón de Sansó, Hildegard, "El principio de confianza legítima o expectativa plausible en el derecho venezolano", *El derecho venezolano a finales del siglo XX*, Venezuela, Biblioteca de la Academia de Ciencias Políticas y Sociales, 1998, p. 311.

plied in administrative law, it is interesting when speaking of the legitimate expectations that have been raised in the governed by administrative acts and different from the legislative work, considering that the latter can only be invoked in certain cases and under specific criteria. Therefore, if we are dealing with an act that motivates its exercise, it is administrative in nature and the scope of this principle encompasses the expectations of law since it can result from the express recognition by the authority or from its silence, that is by tolerating, as in the above-mentioned case of the “Berlin widow”.

However, in legislative acts, this principle is valid only for acquired rights as allowing its application in the expectations of law would imply paralyzing legislative work or slowing down the development of the right to the detriment of society.

V. THE POSITION OF THE MEXICAN SUPREME COURT OF JUSTICE

We start from the premise that legitimate expectations represent the expectations of rights in the case of administrative acts and acquired rights when it involves legislative acts.²⁵ Based on this classification, the Supreme Court of Justice narrows the scope of application of the principle of legitimate expectations by differentiating between administrative and legislative acts.

As regards administrative acts, the principle is invoked to safeguard mere legal expectations because even when there was no rule regulating certain behaviors or circumstances (objective law) if the administrative authorities had previously issued an act in which it recognized a private individual the possibility of enjoying a right or committing a behavior or, as the case may be, had tolerated it or even kept silent for a prolonged period of time, it is thereby generated the expectation that the situation would be upheld. Then, regarding administrative acts, legitimate expectations must be understood as the protection of the expectations reasonably created in favor of the governed since the authority itself induced or tolerated said expectations from its actions or omissions, which were moreover maintained permanently over time. Hence, the individual assumed this behavior, but due

²⁵ Concerning administrative acts, the Mexican Supreme Court of Justice has granted individuals the prerogative of an expectation of rights, as shown in the following isolated opinion: “revalidación de permisos o autorizaciones para realizar una actividad de interés público. el particular tiene una legítima expectativa de derecho que obliga a la administración pública a motivar ampliamente (motivación reforzada) su negativa”. Tesis I.18o.A.81 A (10a.), *Gaceta del Semanario Judicial de la Federación*, Décima Época, July 2018, t. II, p. 1599.

to a sudden and unforeseeable change, that expectation was broken. Public or collective interests must then be weighed against private interests to see which will prevail since authorities may modify the decision in response to an imperative need of the public interest, but without infringing on the rights of the governed.

Our analysis must be closely related to:

...the principle of unilateral irrevocability of the administrative acts that contain favorable resolutions, within the framework of what is prescribed in Articles 2, last paragraph, and 13, section III, of the Federal Law of Administrative Contentious Procedure, in addition to Article 36 of the Federal Tax Code, from which it follows that the modification of a ruling in favor of an individual can only be modified before the competent court, *i. e.*, the Federal Court of Administrative Justice, specifically through the trial of harmfulness.²⁶

Therefore, legitimate expectations are considered the subprinciple that protects the expectations reasonably created in favor of the governed based on the hope that the authority itself conveyed with its actions or omissions, which were sustained over time and generated security in the individual in which the individual's behavior adjusted (expectation) but that, due to a sudden and unforeseen change, said expectation was broken.

It is clear that regarding those legislative acts, legitimate expectations:

Should be invoked only under the perspective of non-retroactivity of the provisions enshrined in Article 14 of the Political Constitution of the United Mexican States because attempting to protect mere legal expectations against legislative acts would be equivalent to freezing the right, to its total or partial immobilization and subsequent definitive closure to social, political and economic changes, which would go against the democratic rule of law and the power of lawmakers to tailor the law to the changing needs of society and reality.²⁷

The above makes even more sense in a globalized world with a fast-paced technological dynamic.

Moreover, specifically in the tax sphere, its legislation is a matter for the Congress and, therefore, entails a wide margin of freedom in its design. Thus,

²⁶ Tesis 2a. XXXVIII/2017 (10a.), *Gaceta del Semanario Judicial de la Federación*, Décima Época, March 2017, t. II, p. 1386.

²⁷ Tesis 2a. XXXIX/2017 (10a.), *Gaceta del Semanario Judicial de la Federación*, Décima Época, March 2017, t. II, p. 1387.

there is not constitutionally protected right for the tax system to remain unmodifiable and static; on the contrary, it is indispensable for the public power to adapt tax regulations to public needs, always seeking the collective interest, which outweighs the individual interest of each taxpayer. Therefore, by guaranteeing the protection of the principle of general taxation, the ultimate aim of the State —the common good— is protected, but this can only be possible if the necessary financial resources are available. The constitutional reform on energy was specifically intended to bring about a trade opening that would allow Mexico to receive technology and investments that would make the State self-sufficient in hydrocarbons. Although the country potentially has the resources, it is necessary and very costly to extract them, and this requires capital. But it is not in the interest of generating economic development that we can accept an attempt to petrify the rules for the benefit of business interests and to the detriment of the State, and even less so in such a dynamic field where not only national factors, but also geopolitical interests, have an impact. Accordingly, legitimate expectation does not have the power to oppose lawmakers with mere legal expectations to question the constitutional regularity of the acts determining the establishment, modification or elimination of regulations on contributions, costs or prices because it is impossible for the taxpayer to expect that a rate, tariff or even tax system will remain unchanged in the future. We find this contrary to constitutional principles to do so.

Therefore, there are two reasons for which the possibility of enforcing to protection of legitimate expectations against acts of the legislative branch cannot be invoked:

1. Its application would imply the paralysis of the law and consequently the definitive shutdown to social change.
2. Processes of reform or enacting new laws must be in the public interest and not in the interest of private parties.

Legitimate expectation in national law must be understood as a sub-principle or manifestation of the principle of legal certainty as an interdiction or prohibition to arbitrariness or excess. Hence, the expectation generated cannot be modified capriciously, untimely and unpredictably by the authority, except when so required by the public interest, for which it is essential to justify and state the reasons, *i. e.*, to apply the “test of damage and public interest *ex officio*”. It is then necessary “to distinguish these differences and formulate a suitable and adequate classification of the information,

thus generating an individualized and pertinent rule for the case by applying the test of damage and public interest *ex officio*...”.²⁸

It is important to point out that the application of legitimate expectation must be qualified according to the case when it is invoked in defense of administrative acts. In legislative acts, it must be assessed whether it is an issue for legislators. Therefore, there can only be a violation of rights by the retroactive application of the rule and in that case, the legal sphere of the governed would be violated.

Specialization that arises every day in the law makes it possible to clearly identify allusive aspects of the application of the rules, where it is necessary to point out that in the interpretation of the constitutional text and general principles of law, they allow the judge to positivize such refined institutions as legitimate expectations in their resolutions, although not with the same background and development, but in the material results. Therefore, when our courts hold that legitimate expectations are the manifestation of the right to legal certainty in its aspect of interdiction or prohibition of arbitrariness or excess, then it's different nuances be recognized, depending on whether it is invoked against administrative or legislative acts,²⁹ but the important thing is that its existence is recognized and that it can be invoked.

VI. THE PRINCIPLE OF LEGITIMATE EXPECTATIONS IN LEGISLATIVE ACTS *VERSUS* ADMINISTRATIVE ACTS

The principle of legal certainty, as mentioned, does not cover the need to indefinitely preserve the legal system established at a given historical moment since the social and economic dynamics are dialectic. The regulations by law that exclusively affect the future emergence of situations, rights or legal relations, in our opinion, do not condition the principle of protection of legitimate expectations because the governed cannot assume that laws must remain unchanged. It is essential for legislators to be ready to react to new scenarios, application of technologies and even correct the mistakes they may have made, always assuming that lawmakers will respond to the will of the people in a democratic regime since a democracy cannot exist if, when faced with a change in the legislative order, compensation could be

²⁸ Tesis 2006299. I.1o.A.E.3 K (10a.), *Gaceta del Semanario Judicial de la Federación*, Décima Época, April 2014, p. 1523.

²⁹ Tesis 2a. /J. 103/2018 (10a.), *Gaceta del Semanario Judicial de la Federación*, Décima Época, October 2018, t. I, p. 847.

demanded from the State under the argument that rights like trust in the previous law were transgressed. A statement of this type would paralyze energy economic activities. The road map of the changes that began late last century must be maintained where, from a legal perspective, the pursuit of objectives of general interest stands out, separating the operating companies from the political agents and technical authorities that regulate it. However, not only the economic aspect should be protected, but modern, clean and energy-efficient technologies must be sought so as to promote the reduction of greenhouse gases and mitigate climate change, factors that allow us to advance in research, development and innovation and this cannot be achieved by paralyzing the regulatory system.³⁰

Thus, the principle of legal certainty is a superior value that constitutes the very concept of the rule of law. It has even been asked whether the State must respond financially for a modification to the law, and the answer is no, because we should remember that this principle is the sum of certainty and legality, hierarchy and regulatory publicity, non-retroactivity and a deterrent to arbitrariness, which allows justice and equality in freedom, but never the immobility of the law. For this reason, lawmakers must prioritize clarity and not opacity in the regulatory content and must therefore avoid confusing and ambiguous situations to provide certainty.

We cannot say that the principle of legal certainty can protect the need to indefinitely preserve a legal system or provision that was established at a certain time and under certain conditions, but it must guarantee citizens' trust in adherence to and respect for the situations resulting from the application of valid rules in force. In terms of the procedural rules of the provision to be applied, it is the one in force at the time the regulatory assumption is made. Therefore, to argue that the State intends to give retroactive effects to a provision by applying the new rule to a situation that occurred previously, but that is updated in the procedure of calculation or price, is incorrect in our opinion.

In this context, the principle of expectations is a limit to the legislative power, but only in relation to the non-retroactive application of the new regulatory constructs, a right embodied in Article 14 of the Mexican Constitution. This article also implies the need to not freely repeal the rules that establish guarantees for the governed, but we cannot go to the other extreme and pretend that, invoking the principle of protection of legitimate

³⁰ Hernández-Mendible, Víctor and Orjuela Córdoba, Sandra, *Energía eléctrica: regulación de fuentes convencionales, renovables y sostenibles*, Venezuela, Editorial Jurídica Venezolana, 2017, p. 55.

expectations, compensation can be requested because lawmakers changed the law. Fortunately, there are no precedents in Mexico's jurisprudence or courts recognizing and declaring compensation for legislators' patrimonial liability, but it should be pointed out that the possibility of compensation would only apply to acts or rulings by the administrative authority when its actions are irregular.

VII. THE IMPLEMENTATION OF THE PRINCIPLE OF LEGITIMATE EXPECTATIONS IN THE FIELD OF HYDROCARBONS

In Mexico, after the constitutional reform of December 20, 2013, the reforms and additions to various provisions of the Political Constitution of the United Mexican States on energy were published, with amendments made to Articles 25, 27 and 28. The reform to Fourth Transitory Article established that for 120 calendar days following its entry into force, the necessary adjustments to the legal framework would be analyzed to enforce the provisions of the law in question, among which contracting modalities stand out.

Thus, on August 11, 2014, the Hydrocarbons Law was published in the Federal Official Gazette to regulate Article 25, paragraph four; Article 27, paragraph seven; and Article 28, paragraph four, of the Constitution concerning the oil industry and which were published in the Federal Official Gazette on November 29, 1958, but it was not until October 31, 2014, that the Regulations of the Hydrocarbons Law was published in the Federal Official Gazette.

In this context, the ruling is issued to set the methodology to determine the maximum prices of natural gas subject to first-hand sale. Published in the Federal Official Gazette on February 15, 2016, it entered into force on March 1, 2017, with Energy Regulatory Commission Resolution (CRE) RES/998/2015. In response, contractors filed *amparo* suits against the Decree by which the Hydrocarbons Law is issued and various provisions of the Foreign Investment Law, the Mining Law and the Public-Private Partnerships Law are amended, published in the Federal Official Gazette on August 11, 2014, particularly Articles 81, Section VI, 82 and Thirteenth Transitory Article of the Hydrocarbons Law. The CRE was one of the authorities held responsible in the various *amparo* proceedings and was sued for issuing and ordering the abovementioned resolution, as well as for issuing the preliminary draft and regulatory impact statement prior to such resolution and its sole annex. Petróleos Mexicanos was sued for implementing the above reso-

lution and violating the rights embodied in Articles 1, 14, 16, 25 and 28 of the Federal Constitution.

The central argument was that, while considering the estimated value of the price of natural gas in southern Texas, the new ruling considers the long-term relationship between the Houston Ship Channel, Henry Hub and southern Texas markets, as opposed to the arithmetic average previously used.

The CRE simply stated that such a ruling was because of the need for first-hand sales of natural gas to reflect the conditions of a competitive market, the opportunity cost and conditions to compete in the international energy market, but without saying how the changes made would contribute to reaching that end, so that the provisions have the same purpose but a different methodology. It was also argued that the absence of a reasonable period of time for the transition process to this new methodology violated its legal sphere.

In other words, Articles 81, Section VI and 82, as well as the Thirteenth Transitory Article of the Hydrocarbons Law, in accordance with RES/998/2015 and its sole annex, violated the rights of legality and legal certainty because they lacked the necessary justification, since before the new constitutional and legal framework applicable to natural gas prices, RES/524/2015 and its sole annex were in force, contemplating two different methodologies depending on the place where the first-hand sale took place, whether in Reynosa, Tamaulipas or in Ciudad Pemex, Tabasco.

Therefore, in the first-hand sale of natural gas conducted in Ciudad Pemex, Tabasco, the daily or monthly price of the maximum first-hand sales price in Reynosa, Tamaulipas, was taken as a basis and the netback rate applicable to the net rate from the Reynosa border to Ciudad Pemex was added to it. That is, the price was the same in one place and the other, only that the cost of transportation from Reynosa would be added. This is reflected in the opportunity costs and in the conditions of competition in the international gas market and even where the sale is made, but the new methodology to determine maximum first-hand natural gas prices was modified.

Thus, if we bear in mind that according to Article 25 of the Constitution, the State must guarantee the country's economic growth, it was argued that this methodology contravened rights and even violated Articles 33, 34 and 35 of the Charter of the Organization of American States and Article 26 of the American Convention on Human Rights, since Mexico has the duty to protect the economic and cultural rights provided in the Constitution, specifically the right to comprehensive development. As it is violated, when there is a rise in natural gas prices, this attitude must be analyzed

and reined in because it undoubtedly affects the entire production and sales chain, in addition to the fact that this measure was neither grounded nor justified as to why said amendment was made, which then led to an imbalance in the development of the private sector. Therefore, the new methodology is believed to be contrary to the spirit of Article 25 of the Constitution, as it slows down economic development and does not encourage fair growth; on the contrary, it generates an increase in electricity prices. Therefore, the ruling issued regarding Article 81, Section VI, Article 82 and the Thirteenth Transitory Article of the Hydrocarbons Law is deemed contrary to Article 28, third paragraph of the Constitution.

Under this context, the following were brought before Mexican courts as claimed acts:

- The discussion, approval, enactment, order of publication and endorsement of the Hydrocarbons Law, particularly Article 81, Section VI, Article 82 and the Thirteenth Transitory Article;
- The issuance of the regulation of activities referred to in Title Three of the Hydrocarbons Law, in particular with respect to the Seventh Transitory Article;
- The issuance of resolution RES/998/2015 and its sole annex;
- The preliminary draft of the methodology resolution and the regulatory impact statement attached thereto, and
- The invoice showing the increase in the gas.

All the above, under the argument of that the principle of legal certainty and legitimate expectations was violated.

We will begin by pointing out that it is questionable as regards the invoice that there is no conclusive evidence to determine if the plaintiff knew about the invoice on the date the digital tax receipt was issued. In these cases, two moments can be identified: the first, in attaching the digital Tax Administration Service seal; and the second, placing the voucher at the disposal of the taxpayer for which it is issued and claims to argue that it was aware of the acts that are claimed, not on the date of issuance, but until the corresponding payment was made. Then, it is not possible to indicate that the act was known until the corresponding payment was made since it is necessary for the invoice to be processed for it to be issued. On the other hand, Pemex's issuing the invoice is not an act of authority for effects of the *amparo* because the company's action does not mean that it was performed as an authority since it was carried out in a commercial relationship and is therefore an act between private parties.

It should be established that the Energy Regulatory Commission has the authority to supervise the regulated activities and, among others, to take measures like issuing general provisions for the regulation of the activities set forth in the Hydrocarbons Law, including the terms for providing services and determining the applicable considerations, prices and tariffs, except for the activities of retail sales, liquified petroleum gas (LP), gasoline and diesel. Therefore, it is incumbent on the CRE to issue the pertinent resolutions and therefore Resolution 998, issued in 2015, is legal and constitutional.

In this way, the regulations should contemplate the applicable taxes, the opportunity cost and the competitive conditions of the international market. Hence, the Regulatory Energy Commission can establish the generally applicable methodology for calculating the considerations, prices or tariffs applicable to goods or services that cannot be traded on the international market, whereby the methodology should consider an estimate of efficient costs to produce the good or provide the service and obtain an acceptable return that reflects the opportunity cost of the capital invested, the estimated cost of financing and the risks inherent to the project.

Thus, first-hand sales of hydrocarbons, oil products and petrochemicals will be subject to asymmetric regulation prices issued by the Energy Regulatory Commission, in accordance with the provisions of the Law of Income on Hydrocarbons. In addition to all of the above, the opportunity cost and the conditions of competition in the international market should be taken into account. On the other hand, the third paragraph of Article 28 of the Mexican Constitution states that the laws will set the bases for establishing the maximum prices of articles, materials or products needed for the national economy or for mass consumption; that is, the constitutional text empowers ordinary legislators to use ordinary laws to regulate the determinations of the maximum prices of goods or services needed for national economy or mass consumption so that the corresponding regulatory aspects are delegated to the laws issued by Congress. Through them, the mechanisms, procedures and authorities in which such power can be exercised may be established.

In view of the above, we believe the principle of legal certainty is not affected because based on the provisions of the Hydrocarbons Law, the governed have the certainty of the instances in which the Energy Regulatory Commission can and must establish the maximum first-hand prices for the sale of natural gas, as well as the cases in which such authority can be exercised by the Federal Executive branch. Attempts have been made to argue that there are inconsistencies between the provisions of Article 9, Sections I and II of the Federal Antitrust Law and Article 81, Section VI, Article

82 and Thirteenth Transitory Article of the Hydrocarbons Law, by trying to prove the violation of the principle of certainty because there is no certainty as to who the competent party is to establish maximum prices for first-hand sales of natural gas. Such attempts are not valid because Article 9 of the Federal Antitrust Law stipulates that the determination of the maximum prices of goods and services necessary for national economy or mass consumption corresponds solely to the Federal Executive Branch, who, under the terms of Article 28 of the Constitution, may determine by decree the goods and services that may be subject to maximum prices as long as there are no conditions of effective competition in the corresponding market while the Commission is the body to issue the statement as to whether there are conditions of effective competition or not.

Therefore, the Ministry, without affecting the powers of other agencies or entities and prior opinion of the Commission, will set the prices corresponding to goods and services based on criteria that prevent supply shortages. So, it is feasible to impose maximum prices for goods and services necessary for the national economy or mass consumption, but for this, it is essential for the Commission to determine, through the corresponding statement, that there are no conditions of effective competition. As a result of said statement, the Federal Executive Branch can then determine prices by decree.

To this end, the Congress expressly empowered the Energy Regulatory Commission to determine the maximum first-hand sale prices of hydrocarbons, oil products and petrochemicals and even to establish the corresponding methodology so as to limit Pemex's dominant power to the extent that greater participation of economic agents is achieved in a way that encourages market development and competition. Accordingly, Article 9 of the Federal Antitrust Law grants an exceptional power to the head of the Federal Executive Branch, which can only be exercised after the Federal Antitrust Commission issues a statement indicating that there is no effective competition, in which case the Mexican President can set the maximum prices for the sale of goods and services.

Thus, secondary laws on hydrocarbons, oil products and petrochemicals empower the Energy Regulatory Commission to issue, in principle, the regulations on the applicable considerations, prices and tariffs so as to encourage the participation of new parties in the energy sector and open up the market.

The Hydrocarbons Law contemplates the common and particular assumption of competence to regulate such matters while the provision in the Federal Antitrust Law is a rule of exception for specific cases established

by law; therefore, there is no violation of the principle of legal certainty. In contrast, the provisions are compatible and complement each other as to whether the Energy Regulatory Commission has the power to regulate first-hand sales of hydrocarbons and to determine the methodology and prices of these goods. It should be noted that as a coordinating regulatory body on energy issues, belonging to the centralized public administration, with technical, operational and administrative autonomy to regulate and promote the efficient development of, *inter alia*, the transportation, storage, distribution, compression, liquefaction, regasification and sale to the public of oil, gas, natural gas, liquefied gas, petroleum, petroleum products and petrochemicals, it is therefore a body that has been constitutionally granted technical authority. The commission is also responsible for regulating the national energy sector, which includes the gas, refined products, hydrocarbon derivatives, and electricity industries. Therefore, there is no violation whatsoever,³¹ as argued by the governed.

As to the argument seeking to give permanence to the provision that establishes the methodology to determine gas prices with Resolution 998/2015, costs are indeed increasing. However, no violation of the principle of legitimate expectation can be alleged since the terms of the contract are not modified and, when the logistics change, it is necessary to adjust calculation procedures, but no right is violated because prices in the oil products market are driven by factors, even at the international level, and in the logistics for their transportation, there are contingencies that the market must recognize and assume. Therefore, the law must regulate new scenarios to prevent potential abuses or arbitrariness. To understand it differently would imply accepting that the markets are static or that lawmakers would have to undertake a case-by-case approach to be able to reflect all the scenarios that might be considered. This is an impossible task, especially considering that these types of markets are extremely dynamic.

In addition to this, it must be recalled that Article 25 of the Constitution does not give the governed any individual guarantee to use the *amparo* proceedings to demand that the authorities adopt certain measures to comply with the principles pertaining to their fundamental rights. Therefore, no violation can be claimed in economic terms when the authorities issue specific measures in this field in order to ensure the country's growth and development as in this case. Hence, the concepts of violation invoked by the plaintiffs are unfounded since they are not a constitutional or human right susceptible of being restored through an *amparo* proceeding.

³¹ See the judgment of *Amparo en revisión* 29/2018, quejosa y recurrente Caleras Bertrán, S. A. de C. V.

However, we feel that without the authority being obliged to do so, it was feasible to set a reasonable period of time for the transition process. Therefore, the amendments to Articles 81 and 82 and the Thirteenth Transitory Article of the Hydrocarbons Law do not violate the right to the economic development of the State when allowing an increase in prices in the first-hand sales of natural gas. The authority is then not obligated to consider the principle of legitimate expectation in adopting economic measures and expect legislators to include all the necessary elements to determine the price of natural gas. This is not possible since, as mentioned above, the variable of these types of markets are in constant flux.

Above all, we must consider that energy issues are related to a structural change of the State's economic model seeking the participation of new economic agents in the energy sector and undoubtedly increased logistics costs for the sales of gas is an issue intimately linked to economic aspects, including "economic costs". Therefore, legislators cannot provide a detailed definition of each of the words or terms used in the text of the law. Consequently, this argument is unfounded when claiming the violation of the principle of legality in terms of legitimate expectations.

In hydrocarbons issues, the violation of the principle of legitimate trust may be invoked when a provision that entered into force after the signing of the contract is invoked and the new provision modifies the terms of the contract. Since hydrocarbons are a strategic sector for Mexico, public interest must always prevail over that of the contractor, but the principle of *pacta sunt servanda* cannot be violated. In these cases, the principle of legitimate expectations "does not apply in cases in which the law confers the authority a wide margin of discretion to regulate situations characterized by the absence of a protected right in favor of the governed, which enables the relative legal order to be preserved without modifications".³² This is the spirit of the agreement and contractual participation, unlike other issues that are not strategic in nature, where it can even be weighed in the light of conforming interpretation.

VIII. CONCLUSIONS

The principle of legitimate expectation is a sub-principle derived from the principle of legal certainty embodied in Article 16 of the Mexican Constitution.

³² Tesis I.1o.A.E.248 A (10a.), *Gaceta del Semanario Judicial de la Federación*, Décima Época, February 2019, t. II, p. 2925.

The expectation of a right must be understood as the claim or hope that a given situation will come about to subsequently generate a right, but it can never be understood as an acquired right because, even when demanded, public interest will prevail in the behavior of the authorities.

In their decisions, Mexican courts have indicated that the principle of legitimate expectation must be understood as the protection of reasonably created expectations in favor of the governed. This is closely tied in with the principle of unilateral irrevocability of administrative acts comprising resolutions that benefit the governed.

The principle of legitimate expectation in administrative acts does not provide indefinite protection in relation to the regulatory framework in force in a given space and time, but it does require that provisions not be applied retroactively. In other words, a rule issued *a priori* cannot modify or affect a legal situation concluded in the past.

In matters of hydrocarbons, the principle of legitimate expectations does not apply to the acts of legislators and even less so to claim compensation because it exercised its duties, which are to legislate, based on new conditions of competition in the international gas market.

The methodology of general application to calculate the considerations, prices or tariffs falls under the authority of the Energy Regulatory Commission. Therefore, exercising its authority in no way transgresses the content of the clauses since only the logistics changed, implying that the calculation procedures were updated.

Based on the origin of the principle invoked, which emerged in German law, in ordinary and constitutional case law and then became part of the case law of the Court of Justice of the European Communities with different nuances, under no circumstance is it accepted that a rule must remain static in the acts and rulings of the authority, under the argument of relying on legal expectations. Still less can the legislator be expected to petrify the rule since it must evolve based on social and economic dynamics.

The principle of legitimate expectation, which is constitutionally based on Article 16 and stems from the principle of legal certainty, cannot be invoked against acts of authority that modify provisions based on resolutions intended to make the law more dynamic, and even less so can legislators be asked not to enact legislation in order to maintain a status of personal benefit or comfort.

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PART FIFTH
HUMAN RIGHTS, ENVIRONMENT
AND CLIMATE CHANGE

THE MEXICAN OIL & GAS SECTOR: BETWEEN ENVIRONMENTAL PROGRESSIVITY AND REGRESSION

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SUMMARY: I. *Introduction*. II. *Human rights and sustainability in the context of energy development*. III. *From environmental concurrency to exclusivity*. IV. *The paradigm of the human right to good governance*. V. *The principle of progressivity and environmental regression*. VI. *Concluding remarks*. VII. *Bibliography*.

I. INTRODUCTION

To speak of subsoil resources, especially oil & gas, is to speak of the most widely used sources of energy around the world: natural gas (21.4%), coal (28.9%) and oil (31.1%).¹ Mexico is no exception since the history of its modern development is supported by these resources, particularly crude oil and natural gas, which are also one of the main sources of foreign exchange and tax revenues for the country. Therefore, they have been a fundamental element of public finances.

The country's main supply of energy came from oil & gas and amounted to 82% in 2013, a much higher figure than that of other sources. That same year, the use of coal represented 7.7% of the energy supply, nuclear 1.7%, geothermal 1.8% and hydraulic 1.8%.² Therefore, its regulation is very important because it ties in with national development planning objectives, which seek to rationally and systematically organize economic, social, political and cultural activities, as well as environmental protection and the

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¹ Organisation for Economic Co-operation and Development, *Key World Energy Statistics 2015*, Paris, OECD-International Energy Agency, 2015, p. 6.

² Aguilera Gómez, Manuel *et al.*, "Contenido y alcance de la reforma energética", *Economía UNAM*, vol. 13, No. 37, January-April 2016, pp. 5 and 6.

rational use of natural resources, in order to achieve the transformation of the country's reality, based on the norms, principles and objectives established by the federal Constitution and the various applicable laws.³

In Mexico, ownership of fossil resources has passed from private to exclusively national ownership. However, even though the country still has great potential for such resources, the Peña Nieto administration argued there was insufficient financial availability and technical resources to efficiently operate exploration and production projects.⁴ Hence, on December 20, 2013, the Political Constitution of the United Mexican States —*Constitución Política de los Estados Unidos Mexicanos*— (hereinafter, federal Constitution) underwent a series of energy reforms, including the one related to the seventh paragraph of Article 27, which led to a system that, although reserving the ownership of hydrocarbons to the Nation when found in the subsoil, allows private parties to have access to them by entering into contracts. Therefore, once oil & gas have been extracted, they become the property of whoever extracted them. This situation is not trivial since they are non-renewable natural resources of a strategic nature that guarantee the country's development and its national sovereignty.⁵

On top of this, the abovementioned reforms have had an impact on the administrative organization of the State. The creation of the stipulated new bodies, which led to far-reaching regulatory changes as evidenced in this study, did not uphold the principles of the division of powers, regularity, legality, and legal reservations, as well as those related human rights, like progressiveness, which directly affect sustainable development and the guarantee of human rights to a healthy environment, water and development, to mention a few, thus giving rise to international responsibility.

II. HUMAN RIGHTS AND SUSTAINABILITY IN THE CONTEXT OF ENERGY DEVELOPMENT

Human rights were first recognized with the inclusion of the Bill of Rights in the Constitution of the United States of America in 1787 and the proclama-

³ Tesis P./J. 76/2009, *Semanario Judicial de la Federación y su Gaceta*, Novena Época, t. XXX, July 2009, p. 1543, available at: <https://sjf2.scjn.gob.mx/detalle/tesis/166883>.

⁴ Secretaría de Energía, "Programa Sectorial de Energía 2013-2018", *Diario Oficial de la Federación*, México, December 13, 2013.

⁵ Anglés Hernández, Marisol, "El artículo 27 en materia de energía", *Derechos del Pueblo Mexicano. México a través de sus Constituciones*, Exégesis constitucional, vol. VII, 9th ed., México, Cámara de Diputados, H. Congreso de la Unión, LXIII Legislatura, UNAM, Instituto de Investigaciones Jurídicas, Porrúa, Instituto Nacional Electoral, 2016, p. 498.

tion of the Declaration of the Rights of Man and of the Citizen in France in 1789.⁶ Years later, because of the atrocities committed during World War II, countries reached a consensus to work together to prevent international conflicts and attain peace and justice. In this scenario, the United Nations was founded on October 24, 1945, and three years later, the Universal Declaration of Human Rights was adopted.⁷

Since then, international human rights law began to develop and has come to practically enjoy universal acceptance since it is made up of human beings' essential and inalienable guarantees, which must govern the actions of the States members of the UN. This universal effort is complemented by the regional systems protecting human rights: the African, Asian, European and Inter-American systems, which autonomously and independently establish an international legal order of protection at a regional level and set a catalog of international responsibilities for the member States of each system.

In the American region, the Organization of American States (hereafter, OAS) was created in 1948 with the mandate to achieve peace and justice and to build solidarity, as well as to defend sovereignty, territorial integrity and independence.⁸ The constitutive instruments of this Organization include the OAS Charter, the American Declaration of the Rights and Duties of Man, the American Convention on Human Rights, the Statutes and Rules of Procedure of the Inter-American Court of Human Rights (IACtHR) and the Inter-American Commission on Human Rights (IACHR), as well as various protocols and conventions.⁹ This is the legal basis that obligates OAS members to guarantee human rights in each of the undertakings carried out on their own or allowed to be carried out in their territories.

On June 10, 2011, Mexico amended the first paragraph of Article 1 of the federal Constitution to read: In the United Mexican States, all persons shall enjoy the human rights recognized in this Constitution and in the international treaties to which the Mexican State is a party, as well as the guarantees for the protection of these rights, the exercise of which may not be

⁶ *Declaration of the Rights of Man and of the Citizen*, French National Constituent Assembly, August 29, 1789.

⁷ United Nations, *Universal Declaration of Human Rights*, New York, General Assembly, A/RES/217(III), adopted on December 10, 1948.

⁸ Jiménez de Aréchaga, Eduardo, *La Convención Interamericana de Derechos Humanos como derecho interno*, Montevideo, Fundación de Cultura Universitaria, 1988, p. 55.

⁹ Organization of American States, *Basic Documents in the Inter-American System*, Washington, D. C., OAS, 2001; Inter-American Commission on Human Rights, *Petition and Case System. Informational brochure*, Washington, D. C., OAS, 2010, p. 12.

restricted or suspended, except in the cases and under the conditions established in this Constitution.

Furthermore, in its Dissenting Opinion 293/2011, the Plenary of the Mexican Supreme Court of Justice (hereafter, Supreme Court) ruled that all provisions including a human right and those contained in international treaties have constitutional rank; that IACtHR judgments are binding for judges in Mexico, even in the case of decisions regarding disputes to which Mexico is not a party; and that if the federal Constitution contains any restriction to the exercise of a right, it shall be enforced.¹⁰

On the other hand, although it has different meanings, the block of constitutionality as a legal category starts from the assumption that, in addition to the provisions inserted in constitutions, there are others of the same rank that do not expressly appear in the constitutional text. Thus, the block of constitutionality makes it possible to incorporate rights from international sources into the constitutional framework.¹¹

As to the concept of sustainability, it is at the beginning of the 20th century when the relationship between the environment and development was established and this pairing was fully adopted and accepted.¹² Its confluence leads us to the heart of sustainable development defined as “development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs”.¹³ It is a different approach to development that incorporates economic, social and environmental factors at the same level, and constitutes, at least in discourse, the point of reference for global international cooperation.

The clearest example of such cooperation is found in the adoption of the 2030 Agenda for Sustainable Development, approved in September 2015 by the UN General Assembly with the aim of reaching its goals in 2030. This instrument establishes a transformative approach towards economic, social, and environmental sustainability.

¹⁰ Tesis P./J. 20/2014, *Gaceta del Semanario Judicial de la Federación*, Décima Época, vol. I, April 2014, p. 202, available at: <https://sjf2.scjn.gob.mx/detalle/tesis/2006224>. Tesis P./J. 21/2014, *Gaceta del Semanario Judicial de la Federación*, Décima Época, April 2014, p. 204, available at: <https://sjf2.scjn.gob.mx/detalle/tesis/2006225>.

¹¹ Rodríguez Manzo, Graciela *et al.*, *Bloque de constitucionalidad en México*, México, SCJN-Oficina en México del Alto Comisionado de las Naciones Unidas para los Derechos Humanos-Comisión de Derechos Humanos del Distrito Federal, 2013, p. 18.

¹² Jiménez-Herrero, L. M., “Cooperación mundial para el desarrollo sostenible”, *Revista Española de Desarrollo y Cooperación*, No. 9, Madrid, Autumn-Winter 2002, p. 10.

¹³ United Nations, *Our common future*, New York, United Nations, World Commission for Environment and Development, 1987, p. 67.

The Agenda includes 17 Sustainable Development Goals (SDGs) and 169 targets. Target 9.4 aims to upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries acting in accordance with their respective capacities. This target complements Target 7.a, which refers to enhancing international cooperation to facilitate access to clean energy research and technologies, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology. Meanwhile, Target 3.9 aims to substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.¹⁴

As to the synergy between human rights and the environment, the General Assembly of the OAS has stated:

That the effective enjoyment of all human rights..., could foster better environmental protection by creating conditions conducive to modification of behavior patterns that lead to environmental degradation, reduction of the environmental impact of poverty and of patterns of unsustainable development, more effective dissemination of information on this issue, and more active participation in political processes by groups affected by the problem.¹⁵

Therefore, the connection between human rights, the environment and sustainable development is undeniable since all human rights are vulnerable to environmental degradation in the sense that the full enjoyment of these rights depends on the adequate environment.¹⁶ Consequently, inadequate management and disposal of hazardous waste and residue pose a serious threat to human rights, including the right to life and to health.¹⁷

It is important to bear in mind that the oil & gas industry is one of the most polluting industries, both in its processes and its emergencies (explo-

¹⁴ United Nations, *Transforming our world: The 2030 Agenda for sustainable development*, New York, General Assembly, A/RES/70/1, 21 October 2015, pp. 15, 19.

¹⁵ Organization of American States, *Human Rights and the Environment*. Resolution adopted at the third plenary session, held on June 5. AG/RES 1819 (XXXI-O/01), Washington, D. C., Organization of American States, 2001.

¹⁶ United Nations, *Report of the Independent Expert on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment*, John H. Knox, Doc. ONU A/HRC/22/43, Human Rights Council, December 24, 2012, para. 19.

¹⁷ United Nations, *Adverse Effects of the Illicit Movement and Dumping of Toxic and Dangerous Products and Wastes on the Enjoyment of Human Rights*, New York, United Nations, Commission on Human Rights, E/CN.4/RES/2005/15, adopted on April 14, 2005.

sions, spills, etc.) since oil & gas are persistent pollutants in the environment, able to cause toxic effects on ecosystems and their elements (soil, water, air and biodiversity),¹⁸ as well as on human beings as some hydrocarbons, such as polycyclic aromatic hydrocarbons are carcinogenic.¹⁹ However, in accordance with Article 96 of the Hydrocarbons Law, the industry in this sector is of public utility and exploration and extraction activities are considered to be of social interest and public order. Hence, they are given preference over any other activity involving the use of the surface or the subsoil of the land.

It should be recalled that public utility is an abstract and relative concept determined by the political, social, and economic conditions prevalent at a given time and place, for the purpose of satisfying the needs of the community. Generically, it encompasses three causes: a) public causes, i.e., when the expropriated property is directly intended for a public service or work; b) social causes, which immediately and directly satisfy a specific social class and indirectly the entire community, and c) national causes, which satisfy the country's need to adopt measures to address situations that affect it as a political or international entity.²⁰

In terms of social interest, we have that it refers to aspects related to the general needs of society that the State protects directly and permanently. Hence, if a specific situation affects or benefits the community, there is social interest.²¹ While the provisions of public order are those issued to regulate aspects in which the State is the interested party, such as its public performance or the regulation of a given social branch of transcendence for the advancement of society and whose application is of interest to the State.²²

Within the framework of the energy reform, the axiological and teleological content of concepts of public use, social interest and public order is lost since it seeks to modify its essence and scope aimed at the general in-

¹⁸ Edwards, N. T., "Polycyclic Aromatic Hydrocarbons (PAHs) in the Terrestrial Environment. A Review", *Journal of Environmental Quality*, vol. 12, No. 4, 1983, pp. 427-441; Haritash, A. K. y Kaushik, C. P., "Biodegradation Aspects of Polycyclic Aromatic Hydrocarbons (PAHs): A Review", *Journal of Hazardous Materials*, vol. 169, Nos. 1-3, 2009, pp. 1-5.

¹⁹ Amador-Hernández, J. *et al.*, "Determinación simultánea de seis hidrocarburos policíclicos aromáticos en medio micelar por regresión de mínimos cuadrados parciales (pls-1) utilizando espectros de fluorescencia de ángulo variable lineal", *Boletín de la Sociedad Chilena de Química*, vol. 44, No. 3, 1999, p. 299.

²⁰ Tesis P./J. 39/2006, *Semanario Judicial de la Federación y su Gaceta*, Novena Época. t. XXIII, March 2006, p. 1412, available at: <https://sjf2.scjn.gob.mx/detalle/tesis/175593>.

²¹ Tesis aislada I.14o.C.24C, *Semanario Judicial de la Federación y su Gaceta*, Novena Época, t. XIX, January 2004, available at: <https://sjf2.scjn.gob.mx/detalle/tesis/182292>.

²² *Idem*.

terest and collective well-being to benefit a few, members of the neoliberal elite holding economic power, which is the group that can access the oil & gas sector.

In addition to the above, the Hydrocarbons Law limits the sovereign exercise of the different levels of government and oversteps the principle of regulatory hierarchy by stipulating in Article 96, that the states, Mexico City, municipalities and delegations will contribute to carrying out exploration and extraction projects, as well as pipeline transportation and distribution and storage, through procedures and bases for coordination that expedite and guarantee the granting of permits and authorizations in the scope of their jurisdiction. However, the law does indicate the modality to be used to prevent and repair environmental damage, as well as to address any health problems that may arise.

In strict adherence to the law, all development polity that involves any activity, including that regarding oil & gas, must aim at the proposals of the federal Constitution, that is, to guaranteeing human rights, including a healthy environment, to water, to repair, to health, and to sustainable development. This last one implies setting objectives and targets, as well as implementing short-, medium- and long-term strategic sector programs at the different levels of government, which often face problems due to different interests, lags and resistance.²³ There is therefore no justification for the implementation of legal mechanisms (general administrative provisions, regulations, guidelines, etc.) allowing a certain sector —oil & gas— to operate under a more permissive regulatory framework than others.

III. FROM ENVIRONMENTAL CONCURRENCY TO EXCLUSIVITY

According to Bandeira de Mello, competency is the comprehensive circle of a set of public duties to be fulfilled through the exercise of related and delimited instrumental powers, legally conferred to satisfy public interests.²⁴

This goal is taken up by Article 25 of the federal Constitution, in stating that: “Under criteria of social equity, productivity and sustainability, [the State] shall support and stimulate social and private enterprises, subject to

²³ Labrador Sánchez, A., “Desmitologizar el concepto de Desarrollo Sustentable”, in Guerrero del Castillo, E. & Márquez Muñoz, J. F. (coords.), *Visión social del desarrollo sustentable*, México, UNAM, Facultad de Ciencias Políticas y Sociales, 2014, p. 43.

²⁴ Bandeira de Mello, C. A., *Curso de derecho administrativo*, México, UNAM-Porrúa, 2006, p. 109.

the conditions dictated by public interest and to the use of the productive resources... while safeguarding their conservation and the environment”.²⁵

The competencies translate into duties attributed to the State, its bodies and agents placed therein for certain public purposes enshrined in the law.²⁶ In conclusion, competency is the set of powers and attributions expressly established by the legal system for an entity or body to be exercised for the benefit of the public²⁷ and, therefore, determines the limits within which a body may act towards third parties.²⁸

According to the Supreme Court, the competency of the authorities is one of the essential elements of administrative acts, of which the following stand out: a) it always requires having a specific text for it to exist; b) it is binding for the body to which it is attributed, and c) it shares the same nature of legal and abstract acts. Such characteristics are based on the principle of legality, according to which State authorities may only act in the manner and under the terms of the law.²⁹

Even then, in clear violation of the constitutional principle established in Article 73, Section XXIX, subsection g, which refers to environment matters as concurrent, the 2013 energy reform gave way to the creation of the National Agency for Industrial Safety and Environmental Protection of the Hydrocarbons Sector [*Agencia de Seguridad, Energía y Ambiente*] (hereinafter, ASEA), as a decentralized administrative agency of the Ministry of the Environment and Natural Resources [*Secretaría de Medio Ambiente y Recursos Naturales*] (hereinafter, Semarnat). The purpose of ASEA is to protect the people, environment, and oil & gas sector facilities by regulating and supervising: i) industrial safety and operational safety; ii) dismantling activities and facility closures; and iii) waste and polluting emissions.³⁰

²⁵ Constitución Política de los Estados Unidos Mexicanos, *Diario Oficial de la Federación*, México, February 5, 1917. Amended on December 20, 2013.

²⁶ Bandeira de Mello, C. A, *Curso de derecho...*, *op. cit.*, p. 108.

²⁷ López Olvera, Miguel Alejandro, “La delimitación de competencias en el derecho turístico mexicano”, *Régimen jurídico del turismo y de la zona marítimo-terrestre*, México, UNAM, Instituto de Investigaciones Jurídicas, 2009, p. 297.

²⁸ Amparo directo 2093/88, Tribunales Colegiados de Circuito, *Semanario Judicial de la Federación*, Octava Época, t. III, México, January-June 1989, p. 390.

²⁹ Tesis aislada 2a. CXCVI/2001, *Semanario Judicial de la Federación y su Gaceta*, Novena Época, t. XIV, October 2001, p. 429, available at: <https://sjf2.scjn.gob.mx/detalle/tesis/188678>.

³⁰ Transitory Article Nineteenth, Decreto por el que se reforman y adicionan diversas disposiciones de la Constitución Política de los Estados Unidos Mexicanos, en Materia de Energía, *Diario Oficial de la Federación*, México, February 5, 1917. Amendments on 20 December 2013, available at: <http://www.diputados.gob.mx/LeyesBiblio/ref/cpeum.htm>.

In our opinion, upon opening the oil & gas sector to private investment, it was necessary to strengthen the General Office of Environmental Impact and Risk, as well as the Federal Environmental Protection Agency [*Procuraduría Federal de Protección al Ambiente*] (hereinafter, PROFEPA). Since their creation and until the mentioned reform, these Semarnat agencies were authorized to carry out, in the first case, environmental impact and risk assessments and, in the second case, inspection, surveillance and sanctions in oil & gas sector. Such activities were carried out exclusively by the State-owned company Petróleos Mexicanos (hereinafter, Pemex).

In addition, the reference standards (technical regulations) that were in force for Pemex at the time, as the exclusive entity in the oil & gas sector, should have been incorporated into the ASEA standardization process and become Official Mexican Standards [*Normas Oficiales Mexicanas*], i.e., binding for both Pemex and private companies in the hydrocarbons sector. However, this did not happen.

IV. THE PARADIGM OF THE HUMAN RIGHT TO GOOD GOVERNANCE

Since the Enlightenment, the principle of the division of powers in State organization and operation has been advocated as a fundamental element of democratic States. In Mexico, this principle is found in Article 49 of the federal Constitution. However, given the complex reality of contemporary States, there is a need to perfect the ways public bodies act and the distribution of the duties among them. Therefore, there are usually functions or tasks within a State that are performed by different bodies other than the traditional ones,³¹ although always in the public interest. The principle of the division of powers is clearly essential for organizing government structures as it serves to establish checks and balances between the various State bodies.³² It also gives support to national institutions and is linked to other constitutional principles that give order and coherence to the legal system.

In this context and according to the United Nations,

...[t]he future of public administration... lies in the institution of measures aimed not only at reaffirming the developmental role of public administra-

³¹ Carbonell, Miguel, “Órganos constitucionales autónomos”, *Enciclopedia Jurídica Mexicana*, 2a. ed., México, UNAM, Instituto de Investigaciones Jurídicas, Porrúa, 2004, pp. 378 and ss.

³² Cueva, Mario de la, *Teoría de la Constitución*, México, Porrúa, 1982, pp. 185-194.

tion and upholding its core values, but also at reconfiguring public service organizations into open, participative, knowledge-sharing, innovating and results-oriented service-delivery systems.³³

In this sense, the public administration establishes the procedures for its activities, which must be in line with human rights and the guarantees arising from the case law of both the Federal Judiciary and by the IACtHR.

It should be stressed that the Inter-American Human Rights System has established the States' obligation to have clear rules for the behavior of their agents so as to avoid inadequate margins of discretion in the administrative sphere and which could lead to arbitrary or discriminatory practices.³⁴

Accordingly, the rules on the control undertaken by public administration take on special significance. As Valadés argues, the essence of the rule of law lies in the application of effective forms of control, which constitutes a guarantee for citizens. Thus, a cornerstone of modern constitutionalism has been the defense of freedom and, as a result, the limitation of power. This implies establishing a wide range of control instruments,³⁵ a control that "is not restricted only to supervising the activities of others or its own, but simultaneously establishing methods that prevent abusive exercise of power, *i. e.*, that the established restrictions are observed".³⁶

Along these lines, the International Court of Justice (ICJ) held that: "[...] in] the field of environmental protection, vigilance and prevention are required on account of the often-irreversible character of damage to the environment and of the limitations inherent in the very mechanism of reparation of this type of damage".³⁷

Meanwhile, the European Court of Human Rights determined that States must govern the licensing, setting up, operation, security and supervision of the activity and must make it compulsory for all those concerned to take practical measures to ensure the effective protection of citizens whose lives might be endangered by the inherent risks. In any event, the relevant

³³ United Nations, *Report of public administration and development*, A/60/114, New York, General Assembly, July 12, 2005, p. 1.

³⁴ Inter-American Commission of Human Rights, *Access to justice as a guarantee of economic, social, and cultural rights. A review of the standards adopted by the Inter-American System of human rights*, Washington, D. C., Organization of American States, 2007, p. 97.

³⁵ Valadés, Diego, "El poder de controlar", *Liber ad honorem Sergio García Ramírez*, México, UNAM, Instituto de Investigaciones Jurídicas, 1998, vol. I, p. 664.

³⁶ Huerta Ochoa, Carla, *Mecanismos constitucionales para el control del poder político*, 3rd ed., México, UNAM, Instituto de Investigaciones Jurídicas, 2010, p. 27.

³⁷ International Court of Justice, *Case concerning The Gabčíkovo-Nagymaros (Hungary vs. Slovakia)* Judgment, 25 September 1997, para. 140.

regulations must also provide for appropriate procedures, considering the technical aspects of the activity in question, for identifying shortcomings in the processes concerned and any errors committed by those responsible at different levels.³⁸

In the framework of environmental protection, the State's international responsibility stemming from the behavior of third parties may be the result of a lack of regulation, supervision or oversight of the activities of these third parties that cause damage to the environment.³⁹ Along this vein, the IACtHR has pointed out that States have the obligation to establish adequate mechanisms to supervise and oversee certain activities so as to guarantee human rights, protecting them from actions of both public and private entities.⁴⁰

Even then, the ASEA law regulates that its powers include: to regulate, supervise and sanction in matters of industrial safety, operational safety and environmental protection for the activities of the sector,⁴¹ as well as to authorize the management systems of the regulated parties and to issue, suspend, revoke or deny licenses, authorizations, permits and registrations related to environmental matters.⁴² This situation jeopardizes the impartiality of the mentioned administrative control since the same body is empowered to authorize, inspect and sanction. As indicated above, prior to the energy reform, the body in charge of inspecting, overseeing and sanctioning environmental matters, which included the oil & gas sector, was the PROFEPA, which is now excluded from this sector.

On the other hand, Article 7 of the United Nations Convention against Corruption stipulates that each State Party shall: "...endeavour to adopt,

³⁸ European Court of Human Rights, *Case Önerildiz v. Turkey*, Application No. 48939/99, Strasbourg, Judgment, 30 November 2004, para. 90; European Court of Human Rights, *Case Budayeva & others v. Russia*, Nos. 15339/02, 21166/02, 20058/02, 11673/02 and 15343/02, Strasbourg, Judgment, 20 March 2008, para. 130 and 132.

³⁹ Inter-American Court of Human Rights, *Advisory Opinion OC-23/17 Requested by the Republic of Colombia: The Environment and Human Rights*, November 15, 2017, para. 119.

⁴⁰ Inter-American Court of Human Rights, *Case Ximenes Lopes v. Brazil*, (Merits, Reparations and Costs), Judgment of July 4, 2006, paragraphs 89-90; Inter-American Court of Human Rights, *Case of the Kichwa Indigenous People of Sarayaku v. Ecuador*, (Merits and reparations), Judgment of June 27, 2012, para. 167, and Inter-American Court of Human Rights, *Case I.V. v. Bolivia*, (Preliminary objections, merits, reparations and costs), Judgment of November 30, 2016, para. 154 and 208.

⁴¹ Article 5, Section III, Ley de la Agencia Nacional de Seguridad Industrial y de Protección al Medio Ambiente del Sector Hidrocarburos, *Diario Oficial de la Federación*, México, August 11, 2014.

⁴² *Ibidem*, Sections XVII and XVIII.

maintain and strengthen systems for the recruitment, hiring, retention, promotion, and retirement of civil servants... that are based on principles of efficiency, transparency and objective criteria such as merit, equity and aptitude...”.

This failed to materialize in the energy reform laws. One example is the appointment and possible removal of the Executive Director of the ASEA, which are exclusive powers of the head of the Federal Executive branch, which affects the impartiality of the actions of officials with decision-making power and opens the door to a high level of submission, discretion, arbitrariness, and control.

Additionally, the ASEA has a Technical Council, which supports the performance of its activities and serve as a coordinating body among Federal Public Administration agencies, bodies and entities. The Council's functions include issues related to industrial safety, operational safety and environmental protection; knowledge of exercise of the resources trust; formulating national oil & gas policies. However, neither the law nor its regulations mention the qualities required of Council members, nor how they are appointed, which gives rise to discretionary power and, above all, uncertainty. But it also serves as an instrument of control since the decisions made by this collegiate body will depend on the profile and selection process of its members.

From the perspective of the right to development, it is considered essential to incorporate basic human rights principles, including accountability, and participation,⁴³ which are central to determining and consolidating good governance practices.⁴⁴ In addition to this, it is important to consider that the guarantee of the right to a healthy environment is intertwined with a series of procedural rights that make it possible.⁴⁵ These are the rights of access to information, participation and justice in matters of environmental interest, which find protection in the Regional Agreement on Access to Information, Public Participation and Access to Justice in Environmental Matters in Latin America and the Caribbean, a legally binding instrument,

⁴³ Kirkemann Hansen, J. & Sano, H. O., “The Implications and Value Added of a Rights- Based Approach”, *Development as a Human Rights. Legal, Political and Economic Dimensions*, Cambridge, Intersentia, 2010, pp. 40 and ss.

⁴⁴ United Nations, *The right to development*, A/RES/69/181, New York, General Assembly, February 6, 2015, p. 8.

⁴⁵ Anglés Hernández, Marisol, “El derecho a disfrutar de un medio ambiente sin riesgos, limpio, saludable y sostenible en el Convenio de Aarhus y Escazú”, en Aguilar Cavallo, G. (coord.), *El Acuerdo de Escazú. Perspectiva Latinoamericana y Comparada*, Valencia, Tirant lo Blanch, 2021, pp. 154.

adopted by the Mexican State, which is expected to contribute to environmental governance.

Therefore, since its creation, ASEA should have included a mechanism to carry out popular complaints, as established in Article 190 of the LGEE-PA. However, seven years elapsed for it to develop and put into operation the Public Complaint System on the agency's internet portal, to thus allow the registration, reception, prevention, service, and investigation of the complaints presented in the matters within the Agency's competence.

In view of the above, we agree with Márquez, who holds that at present:

Authoritarian vertical structures should be discarded, and progress should be made towards more democratic horizontal structures with the presence of four major administrative areas: human, scientific-technical, conciliation and control, without this classification implying any disassociation between them.⁴⁶

This must go hand in hand with the cooperation of the industrial sector in order to attain sustainable development that responds to global challenges and difficulties, such as the efficient use of resources and energy, the reduction of pollution and climate change.⁴⁷

V. THE PRINCIPLE OF PROGRESSIVITY AND ENVIRONMENTAL REGRESSION

In addition to having means of control, State action must be governed by the principle of progressivity,⁴⁸ which is broken down into two obligations incumbent upon States. The first, which is positive in nature, refers to the duty to constantly enhance the enjoyment of human rights, and the second, which has a negative component, implies the State's duty to refrain from taking deliberately regressive measures that reduce the levels of protection of existing rights or suppress existing ones. Under these parameters, a violation of the obligations arising from the concept of progressivity may occur when

⁴⁶ Márquez Gómez, Daniel, "Un nuevo paradigma en administración pública: El derecho humano a la buena administración pública", in Fernández Ruiz, Jorge (coord.), *Estudios jurídicos sobre administración pública*, México, UNAM, Instituto de Investigaciones Jurídicas, 2012, p. 92.

⁴⁷ United Nations, *Industrial development cooperation*, A/RES/67/225, New York, General Assembly, April 9, 2013, p. 2.

⁴⁸ Article 2.1, *International Covenant on Economic, Social and Cultural Rights*, New York, United Nations, 1966.

States do not take any measures to further the enjoyment of rights (omissions) or when they take deliberately regressive measures (actions).⁴⁹

In the environmental context, a rule is regressive when the effectiveness achieved upon its implementation is lower than it previously was, to the extent in which the new law/regulation limits, restricts, reduces or annuls the level of previously acquired environmental protection and as long as there is no justification or technical-scientific support that allows it to determine, with a certain degree of certainty, the non-affectation of the protected legal right. The omission of State powers to exercise their regulatory capacity, especially by enacting environmental laws and their respective regulations is also considered regression, or when this power is exercised partially, incompletely or erroneously from a scientific, technical and legal perspective, rendering the law inapplicable or ineffective for environmental purposes.⁵⁰

In the case of Mexico, there is evidence of a failure to apply the principle of progressivity in the amendments to Regulation of the General Law of Ecological Balance and Environmental Protection in matters of Ecological Planning, which also violates the principles of legality, legal reserve, and hierarchical subordination. This is because its enactment contradicts the prevalence of the hierarchically superior law, the General Law of Ecological Balance and Environmental Protection [*Ley General del Equilibrio Ecológico y la Protección al Ambiente*] (hereinafter, LGEEPA), which regulates the provisions of the federal Constitution concerning the conservation and restoration of the ecological balance, as well as environmental protection, with the aim of encouraging sustainable development and establishing the bases to:

- I. Ensure the right of all persons to live in a healthy environment for their development, health, and well-being;
- II. Define the principles of environmental policy and the instruments for their application;
- III. The conservation, restoration and improvement of the environment;
- IV. The conservation and protection of biodiversity, as well as the establishment and management of protected natural areas;
- V. The sustainable use, conservation and, where appropriate, the restoration of soil, water and other natural resources, in such a way that obtaining

⁴⁹ Anglés Hernández, Marisol *et al.*, *Manual de derecho ambiental mexicano*, México, UNAM, Instituto de Investigaciones Jurídicas, 2021, available at: <https://archivos.juridicas.unam.mx/www/bjv/libros/13/6429/13.pdf>.

⁵⁰ Peña Chacón, Mario, *Derecho ambiental efectivo*, San José, Universidad de Costa Rica, 2016, p. 57.

economic benefits and the activities of society are compatible with the preservation of ecosystems;

VI. The prevention and control of air, water, and soil pollution...⁵¹

Also apparent is the lack of effective mechanisms for citizens to participate in the control of regularity, which consists of determining whether the regulations were drafted in compliance with the provisions of the hierarchically superior laws. Thus, the correlation between a lower law and a more superior one reflects the concept of regularity.⁵²

In addition to the above, the Supreme Court has argued that, given the principle of legality, independent regulations cannot exist in the legal system because a pre-existing law is necessary. Therefore, regulations may not contain issues which are exclusively reserved to the law, thereby giving importance to the concept of legal reserve: The principle of hierarchical subordination to which regulatory power is subject consists of the requirement that the regulation must necessarily be preceded by a law, the provisions of which are further developed, complemented or elaborated wherein it finds justification and scope.⁵³

As explained below, this change violates the principles mentioned in this section since ecological management is defined as an instrument designed to regulate or manage land use and productive activities through the analysis of deterioration trends and the potential uses of natural resources that will lead to the protection of the environment and the preservation and sustainable use of these resources.⁵⁴

As a result of the energy reform, however, changes were made to Articles 38, 42, 43, 44, 48 and 58 of said regulation to exclude activities that allow the development of the oil & gas sector from being applied. These include a) reconnaissance and surface exploration, and the exploration and extraction of oil & gas; b) the treatment, refining, sale, marketing, transportation and storage of oil; c) the processing, compression, liquefaction, decompression and regasification, as well as the transportation, storage, distribution and retail sale of natural gas; d) the transportation, storage, dis-

⁵¹ Article 1, Ley General del Equilibrio Ecológico y la Protección al Ambiente, *Diario Oficial de la Federación*, México, January 28, 1988. Amended on November 5, 2013.

⁵² Casarín León, Manlio Fabio, “Control de la administración pública”, en Cisneros Fariás, Germán *et al.* (coords.), *Creación de normas infralegales para el control de la administración*, México, UNAM, Instituto de Investigaciones Jurídicas, 2007, p. 120.

⁵³ Tesis 2a. I/2015, *Gaceta del Semanario Judicial de la Federación*, Décima Época, t. II, February 2015, p. 1770, available at: <https://sjf2.scjn.gob.mx/detalle/tesis/2008434>.

⁵⁴ Article 3, Section XXIV, Ley General del Equilibrio Ecológico..., *cit.*

tribution and retail sale of liquefied petroleum gas; e) the transportation, storage, distribution and retail sale of oil products; and f) pipeline transportation and storage linked to pipelines. On top of that, it even provides for changes to regional ecological management programs when these include environmental management units, criteria, guidelines, strategies, directives or any other provision related to activities that allow the development of the oil & gas industry, creating exceptions for an economic sector, thereby contravening the principle of sustainability, as well as the principle of good governance.

Environmental regression is also evidenced in pushing for an energy model based on fossil fuels, which compromises the obligations the Mexican State has undertaken in signing the United Nations Framework Convention on Climate Change and the Paris Agreement.⁵⁵

The first aims at stabilizing greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. This translates into an obligation to formulate, implement, publish, and regularly update national and regional programs containing measures to mitigate climate change; to promote and cooperate in the development, application and diffusion, including the transfer of technologies, practices and processes that control, reduce or prevent anthropogenic Greenhouse Gases (GHG) emissions.

Under the Paris Agreement, the signatory countries pledge to avoid global temperature increases exceeding 2°C and ideally 1.5°C. As one of the signatories to the agreement, Mexico has committed to decarbonize its economy during the second half of the century and increase its climate resilience. It has voluntarily agreed to reduce 22% of its GHG emissions by 2030 and 51% of its black carbon emissions by 2020. However, at the same time, the Mexican government is encouraging the use of fracking—hydraulic fracturing—which emits significant amounts of methane into the atmosphere, the second most common greenhouse gas with an atmospheric life of approximately 12 years and a global warming potential 25 times greater than that of carbon dioxide.⁵⁶ This situation is compounded by the fact the Mexico is especially vulnerable to the effects of climate change

⁵⁵ Anglés Hernández, Marisol, “Reforma energética y cambio climático. Algunos puntos de desencuentro”, in Cárdenas Gracia, Jaime (coord.), *Reforma energética. Análisis y consecuencias*, México, UNAM, Instituto de Investigaciones Jurídicas-Tirant lo Blanch, 2015, p. 119.

⁵⁶ Howarth, Robert W. *et al.*, “Methane and the Greenhouse-gas Footprint of Natural Gas from Shale Formations: A Letter, *Climatic Change*, Dordrecht, 2011; Castillo Rodríguez, Francisco, *Biotecnología ambiental*, Madrid, Editorial Tébar, 2005, vol. 106, No. 4, p. 128.

due to its geographic location, its topography and socioeconomic characteristics.⁵⁷

The behavior of the Mexican State is replicated throughout the world since in terms of governance, the greatest difficulty lies in the lack of government leadership because the States receiving capital do not fulfill their obligation to protect human rights.⁵⁸ Instead, they prefer to privilege economic investment, without realizing that in the long run, omissions in the area of environmental rights (degradation, pollution) will become liabilities that they themselves will have to take on.

VI. CONCLUDING REMARKS

The Mexican government's commitment to face the energy crisis by pursuing a model centered on the exploration and extraction of fossil resources contradicts the commitments undertaken to reduce GHGs under the United Nations Framework Convention on Climate Change and the Paris Agreement. Furthermore, global warming exacerbates the vulnerability of populations and ecosystems, the consequences of which could be devastating for the country.

The oil & gas reform is based on a vertical model, in which the head of the Federal Executive branch controls most of the bodies created for its implementation since he has the power to appoint and remove actors with important decision-making powers. There are no rules for these procedures, which violates the principle of the human right to good governance.

The ASEA-derived regulations are not in line with the obligations acquired through international human rights and sustainability instruments to which the Mexican State is party as they facilitate the extraction and sale of fossil resources instead of decisively advancing the development and implementation of clean technologies.

In the framework of the Inter-American and national human rights systems, the exploration and extraction of oil & gas must be carried out in such a way that it guarantees the rights of the people living where these resources are located. Moreover, exploration and extraction activities must be carried

⁵⁷ Secretaría de Medio Ambiente y Recursos Naturales, *Sexta Comunicación Nacional y Segundo Informe Bial de Actualización ante la Convención Marco de las Naciones Unidas sobre el Cambio Climático*, México, Instituto Nacional de Ecología y Cambio Climático, 2018, p. 429.

⁵⁸ United Nations, *Working Group on the issue of human rights and transnational corporations and other business enterprises*, A/73/163, New York, General Assembly, 16 July 2018, para. 31.

out with a sustainable approach; otherwise, the Mexican State might incur international liability.

Regulations stemming from the oil & gas reform is regressive as it omits the principle of progressivity as can be noted in the amendment to the Regulation of the General Law of Ecological Balance and Environmental Protection in matters of Ecological Planning. This also violates the principles of legality, legal reserve and hierarchical subordination since its enactment contradicts the prevalence of the hierarchical superior law, which is the LGEEPA, the federal Constitution provision dictating that national development must be comprehensive and sustainable.

One success has been the development and implementation of the Public Complaint System, which can be accessed on the ASEA internet portal, with a view to allowing access to public participation in matters of environmental interest involved in the oil & gas sector, which, in turn, contributes to environmental governance and the democratic rule of law.

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CLIMATE CHANGE, ENERGY TRANSITION POLICY IN MEXICO AND THE PROMOTION OF THE USE OF NATURAL GAS

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SUMMARY: I. *Introduction*. II. *Energy Transition Law*. III. *Energy transition policy and the use of natural gas*. IV. *Incentives for using natural gas*. V. *Use of natural gas and climate change*. VI. *Conclusions*. VII. *Bibliography*.

I. INTRODUCTION

Climate change is one of the most serious problems humanity faces collectively and “represents a growing threat to ecosystems as well as infrastructure, human settlements, productive processes, public health and other factors affecting development”,¹ so much so that if nothing is done to stop or control it, there will be catastrophic consequences for human life.

In its Fifth Assessment Report (AR5),² the Intergovernmental Panel on Climate Change (IPCC)³ noted: “New evidence confirms that climate system warming is unequivocal... land and ocean surface air temperatures, as a global average, rose 0.85°C in the period 1889-2012”.⁴

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¹ Tudela, Fernando, “Cambio climático, un problema de todos”, *Foreign Affairs Latinoamérica*, vol. 15, No. 4, 2015, p. 8.

² IPCC Fifth Assessment Report 2014.

³ A panel of experts from the United Nations Environment Programme and the World Meteorological Organization.

⁴ Pichs, Ramón, “Prólogo”, in Cruz, Xóchitl y Delgado, Gian Carlo (coords.), *México ante la urgencia climática: Ciencia, política y sociedad*, México, UNAM, Centro de Investigaciones Interdisciplinarias en Ciencias y Humanidades y Programa de Investigación en Cambio Climático 2015, p. 17.

According to the IPCC AR5, human influence on the climate system is becoming increasingly evident and is due to rising concentrations of greenhouse gases (GHG) in the atmosphere⁵ because of the increased production and use of fossil fuels to generate energy. Despite the growing number of climate change mitigation policies, anthropogenic GHG emissions have continued to surge, reaching 49 ± 4.5 Gt of CO₂e per year (49,000 million tons) in 2010. Carbon dioxide (CO₂) emissions from fossil fuel combustion and industrial processes contributed around 78% of the total increase in emissions⁶ and:

In the absence of any additional efforts to reduce GHG emissions beyond current levels, these emissions are expected to grow driven by global population growth and economic activities and subsequently lead to a rise in the global average surface temperatures of between 3.7°C and 4.8°C by 2100 compared to pre-industrial levels.⁷

According to the IPCC Sixth Assessment Report, since 2011 (measurements reported in AR5), concentrations have continued to increase in the atmosphere, reaching annual averages of 410 parts per million (ppm) for carbon dioxide (CO₂).

At the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change, which culminated in the Paris Agreement, it was agreed to hold the global average temperature increase well below 2°C from pre-industrial levels to avert a possible catastrophe, and to continue efforts to limit this temperature increase to 1.5°C so as to minimize adverse effects on the climate system.⁸

Reaching this 2°C target will, however, require substantial reductions in GHG emissions in the coming decades and practically zero emissions of CO₂ and other long-lived gases by the end of the 21st century. The Paris Agreement was limited to voluntary commitments by all the parties, embodied in the so-called Nationally Determined Contributions (NDCs) to be

⁵ IPCC, Climate Change 2014, Synthesis Report, Summary for Policymakers, 2014, p. 5, available at: https://archive.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM_es.pdf.

⁶ Pichs, Ramón, “Prólogo”, *op. cit.*, p. 17.

⁷ Convención Marco de las Naciones Unidas para el Cambio Climático, Acuerdo de París, 2015, available at: https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_spanish_.pdf.

⁸ Convención Marco de las Naciones Unidas para el Cambio Climático, Acuerdo de París, 2015, available at: https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_spanish_.pdf.

implemented in 2020-2024 and which were defined by each signatory country according to their national circumstances. Each party also established NDC implementation timeframes or periods, scope, and methodologies.

Although these NDCs proposed relevant actions such as the expansion of renewable energies and an increase in energy efficiency, there is a notorious weakness or even an absence of measures that directly impact the logic and dynamics of the oil-gas business. Nor is it by chance that the negotiators of the Paris Agreement refused to establish a carbon budget that could limit emissions, especially those produced by burning fossil fuels, and to abandon the attempt to transition from coal and oil to (natural) gas as a way to decarbonize the energy matrix through the so-called expansion of *low-carbon energy sources*. This reveals a resistance to genuine change in the energy paradigm since *low-carbon energy sources* include not only renewable, but also gas and nuclear energy.⁹

It is therefore evident that “...for large oil companies to change their production patterns... implies a devaluation of their capital...”.¹⁰ Thus, there are economic and social forces interested in maintaining sustained growth in their production levels and the growing use of fossil fuels to the detriment of the climate system.

The Mexican government, meanwhile, boasts of maintaining a leading position at the international level in addressing climate change and has committed to building consensus and defining actions to deal with it. Thus, Mexico is the first and only developing country to submit five National Communications to the United Nations Framework Convention on Climate Change (UNFCCC), and its First Biennial Update Report. It “...was one of the few countries to submit its INDCs in the originally stipulated time. In fact, it was the first developing country to do so”.¹¹ It was also the first developing country and the second country in the world to have a legal framework on climate change by enacting the General Law on Climate Change (LGCC) in June 2012. But while the central issue of energy and environmental policy in most countries around the world has focused on how to reduce production, consumption and dependence on fossil fuels be-

⁹ Delgado, Gian Carlo, “COP 21 y la transición hacia escenarios de bajo carbono, eficiencia, innovación tecnológica y cambio de paradigma” in Rueda, Clemente and Gay, Carlos (coords.), *21 Visiones de la COP 21, El Acuerdo de París: Retos, y áreas de oportunidad para su implementación en México*, México, UNAM, 2016, pp. 83-85.

¹⁰ Schoijet, Mauricio, *Límites del crecimiento y cambio climático*, México, Siglo XXI, 2008, p. 49.

¹¹ Muñoz, Gabriela, “Contribuciones previstas y determinadas a nivel nacional” in Rueda, Clemente and Gay, Carlos (coords.), *21 Visiones de la COP 21, El Acuerdo de París: Retos y áreas de oportunidad para su implementación en México*, Mexico, UNAM, 2016, p. 64.

cause of their effects on the global climate, Mexico, with its energy reform and implementation of the Energy Transition Law (LTE) and its policy instruments, has opted for greater extraction, importing and use of one fossil fuel –natural gas– in the electricity industry.

The aim of this paper is to analyze the LTE within the framework of the 2013 energy reform and the promotion of the use of natural gas to achieve the objectives of this law and of the LGCC, as well as to detail its consequences on the climate system.

II. ENERGY TRANSITION LAW

In December 2013, Mexico approved the Constitutional Reform on energy-related matters, by amending Articles 25, 27 and 28 of the Constitution. Published in the Federal Official Gazette on December 20 of the same year, its decree also included twenty-one transitory articles, among which we highlight the Seventeenth:

...the Congress of the Union will adapt the legal framework to establish the bases on which the State will ensure the protection and care for the environment, in all processes related to this decree by incorporating criteria and best practices in the areas of efficiency in the use of energy, the reduction in generating greenhouse gases and compounds..., as well as a smaller carbon footprint in all its processes.

And the Eighteenth Transitory Article, which says: “The Federal Executive... shall include a transition strategy in the National Program for the Sustainable Use of Energy (PRONASE) to promote the use of cleaner technologies and fuels”.

In compliance with the above, the Ministry of Energy (SENER) and the National Commission for the Efficient Use of Energy (CONUEE) developed the first Transition Strategy to Promote the Use of Cleaner Technologies and Fuels, which became part of the PRONASE in force at that time and was published in the Federal Official Gazette on December 19, 2014.

Subsequently and under pressure from non-governmental organizations when the 21st Conference of the Parties (COP 21) to the UNFCCC was taking place, the Mexican Congress passed the Energy Transition Law.

Article 3 of this law defines the Transition Strategy to Promote the Use of Cleaner Technologies and Fuels as the guidelines for designing the Spe-

cial Energy Transition Program (PETE) and the PRONASE, which are the mandatory benchmarks for clean energy and energy efficiency policies.

The update to the first Transition Strategy to Promote the Use of Cleaner Technologies and Fuels was published in the Federal Official Gazette on December 2, 2016,¹² in compliance with the Fifteenth Transitory Article of the LTE. The Agreement by which the SENER issued the PETE 2017-2018 was published on May 31, 2017, and the Energy Transition Law Regulation was published on May 4, 2017.

III. ENERGY TRANSITION POLICY AND THE USE OF NATURAL GAS

As part of the secondary laws prescribed by the transitory articles of the 2013 constitutional energy reform, the LTE was belatedly enacted in December 2015, with the aim of: "...regulating the sustainable use of energy, as well as obligations regarding clean energy and the reduction of polluting emissions from the *electricity industry*, while maintaining the competitive edge of the productive sector".

This is the only law in the energy law related to environmental protection. One of its objectives is to help meet the LGCC goals of reducing GHG emissions from electricity generation, by promoting the use of clean energies like those from renewable sources. This is reflected in the Third Transitory Article of the LTE, which states: "The Ministry of Energy shall set a minimum participation of clean energy in the generation of electricity of 25% by 2018, 30% by 2021 and 35% by 2024". For this reason, it should be the principal legal instrument to mitigate the negative effects of the energy reform on the climate system.

It is important to clarify what is meant by *clean energies*. To this end, the LTE refers to the Electricity Industry Law (LIE), published in the Federal Official Gazette on August 11, 2014, which explains that they are: "Those energy sources and electricity generation processes whose emissions or waste... do not exceed the thresholds established in the regulatory provisions...". Renewable energies are considered clean energies, including wind, solar radiation in all its forms, ocean in its diverse forms, heat from geothermal deposits, hydroelectric, bioenergy, methane produced from waste, and

¹² On February 7, 2020, the most recent update of the Transition Strategy to Promote the Use of Cleaner Technologies and Fuels was published in the Official Gazette of the Federation.

hydrogen, *inter alia*. However, attention must be drawn to the fact that this legislation includes nuclear energy in the *clean energies* category, as well as:

The energy generated by efficient cogeneration plants under the efficiency criteria issued by the Energy Regulatory Commission (CRE) and the emissions criteria established by the Ministry of the Environment and Natural Resources (Semarnat); energy generated by thermal power plants with geologic carbon dioxide capture and storage or bio-sequestration processes with an efficiency equal to or greater in terms of kWh-generated per ton of equivalent carbon dioxide released into the atmosphere at the minimum efficiency established by the CRE and the emissions criteria established by Semarnat; technologies considered *low-carbon emission* technologies according to international standards, and other technologies determined by SENER and Semarnat, based on energy and water efficiency parameters and standards, atmospheric emissions and waste generation whether direct, indirect or during its life cycle.¹³

With the entry into force of this legislation, the Law for the Use of Renewable Energies and Energy Transition Financing, which as its name indicates, regulated the use of renewable energies, and did not take fossil sources into account, was repealed.

Thus, from the revised definition of clean energies in the LTE, it can be inferred that: The goal of 35% of electricity generation from *clean energies*¹⁴ by 2024, contained in the LGCC (and established by the LTE) was therefore intended to be met not only with renewable energies, but also through the use of a fossil fuel: natural gas.¹⁵

In this regard, the National Electric System Development Program (PRODESEN) 2018–2032 recognizes:

...that the broader the definition and the list of technologies considered clean, the lower the cost of incorporating these technologies into the system, making it possible for the country to boost its competitiveness, diversify its

¹³ The Sixteenth Transitory Article of the Energy Transition Law, as well as the administrative provisions published in the Federal Official Gazette on December 22, 2016, establish the conditions and thresholds for cogeneration, thermal generation with carbon capture and other low-carbon emission technologies (natural gas) that are considered clean energy. In the Reform to the Electricity Industry Law published in the Official Gazette of the Federation on May 11, 2022, the same definition of Clean Energy is maintained.

¹⁴ The General Law on Climate Change does not define what is meant by clean energies.

¹⁵ Mendivil, Ana and Niño, Gabriela, “La política climática de México tras el Acuerdo de París”, México, Friedrich Ebert Stiftung, 2016, p. 16.

electricity generation matrix and maintain an efficient and trustworthy balance of the system.¹⁶

To meet its goals and objectives, the LTE institutes the creation of planning instruments for the national energy policy on *clean energies*, such as the Transition Strategy to Promote the Use of Cleaner Technologies and Fuels and the Special Energy Transition Program.

The Strategy is the guiding instrument for national policy in the medium and long term, 15 and 30 years respectively. About *clean energies*, it seeks, in the medium term, to reduce under economic viability criteria the country's dependence on fossil fuels as a *primary source* of energy and to establish policies and measures to advance the use of renewable resources and replacement of fossil fuels in final consumption. Meanwhile, the Program establishes the activities and projects that must be developed in accordance with the strategy.

Closer examination of the Strategy¹⁷ shows that it does not contain a definition of *clean energies*, by which it can be understood that the definition does not differ from that of the law, that is, it includes not only renewable energies, but also low-carbon emission energies such as natural gas. The goals and scenarios of the energy transition are set out in terms of clean energies; however, the policies and lines of action to reach those objectives are focused on seven areas: bioenergy, wind energy, solar energy, geothermal energy, hydropower and energies from the ocean, carbon capture and storage, development and social impact, but does not include natural gas or low-carbon emission fuels.

Notwithstanding the above approach to renewable energies, the Strategy acknowledges that in forecasting participation by technology type in electrical energy consumption, the contribution of conventional (fossil) fuels will go from 77% of total electricity consumption in 2016 to 59% in 2030, increasing with an average annual growth rate of 1.05%, while renewable energies will go from contributing 23% to 27.6% in the same period, growing at an average annual rate of 5.9%. It is worth noting that nuclear power is expected to have an average annual growth rate of 9%.¹⁸ So, it is possible to assert that: "In this regard, a study by the Economic Commission for Lat-

¹⁶ Secretaría de Energía, Programa de Desarrollo del Sistema Eléctrico Nacional, México, 2018, p. 28, available at: <https://www.gob.mx/cms/uploads/attachment/file/331770/PRODE-SEN-2018-2032-definitiva.pdf>.

¹⁷ Refers to the version published in 2016.

¹⁸ Secretaría de Energía, Estrategia de Transición para Promover el Uso de Tecnologías y Combustibles más Limpios, México, *Diario Oficial de la Federación*, December 2, 2016, avail-

in America and the Caribbean (ECLAC) indicated that Mexico is projected to continue to depend on fossil fuels to a large extent until 2030”.¹⁹

The Special Energy Transition Program has the express objective to expand installed capacity and the generation of clean energy; diversify the energy matrix; decarbonize the electricity sector and meet the demand for competitively priced electricity and respect for the environment. Hence, the program does take into account the LIE definition of *clean energy* and has a clear focus on these aspects.²⁰

It bears mentioning that neither the Strategy nor the Program has established quantitative goals for the participation of renewable energies within the global goals of clean energy in electricity generation.

The programs and prospects of the electricity sector merely refer to the development of clean energies in general. According to PRODESEN, in 2017 the installed capacity of the System was 75,685 MW, 70.5% of which were conventional electricity plants and 29.5% plants with clean technologies, classified as such based on the LIE definition, with emphasis on the substitution of solid or liquid fuels for natural gas.²¹

Within the clean energy package, in addition to efficient cogeneration, PRODESEN includes the conversion of thermoelectric plants to dual combustion ones. It also scheduled, as of 2014, the conversion of seven thermoelectric generation units to dual combustion for the purpose of reducing the use of fuel oil and replacing it with natural gas.²²

Between 2018 and 2021, combined cycle electricity and turbo gas power plants were expected to be installed, representing 47% of the total additional capacity.²³ As a result, natural gas consumption would grow at an average rate of 2.4% a year so that by the end of the planning period, i.e., 2032, its share would reach 63% of the total fossil fuel consumption used to produce electricity. This would be possible with 10 gas pipelines starting

able at: https://www.gob.mx/cms/uploads/attachment/file/182202/20161110_1300h_Estrategia_CCETE-1.pdf.

¹⁹ Mendivil, Ana and Niño, Gabriela, “La política climática...”, *op. cit.*, p. 5.

²⁰ Secretaría de Energía, Programa Especial de la Transición Energética 2017-2018, México, *Diario Oficial de la Federación*, May 31, 2017, available at: <https://www.gob.mx/cms/uploads/attachment/file/213322/PETE.pdf>.

²¹ Secretaría de Energía, Programa de Desarrollo del Sistema Eléctrico..., *op. cit.*, p. 18.

²² *Ibidem*, p. 37.

²³ According to PRODESEN 2021-2035, it is estimated that in the evolution of the estimated electricity production of the period, the consumption of natural gas will continue to be predominant, with a gradual incorporation of the participation of renewable energies with the aim of meeting the established goals, guaranteeing reliability in conditions of economic viability.

operations in 2018, thereby boosting transportation capacity by 12,193 million cubic feet per day.²⁴

The following table shows the composition of electricity generation during the PRODESEN planning period. With the exception of wind energy, the growth of the rest of the renewable energies remains stagnant, while nuclear energy stands out for its remarkable expansion.

TABLE 1. TOTAL GENERATION BY TYPE
OF TECHNOLOGY IN 2022 AND 2032 IN %

<i>Technology</i>	<i>2022</i>	<i>2032</i>
Combined cycle	52	51
Coal-fired and fluidized bed combustion	11	7
Conventional thermoelectric, internal combustion and Turbo-gas power plants	4	2
Wind	10	13
Hydroelectric	9	8
High efficiency cogeneration	3	2
Nuclear	3	8
Solar	4	4
Geothermal	2	3
Bioenergy	2	2

SOURCE: prepared by the author based on information provided by PRODESEN.²⁵

The Electricity Sector Outlook 2017-2031 estimates that:

...between 2017 and 2031, 55,840 MW of electricity generation will be added, 37.4% of which will correspond to conventional technologies... 62.6% to clean technologies. It should be noted that of the total additional capacity, the two main technologies contributing the most to the system are combined cycle power plants with 33.9% and wind power stations with 24.2%.²⁶

²⁴ *Ibidem*, p. 81.

²⁵ *Ibidem*, p. 80.

²⁶ Secretaría de Energía, *Prospectiva del Sector Eléctrico 2017-2031*, México, p. 77, available at: https://www.gob.mx/cms/uploads/attachment/file/284345/Prospectiva_del_Sector_Electrico_2017.pdf. To the latest Electricity Sector Outlook 2018-2032, in the period the addition of 66,912 MW of new capacity is foreseen, of which 54.9% will be from clean technologies and the remaining 45.1% from conventional technologies. Combined cycle technology will concentrate 42.0% of the total additions.

The Natural Gas Outlook for 2017-2031 reports on the growth of the sector's demand for natural gas:

The use of natural gas for electricity generation has progressively risen in the country. It accounted for 70% of the demand for fossil fuels used in the electricity sector in 2016 because of the strategy of substituting expensive and contaminating fuels such as oil fuel and diesel for cheaper and more environmentally friendly sources such as natural gas.²⁷

Likewise, “[i]n 2031, it is estimated that the demand for natural gas will have increased 26.8% [*sic*] compared to 2016, going from 3,395 MMSCFD²⁸ in 2016 to 5,947.2 MMSCFD in 2031”,²⁹ an increase of 2,552.2 MMSCFD of natural gas, corresponding to an actual increment of 75%, resulting from building transportation infrastructure and the Federal Electricity Commission (CFE) fuel substitution strategy combined with the conversion of power plants to dual combustion plants. In addition, “[t]his strategy is part of the clean energy goals set out in the Energy Transition Law published in December 2015 to regulate the sustainable use of energy, as well as the obligations regarding clean energy and the *reduction of pollutants in the electricity industry*”.³⁰

The scenario for renewable energies is very different. At the end of 2016, the installed capacity in Mexico had risen 10.17% over the preceding year. Meanwhile, 15.4% of electric energy was generated using renewable energies, and solar and wind power were the technologies that showed the greatest growth.³¹

PRODESEN estimates that between 2017 and 2031, renewable energies will grow by an average annual rate of 7.4%, to end the period at 135,027 GWh.³²

According to an ECLAC report, in 2012 a comparative analysis of the efficient and renewable energy policies in Mexico and China found that

²⁷ *Ibidem*, p. 14.

²⁸ Millions of standard cubic feet per day.

²⁹ *Ibidem*, p. 17.

³⁰ *Ibidem*, p. 62. In the Natural Gas Outlook 2018-2032 it is estimated that in 2032 the demand for natural gas will be 9,920.5 mmcf, which will represent an increase of 30.33% compared to 2017. And it is confirmed that the electricity sector will continue to lead the demand for gas, derived from the continuous use of natural gas associated with the conversion of electricity generation plants, the progress in projects for the installation of combined cycle power plants and the expansion of the infrastructure of the gas pipeline network.

³¹ Secretaría de Energía, *Prospectiva de Energías Renovables...*, *op. cit.* p. 13.

³² *Idem*.

Mexico had not allocated significant resources for renewable energy projects.³³ From the data, we observe that this trend continues.

IV. INCENTIVES FOR USING NATURAL GAS

Due to its low carbon emissions, natural gas has long been considered an alternative to the use of solid fossil fuels like coal or liquid fuels like diesel or fuel oil. Even major oil companies have spread the idea that it can be a bridge fuel for the transition to renewable energies, claiming that in order to achieve the long-term emission reduction goals, it is necessary to lower the use of coal and other fuels with large carbon footprints per unit of energy produced and replace them with natural gas of both conventional and non-conventional origins. The latter, however, is extracted by using the controversial hydraulic fracturing technology with estimated GHG emissions up to 11% higher than those generated by extracting from conventional deposits.³⁴

In its Fifth Assessment Report (2014) of the Intergovernmental Panel on Climate Change (IPCC), Working Group III suggested some possible benefits to increasing natural gas production, even when extracting from shale basins.³⁵

According to a paper by the German Institute for Economic Research, Mexico pushed through its energy reform with the intention of expanding the use of natural gas over other fossil fuels, mainly in the energy sector, and thus opening the market to private investors.³⁶

This is reflected in the different strategies adopted, especially by Semarnat, supposedly aimed at lowering emissions and complying with international commitments. Moreover, investment programs in gas production, import and transportation infrastructure highlight the following items:

³³ Heres, David, *El cambio climático y la energía en América Latina*, Chile, United Nations ECLAC, European Union, 2015, p. 33.

³⁴ Hultman, Nathan *et al.*, “The Greenhouse Impact of Unconventional Gas for Electricity Generation”, *Environmental Research Letters*, no. 6, 2011, p. 1.

³⁵ Committee on Climate Change, “Does the IPCC Endorse Shale Gas?”, United Kingdom, April 17, 2014, available at: <https://www.theccc.org.uk/2014/04/17/does-the-ipcc-endorse-shale-gas/>.

³⁶ Feijoo, Felipe *et al.*, “North American Natural Gas Model Impact of Cross-Border Trade with Mexico”, *Discussion Paper of DIW Berlin*, no. 1553, 2016, p. 1, available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2737266.

1. *Government policy and mitigation actions*

The National Climate Change Strategy 10-, 20- and 40-Year Outlook was published as mandated by the LGCC in the *Federal Official Gazette* on June 3, 2013. It is the planning instrument to guide the nation in combating the phenomenon of global warming and its aftermaths over the next 40 years. Like the LGCC, this document does not include a definition of clean energies although the Third Transitory Article of the Law establishes that SENER, in coordination with the CFE and the CRE, should advocate for the generation of electricity from clean energy sources reaching a minimum goal of 35% by 2024.

Among the array of mitigation actions of this Strategy, the CFE fuel substitution strategy is considered one of the most viable medium-term actions, given the current conditions, in order to reach the goals, set by the law on this issue.

One of the main tactics in the Strategy is to accelerate the energy transition towards clean energy sources since Mexico has vast potential for generation through renewable sources and to overcome the barriers to their full incorporation into the national energy system. Among the lines of action is to promote the generation of energy through the use of clean sources and more efficient technologies to replace fossil fuels, thus minimizing their environmental and social impact and to encourage the generation of energy through renewable sources such as wind, photovoltaic, geothermal, hydroelectric and solar thermal power, as well as the inclusion of nuclear energy, as part of the clean energy sources for the energy transition.

Objective 3 of the Special Program on Climate Change 2014-2018 published in the *Federal Official Gazette* on April 28, 2015, sets out: “To reduce greenhouse gas emissions to transition to a competitive economy and low-emission development”, in light of Strategy 3.2 which focuses on “accelerat[ing] the energy transition to less carbon-intensive energy sources”. To this end, it proposes actions such as promoting the diversification of the energy matrix with public and private investment in generation using clean energies, thus replacing diesel and fuel oil in the energy matrix with less carbon-intensive sources and developing policies and measures to ensure the adequate supply of natural gas. It should be noted that biofuels and renewable energies are also mentioned.³⁷

³⁷ Gobierno de la República, Plan Nacional de Desarrollo 2013-2018, Programa Especial de Cambio Climático 2014-2018, México, 2013, available at: http://www.semarnat.gob.mx/sites/default/files/documentos/transparencia/programa_especial_de_cambio_climatico_2014-2018.pdf.

On March 27, 2015, Mexico submitted its Nationally Determined Contributions (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC) in preparation for the Conference of the Parties held in Paris in December 2015. The NDC proposed to lower GHG emissions by 22% from the baseline by 2030, and 51% of black carbon. It also committed to reaching peak emissions by 2026 by decoupling GHG emissions from economic growth, i.e., emissions intensity per unit of GDP would be reduced by around 40% by 2030.³⁸

The mitigation actions to achieve this goal in the electricity industry include generation with 35% clean energy by 2024 and 43% by 2030 (66%) and the substitution of natural gas for fuels (1%).³⁹

The First Biennial Update Report for the UNFCCC,⁴⁰ which outlines the guidelines for emissions to comply with the INDCs pledged at the 2015 Paris COP21 details the areas of opportunity identified for GHG emissions reduction at the sectoral level, among which are, in the case of oil and gas: a reduction of fugitive methane emissions in the extraction of unconventional gas reservoirs and deep waters; improvement of operating practices promoting cogeneration and energy efficiency projects; and greater supply of natural gas to replace more carbon intensive fuels.

To accelerate the energy transition towards clean energy sources, some of the proposed mitigation measures are disseminating the advantages of cogeneration and converting 7 generation plants from fuel oil to gas, among others that include fostering renewable energy sources. In this context, it should be recognized that the proposed path for the electricity industry envisages the installation of more than 18000 MW of generation capacity from renewable sources in 2018.

2. *Reduction of short-lived climate pollutants*

The aforementioned National Climate Change Strategy 10-, 20- and 40-Year Outlook acknowledges that control of short-lived climate pollutants such as methane, tropospheric ozone and especially black carbon, generates mitigation opportunities that are cost-effective and have a significant

³⁸ Mendivil, Ana & Niño, Gabriela, “Una política energética sustentable: un pendiente para México”, México, Friedrich Ebert Stiftung, *Perspectivas*, No. 1, 2016, p. 13.

³⁹ *Idem*.

⁴⁰ Gobierno de la República, *Primer Informe Bienal de Actualización ante la Convención Marco de las Naciones Unidas sobre el Cambio Climático*, México, Semarnat, Instituto Nacional de Ecología y Cambio Climático, 2015.

impact. Such actions have high global-warming potential and great environmental co-benefits, in addition to contributing to reducing toxic compounds harmful to human health.

Currently, there is no baseline for short-lived climate pollutants emissions; they are calculated as a carbon dioxide equivalent because there is still no international scientific consensus on the proper conversion factors.

The inclusion of black carbon in the absence of scientific certainty on the issue is another example of this policy promoting natural gas. Given the toxicity and carcinogenicity of soot particles or black carbon, Mexico, under the pretext of combining climate change mitigation efforts with the protection of public health, was the only country to commit to a goal of reducing this compound by up to 51% from the baseline by 2030, in its NDCs submitted in March 2015.⁴¹ However, this raises reasonable suspicions about its encouraging the use of this fossil fuel as it is, after all, derived from liquid or solid fossil fuels and the best way to reduce its emission is to replace it with natural gas. This seems to simply give the appearance of complying with the ambitious mitigation goals, without jettisoning the use of fossil fuels or changing the country's energy profile.

3. *Failure to include renewable energy goals in NDCs*

It is necessary to point out that Mexico has not committed to any specific renewable energy goals, unlike other countries like Brazil, India and China. Brazil has pledged to diversify its energy matrix so that by 2030 between 28% and 33% of renewable energies would be used to generate electricity. India will build 100 GW of solar energy capacity and 60 GW generated by wind power capacity by 2022. Finally, China will install between 800 and 1,000 GW of renewable energy by 2030.⁴²

4. *Carbon tax does not include natural gas*

“Among the best climate change mitigation policies is the imposition of a price on carbon to hold us accountable for the social costs of our

⁴¹ Gobierno de la República, *Compromisos de Mitigación y Adaptación ante el Cambio Climático para el periodo 2020-2030*, México, 2015, available at: https://www.gob.mx/cms/uploads/attachment/file/162974/2015_indc_esp.pdf.

⁴² Mendivil, Ana and Niño, Gabriela, “Una política energética sustentable...”, *op. cit.*, p. 6.

actions”.⁴³ At COP21, Mexico declared that its policy of promoting clean energies is based on a carbon tax established in 2013, but this is applied to all fuels, except natural gas.⁴⁴

5. *Natural gas imports and gas pipeline expansion*

To sustain this policy, Mexico needs to import large quantities of natural gas. Among the premises considered by the Five-Year Plan for the Expansion of the Integrated National Natural Gas Transportation and Storage System 2015-2019 for planning the National Gas Pipeline System are: “The resulting balance in global terms shows that the demand for natural gas grows, on average, 500 million cubic feet per day every year, while the supply decreases, on average, 100 MMSCFD. This implies a growing demand for imported natural gas, both by pipeline and liquefied natural gas (LNG), (by sea)”.⁴⁵

The cited five-year plan contained projects considered strategic to guaranteeing the efficient development of the gas transportation system and entailed an expansion of 5,159 km of new gas pipelines with an estimated total investment of \$9,736 million USD.

In March 2018, the National Natural Gas Control Center (CENAGAS) published a third revision of the 2015-2019 Five-Year Plan, approved by SENER. This new version contained plans for 10 new pipelines that would add a further 3,354 km to the system.⁴⁶ In addition, CENAGAS conducted a study of the underground storage potential for natural gas, which was centered on identifying hydrocarbon deposits which could be converted to subterranean natural gas storage units. Meanwhile, there are three storage

⁴³ Huesca, Luis and López, Alejandra, “Impuestos ambientales al carbono en México y su progresividad. Una revisión analítica”, *Economía Informa*, México, No. 399, May-June, 2016, p. 23.

⁴⁴ Mendivil, Ana and Niño, Gabriela, “Una política energética sustentable...”, *op. cit.*, p. 6.

⁴⁵ Secretaría de Energía, Plan Quinquenal de Expansión del Sistema de Transporte y Almacenamiento Nacional Integrado de Gas Natural 2015-2019, México, 2015, p. 9, available at: https://www.gob.mx/cms/uploads/attachment/file/43397/Plan_Quinquenal_del_Sistema_de_Transporte_y_Almacenamiento_Nacional_Integrado_de_Gas_Natural_2015-2019.pdf.

⁴⁶ Secretaría de Energía, Tercera Revisión Anual, Plan Quinquenal de Expansión del Sistema de Transporte y Almacenamiento Nacional Integrado de Gas Natural 2015-2019, México, 2018, p. 68, available at: https://www.gob.mx/cms/uploads/attachment/file/311763/531.DGGNP209.18.INF1.OT.12_Tercera_Revisi_n_PQ_2015-2019.pdf. In the Five-Year Plan corresponding to the period 2020-2024 it is reported that from the first to December 31, 2019, the natural gas transmission network grew 7.7%.

and regasification terminals for LNG located in Ensenada, Manzanillo and Altamira.⁴⁷

Natural gas imports went up 53% in 2015.⁴⁸ The year before that, 69% of all natural gas imports came from the United States,⁴⁹ highlighting how dependent the country was on its northern neighbor and how vulnerable that made it.

An average of 2,000 MMSCFD entered Mexico through pipelines from the United States, and the capacity was projected to increase to more than 5,000 MMSCFD by 2020, which, along with the construction of LNG regasification terminals, could elevate the volume of imports.⁵⁰

According to the National Energy Balance, domestic natural gas production fell from 4,685.0 MMSCFD in 2006 to 3,568.1 MMSCFD in 2016 with an average annual growth rate of -2.7. Meanwhile imports rose from 1,018.4 MMSCFD in 2006 to 4,181.1 MMSCFD in 2016 with an average annual growth rate of 15.1. In total, demand increased from 5,672.9 MMSCFD to 7,618.7 MMSCFD from 2006 to 2016, with an average annual growth rate of 3.0.⁵¹

At the close of 2016, import volume was 4,168 MMSCFD, up 17.5% over the previous year. Of the imported volume, 87.2% (3,791 MMSCFD) came through import pipelines from the United States and 12% as LNG (527 MMSCFD).⁵²

From a review of previous budgets, it can be said that: "...the energy reform amounted to the construction of a great, political, economic and infrastructural scaffolding for projects to extract this hydrocarbon (natural gas), promoted by the Federal Government".⁵³

V. USE OF NATURAL GAS AND CLIMATE CHANGE

As already mentioned, natural gas is frequently touted as a bridge fuel that will allow society to continue to use fossil fuels in the coming decades since its

⁴⁷ *Ibidem*, p. 30.

⁴⁸ During 2019, 69% of the demand was met with imported natural gas.

⁴⁹ Pemex, *Indicadores Petroleros*, México, 2016, available at: http://www.pemex.com/ri/Publicaciones/Indicadores%20Petroleros/eimportpetro_esp.pdf, 201.

⁵⁰ Feijoo, Felipe *et al.*, "North American Natural Gas Model", *op. cit.*, p. 4.

⁵¹ Secretaría de Energía, Sistema de Información Energética, available at: <http://sie.ener-gia.gob.mx>.

⁵² *Idem*.

⁵³ Mendivil, Ana and Niño, Gabriela, "Una política energética sustentable...", *op. cit.*, p. 6.

combustion emits a smaller amount of GHGs per unit of energy than other fossil fuels like coal and fuel oil. Natural gas is mainly composed of methane, whose greenhouse effect potential is far higher than that of carbon dioxide produced by combustion.

The supposed advantages of using natural gas as an alternative are misleading; owing to methane's high global warming potential, the possible benefits of reducing the carbon footprint by using it as a replacement for solid or liquid fuels are not merely offset, but far exceeded.

For purposes of GHG inventory calculations, it is standard practice to consider methane as having 28 times the global warming potential of carbon dioxide at 100 years.⁵⁴ The half-life of methane in the atmosphere is 12 years while carbon dioxide has an effective influence on atmospheric chemistry lasting 100 years or more.⁵⁵

The 2013 IPCC report on the scientific bases of global warming highlights the role of methane in global warming and establishes that there is no scientific argument for selecting 100 years as the value for warming potential and not one corresponding to other time horizons.⁵⁶ According to Howarth, it is more appropriate to use a 20-year value, which is 86 times that of CO₂, because of the urgent need to prevent the severe effects of global warming over the next 15 to 35 years⁵⁷ and to achieve the goals of the Paris Agreement to hold the increase of average global temperature well below 2°C and to continue efforts to limit that increase to 1.5°C above pre-industrial levels so as to lower the risks of climate change as quickly as possible.

If this is taken into account, the GHG footprint of natural gas in electrical power generation is almost 30% higher than that of coal.⁵⁸

With regard to fugitive emissions, natural gas management systems are the main sources of methane emissions in the United States, accounting for 40% of total methane emissions.⁵⁹

⁵⁴ Value used in the Inventarios Nacionales de Gases y Compuestos de Efecto Invernadero, as well as in the Registro Nacional de Emisiones according to the Acuerdo que establece los gases o compuestos de efecto invernadero que se agrupan para efectos de reporte de emisiones, así como sus potenciales de calentamiento, *Diario Oficial de la Federación*, August 14, 2015.

⁵⁵ Howarth, Robert W. *et al.*, "A Bridge to Nowhere: Methane and the Greenhouse Gas Footprint Of Natural Gas", *Energy Science and Engineering*, 2014, p. 6.

⁵⁶ *Ibidem*, p. 7.

⁵⁷ *Ibidem*, p. 1.

⁵⁸ *Ibidem*, p. 9.

⁵⁹ Howarth, Robert W. *et al.*, "Methane Emissions from Natural Gas Systems. Background Paper Prepared for the National Climate Assessment", February 25, 2012, Cornell

In studies published up to 2011, estimates of fugitive methane emissions in natural gas extraction and processing systems are 0.4% to 2% of the natural gas produced during the life cycle of a well while in transportation and distribution systems, they range from 0.4% to 2.5%. In more recent investigations, estimates have been as high as 10% of the natural gas extracted.⁶⁰

To get an idea of the above, if we take the values in the Natural Gas Outlook for 2017-2031, which foresees that in “2031 the demand for natural gas will grow 26.8% [*sic*] over 2016, moving from 3,395 MMSCFD in 2016 to 5,947.2 MMSCFD in 2031”.⁶¹ In 2016, 152.775 MMSCFD of methane were released into the atmosphere and by 2031, it will have increased to 267.62 MMSCFD due to fugitive emissions in the extraction, production and transportation of natural gas. It is important to clarify that these estimates have a high degree of uncertainty, but it should be considered that the global warming potential of methane over carbon dioxide is 28 times greater at 100 years and 86 times greater at 20 years.

And so, it can be seen that much of the federal government’s efforts at energy reform and climate change mitigation, far from leading to a decarbonization of the economy by encouraging the use of renewable energy, is heading towards promoting the use of natural gas. This was evident in the widespread publicity of the reform in the media that promised as one of its benefits: “Cheaper and more abundant gas will contribute to lowering light bills”.

VI. CONCLUSIONS

As shown in all the planning documents on energy and climate policy, the use of natural gas was promoted by prioritizing measures to replace solid and liquid fuels with this fossil fuel, whose management produces large amounts of fugitive methane emissions which pose a far greater global warming potential than carbon dioxide. These emissions are therefore expected to contribute significantly to the increase in the planet’s average global temperature and to the disruption of the climate system.

The proposed expansion of clean fuels with low-carbon content is a clear sign of the resistance to change in an energy paradigm currently based

University, available at: <http://www.eeb.cornell.edu/howarth/Howarth%20et%20al.%20--%20National%20Climate%20assessment.pdf>.

⁶⁰ *Ibidem*, pp. 2 and 3.

⁶¹ Secretaría de Energía, *Prospectiva de Gas Natural 2017-2031*, *op. cit.*, p. 17.

on the extraction and consumption of hydrocarbons. But it is necessary to move towards a real decarbonization of the economy and to adopt a sustainable model committed to the environment by limiting energy consumption and promoting renewable energies.

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