



Pemex's Flaring Challenges: Debt and Oil Production Priorities Limit Flaring Mitigation Options

By **Adrian Duhalt**

Mexico's Petróleos Mexicanos (Pemex) is well known as one of the world's most indebted oil and gas companies,¹ but it has also recently gained notoriety for its natural gas flaring practices.² While some international oil and gas companies boast a more diverse portfolio, Pemex, following the directives of the current Mexican administration, is focusing on growth prospects concentrated on crude oil production and refining. In the context of policies that emphasize energy self-sufficiency, Pemex's weak financial position, and presidential elections about a year away, the company seems to have few good options for improving its environmental record by reducing the volume of natural gas it flares.³

Since taking office in December 2018, President Andrés Manuel López Obrador, whose term ends in 2024, has introduced an array of sweeping changes to the country's energy policy. Contrary to the previous government, which encouraged the expansion of renewables, greater engagement of private firms, and stronger institutional scaffolding, the current administration's approach has focused on restoring control of the national hydrocarbon value chain to Pemex.

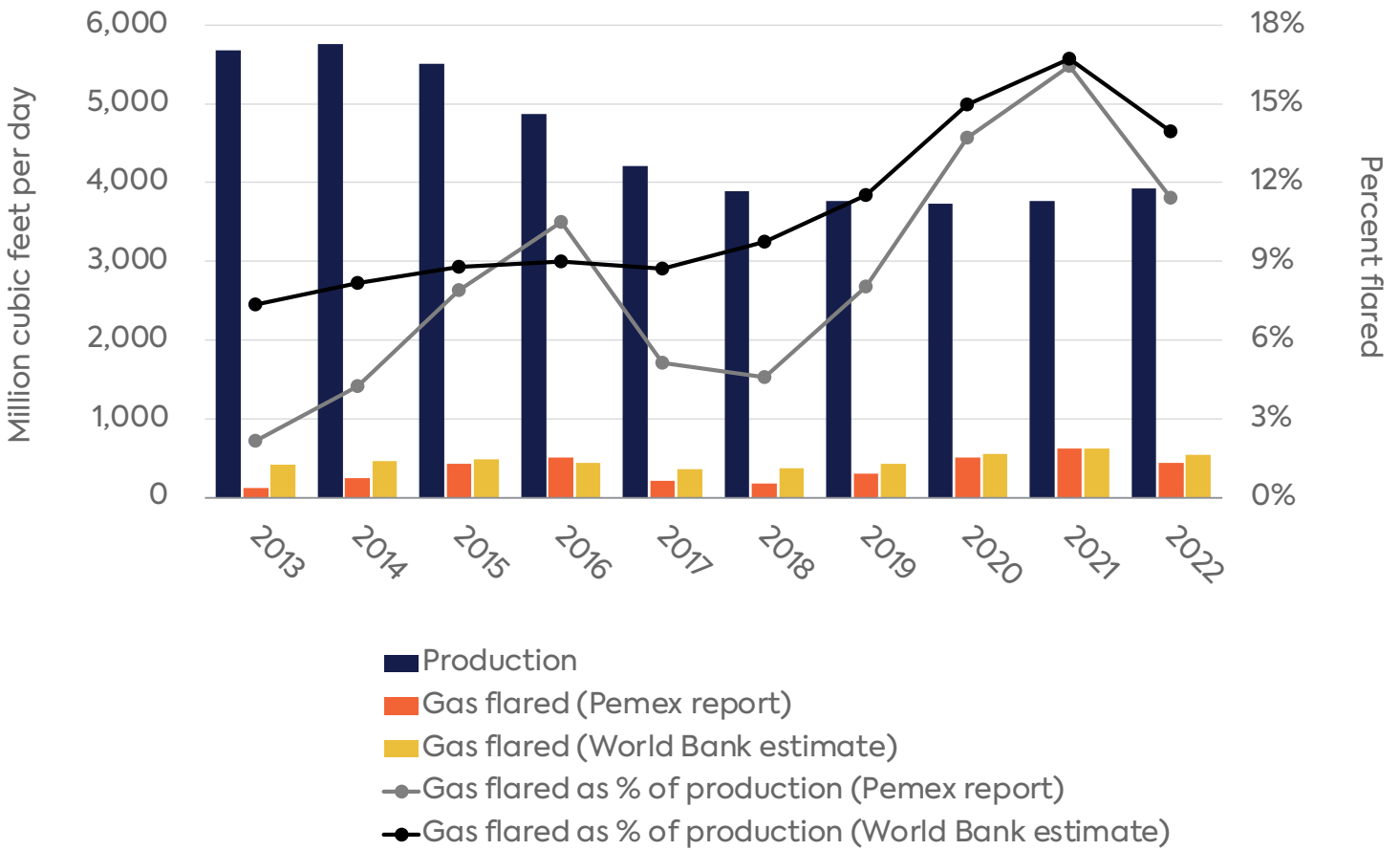
To bolster Pemex's position, the company's strategy since 2019 has been to increase crude oil production and refining, regardless of the environmental costs.⁴ In Pemex's shift to prioritizing crude production, natural gas flaring increased from an average of 178 million cubic feet per day (MMcf/d) in 2018 (the year before López Obrador took power) to 449 MMcf/d in 2022, according to Pemex's reports;⁵ the World Bank estimates that the volume of flared gas grew from 379 MMcf/d to 548 MMcf/d in the same period (Figure 1).⁶

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Figure 1: Pemex’s gas production and flaring



Note: Annual figures of natural gas flaring are based on quarterly averages. Production figures exclude nitrogen.
 Source: World Bank, “Global Gas Flaring Reduction Partnership” (GGFR), <https://bit.ly/3xJ9fLd>; Pemex Institutional Database, “Production of Natural Gas,” <https://bit.ly/3YX3sO8>; Pemex, Quarterly Financial Reports, <https://bit.ly/2kHMx4a>.

The numbers from Pemex and from the World Bank indicate that gas flaring poses important challenges for the company on both environmental and financial fronts. Pemex will need to reduce natural gas flaring to meet its climate commitments, but making progress toward such a goal would require investment in infrastructure at a time when its priority is to bolster crude oil output and its finances are tighter than ever: as of March 2023, the company’s financial debt amounted to \$107.4 billion and overall liabilities stood at \$213.9 billion.⁷ Because Pemex’s finances are intertwined with the state, investing in flaring mitigation infrastructure would have to follow from a shift in the government’s priorities—a shift that doesn’t seem likely given the company’s financial woes and with Mexico’s next presidential elections only about a year away.



Mexico's Bet on Hydrocarbons and Pemex's Flaring Trajectory

Enhancing Mexico's energy independence has been a key ambition of the López Obrador administration. The country's crude oil output peaked at 3.38 million barrels per day (MMb/d) in 2004⁸ but shrank to 1.81 MMb/d in 2018⁹ as a result of factors including falling proved reserves.¹⁰ Reversing the downward trajectory has become a top priority of Mexico's present government.¹¹ Through enhanced recovery processes in mature fields and the development of new ones, Pemex had projected that production would rise to 2.32 MMb/d by 2022,¹² but instead, oil output stood at 1.68 MMb/d.¹³

Likewise, the López Obrador government has aimed to expand production of motor fuels such as gasoline and diesel, which saw production volumes more than halved under the previous administration, leading to higher imports in recent years.¹⁴ But between 2019 and 2022, the value of gasoline and diesel imports grew from \$17 billion and \$7.9 billion to \$23.2 billion and \$13.5 billion, respectively.¹⁵ The state plans to reach self-sufficiency in motor fuels by building a new refinery¹⁶ and upgrading the country's six existing refineries,¹⁷ and through the acquisition of the Deer Park refinery in Texas (completed in 2022).¹⁸

Pemex currently boasts a processing capacity of 1.64 MMb/d,¹⁹ which is set to increase to 1.98 MMb/d²⁰ once the new refinery becomes fully operational.²¹ But for Mexico to cease imports of motor fuels (before the end of the López Obrador government in 2024 or otherwise),²² Pemex will need to increase its capacity utilization rates, which, at least through early 2023, stood at only 50.8 percent.²³

As a result of the administration's focus on downstream-related and refining projects, Pemex allocated 61.3 percent of its investment to exploration and production activities and 32.3 percent to the industrial transformation division (refining) in 2022.²⁴ In other words, value-adding activities beyond oil output, such as the production of petrochemicals and fertilizers, have received comparatively little investment. Similarly, the administration has not articulated a concrete decarbonization agenda, and pledges to curb natural gas flaring remain unfulfilled.²⁵

Mexico flared the world's seventh-largest volume of gas in 2022²⁶ and was the 10th-largest methane emitter in 2021.²⁷ Capturing gas rather than flaring it could help Mexico reduce import dependency while working toward meeting its environmental targets. However, flaring is a challenge that has persisted through previous governments:²⁸ Pemex flared around 5.8 percent of its natural gas production during the administration of Enrique Peña Nieto (2013–2018), but the share flared under López Obrador's watch more than doubled to 12.4 percent, peaking at 16.5 percent in 2021 (Figure 1). Although flaring dropped from 620 MMcf/d in 2021 to 449 MMcf/d in 2022, the latter volume is still almost 50 percent higher than that of 2019.



Moreover, additional substantial declines do not appear close at hand. For Pemex, flaring is cheaper than “investing in infrastructure to capture, process and transport natural gas for other uses.”²⁹ Several domestic factors, such as technical failures at processing plants, accidents,³⁰ and insufficient infrastructure for capturing natural gas on site, help explain why flaring has increased since 2019. Pemex has also recognized that, due to the complexity of maintaining production levels at mature fields (alongside other expenses), its natural gas production costs more than doubled since 2010.³¹ Internationally, an abundant supply of relatively inexpensive natural gas from the United States, which Mexico can access thanks to 24 cross-border pipeline connections,³² has also discouraged investment in domestic natural gas activities.

The company’s record of meeting self-imposed flaring reduction goals is not strong. For example, Pemex’s CEO, Octavio Romero Oropeza, vowed in November 2022 to halt gas flaring at one of Mexico’s largest onshore fields, Ixachi,³³ and set January 2023 as the date when 0.3 billion cubic feet (bcf) would be processed on site.³⁴ But the estimated volume of gas flared at Ixachi increased by around 30 percent during that period.³⁵ Ixachi is just a piece of a much larger puzzle.³⁶

Another factor to consider is the apparent inefficiency of the regulator. In response to the growing levels of flaring, the National Commission of Hydrocarbons (CNH) imposed fines on Pemex, but the fines have not served as deterrents. For example, in 2022 the CNH issued four fines to Pemex, one of which was just \$1.98 million. Pemex allegedly opted to pay the fines rather than address its flaring problem.³⁷

Pemex is conscious of how damaging gas flaring is for the environment and acknowledges it as one of the most important weaknesses of its exploration and production operations.³⁸ This acknowledgement indicates that factors beyond awareness are limiting the company’s ability to reduce its flaring.

Pemex’s Financial Burden

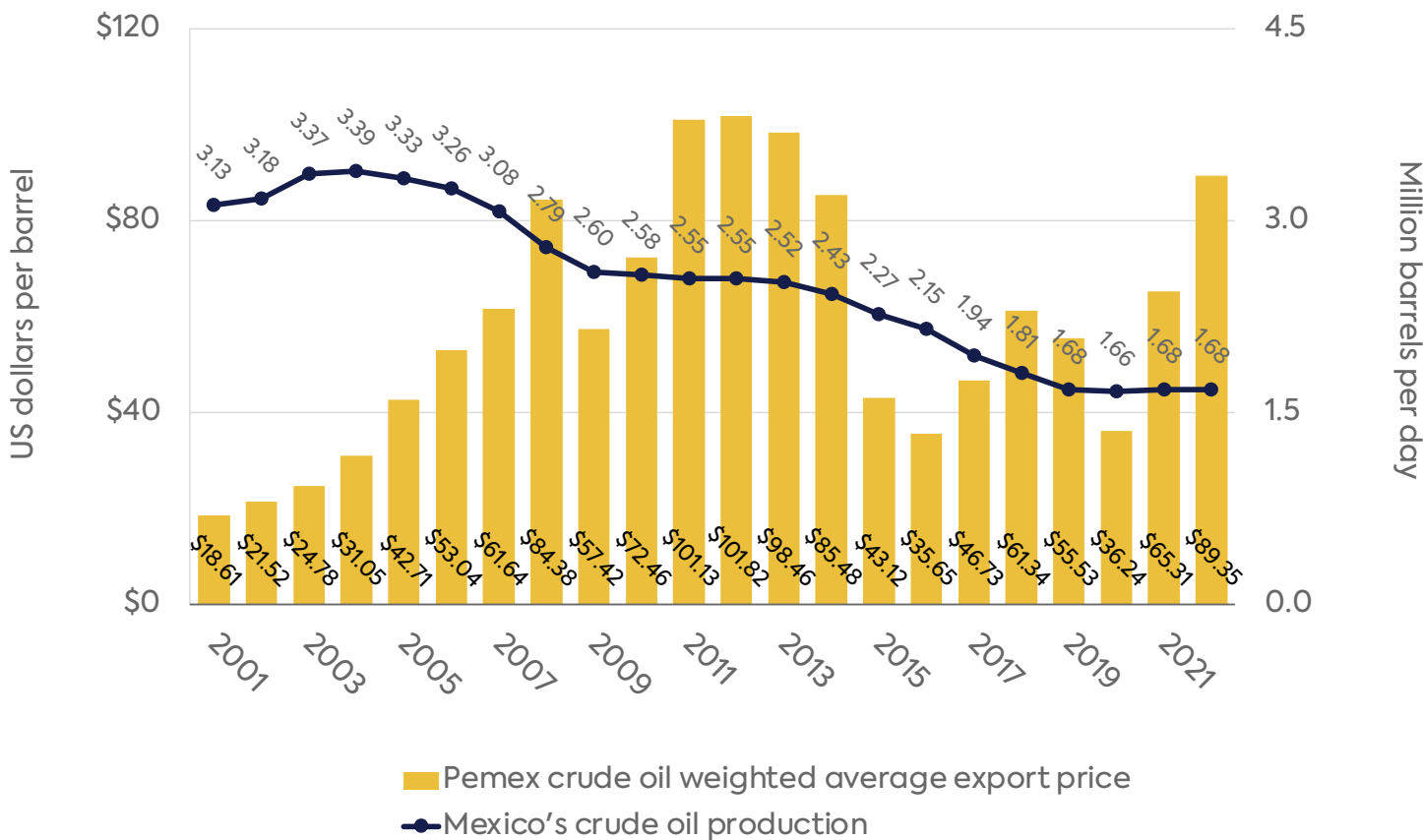
A hurdle that may prevent Pemex from addressing its gas flaring issue is related to its huge debt. Pemex’s financial standing cannot be delinked from the fact that its income plays a central role in government revenues. This institutional arrangement is connected to Mexico’s low levels of tax collection. As a percentage of gross domestic product, tax revenues averaged 17.9 percent in 2020 (compared to 21.9 percent among Latin American countries and 33.5 percent among Organisation for Economic Co-operation and Development [OECD] countries), up from 12.1 percent in 1990 (when the average among Latin American countries stood at 15.6 percent and OECD countries stood at 30.8 percent).³⁹

Mexico’s low tax collection compelled policy makers to look elsewhere to finance public spending:



Pemex revenues. This approach to managing Mexico’s largest company and state revenues has persisted and even deepened through different governments.⁴⁰ Over the course of four consecutive administrations, the average share of Pemex contributions to public revenues increased from 22 percent in 1990–1994⁴¹ to 26.6 percent in 1995–2000. Then, against the backdrop of record levels of production and/or higher crude oil prices (Figure 2), Pemex accounted for 30.3 percent of government revenues in 2001–2006 and 37.3 percent in 2007–2012, peaking at 44 percent in 2008.⁴² Simply put, these figures reveal that Mexico has become reliant on Pemex filling gaps in the government’s budget—a practice that has not faded.

Figure 2: Pemex’s crude oil production and export price, 2001–2022

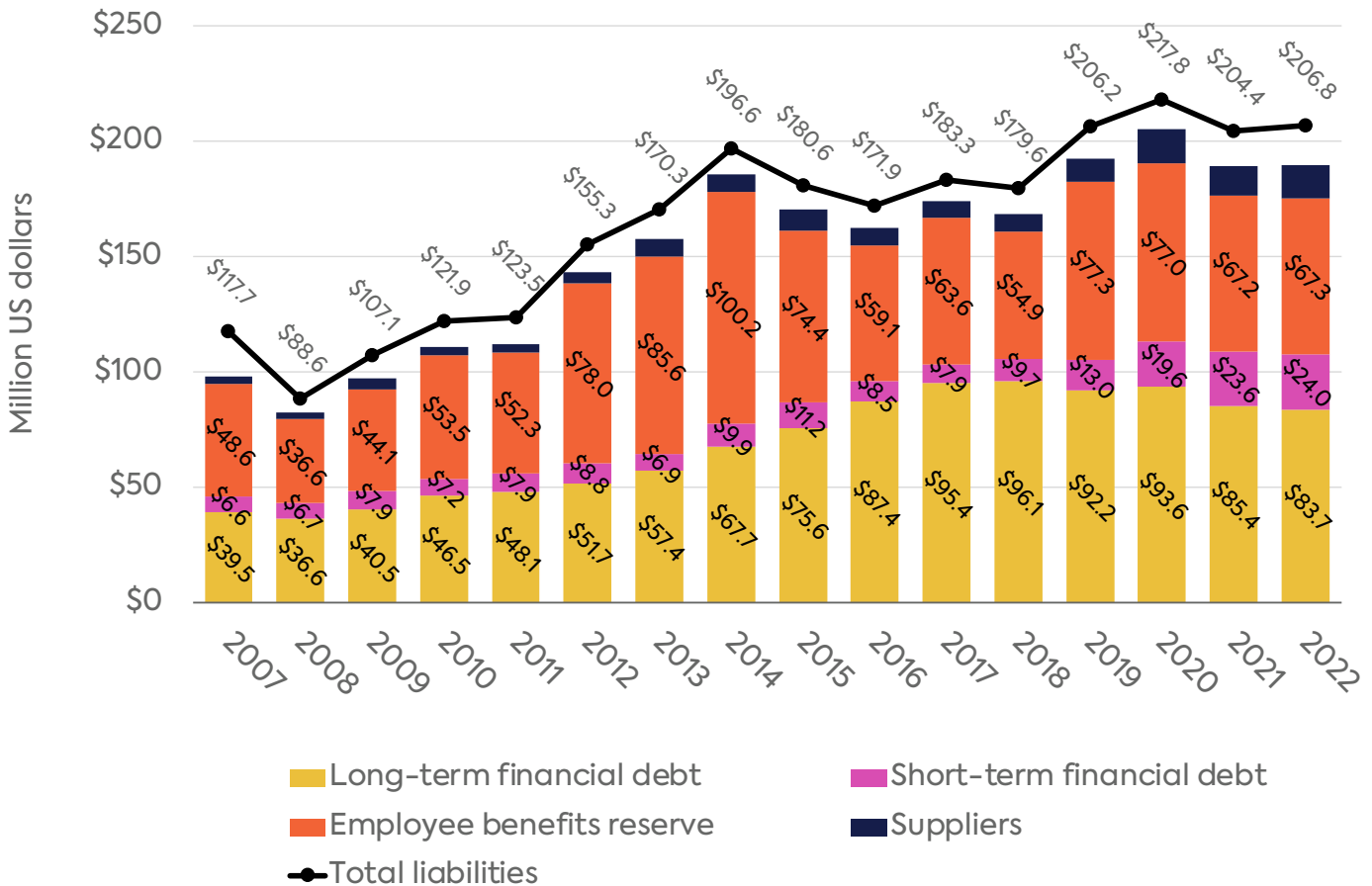


Note: Figures for 2001–2016 include Pemex; figures for 2017–2022 include Pemex and contract-holder firms.
 Source: Pemex, annual reports submitted to the US Securities and Exchange Commission, Form 20-F, <https://bit.ly/3Fg1vo3>; Pemex, “Petroleum Statistics May 2022, Average Crude Oil Export Price,” <https://bit.ly/3Pcbg9X>; Pemex Institutional Database, “Production of Liquid Hydrocarbons,” <https://bit.ly/3Jz8udt>.



Because global volatility can hit energy markets hard, both Pemex’s income and Mexico’s government revenues are vulnerable to these shocks. Therefore, when Mexico’s crude oil export prices per barrel plunged sharply from \$98.46 in 2013 to \$35.65 in 2016 and its oil output fell from 2.52 MMb/d in 2013 to 2.15 MMb/d in 2016, Pemex’s contributions to government revenues dove from 35 percent to 16 percent in that period. Throughout Peña Nieto’s entire term (2013–2018), Pemex’s contributions averaged 23 percent of government revenues.⁴³ During that time, Pemex also piled up financial debt at a pace not previously experienced. By 2018, Pemex had accrued a debt of \$105.8 billion, up from \$64.3 billion in 2013 (Figure 3).⁴⁴

Figure 3: Pemex’s debt and liabilities, 2007–2022



Note: Reported figures are as of December of each year.

Source: Pemex, Quarterly Financial Reports, <https://bit.ly/2kHMx4a>.



Short-term obligations are piling up and are projected to put a dent in Pemex's operations. In March 2023, Pemex reported that its short-term financial debt commitments stood at \$24.9 billion, but if short-term debt to suppliers is included, the total jumps to \$39.8 billion.⁴⁵ That figure is a substantial increase even since 2018, when short-term obligations (financial debt and debt with suppliers) amounted to \$17.3 billion. Furthermore, the Mexican Institute for Competitiveness (IMCO)⁴⁶ expects that between 2023 and 2026 Pemex is due to pay 46.6 percent of its financial debt. Therefore, even though the financial debt and even the value of total liabilities remained fairly similar between 2019 and 2022 (Figure 3), the broad financial shape of Pemex has deteriorated.

The extent of Pemex's financial debt, which since 2017 has settled north of the \$100 billion mark, limits its options, especially in the near term. In this context of tight finances, Pemex has had to prioritize some areas for investment. Under the direction of the López Obrador administration, the priority has been oil production and refining, so other areas have taken a hit, including the company's commitment to tackle gas flaring. Therefore, Pemex's weak financial standing is a hurdle for improving its environmental record.

Pemex's Flaring: Costly to Ignore, Costly to Fix

Given the current administration's strategy of pursuing crude production, Pemex's short-term debt commitments, and Mexico's approaching presidential elections, a dramatic shift to focus on abating flaring would be surprising. Because Pemex is so indebted, it cannot afford to develop multiple facets of its business at once; because it is so intertwined in the Mexican state, its priorities mirror those of the administration. For López Obrador, those goals have been economic development and energy self-sufficiency via crude oil production and refining—at the expense of other areas of the company.

Reducing flaring could help contribute to meeting environmental goals and reducing import dependency,⁴⁷ not to mention bolstering Pemex's operations by capturing gas that can be used for productive purposes. But even if the current administration decided to boost investment in projects to curb flaring now, the payoffs would probably not arrive quickly enough. With presidential elections approaching in June 2024, it is difficult to imagine the current administration supporting projects that wouldn't pay financial or political dividends in time for the upcoming political contest. Given Mexico's electoral timeline and Pemex's limitations, it appears that after López Obrador leaves office on October 1, 2024, Pemex's climate change pledges, financial woes, and flaring practices will persist as challenges for his successor to face.

Notes

1. Amy Stillman and Maya Averbuch, “AMLO Says Plan Coming for Pemex Debt, including Possible Transfers,” Bloomberg, January 27, 2023, <https://tinyurl.com/zxsztu7d>.
2. Stefanie Eschenbacher, “Up In Flames: Gas Flaring Soars in Mexico, Derailing Its Climate Change Pledges as It Seeks to Boost Oil Output,” Reuters, February 23, 2022, <https://reut.rs/3VPiq83>.
3. Pemex, “Quarterly Financial Reports,” <https://bit.ly/2kHMx4a>.
4. For Mexico’s current government, another important goal is to expand the production of motor fuels, which is intended to be achieved by upgrading the country’s six existing refineries. The construction of two coking units at the refineries of Tula, in the state of Hidalgo, and Salina Cruz, in the state of Oaxaca, is also part of this strategy. Additionally, Pemex purchased the Deer Park refinery in Texas in 2022.
5. Values are based on quarterly averages. Pemex, “Quarterly Financial Reports,” <https://bit.ly/2kHMx4a>.
6. World Bank, “Global Gas Flaring Reduction Partnership (GGFR),” <https://bit.ly/3M3kqX4>.
7. In Latin America, only Brazil, Mexico, Argentina, Chile, Colombia, and Peru boast a larger GDP (2021, in current US dollars) than the value of Pemex liabilities (2022). Liabilities include employee benefits, debt with suppliers, taxes and duties payable, and financial derivatives. See: World Bank, “GDP per Country in Current US\$,” <https://bit.ly/3TiiD2i>; Pemex, “Financial Report 4Q2022,” <https://bit.ly/3y4jR7A>; Pemex, “Financial Report 1Q2023,” <https://tinyurl.com/269nn5cd>.
8. Based on monthly averages. See: National Hydrocarbons Commission (CNH), “Crude Oil and Natural Gas Production,” <https://produccion.hidrocarburos.gob.mx/>.
9. Pemex, “Petroleum Statistics January 2023,” <https://bit.ly/2lzZA7Q>.
10. Mexico’s proved reserves (1P) amounted to 25,070 million barrels of oil equivalent (MMboe) in 2000. By 2004, the value stood at 18,895 MMboe, shrinking to 8,484 MMboe in 2018. See: Energy Information System (SIE), “Total Hydrocarbon Reserves, Pemex,” <https://bit.ly/3SQ4sBn>; National Hydrocarbons Commission (CNH), “1P Hydrocarbons Reserves in Million Barrels of Oil Equivalent,” <https://reservas.hidrocarburos.gob.mx/>.
11. Official Gazette of the Federation, “National Development Plan 2019–2024,” December 7, 2019, <https://tinyurl.com/2jyrfe5p>; Pemex, “Business Plan 2019–2023,” <https://bit.ly/2MOXHya>.
12. Pemex, “Business Plan 2019–2023,” <https://bit.ly/2MOXHya>.



13. It is important to note that the industry regulator (CNH) reports different production values for Pemex. Based on production by operator, the CNH estimated that the company's crude oil production averaged 1.78 MMb/d in 2018 and 1.52 MMb/d in 2022. See: National Hydrocarbons Commission (CNH), "Crude Oil and Natural Gas Production," <https://sih.hidrocarburos.gob.mx/>. For more on this data discrepancy, see: Diana Nava, "Pemex manipula las cifras de uno de sus campos para elevar su producción," *Expansión*, March 14, 2022, <https://bit.ly/3ycJDGP>; Pemex, "Petroleum Statistics January 2023," <https://bit.ly/2lzZA7Q>.
14. From 2013 to 2018, Pemex gasoline production declined from 0.437 MMb/d to 0.207 MMb/d, while that of diesel plummeted from 0.313 MMb/d to 0.117 MMb/d. See: Pemex Institutional Database, "Production of Petroleum Products," <https://bit.ly/3KZLXIU>.
15. The overall value of petroleum imports stands at \$74.11 billion in 2022. See: Banco de México (Banxico), "Economic Information System: Oil Trade Balance," <https://bit.ly/3nDEu9e>. In 2022, Mexico imported 1.166 Mb/d of petroleum products from the US, which makes it the US's largest export market. See: US Energy Information Administration (EIA), "Exports of Petroleum and Other Liquids by Destination," <https://bit.ly/3nEiVoY>.
16. Gobierno de México, "Refinería Olmeca en Dos Bocas," <https://bit.ly/2YbMrUp>. According to information provided by Pemex to regulators, investment in the construction of the Olmeca refinery in 2019–2022 amounts to \$13.1 billion, of which \$11.1 billion were invested in 2021 and 2022. See: Pemex, "Información financiera dictaminada," 2022, <https://bit.ly/3nGEHsk>; Pemex, "Información financiera dictaminada," 2021, <https://bit.ly/42faFL7>; Pemex, "2020 Annual Report Submitted to the U.S. Securities and Exchange Commission, Form 20-F," <https://bit.ly/3VVNPpL>.
17. Upgrading Mexico's existing refineries includes the construction of coking facilities at refineries in Hidalgo and Oaxaca. See: Rocío Nahle, "Reporte de las rehabilitaciones y proyectos de las refinerías de Pemex," Twitter video, March 16, 2023, <https://bit.ly/3n2jt7h>; Rocío Nahle, "4,720 mexicanos construyen la coquizadora en Tula," Twitter video, January 25, 2023, <https://bit.ly/3J9A2qP>; Rocío Nahle, "Coquizadora de Salina Cruz," Twitter video, December 9, 2022, <https://bit.ly/41Ab7Ux>. As for capital expenditures in the national system of refining, which refers to the six existing refineries of Pemex, Mexico's government allocated \$1.99 billion in 2019–2021. See: Pemex, "Annual Reports Submitted to the U.S. Securities and Exchange Commission, Form 20-F," <https://bit.ly/3VH0gWe>.
18. Pemex, "Concreta Pemex la adquisición de la refinería Deer Park en EU," press release no. 6, January 20, 2022, <https://bit.ly/3ZhGfX4>.
19. Pemex, "2021 Annual Report Submitted to the U.S. Securities and Exchange Commission, Form

- 20-F,” <https://bit.ly/3yhy2Xa>.
20. Pemex’s new refinery will add 0.340 MMb/d to the country’s refining capacity. See: Gobierno de México, “Refinería Olmeca en Dos Bocas,” <https://bit.ly/2YbMrUp>.
21. With Deer Park included, Pemex’s refining capacity reaches 2.320 MMb/d. The number could be higher once the construction of the two coking units is completed.
22. Jon Martín Cullell, “El arranque de Dos Bocas: la carta de López Obrador para dejar de importar gasolina,” El País, July 1, 2022, <https://bit.ly/422Hllj>.
23. Based on an atmospheric distillation refining capacity of 1.640 M/bd, the volume of crude processed averaged 0.592 M/bd in 2019 (or a capacity utilization rate of 36.1 percent), 0.590 M/bd in 2020 (36 percent), 0.711 M/bd in 2021 (43.4 percent), and 0.816 M/bd in 2022 (49.7 percent). In the first three months of 2023, Pemex processed an average of 0.833 M/bd of crude oil, which corresponds to 50.8 percent of the refining capacity. See: Pemex, “Annual Reports Submitted to the U.S. Securities and Exchange Commission, Form 20-F,” <https://bit.ly/3B62ULB>; Pemex Institutional Database, “Crude Processed at Refineries,” <https://bit.ly/3NRBFvU>.
24. Mexican Institute for Competitiveness (IMCO), “Pemex en la mira al cuarto trimestre del 2022,” <https://bit.ly/3yHdac1>.
25. Stefanie Eschenbacher, “Mexico’s Pemex Increased Gas Flaring at Top Field, Despite Pledge to Stop,” Reuters, February 28, 2023, <https://reut.rs/3maAU5c>.
26. World Bank, “Global Gas Flaring Reduction Partnership (GGFR),” <https://bit.ly/3M3kqX4>.
27. As part of the Global Methane Pledge, Mexico’s commitment is to reduce methane emissions by at least 30 percent in 2030 from its 2020 levels. International Energy Agency, “The Global Methane Pledge,” <https://bit.ly/3mPkYpk>.
28. In 2010, the value of natural gas flaring at the offshore field of Cantarell, Pemex’s most important production asset at the time, was estimated at \$300 million. Senado de la República, “Gaceta Parlamentaria,” June 22, 2011, <https://bit.ly/3NPBpO0>.
29. Stefanie Eschenbacher, “Up In Flames: Gas Flaring Soars in Mexico, Derailing Its Climate Change Pledges as It Seeks to Boost Oil Output,” Reuters, February 23, 2022, <https://reut.rs/3VPiq83>.
30. In 2020, Pemex attributed the rise of flaring to an accident in Akal-C6, one of its offshore facilities. See: Pemex, “2020 Annual Report Submitted to the U.S. Securities and Exchange Commission, Form 20-F,” pg. 43, <https://bit.ly/3LLmOLV>.



31. Pemex, “Business Plan 2019–2023,” <https://bit.ly/2MOXHya>.
32. Sener (Secretaría de Energía), “Estatus de la infraestructura de gas natural,” October 2019, <https://bit.ly/33NxjM7>.
33. Ixachi is located in the southern state of Veracruz.
34. Octavio Romero, Twitter video, November 18, 2022, <https://bit.ly/3J6WntY>.
35. According to satellite data consulted by Reuters, gas flared at Ixachi grew from 1.0 bcf in November 2022 to 1.3 bcf in January 2023. See Stefanie Eschenbacher, “Mexico’s Pemex Increased Gas Flaring at Top Field, Despite Pledge to Stop,” Reuters, February 28, 2023, <https://reut.rs/3maAU5c>.
36. World Bank, “Global Gas Flaring Reduction Partnership (GGFR),” <https://bit.ly/3M3kqX4>.
37. Stefanie Eschenbacher and Ana Isabel Martínez, “Mexico’s Pemex Risks Fines Rather than Fix Violations,” Reuters, November 17, 2022, <https://reut.rs/3nlx7gN>.
38. As stated by Pemex in its strategic analysis of exploration and production activities. See: Pemex, “Business Plan 2023–2027,” pg. 155, <https://bit.ly/3l2z1rb>.
39. OECD et al., “Revenue Statistics in Latin American and the Caribbean,” 2022, <https://bit.ly/3FieHsB>.
40. The different periods mentioned refer to government terms.
41. Although the administration of Carlos Salinas de Gortari commenced in December 1989, 22 percent only refers to annual values from 1990 to 1994. See data based on a presentation delivered by Octavio Romero, Pemex CEO, at Mexico’s Chamber of Deputies: Octavio Romero Oropeza, “Glosa del 1er. Informe de Gobierno,” October 28, 2019.
42. Mexico’s crude oil price per barrel stood at \$84.4 in 2008, up from \$61.7 in 2007. The price of oil was \$35.5 per barrel in 2016, down from \$86.1 two years earlier. These numbers refer to the yearly average price of Maya, Mexico’s oil price benchmark. See: Octavio Romero Oropeza, “Glosa del 1er. Informe de Gobierno,” October 28, 2019.
43. Octavio Romero Oropeza, “Glosa del 1er. Informe de Gobierno,” October 28, 2019.
44. Debt refers to short-term and long-term financial debt.
45. Pemex, “Financial Report 1Q2023,” <https://tinyurl.com/269nn5cd>.

46. Mexican Institute for Competitiveness (IMCO), “Pemex en la mira al cuarto trimestre del 2022,” <https://bit.ly/3yHdac1>.
47. In January–September 2022, Mexico’s overall natural gas imports represented 68.4 percent of domestic demand. When Pemex’s gas needs are not considered, natural gas imports represented 84.6 percent of domestic demand in the same period, which the latest reported. See: CNH (National Commission of Hydrocarbons), “Natural Gas Balance,” September 2022, <https://tinyurl.com/yk46zebr>.

About the Author

Adrian Duhalt is a Research Scholar at the Center on Global Energy Policy at Columbia University’s School of International and Public Affairs.

His professional and research interests sit at the junction between political economy and development issues concerning the energy sector in Mexico and North America. Specifically, his research projects have focused on natural gas and petrochemicals, however, he has similarly had the opportunity to publish articles and reports on topics such as the ammonia-fertilizer value chain, the liberalization of the energy sector in Mexico, social conflict in energy infrastructure projects, and NOCs. As part of the CGEP, Adrian’s objective is to continue broadening the geographical and thematic scope of his research activities.

Prior to joining Columbia, Adrian was postdoctoral fellow in energy studies for the Center of the United States and Mexico and the Center for Energy Studies at Rice University’s Baker Institute. From 2013 to 2017, he was associate professor at the School of Business and Economics at Mexico’s Universidad de las Américas Puebla (UDLAP). In 2014, he was the first Puentes Consortium Visiting Scholar at the Baker Institute’s Mexico Center.

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