

Financial Risks Cloud Development of Argentina's Vaca Muerta Oil and Gas Reserves

Executive Summary

The government of Argentina and a network of regional and global oil and gas companies have combined to develop the country's large fossil fuel reserves in an area of Northern Patagonia known as Vaca Muerta (Dead Cow). The plan is unlikely to succeed.

The plan seeks to double the nation's oil and gas output within six years. Success in Vaca Muerta is seen by Argentina's leadership as the key to its economic recovery. The plan faces strong headwinds from current fiscal, market, political and environmental forces that are likely to continue and slow, if not halt, the plan's progress altogether.



Argentina's plan requires substantial, long-term subsidization. The country's leadership has promised significant production subsidies to global oil and gas interests, subsidies it can ill afford. From 2016 to 2018, Argentina reduced these subsidies by 54% (from US\$15.6 billion to US\$7.2 billion). The Argentine government and economy are wracked by high inflation, currency devaluation, fiscal deficits and a failing trade policy, which required a multi-year US\$57 billion bail-out from the International Monetary Fund (IMF), the largest in its history. Going forward, Argentina has agreed to further reduce both production and consumption subsidies. This reduction will come at a time when the country's energy plan and its

partners require *more* subsidies in order to meet Argentina's ambitious production goals. Recent actions to reduce subsidies have proven disruptive and signify a broken promise by the Argentine government, according to oil and gas producers.

The organizational hub for development is Yacimientos Petrolíferos Fiscales Sociedad Anónima (YPF), Argentina's majority state-owned oil and gas company. It is tasked with the strategic energy goal of moving investment from several more mature conventional production zones to the Neuquén Province, the base of Vaca Muerta's unconventional oil and gas area. YPF has entered into partnership agreements with some of the world's leading companies, including BP, Exxon Mobil, Total S.A., Chevron, Shell, Equinor and others. The Argentine company is financially ill-prepared to take on this role. Its business plan is tied to heavily to government subsidies, which represent the difference between profit and loss. The company's financial position is characterized by weak stock performance, eroding revenues, declining cash flow and flat production. It is unprepared for the challenges facing the global oil and gas markets.

Support by foreign investors is critical to Argentina's energy success. The current energy plan calls for the government of Argentina and Argentine-based companies to pay 64% of development costs. The plan also expects Argentina's global partners to assume these costs over time. This expectation is unrealistic. Recently, the country announced a substantial reduction in its subsidy program, which prompted Tecpetrol, a key global partner, to reduce production, lay off workers and threaten suit against the government. YPF, Argentina's leading producer, also voiced its concern that the subsidy reduction would affect financial performance.

Most of the largest foreign companies involved in Vaca Muerta have made it clear that their participation will be hinged on subsidies. Their financial commitments, thus far, have been small and tentative. While partnership agreements are in place, actual development has been slow. The global oil and gas industry is recovering from a decade of value destruction from poor capital expenditures. The industry faces challenges from investors who are increasingly questioning highly speculative new investments. Over the last six years, 31 projects have been launched in Vaca Muerta. Only five are in active development, and some of these are now threatened.

Investors are concerned about the slow pace of development in Vaca Muerta compared with other unconventional gas and oil producing regions such as the Permian Basin and Eagle Ford in the United States. Six years in, Vaca Muerta has completed only 342 unconventional oil and gas wells. By contrast, in 2014, six years into aggressive development of the Permian Basin, 3,560 wells were in production. Eagle Ford completed 478 wells after merely two years of development.¹

The abrupt reduction in Argentina's production subsidy program—announced in January 2019 but applied retroactively for 2018 production—is shaking investor confidence. When the government recently announced this reduction, which also halted any new projects, Moody's rating agency deemed the action "credit negative" for Tecpetrol, YPF and Pan American Energy (BP). Other companies that are affected by the decision include Total, Wintershall and ExxonMobil. Moody's stated: "This

¹ Datawrapper.de. "Horizontal wells completed in early development years."

change in energy policy stands to weaken investor sentiment and the business environment in the energy sector, and will likely persuade companies to postpone or reduce capital spending on unconventional gas projects.”²

The energy plan faces a wide range of daunting risks, including:

- Economic recession, with continued currency devaluation and inflation,
- Increasing public opposition to IMF policies,
- Investment is largely by Argentine government-controlled companies: From 2012-2017, 65% of actual investments,
- Investment by foreign companies has been slow with oil and gas companies citing various reasons for their skittish investment stance,
- Unstable economics of unconventional oil and gas exploration that include high production costs compared to the rest of the world,
- High infrastructure costs to support oil and gas production and to protect the environment,
- Lack of interest and investment from oil service supply companies,
- Low global market prices for natural gas,
- Competition from other better-positioned oil and gas reserves and competition from renewable and alternative energy sources,
- Political and policy instability that add unplanned costs due to actions by national and provincial governments,
- Unstable domestic energy markets, due to actions by provincial governments that may not align with those of the national government,
- Inadequate water resources, and
- Opposition and litigation from environmental and indigenous rights organizations.

In light of the many economic and political challenges it faces, the country's oil and gas production goals seem overly optimistic. The likelihood of these underlying risks emerging will likely ensure that the goals will not be met. How the production shortfalls and energy policy missteps are managed will determine how Argentina's energy future develops.

² Gallardo, Martina and Waltz, Marianna. Moody's Investor Services. "Argentina oil and gas. Change in compensation policy to slow momentum for unconventional natural gas." February 4, 2019.

Notes About This Analysis

- a) Significant, rapid currency devaluation makes precise financial reporting difficult. We address this in the paper by showing both dollars (US\$) and pesos (ARS) as often as is useful for clarity of understanding and economy of writing. When only dollars are used it is because transactions actually take place in dollars and are relevant to the government's attempt to attract outside companies that conduct their business in dollars. Dollars remain the main currency for the oil and gas industry globally.
- b) The Argentine government uses numerous programs to provide subsidy payments to companies related to oil and gas production, coal, trade, refineries and labor. Government budget documents do not provide sufficient clarity to determine how much is allocated to each program and how the funds will be deployed. Reporting in budget documents is selective and not easily subjected to aggregation of values and analysis.

Individual company financial disclosures also do not typically specify and segment the receipt of cash payments from the government of Argentina or capital expenditure on projects in Vaca Muerta.

The Argentine government provides some data and information through official reports but the amount and frequency of reporting is inadequate. The databases consist of company-based reports that are free-standing and relate to progress on meeting development goals. They are company-specific and not tied to public budgets or corporate financial disclosures.

In this paper, these sources are supported by news articles and published reports by third-party sources, mostly international and national governments and non-governmental organizations. IEEFA conducts diligence on these sources prior to using them. The diligence work is ongoing and includes further dialogue with the authors of cited work.

- c) Yacimientos Petrolíferos Fiscales Sociedad Anónima (YPF), the country's largest integrated energy company, is the government of Argentina's hub for the management of Vaca Muerta development. It transacts much of its development business through joint ventures with foreign corporations. These joint ventures typically announce projects, aggregate planned expenditures and sometimes provide timelines for reaching certain goals. Actual expenditures by YPF and joint-venture partners on specific projects or venture agreements identified in this paper are not currently reported under one uniform accounting source. This report relies upon the Energy Ministry's (Ministerio de Energía y Minería or MINEM) publicly available database of planned and actual expenditures that report on unconventional development by individual companies doing business in Neuquén Province. As with any government reporting, reporting cycles may not correspond with other governmental updating and publication schedules, disclosures may be incorrectly carried over from company reports to public documents, interpretations of categories may vary by company, and public statements attributed to stakeholders may be inaccurate or misleading.

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I. Background

Current Energy Market Reforms Face Weak Economy, Fragile Fiscal Conditions and Ongoing Policy Volatility

Argentina's Recent History: Inflation, High Interest Rates, Devaluation of the Peso, Capital Flight- Lead to an IMF Bail-Out

Argentina is in the midst of an economic and fiscal crisis. The inflation rate has ranged from 20-40% in the past year;³ its interest rate is 60%, and its currency has devalued by more than 60%. These trends, and resulting capital flight, have led to a fiscal crisis and a multiyear series of cash infusions from the International Monetary Fund (IMF) to the Argentine government growing to US\$57 billion in 2018, the largest commitment of IMF resources in history.⁴ With the current bailout, the Argentine government has committed to a program of revenue actions and expenditure reductions, including a reduction in "inefficient energy subsidies."⁵

Change in Government: Policies Change from Kirchner and Fernandez to Macri

The energy policy of the current government, led by Mauricio Macri since December 2015, has changed significantly from that of the two previous governments. Led by Nestor Kirchner (2003-2008) and his wife, Cristina Fernández (2008-2015), Argentina went from being an oil exporter to a net oil and gas importer. Their policies set price controls on domestic natural gas, tightened export taxes, imposed export limits to keep the domestic market supplied, and required that foreign currencies generated in Argentina, remain in Argentina. "Faced with an unprofitable domestic market due to price controls and with restrictions for repatriating their earnings, companies cut investments in exploration and production (E&P). As a result, output declined."⁶

As part of the reforms, Yacimientos Petrolíferos Fiscales Sociedad Anónima (YPF), the country's largest integrated energy company, was renationalized. Today, the government of Argentina has a 51% ownership interest and YPF is the organizational linchpin in Vaca Muerta. YPF is also traded on the Buenos Aires and New York Stock Exchanges.

On the consumption side, the previous governments had decoupled local prices from international prices and created massive subsidies in 2001 to shield the

³ Trading Economics. [Argentina Inflation Rate](#).

⁴ The Guardian. [Argentina gets biggest loan in IMF's history \\$57 billion](#). September 26, 2018.

⁵ International Monetary Fund. [Argentina: Request for Stand-by Arrangement – Press Release and Staff Report](#). July 13, 2018.

⁶ Wilson Center. Patricia Vasquez. [Argentina's Oil and Gas Sector: Coordinated Federalism and the Rule of Law](#). May 2016. p. 8.

nation's poorest during the economic crash.⁷ (Subsidies are discussed in Section II).

Consumption subsidies increased, even once the economy recovered, and became “a distinguishing trait of the populist Kirchner and Fernández administrations.”⁸ During this time, the energy sector was the largest recipient of annual budgetary subsidies, receiving more than half the total. Electricity generation was especially heavily subsidized.⁹

During the last three years of the Fernandez presidency, between 2012 and 2015, there was a renewed focus on stimulating the fossil fuel sector to attract private investors, who had largely fled the sector and caused a significant reduction in production. Energy self-sufficiency became an important policy goal. Around the same time, the discovery of massive oil and gas reserves in Vaca Muerta was announced,¹⁰ and with it a series of policy initiatives to encourage development ensued. The policy initiatives were to be funded by a combination of public and private investment using Argentine government subsidies, domestic capital investment and the participation of an array of oil and gas companies from outside Argentina.

The energy policy under the new Macri government has stepped up efforts to attract private investment in Vaca Muerta. Expectations were—and remain—high that the development of Vaca Muerta will allow Argentina to return to energy self-sufficiency and to generate revenue, dollarized revenue in particular, from oil and gas exports. The government's recently released energy plan, published by MINEM,¹¹ sets forth an ambitious set of goals for unconventional oil and gas production in Vaca Muerta.

The goals attempt to reverse a 20-year decline in oil production and a ten-year decline in natural gas production.¹² Argentina plans to grow its oil production from 488,000 barrels per day to 1.5 million barrels per day by 2030. The immediate goal is a 15% annual increase from 2018 and 2023.¹³ On the natural gas side, the plan is to grow production from 131 MMm³/day to 400 MMm³/day by 2030. The immediate goal is a 14% annual increase from 2018 to 2023.¹⁴

The Macri government's strategy broadly is to reduce the energy sector's reliance on government policy and financial dependence and to introduce market mechanisms. Consumption and production subsidies are to be phased down or out. Market pricing will replace both production and consumption subsidies. From a development standpoint for Vaca Muerta, this has meant signing a significant

⁷ For a discussion of the history and type of energy subsidies during these years see: Oil Change International. Sam Pickard. [G20 subsidies to oil, gas and coal production: Argentina](#). November 2015.

⁸ Wilson Center. Patricia Vasquez. [Argentina's Oil and Gas Sector: Coordinated Federalism and the Rule of Law](#). May 2016.

⁹ Congressional Research Service. J. F. Hornbeck. [Argentina's Post-Crisis Economic Reform: Challenges for U.S. Policy](#). April 13, 2013. p. 5

¹⁰ MercoPress. [YPF announces a billion barrels shale-oil discover in Argentina](#). November 8, 2011.

¹¹ Secretaria de Gobierno de Energia. [Argentina Energy Plan](#). October 2018.

¹² *Ibid.*, p. 20.

¹³ *Ibid.*, p. 32.

¹⁴ *Ibid.*, p. 33.

number of joint venture concession agreements with YPF and multinational oil and gas interests to bring market investment into the region.

Vaca Muerta: Discovery of Abundant Oil and Gas Reserves Promise Economic Recovery

Vaca Muerta, which means *Dead Cow* in Spanish, has produced oil and gas for decades. However, its potential to produce unconventional oil and gas was recognized only recently, and is largely due to technological advances, such as horizontal drilling and fracking.¹⁵ Vaca Muerta's first shale gas well was completed in 2010, and its first horizontal well in 2011.

The U.S. Energy Information Administration (EIA) in 2011,¹⁶ and again in 2013, reported that Argentina held the second largest shale gas and fourth largest shale oil reserves in the world. A large portion of these are in the Vaca Muerta basin (sometimes referred to as the Neuquén or Neuquina Basin), which is located primarily in the province of Neuquén, the southwest region of Argentina, and is 1200 km (750 miles) from Buenos Aires.

To develop the region, the government of Argentina has developed a network of concession agreements with domestic and global oil and gas companies. In May 2013, YPF announced its joint venture with Chevron to invest US\$1.24 billion¹⁷ to drill 100 wells in the Loma Campana field in Vaca Muerta. YPF estimated oil and gas production would be 750 million barrels of oil equivalent (BOE) over the total life of the project.¹⁸ To date, this is the most productive oil field in Vaca Muerta.

Later that year, YPF announced joint ventures with Dow Argentina, a subsidiary of Dow Chemical Company, and Shell Argentina. Since then, YPF has announced joint ventures with ExxonMobil, Schlumberger and Statoil (Equinor).¹⁹

Many international companies—including Total, Wintershall, Petrobras, Petronas, Pan American Energy (whose largest shareholder is British Petroleum)—have now entered Vaca Muerta, though the process by which they obtained their interests in the region remain opaque. Tecpetrol, an Argentine-based subsidiary of Tecpetrol International (founded in Italy but based in Spain) and part of the international Techint group, has announced a significant commitment in a joint venture with YPF. Production from this project has moved apace and the production from its Fortín de Piedra site now provides for 10% of the country's gas consumption, according to the company.²⁰

¹⁵ Wall Street Journal. [Oil Industry Tries to Take the Fracking Boom Global](#). June 19, 2018.

¹⁶ U.S. Energy Information Administration (EIA), [Annual Energy Outlook 2011](#). April 2011.

¹⁷ Chevron Press Release. [Chevron, Argentina's YPF Sign Accord to Develop Vaca Muerta Shale](#). July 16, 2013.

¹⁸ YPF [corporate presentation 2013](#). Slide 11.

¹⁹ For a more complete description of the ownership, participation, investment commitments and type of development within various Vaca Muerta resource blocks see: YPF. [Annual Report: 2017](#). p. 37-44.

²⁰ OilPrice.com. [Is Argentina Producing Too Much for Natural Gas?](#) October 3, 2018.

II. Energy Subsidies Declining, Still Drive Development of Vaca Muerta

Argentina's domestic energy mix in 2017 consisted of: 57% natural gas, 30% from oil, and 1% from coal. The remaining portion came from hydroelectric (4%), nuclear (2%), biomass and biofuels (4%) and renewables (2%).²¹ While oil production has been heavily subsidized²² in the past, and the government has plans to subsidize renewable energy in the future,²³ the bulk of production subsidies since 2017 have been related to natural gas.²⁴

Foreign Company Investments Dependent Heavily on Continuation of Subsidies

Most of the subsidies are given to only a few companies with concession agreements. Two companies, YPF and Pan American Energy (PAE), a BP subsidiary, received more than 70% of the subsidies²⁵ related to oil and gas exploration and production in 2016 and 2017.²⁶

Tecpetrol S.A., a subsidiary of Tecpetrol International,²⁷ has also been a recipient of subsidies.²⁸ The company's joint venture agreement to spend US\$2.3 billion is heavily dependent on energy subsidies from the Argentine government. It has characterized the current natural gas subsidy regime as: "...the fundamental milestone that makes the larger investment program and the quantitative and qualitative growth of the Company possible."²⁹ Similarly, PAMPA Energías has noted that the failure of the Argentine government to deliver on its fossil fuel subsidies would "substantially impair" the ability of the company to generate revenue and "would negatively affect our financial condition and results of operations."³⁰ A further analysis of the importance of subsidies to foreign companies is provided below.

Independent Analysis Demonstrates Lack of Financial Viability Without Subsidization

OpenOil, a Berlin-based organization that provides open data sources and analysis on oil and gas, analyzed the initial large Vaca Muerta deal between YPF and Chevron.

²¹ Secretaria de Gobierno de Energía. [Argentina Energy Plan](#). October 2018.

²² For a good discussion of oil and gas subsidy and regulation see: Vista. [Disclosure document](#). February 19, 2018 and Wilson Center. [Oil and Gas Sector: Coordinated Federalism and the Rule of Law](#). May 2016.

²³ Secretaria de Gobierno de Energía. [Argentina Energy Plan](#). October 2018.

²⁴ EJES. Crespo, Zanotti, Kofman. [Informe Económico: Transferencias al sector hidrocarburífero en Argentina](#).

²⁵ Table 1: Direct Subsidies: Top Five Companies and Total Disbursements: 2016 and 2017.

²⁶ FARN. [Los subsidios a los combustibles fósiles en Argentina 2017-2018](#). May 2018.

²⁷ Tecpetrol. [Consolidated Financial Statements for 2017](#). p. 6.

²⁸ Petroquímica. [Tecpetrol ya produce el 10% del gas natural del país](#). October 4, 2018.

²⁹ Tecpetrol. [Consolidated Financial Statements for 2017](#). p. 3.

³⁰ Pampa Energía S.A. [Annual Report: 2017](#), p. 79.

The report concluded that the project would need upward of US\$9 billion in subsidies in order to make the project viable. Without subsidies, "cost savings would need to exceed 25% (versus 2013 predictions) for the project to be viable."³¹

Subsidies Represent Diminishing Portion of Both Public Expenditures and GDP

Planned Cutbacks Hit Consumers and Producers; Producer Subsidies Remain a Priority.

Both energy production and consumption subsidies have played a significant role in Argentina's recent history. Since the financial crisis of 2001, the energy sector has remained the largest recipient of subsidies receiving 56 percent of the total, compared to transportation (30 percent) and public services (14 percent) in 2013.³²

For over a decade 2004-2014 energy subsidies grew at a rate faster than overall federal spending, claiming an increasing share of annual budgets.³³ In 2004 energy subsidies consumed 1.8% of public expenditures. By 2014, the percentage increased to 11.28% of public expenditures.³⁴ They are forecast to be 5.4 percent for 2019.³⁵

³¹ Open Oil. [Vaca Muerta, Argentina](#). November 2016.

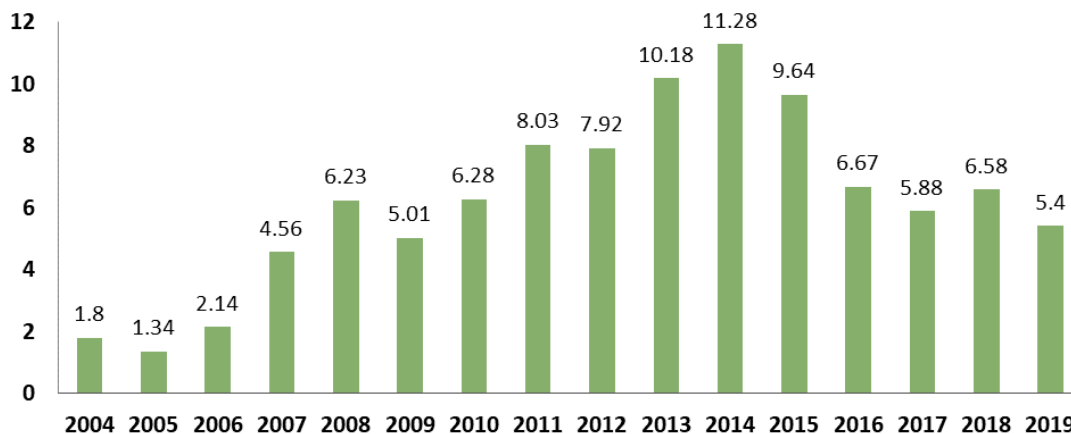
³² Congressional Research Service. J. F. Hornbeck. [Argentina's Post-Crisis Economic Reform: Challenges for U.S. Policy](#). April 13, 2013.

³³ Fundación Ambiente y Recursos Naturales (FARN). [Los subsidios a los combustibles fósiles en Argentina 2017-2018](#). May 2018 (Exchange rates assumed for the analysis are 15 ARS/\$ in 2016, and 17 ARS/\$ in 2017. Figures for 2018 and 2019 were updated by FARN in November 2018.)

³⁴ FIEL. Fernando Navajas. [Subsidios a la energía, devaluación y precios](#). April 30, 2015. The Latin American Economic Research Foundation, FIEL, is a private research organization, independent, apolitical and non-profit, dedicated to the analysis of the economic problems of Argentina and Latin America. It was founded in 1964 by business organizations in Argentina, the Buenos Aires Stock Exchange, the Argentine Chamber of Commerce, the Argentine Rural Society and the Argentine Industrial Union. FARN. [Los subsidios a los combustibles fósiles en Argentina 2017-2018](#). May 2018. Updated by FARN in November 2018 and Zanotti, et al., Taller Ecologista Rosario y Observatorio Petrolero Sur en EJES (Enlace por la Justicia Energética y Socioambiental). [Ganadores y perdedores en la Argentina de los hidrocarburos no convencionales](#). 2017.

³⁵ FARN. [Subsidios a los combustibles fósiles en el presupuesto 2019](#). October 26, 2018.

Figure 1: Total Energy Subsidies as a Percent of Public Expenditures, 2004-19

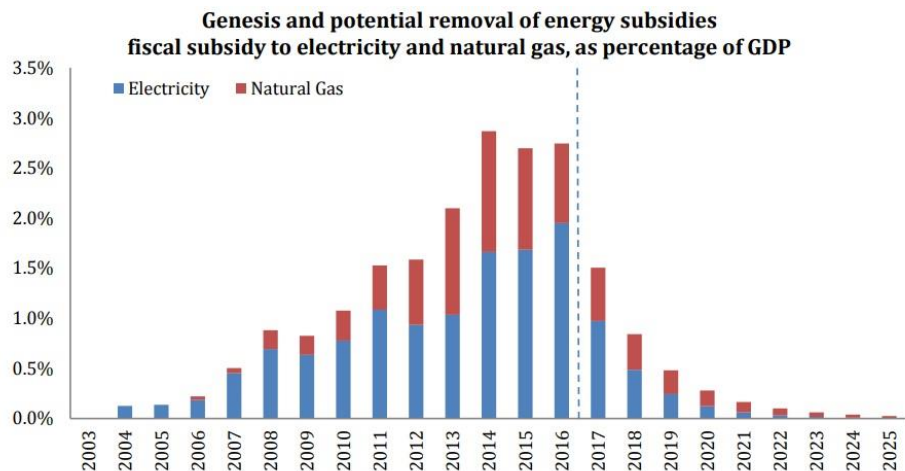


Source: FARN. *Los subsidios a los combustibles fósiles en Argentina 2017-2018*. May 2018. Updated by FARN in November 2018; and Zanotti, et al., *Taller Ecologista Rosario y Observatorio Petrolero Sur en EJES (Enlace por la Justicia Energética y Socioambiental). Ganadores y perdedores en la Argentina de los hidrocarburos no convencionales*. 2017.

Another way to view the subsidies is as a percentage of GDP. Energy subsidies went from representing 2% of GDP in 2004 to more than 10% in 2015, before dropping to 3.1% in 2018.

The following chart³⁶ illustrates the growth of subsidies from the early 2000s to its peak at 2.9% of GDP in 2014, remaining above 2.5% in 2015 and 2016.

Figure 2: Genesis and Potential Removal of Energy Subsidies



Source: FIEL. Artana et al. *Argentina*. May 2017. The Latin American Economic Research Foundation, FIEL, is a private research organization, independent, apolitical and non-profit, dedicated to the analysis of the economic problems of Argentina and Latin America.

³⁶ FIEL. Artana et al. *Argentina*. May 2017. FIEL is a think-tank based in Buenos Aires. See footnote 28 for a longer description of FIEL.

Trends in Subsidy Allocations: Overall Decrease, Consumers Hit Hardest, Increase for Oil and Gas Producers

Argentina's most important energy subsidies are distributed through three spending programs that are funded through annual budget appropriations: ENSARA and Plan Gas³⁷ are production subsidies provided to oil and gas companies and CAMMESA is commonly referred to as a consumer subsidy.

Each source is targeted to different sectors of Argentina's economy and society. Oil and gas producers benefit directly from ENSARA and Plan Gas. This is direct money to the companies to improve their quarterly and annual balance sheets. The CAMMESA revenue source subsidizes the domestic market and translates into lower or higher utility bills for Argentina's households and businesses.

Long-term trends and annual subsidies are a subject of intense concern as they are clear indicators of governmental priorities. Changes in funding levels are felt immediately by oil and gas producers, households and businesses in Argentina.

The subsidy levels between 2016 and 2018 have been adjusted during a time of fiscal and economic distress. Argentina's leaders are now forced by the fiscal crisis to cut spending and manage an economy plagued by currency devaluation, inflation and fiscal crisis. Argentina's leaders face demands, however, to increase subsidies to oil and gas companies in order to attract investment and achieve national production goals, including the expansion of Vaca Muerta. Leaders also must ensure that Argentina has a stable and affordable source of energy for electricity and heat to businesses and households. This effort to keep the price of gas and electricity affordable to Argentines also adds pressure on the government to spend more.

The current trends in consumer and producer subsidies reflect these pressures. Given the deterioration of the constant buying power of the peso, the trends are best illustrated when stated in US dollars.

Consumer Subsidies Have Reduced by 61% Since 2016-2018

In 2016-2018, consumer subsidies declined by 61% (from US\$10 billion to US\$3.9 billion). On a year to year basis, from 2017 to 2018 consumer subsidies declined by 7%. Consumer subsidies for oil and gas still receive the highest allocations, even after the US\$6.1 billion reduction. Argentinian households, however, feel the brunt of the spending declines in the form of higher monthly gas bills.

Under the previous governments (2003-2015) and in response to the economic crisis that began in 2001, consumption subsidies were put in place to protect the

³⁷ Plan Gas, or Gas Plan, refers to a subsidy program, launched in 2013, that offered a price floor to producers of natural gas, above a set level. In 2017, the Ministry of Energy and Mining (MINEM) published Resolution 46-E/2017, specifically to stimulate unconventional production of natural gas in the Neuquén Basin. This program is commonly referred to as the Plan Gas, Gas Plan, Resolution 46 or Resolution 46/2017.

most vulnerable from the impact of Argentina's economic crisis.³⁸ They became a form of social transfer, keeping monthly costs for heating and electricity affordable to the public. "The consumption subsidies... were greatly expanded and became a distinguishing trait of the populist Kirchner and Fernandez administrations."³⁹

Under the Macri government, consumer subsidies set in place in the early 2000s have remained high relative to the cost of production. As recently as 2015, consumers paid less than 10% of the generation cost of the electricity.⁴⁰ The cost of these social transfers has been characterized as a source of Argentina's fiscal imbalance.⁴¹

The Argentine government has set upon a path of reducing and potentially phasing out subsidies for fossil fuels. The promised phase down is a cornerstone of the recent Stand-By fiscal arrangement with the IMF.⁴² The IMF and Argentine government have agreed to future restrictions on the amount of energy subsidies that Argentina can pay under the terms of its loan:

We will continue to make progress on the reduction of subsidies on energy and transport with the objective of increasing the proportion of the cost of producing those services that is covered by prices charged to the consumer from around 80 percent in 2017 to 90 percent in 2020, on average, for gas, and from almost 60 percent in 2017 to 90 percent in 2020, on average, for electricity. At the same time, we will continue working towards eliminating the differences across regions. We will maintain the social tariff component that will protect those that cannot afford the higher tariffs.⁴³

The program of consumer subsidy phase out has three basic components: a) reducing federal outlays; b) increasing the cost of electricity and natural gas to consumers through tariff increases, and c) phasing in the subsidy reductions in particularly vulnerable regions of Argentina and in general across Argentina for lower income individuals and families harmed by the increases.⁴⁴

The reduction in subsidies to consumers is occurring while consumers have faced drastically higher prices for both heating and electricity, since natural gas is the primary fuel source. In April, 2018, the government forecast an increase in home

³⁸ Though beyond the scope of the report, the financial crisis of 2001, widely considered to have been caused by austerity measures imposed by the IMF, continues to dominate both popular memory and political discourse in Argentina.

³⁹ Wilson Center. Patricia Vasquez. [Argentina's Oil and Gas Sector: Coordinated Federalism and the Rule of Law](#). May 2016.

⁴⁰ FIEL. [Argentina. May 2017](#). This paper was provided to the OECD in the context of the project "Growth, investment and the low carbon transition". It was written by Daniel Artana, Oscar Natale and Cynthia Moskovits from FIEL, based in Buenos Aires, Argentina. See footnote 28 for more information on FIEL.

⁴¹ International Energy Agency (IEA). [Tracking fossil fuel subsidies in APEC economies](#). 2017, p. 18.

⁴² International Monetary Fund. [Argentina: Request for Stand-by Arrangement – Press Release and Staff Report](#). July 13, 2018.

⁴³ *Ibid.*, p. 69.

⁴⁴ MINEM. [Precio de Gas Natural en el PIST](#). October 2017.

heating gas prices of 28-49%,⁴⁵ and, in July, it announced an additional increase by yearend.⁴⁶ In some parts of the country, water, electricity, and heating bills had risen by more than 1300% between November 2017 and July 2018.⁴⁷

The question of high consumer prices for natural gas in a country with significant reserves is central to the success or failure of the Vaca Muerta development. One recent article on how Tecpetrol might respond to changing production subsidies closes with this statement: "However, what remains is why local gas is still so expensive in Argentina compared to other producing countries. And why does this government, like the previous one, need to subsidize the oil companies to invest in increasing production."⁴⁸

Direct Production Subsidies, Cut by 34% Since 2016, Remain Priority

Since 2016, overall subsidies have been reduced by 54%. Production subsidies, however, were reduced by only 34%. Consumer subsidies were reduced by 61%. In absolute dollar terms, production subsidies were reduced by US\$1.2 billion, while consumer subsidies were reduced by US\$6.1 billion over the same period.⁴⁹

Between the two subsidy programs for oil and gas production, ENSARA has received a US\$900 million increase since 2016, from US\$1.1 billion to US\$2.0 billion. The 2019 budget is projected to increase subsidies to the private sector for production of natural gas.⁵⁰

Between 2016 and 2018, overall subsidies for both consumers and producers have declined by 54% from (US\$16 billion to US\$7.2 billion). From 2017 to 2018, overall subsidy levels were flat at US\$7.2 billion.⁵¹

⁴⁵ Reuters. [Update 1 Argentina says home heating gas prices to rise 28 pct to 40 pct](#). March 28, 2018.

⁴⁶ Telesur. [Argentina continues endless energy hikes](#). July 23, 2018.

⁴⁷ Ibid.

⁴⁸ Peco, Silvia. [Ambito.com. "Alcotan los subsidios al gas y Techint amenaza al Gobierno."](#) January 31, 2019

⁴⁹ Instituto Argentino de Energía "Gral. Mosconi." "Informe Annual: 2018. La evolucion de produccion de hidrocarburos en Argentina March 2019.

⁵⁰ FARN. [Subsidios a los combustibles fósiles en el presupuesto 2019](#). October 26, 2018.

⁵¹ Instituto Argentino de Energía "Gral. Mosconi." "The evolution of hydrocarbon production in Argentina." March 2018. Data regarding subsidy payments and the four figures 3-6 related to these subsidy payments are taken from this report.

Figure 3: Total Current Subsidies, 2016-2018 (Data in Millions USD)

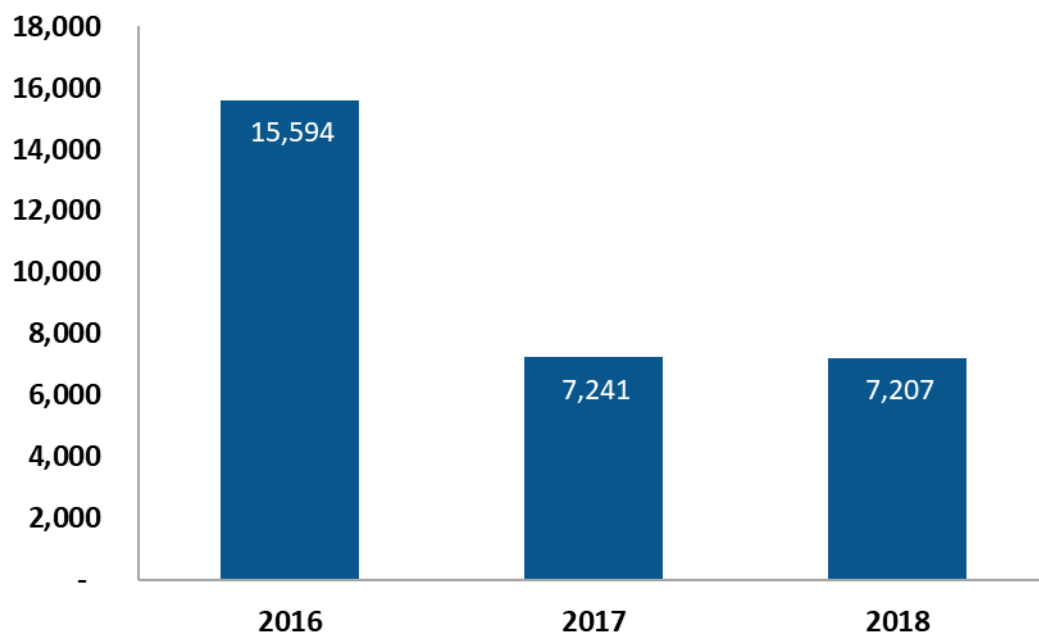
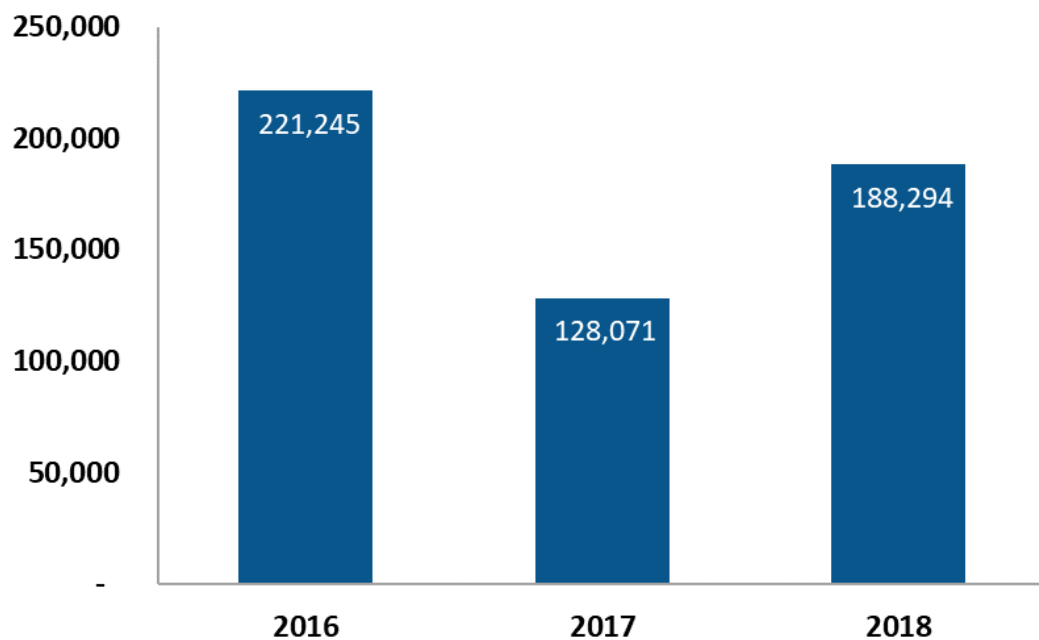


Figure 4: Total Current Subsidies, 2016-2018 (Data in Millions of ARS)



- Production subsidies for oil and gas (ENSARA and Plan Gas) declined by 34% (from US\$4.1 billion to US\$2.8 billion) since 2016. From 2017 to 2018, production subsidies for oil and gas increased by 30% from US\$2.1 billion to US\$2.7 billion.
- Oil and gas subsidies (ENSARA) have increased by 86% from 2016 to 2018 (from US\$1.1 billion to US\$2.0 billion). The subsidy for oil and gas increased by 177% from 2017 to 2018 (from US\$710 million to US\$2.0 billion).
- Plan gas subsidies declined by 75% from 2016 to 2018 (from US\$3.0 billion to US\$750 million). Plan gas subsidies decreased from 2017 to 2018 by 46% (from US\$1.4 billion to US\$750 million).

Figure 5: Oil and Gas Production Subsidies 2016-2018 (Data in Millions of USD)

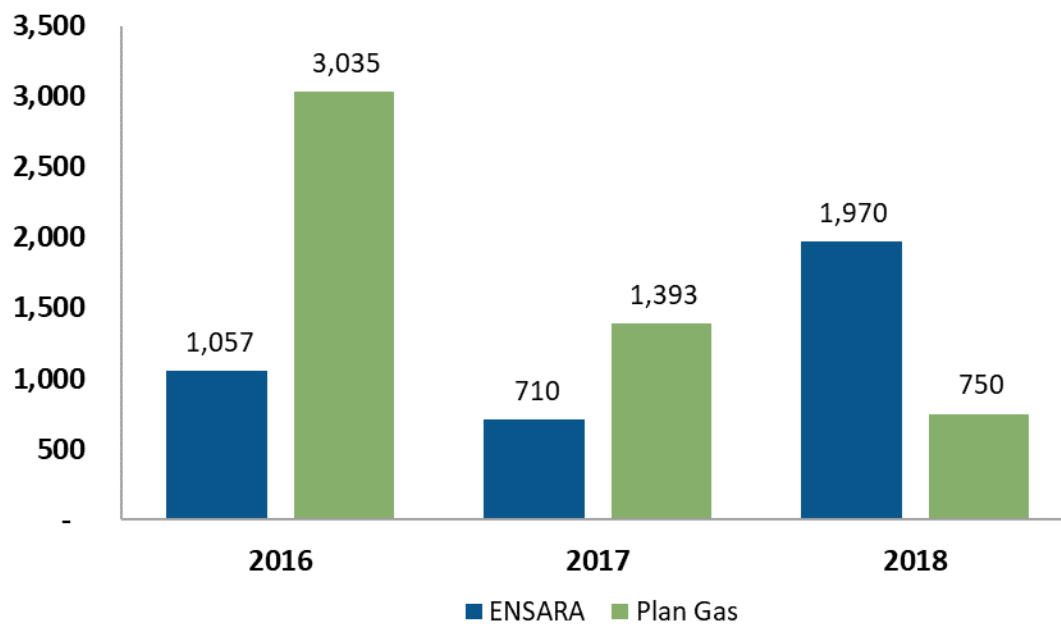
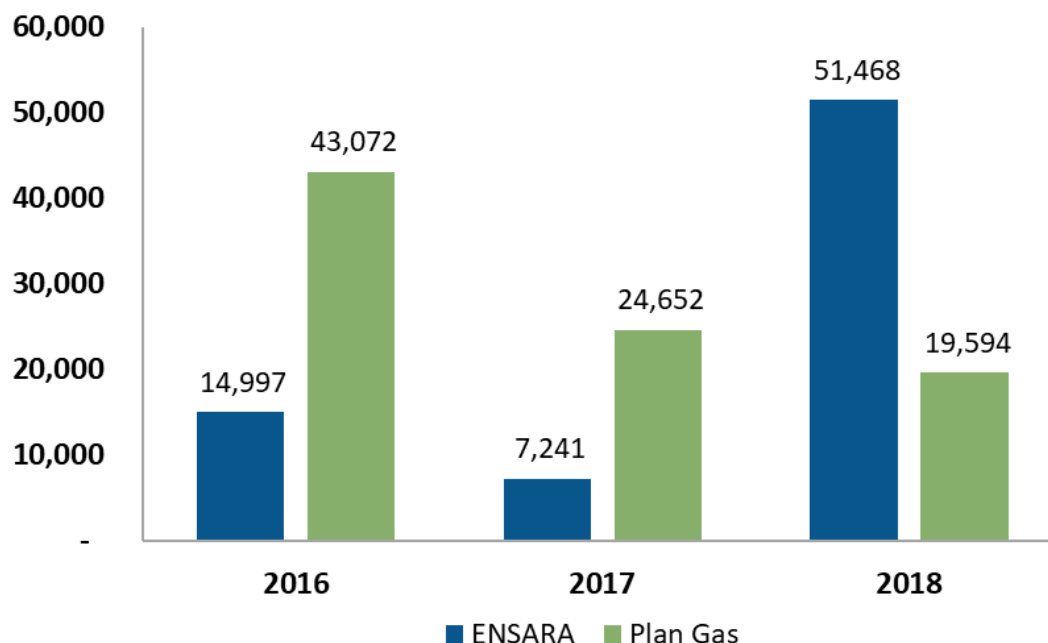


Figure 6: Oil and Gas Production Subsidies 2016-2018 (Data in Millions ARS)



In another action, Argentina has agreed to join with Canada in a peer review of its fossil fuel subsidies to ensure that both countries are adhering to their stated goals of eliminating inefficient subsidies.⁵² The concept of inefficient subsidies devised by the G20 peer review process does not have a uniform definition as each country's economy and energy market structures vary. In Argentina, inefficient subsidies have thus far been defined largely in terms of the disbursement of subsidies to consumers.⁵³

Energy Plan Is Ambitious, But Slow to Produce Results

The Argentine government estimates that oil production from Argentina will double by 2023 and natural gas production more than double by 2024, largely based on production gains made from Vaca Muerta reserves.⁵⁴

The government anticipates oil production rising 15% from 488,000 bpd in 2018 to 560,000 bpd in 2019. For 2018, oil production in Argentina rose 2%, to 489,000

⁵² Canada, Department of Finance. [Canada and Argentina to Undergo Peer Reviews of Inefficient Fossil Fuel Subsidies](#). June 4, 2018.

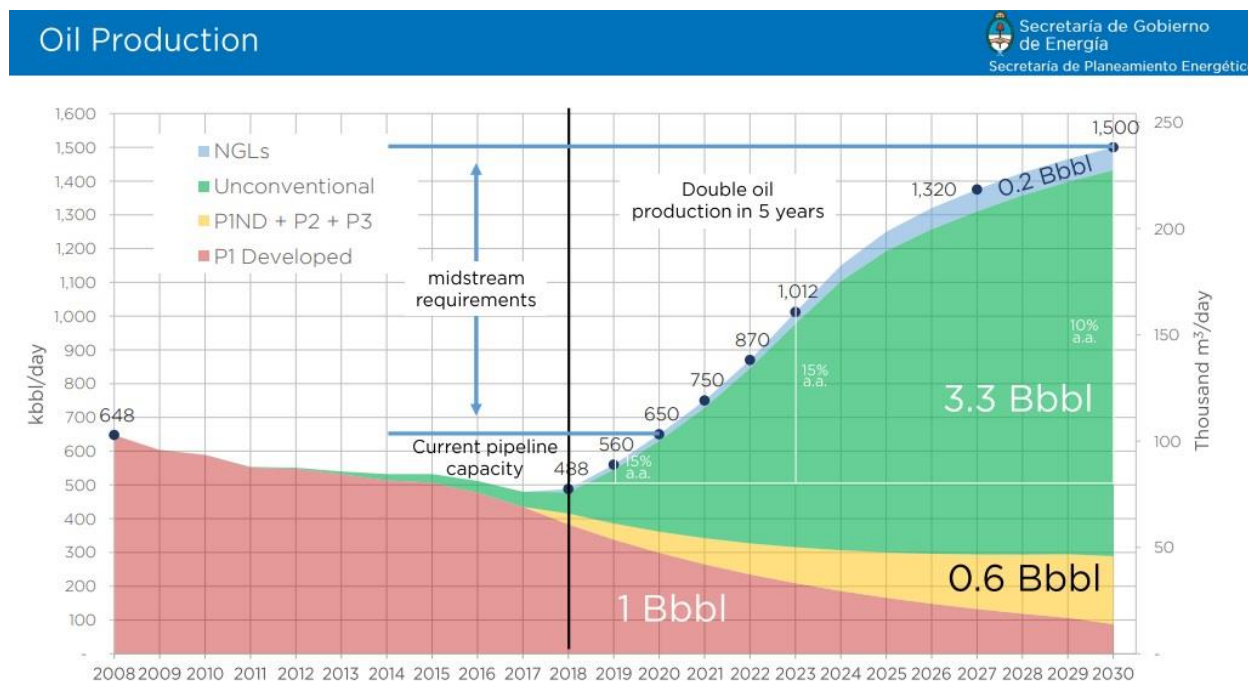
⁵³ International Energy Agency (IEA) and the Organisation for Economic Cooperation and Development (OECD). [Update on Recent Progress in Reform of Inefficient Fossil Fuel Subsidies That Encourage Wasteful Consumption](#). pp. 4 and 9-10. June 2018.

⁵⁴ Secretaria de Gobierno de Energía. [Argentina Energy Plan](#). October 2018, p. 32 (Oil Production) and p. 33 (Natural Gas Production).

bpd.⁵⁵ YPF has stated it sees significant improvement in 2019.⁵⁶

Natural gas production was 132 MMm³/day in 2018, an increase of 5% over 2017. The Argentine Energy Plan expects production to rise 14% to 150 MMm³ day by 2019.⁵⁷

Figure 7: Actual and Estimated Oil Production: 2008-2030



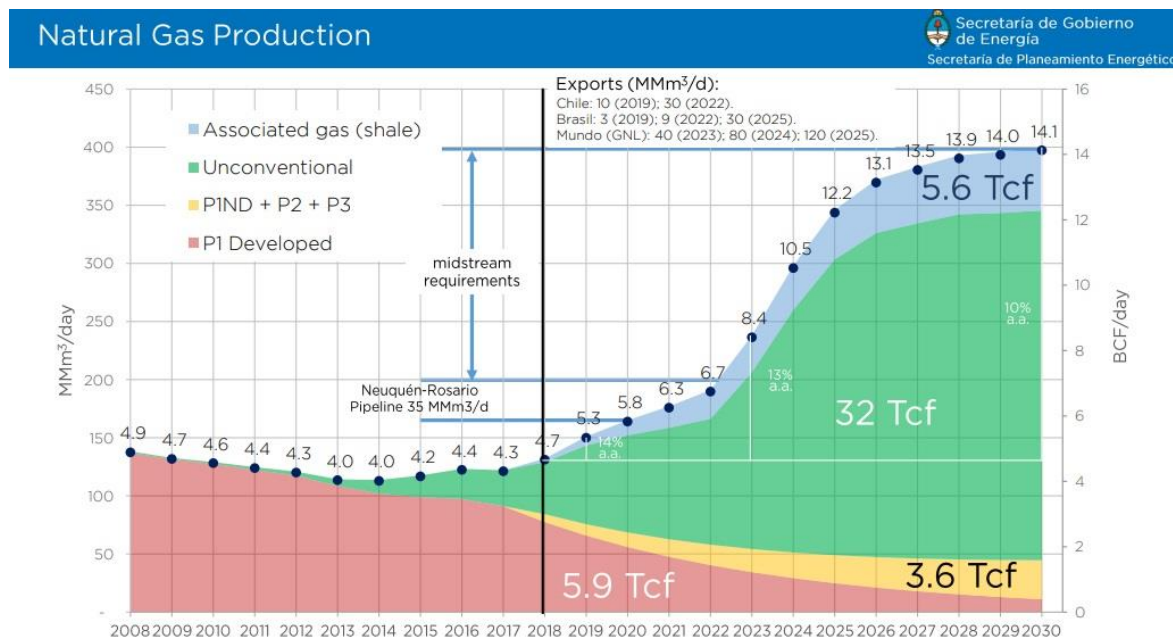
Source: Secretaria de Gobierno de Energia. Argentina Energy Plan. October 2018.

⁵⁵ Ibid., p. 32 (Oil Production).

⁵⁶ S&P Global. Argentina's YPF sees return to oil production growth in 2019. August 8, 2018.

⁵⁷ Secretaria de Gobierno de Energia. Argentina Energy Plan. October 2018, p. 33 (Natural Gas Production).

Figure 8: Actual and Estimated Gas Production: 2008-2030



Source: Secretaría de Gobierno de Energía. *Argentina Energy Plan*. October 2018.

Foreign partners are vital to develop Vaca Muerta.⁵⁸ Foreign partners—oil service companies, mid-size and large multinational oil and gas companies—bring financial investments, technology and technical expertise. Investment incentives embedded in Argentina’s 2014 Hydrocarbons Law have created an opportunity for many of the world’s largest oil companies to announce agreements with the Argentine government to develop the country’s shale reserves.

To date, Vaca Muerta’s energy resources have been largely explored, drilled, operated and financed using Argentina’s public and private companies and investment resources.⁵⁹ The entrance of new players into the region is critical to its success. Simply put, the Argentine government and Argentine-based private sector alone do not have the resources to finance both the needs of the public and broader private sector growth, and to develop Vaca Muerta.

Well Completion in Vaca Muerta Lags Far Behind Permian Basin and Eagle Ford

The scale of oil and gas reserves and the opportunity offered by new horizontal and unconventional drilling practices have led many to compare Vaca Muerta with the Permian Basin, the United States’ oil and gas region in Texas and New Mexico.⁶⁰ In

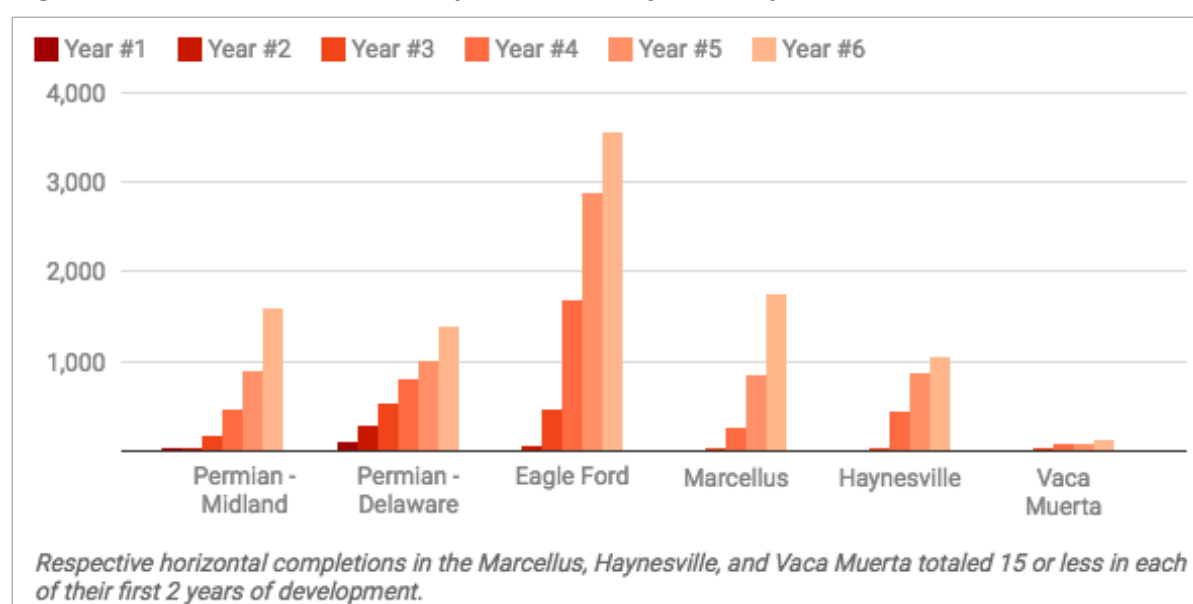
⁵⁸ Oxford Business Group. [Production Picks up at Argentina’s Vaca Muerta shale deposit](#).

⁵⁹ Secretaría de Gobierno de Energía. *Argentina Energy Plan*. October 2018, p. 73.

⁶⁰ Rystad Energy Press Release. [Will the Vast Potential of Argentina’s Vaca Muerta Shale Play Ever Be Unlocked?](#) November 15, 2018.

2018, the sixth year⁶¹ of operational performance to step up the development of Vaca Muerta, the Argentine government claimed 342 completed unconventional gas and oil wells.⁶² By contrast, by 2014, the sixth year of aggressive development in the Permian Basin,⁶³ there were 3,021 completed unconventional wells in that basin between the Midland and Delaware regions, according to Datawrapper, which drew on research from Rystad.⁶⁴ The comparison with Eagle Ford, a different shale formation also located in Texas, is even more striking. Six years into development, that basin had 3,560 wells.⁶⁵ After only two years of development, the shale play in Eagle Ford had 478 wells, already more than Vaca Muerta was able to complete after six years of development.⁶⁶

Figure 9: Horizontal Wells Completed in Early Development Years



Source: Rystad Energy Shale Intel—Vaca Muerta Study 2018.

⁶¹ We mark the first year for Vaca Muerta development as 2013, consistent with the signing of the first large investment with Chevron.

⁶² Secretaría de Gobierno de Energía. [Argentina Energy Plan](#). October 2018, p. 36. (2018 Unconventional Gas + Unconventional Oil).

⁶³ We use 2009 as the point where the Permian’s shale production started to take off. Pioneers Natural Resources. [The power of the Permian](#). See also Rystad Energy. [Q2 2014: Permian is becoming the largest tight oil play in the US](#). Rystad’s charts show the Permian Basin upward trajectory starting in 2009 based on its entry into tight oil production. For discussion on dynamics of tight oil see Springer, Xin-Shun Zang, et al. [Classification and characteristics of tight oil plays](#). January 21, 2016.

⁶⁴ Datawrapper.de. [“Horizontal wells completed in early development years.”](#)

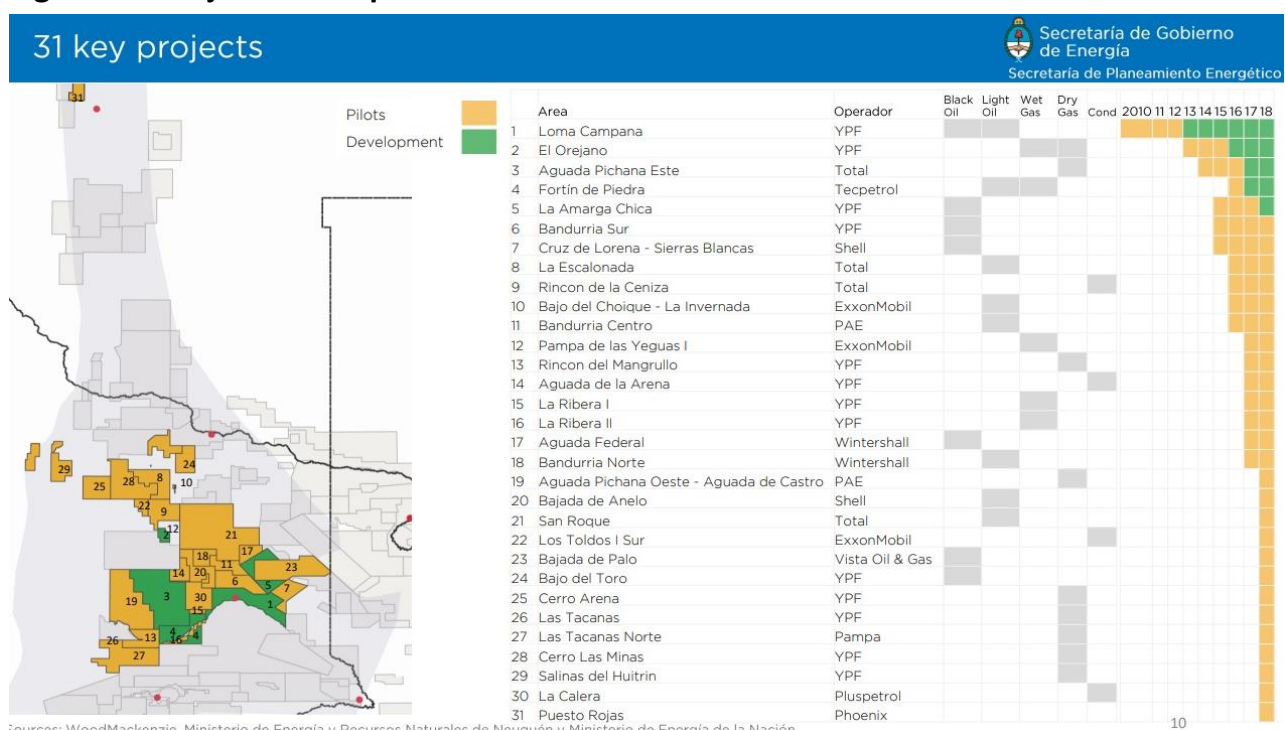
⁶⁵ Ibid.

⁶⁶ Ibid.

Most Joint Venture Agreements Have Not Moved Into Actual Development

Argentina's energy plan released in September identifies 31 agreements⁶⁷ with a mix of foreign oil and gas interests that include the following companies, with their countries' headquarters listed in parentheses: Total (France), ExxonMobil (U.S.), Shell (Netherlands), Pan American Energy (PAE), a BP subsidiary (Great Britain), Wintershall (Germany) and Vista Oil and Gas (Mexico).⁶⁸ YPF is the lead operator on 13 of the projects and has joint venture agreements with most of the remaining corporations.

Figure 10: Project Developers in Vaca Muerta⁶⁹



Source: Secretaría de Gobierno de Energía. *Argentina Energy Plan*. October 2018. p. 10, and Wood Mackenzie.

Of the 31 projects, five are in the development phase and the remaining 26 are considered to be in the pilot stage. Only two projects that have a foreign operator, Aguada Pichana Este and Fortin de Piedra, are in the development phase. These are under the direction of Total S.A. and Tecpetrol, respectively.

The size and number of agreements with foreign firms has been highlighted by the

⁶⁷ Secretaría de Gobierno de Energía. *Argentina Energy Plan*. October 2018, p. 10.

⁶⁸ In April 2018, Vista Oil and Gas finalized its acquisition of PAMPA and PlusPetrol listed on the chart. Vista Oil and Gas is based in Mexico.

⁶⁹ Secretaria de Gobierno de Energia. *Argentina Energy Plan*. October 2018, p. 10.

government in its marketing activities. Despite these advances, the government also acknowledges that it requires an even greater level of outside participation.⁷⁰

Oil and Gas Exploration Investment in Vaca Muerta Driven Largely by Argentine Government or Argentine-Based Corporations

Based on a review of actual expenditures through 2017 made in Neuquén Province, the province that holds most of Vaca Muerta, the government and domestic corporations have been responsible for 65% of all dollars invested in unconventional production, with foreign companies having invested the remaining 35%.⁷¹

The Argentine government acknowledges that it is the principal driver of development in Vaca Muerta. The plan is for the private sector to take an increasing role.⁷² How this will be achieved remains to be seen.

The plans to date for the Neuquén Province show that actual expenditures are made predominantly by the Argentine government or Argentine-based companies. Planned expenditures for unconventional oil and gas investments from 2013-2018 amounted to US\$19.8 billion. Of that amount, 61% of the planned expenditures were from YPF or other Argentine-based companies and 39% (or US\$7.7 billion) were planned expenditures from foreign companies. YPF is expected to contribute almost all of the Argentine planned expenditures.⁷³

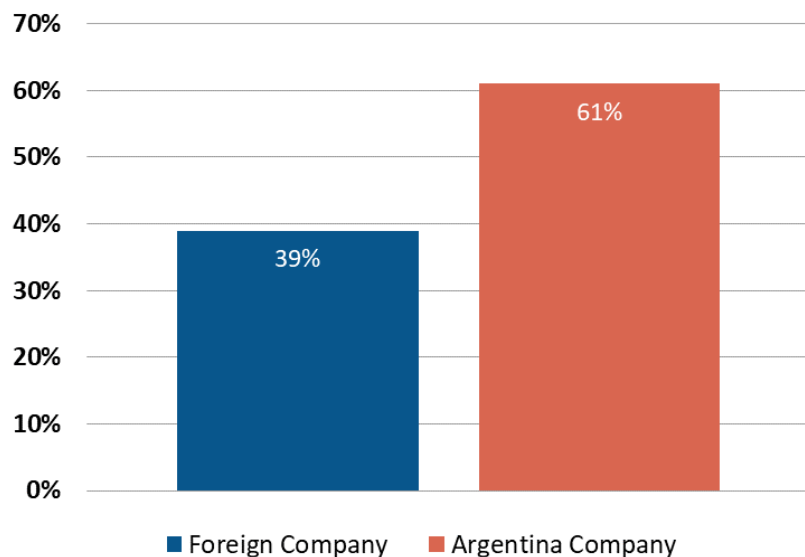
⁷⁰ Ibid., p. 15.

⁷¹ Appendix II: Actual Investment in Neuquén Province Domestic and Foreign (2013-2017). The Argentine government requires both foreign and domestic companies to forecast their planned expenditures in oil and gas exploration each year to the Department of Energy (MINEM). Companies must also declare the actual amounts spent at the end of the year.

⁷² Ibid., p. 73.

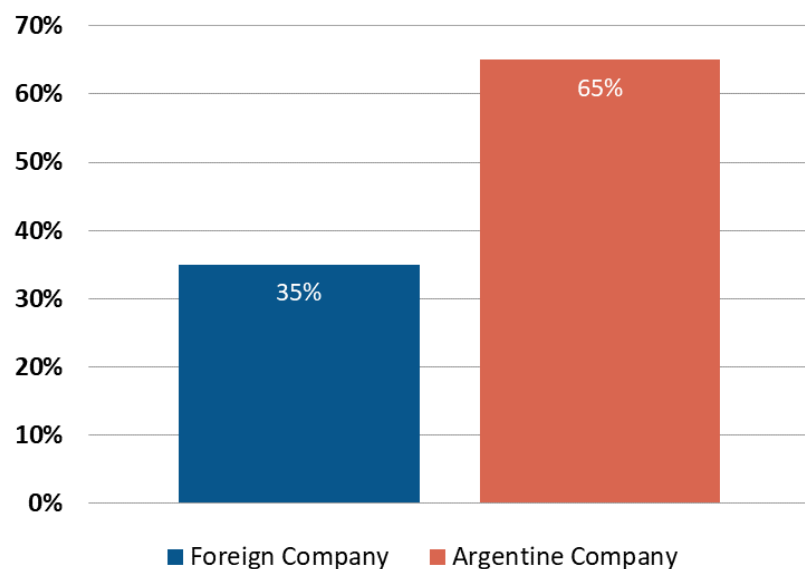
⁷³ See Appendix I.

Figure 11: Foreign and Argentine-Based Planned Investment in Vaca Muerta



From 2012 through 2017, aggregate actual expenditures amounted to US\$13.9 billion, of which US\$9.1 billion, or 65%, were made by Argentine-based companies while US\$4.9 billion, or 35%, have been made by foreign companies. YPF's outlay accounts for 63% of all actual expenditures. (See Appendix II: Actual Investments, Unconventionals, Neuquén Province, 2012-2017.)

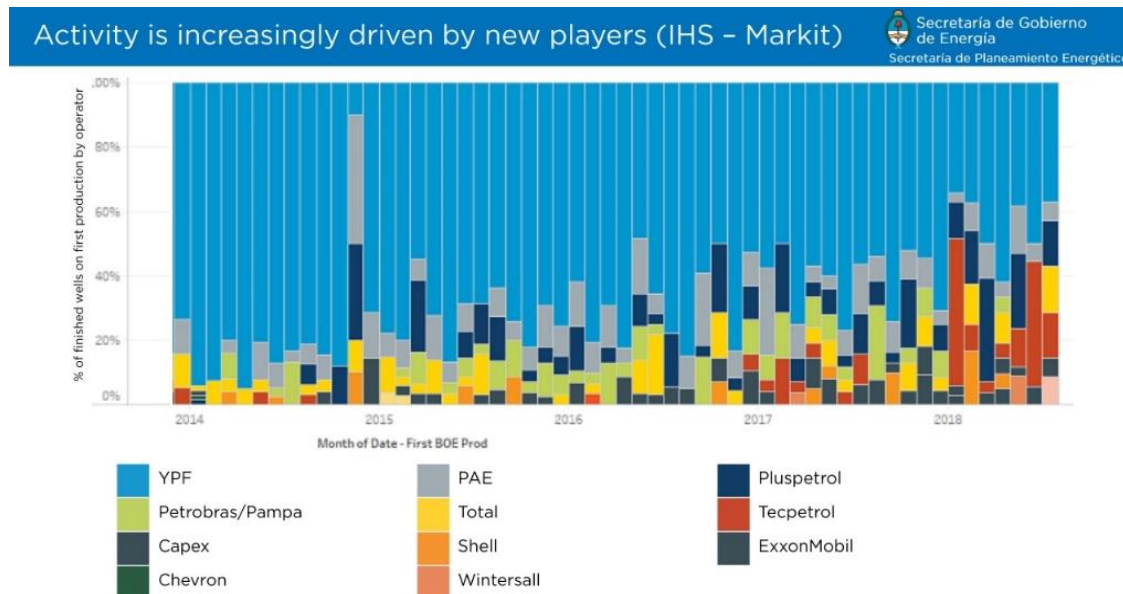
Figure 12: Foreign and Argentine Based Actual Investment in Vaca Muerta



Source for Figures 9 & 10: Secretaría de Gobierno de Energía– MINEM. *Inversiones realizadas en base a DDJJ presentadas por las empresas*. Additional information about exact amounts of subsidies paid to companies was supplied by the Minister of Energy in response to a request from FARN.

Although YPF has led investment and production in Vaca Muerta, Argentina's energy plan expects foreign, private sector companies will assume a larger role (Figure 11). Foreign companies are expected to increase production, improve the technological capacity of the country and reduce the need for continued subsidies. The energy plan assumes increasing capital expenditures from the foreign partners will replace public dollars from the Argentine government.

Figure 13: Increasing Role off Foreign Entities⁷⁴



This increase in private sector investment is taking place at a slower rate than anticipated, which threatens the logic of the energy plan. As a result, the Argentinian government must prolong its leadership role as producer and financier. The resulting tensions from this misalignment of the government's goals and resources is illustrated in the financial performance and prospects of YPF and in the evolving positions of the foreign partners.

Majority Government-Owned Energy Company YPF Leading Development of Vaca Muerta

Financial Stability Heavily Depends on Government Subsidies

YPF is Argentina's leading oil and gas company. In 2012, the government re-nationalized the company, declaring energy self-sufficiency was in the national public interest. A law was passed that authorized the expropriation of 51% of YPF from Respol, a Spanish company. The government currently owns 51% of the company and private investors own the remainder. YPF is traded on the Buenos Aires Stock Exchange and New York Stock Exchange.

⁷⁴ Secretaria de Gobierno de Energia. [Argentina Energy Plan](#). October 2018, p. 73.

YPF received the largest share of the production subsidies in 2016 and 2017. In 2016 and 2017, subsidies accounted for 8.7% and 6.0 % of total revenues. Without subsidies in 2016 and 2017, the company's profit picture would have been bleak and its ability to carry out its substantial commitments to Argentina's foreign partners uncertain.

Table 1: Subsidies as a Percentage of YPF Operating and Net Income, 2016 and 2017 (in Billions)

YPF Financial Results (in Billions)	2016*	2017**
Operating Income (ARS)	-24.245	16.073
Operating Income (USD)	-1.468	.642
Net Income (ARS)	-28.379	12.672
Net income (USD)	- 1.719	.505
Subsidy (USD)	1.242	.503
% of Operating Income	85%	79%
% of Net Income	72%	100%

Source: YPF. Annual Report: 2017, and IEEFA analysis.

*Exchange rate in 2016 (stated in YPF financial statements) 16.51 ARS/USD.

**Exchange rate in 2017 (stated in YPF financials): 25.05 ARS/USD.

III. YPF Financially Fragile, Overly Dependent on Subsidies and Shaky International Business Partner

In 2013, YPF launched a five-year business plan. Its main goal is to achieve oil and gas independence, largely by developing unconventional resources, which include horizontal drilling and hydraulic fracturing (fracking). The ambitious plan would require funding from internally generated cash, government subsidies and shale partnerships with global companies.⁷⁵

YPF is the development linchpin for Vaca Muerta. As the co-venture partner with all of the major oil and gas companies, the company's leadership as financier and developer is crucial to the successful development of the region. Based on a review of YPF's financials,⁷⁶ IEEFA finds that the company is poorly positioned to spearhead the development of the project. Its current state is weak and its future financial condition uncertain.

⁷⁵ Petroleum Economist. [Kick starting Argentina's Vaca Muerta](#). June 28, 2016.

⁷⁶ Appendix IV: Table: YPF Selected Financial Data (2012 to 4Q2018).

YPF's Current Finances Are Weak

YPF's operations are concentrated in the upstream, downstream and gas and power segments. The upstream operations consist of exploration, development and production of crude oil, natural gas and liquefied petroleum gas (LPG). Downstream operations include refining, marketing and transportation and distribution of a wide range of petroleum products, petroleum derivatives, petrochemicals, LPG and biofuels. Additionally, the company is active in the gas separation and natural gas distribution sectors both directly and through several affiliated companies. YPF also conducts power generation activities through YPF Energía Eléctrica, a company it controls.⁷⁷

The company had revenues of ARS 436 billion (US\$15.5 billion),⁷⁸ and operating profits of ARS 44 billion (US\$3.3 billion)⁷⁹ in 2018. Substantially all of YPF's sales and income are derived from activities in Argentina.⁸⁰

In 2016 and 2017, YPF received the largest subsidy payment from the government of Argentina, US\$1.2 billion and US\$500 million respectively. In 2016, a year in which YPF posted negative operating income, the US\$1.2 billion subsidy reduced the company's losses 43% from US\$2.8 billion to US\$1.6 billion. In 2017, the US\$500 million subsidy increased YPF's positive operating income 105% from US\$475 million to US\$975 million.

In 2018 YPF, through its crude oil, natural gas liquids [NGL] and gas production operations, produced the equivalent of 193,000 barrels of oil equivalent (kboe/d),⁸¹ a 4.5% decline from 2017. Argentina as a whole ranks 27th among the world's oil producers.⁸² YPF's oil production constitutes 49.7% of Argentina's total crude oil production and 42% of its natural gas production.⁸³

YPF is Argentina's leading developer of unconventional resources (shale oil, wet gas and gas) and has held this leadership role since 2013. YPF holds an interest in 15,000 wells throughout Argentina. Of this amount, 42% is in the Neuquén Basin.⁸⁴ The company has 11 exploration and 37 production joint ventures throughout Argentina that develop conventional and unconventional oil and gas resources. Many joint ventures of YPF govern development in Vaca Muerta.

In Vaca Muerta, the company has affiliation agreements with some of the world's largest oil and petrochemical companies, including Dow Chemical, Chevron,

⁷⁷ YPF. [Annual Report: 2017](#), p. 29-30. For a more complete description of the development of YPF, see page 30.

⁷⁸ Earnings Release Q4 2018 and FY 2018, "[YPF Consolidated Results.](#)" p. 32.

⁷⁹ *Ibid.*, p. 32.

⁸⁰ *Ibid.*, pp. 33.

⁸¹ Earnings Release Q4 2018 and FY 2018, "[YPF Consolidated Results.](#)" p. 33.

⁸² Wikipedia. [List of countries by oil production.](#)

⁸³ United States Securities and Exchange Commission. [Form 20-F for FY 2017, YPF Sociedad Anónima.](#) p. 31.

⁸⁴ YPF. [Annual Report: 2017](#), p. 44-45.

Petronas, SPM Argentina S.A., Shell, Pampa Energies, Total S.A., and ExxonMobil.⁸⁵

Of all of the companies doing business in Vaca Muerta, YPF has made the single largest investment to date (see Appendix II). On an enterprise-wide level, YPF has made total capex investments of ARS332 million (US\$31 billion) since 2013.⁸⁶ YPF has made US\$8.8 billion investments in Vaca Muerta during this period.⁸⁷ YPF's investments in Vaca Muerta represent more than 60% of the total investment made in Vaca Muerta from all companies since 2012.

A brief review of selected financial data from YPF over the last five years shows the following patterns:

- a) Production declined for the third straight year (from 211,000 boe/d to 195,519 boe/d).
- b) Revenues in U.S. dollars are down from 2014 recent peak (from US\$17.6 billion to US\$15.5 billion). Revenues from 2017 to 2018 were flat, in US dollars.
- c) Operating income is down from peak-2014 levels in dollars, but increased by 70%, from 2017 to 2018.
- d) Argentina's annual subsidies for 2016 and 2017 substantially improved its financial performance and are expected to continue to do so.
- e) Capex has averaged US\$5 billion annually since 2013. Spending has declined annually and was US\$3.3 billion in 2018.
- f) YPF's cash position has eroded substantially and that trend is likely to continue in 2019.
- g) Over the last five years, the stock price dropped by 54%, as the S&P 500 has increased by 49%. See Figure 3: YPF Stock Price versus S&P 500 (2014 to present).

⁸⁵ For a more complete description of the ownership, participation, investment commitments and type of development within various Vaca Muerta resource blocks see: YPF. [Annual Report: 2017](#), p. 37-44.

⁸⁶ See Appendix IV, which includes production and financial data.

⁸⁷ Data from Argentine government. MINEN- [Inversiones realizadas en base a DDJJ presentadas por las empresas](#). See also Appendix II.

Figure 14: YPF Stock Price Versus S&P 500 (2014 to Present)



Source: Yahoo Finance, YOF Sociedad Anonime (YPF) Vs. GSPC (SP 500), March 8, 2019.

Looking Forward, YPF's Financials Will Remain Weak

YPF's future is closely tied to the economic and fiscal health of Argentina. Government policy regarding oil and gas regulation, oil and gas price-setting mechanisms, indirect and direct subsidy payments and trade policy all have an impact on its finances.⁸⁸ YPF currently holds the most acreage of any company in Vaca Muerta,⁸⁹ owns the most active wells,⁹⁰ and is the lead operator on the estimated list of 31 key projects under development.⁹¹

According to YPF's 2017 annual financial statement, the company anticipates that its overall production and reserve levels will decline as its mature oil holdings phase out and its investments in unconventional oil and gas move forward.⁹² Argentina's Energy Plan anticipates a more significant role for YPF's private sector venture partners going forward.⁹³ Assuming YPF is able to achieve its relatively smaller role in Vaca Muerta, the company still anticipates that the costs to develop Vaca Muerta will be high in coming years.⁹⁴

It is assumed by YPF that its revenue base will be enhanced through 2021 with a natural gas subsidy program.⁹⁵ The planned subsidies starting in 2018 pay producers of some natural gas the difference between the market price and US\$7.50/MMBtu and then phase down the guaranteed price to US\$6/MMBtu in 2021. Any future subsidies would need to be approved through Argentina's budgetary process. In 2017, the company reported that subsidy payments from the

⁸⁸ YPF. [Annual Report: 2017](#).

⁸⁹ Secretaria de Gobierno de Energia. [Argentina Energy Plan](#). October 2018, p. 8.

⁹⁰ *Ibid.*, p. 9.

⁹¹ *Ibid.*, p. 10

⁹² YPF. [Annual Report: 2017](#). p. 20.

⁹³ Secretaria de Gobierno de Energia. [Argentina Energy Plan](#). October 2018, p. 73.

⁹⁴ YPF. [Annual Report: 2017](#), p. 20.

⁹⁵ United States Securities and Exchange Commission. [Form 20-F for FY 2017, YPF Sociedad Anónima](#). p. 17.

Argentine government have been slow to materialize in the past.⁹⁶ Since the announcement of the subsidy reduction, Moody's has identified YPF as one of the companies that would be negatively affected by the policy change.⁹⁷

Global market conditions for natural gas are likely to produce low revenue scenarios for YPF going forward. Argentina uses the Henry Hub natural gas price as its benchmark indicator of current and future prices.⁹⁸ The Henry Hub price at the end of 3Q2018 was US\$2.9/MMBtu. According to the Energy Information Administration the price of Henry Hub natural gas will rise to around US\$4/MMBtu over the next decade.⁹⁹ This analysis points to several significant risks facing YPF and Argentina.

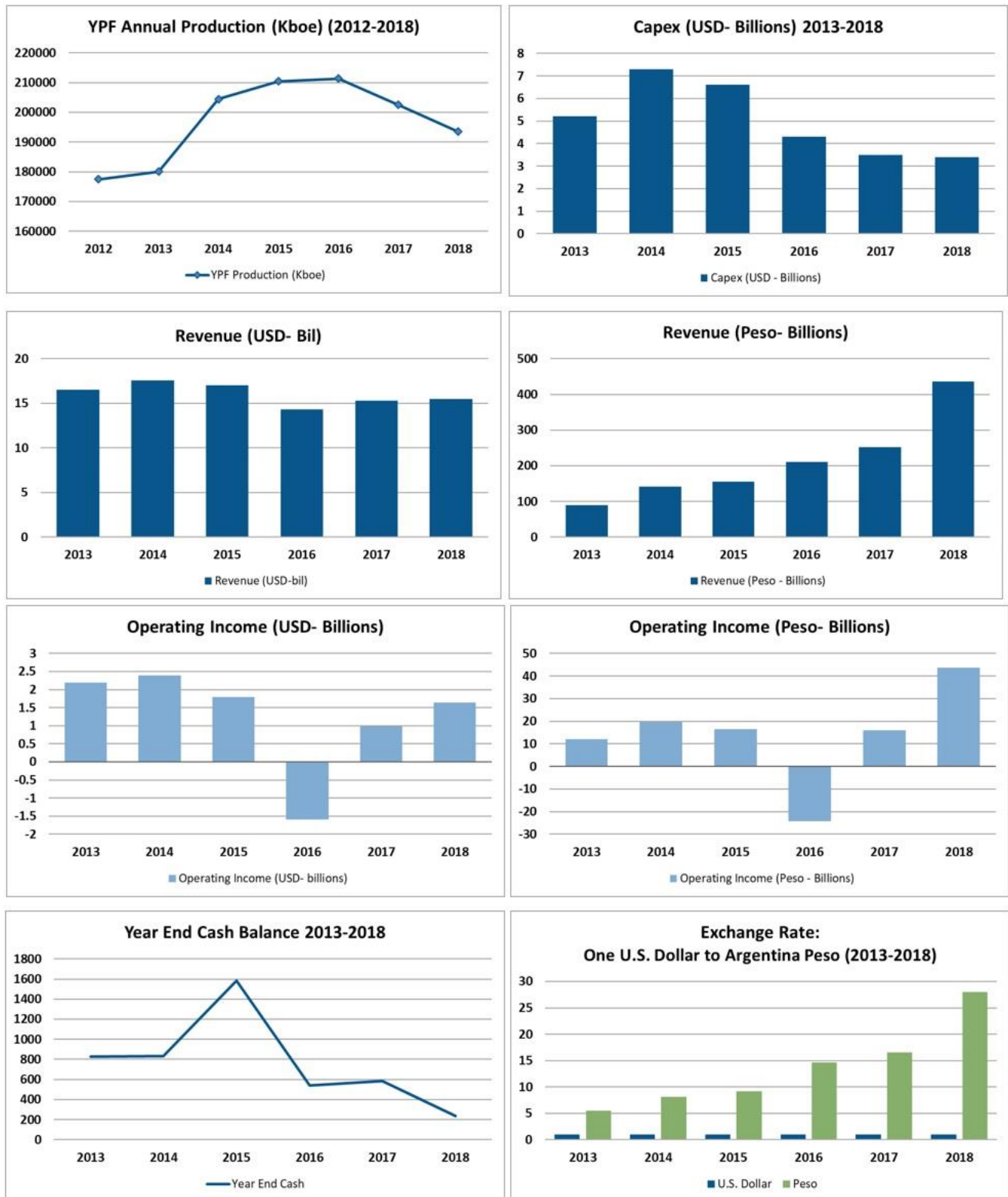
⁹⁶ Econo Journal. [El gobierno debe a YPF \\$5000 millones en subsidios a la producción de gas](#). May 2017.

⁹⁷ Gallardo, Martina and Waltz, Marianna. Moody's Investor Services. "Argentina oil and gas. Change in compensation policy to slow momentum for unconventional natural gas." February 4, 2019

⁹⁸ The company uses the Henry Hub baseline data in its quarterly filings to investors.

⁹⁹ U.S. Energy Information Administration (EIA). [Annual Energy Outlook 2018](#). See Prices/Natural Gas at Henry Hub in the Interactive Table Viewer.

Figure 15: YPF Selected Financials (2013-2018)



Source: IEEFA analysis. See Appendix IV for further detail and for figure sourcing.

The capacity of YPF to execute on all of its commitments to the Argentine government and its many partners is uncertain. The combination of a low and volatile oil and gas pricing environment and subsidization and capital needs required by partnership agreements is challenging. YPF's ability to succeed rests on how it answers the following questions:

- Will Argentina's private venture partners move forward with capital commitments and new investment at a rate that allows for the reduction in YPF's investment?
- What is YPF's and the Government of Argentina's exit strategy from its significant investment in Vaca Muerta? How does it anticipate recouping those investments?
- Are YPF and the Argentine government prepared to invest beyond currently planned levels if the private sector is slow to increase commitments to Argentina?
- What will be the impact on YPF finances of moving from a heavily regulated pricing system for its oil and gas products to a global oil pricing system and a phased-out price subsidy for natural gas? What will be the impact of this new price environment on YPF's capital plans?

IV. Foreign Partners Tentative, Some Reducing Production and Investment

The Argentine government has secured multiple agreements with major oil and gas companies. But investment from these companies has been slow and driven in large part by outlays from the Argentine government or Argentine-based companies.

The Argentine Energy Plan is time sensitive and assumes that investment by foreign companies will substantially replace those from YPF over the next five years (Figure 11). Short- and long-term trends and goals between the Argentine plan and its joint venture partners are not aligned. The dynamics are not promising. International oil and gas companies give priority to areas with known reserves, workable infrastructure, and relatively stable markets and political structures. Their outlook as a global industry is decidedly negative. Argentina requires a willingness to invest in the near future in an area with ample reserves, significant infrastructure deficits, a weak economy, changing markets, an unstable political and policy environment and a fiscal plan that is cutting subsidies at a time when outside companies demand these incentives.

Vaca Muerta has ample reserves, but Argentina appears to be moving at a pace that requires a greater commitment from oil and gas companies than they are prepared to make. Overall, the picture points to Argentina's joint venture partners acting with near-term hesitancy and skittishness.

The long-term picture offered by these officials is cautiously optimistic, yet conscious of the many obstacles to full development (see discussion in Section VI: Risk Factors Cloud Outlook: Individual and Cumulative Risk Factors Challenge Success of Vaca Muerta Plans). The very fact that partner companies continue to see the “potential” of the region over the “long term” suggests they are not ready to accelerate capex expenditures from company resources consistent with Argentina’s energy assumptions. At the same time, Argentina is phasing out its subsidy commitments that have so far been the critical element to investment in the area.

Based on IEEFA’s survey of company actions and recent statements by the heads of Argentine’s major partners, a decidedly mixed outlook emerges.

In addition to the statements made by Tecpetrol and Pampa Energies (above) regarding the need for continued subsidization and the risks involved with tightening them, our survey of other major companies in Argentina underscores that the ambitious production goals advanced by the government are at risk.¹⁰⁰

a) Tecpetrol: Oil and gas company navigates intermittency of demand and backs off when government reduces subsidies, threatens lawsuit.

Tecpetrol, part of the Techint global conglomerate founded in Italy in 1945, committed heavily to unconventional production of natural gas, spending US\$ 757 billion between 2016 and 2018 on unconventional exploration and production in Neuquén Province. (As reported elsewhere, it cited the government’s subsidy program as “...the fundamental milestone that makes the larger investment program and the quantitative and qualitative growth of the Company possible.”)¹⁰¹

The company has informed its investors that one of the challenges in Vaca Muerta is the intermittency of demand. Natural gas is primarily produced for domestic consumption, where demand is seasonal. The company has stated that this market dynamic increases its break-even costs to US\$6/mmbtu compared to continuous production costs of US\$4/mmbtu.¹⁰² A small percentage of natural gas has recently begun to be exported to Chile

In January 2019, the government announced it would cap natural gas production subsidies for 2018 to production amounts originally forecasted by companies under their agreements with the government. Tecpetrol had already produced nearly double that amount last year.¹⁰³ The company responded by discharging three of its four rigs in Fortín de Piedra, laying off 300 workers, announcing to the Buenos Aires stock market that it would

¹⁰⁰ S&P Global. [Argentina’s YPF sees return to production growth in 2019](#). August 8, 2018 and S&P Global. [Argentina’s YPF sees sharper drop in 2018 output on low natural gas demand](#). November 12, 2018.

¹⁰¹ Tecpetrol. [Consolidated Financial Statements for 2017](#). p. 3.

¹⁰² Universidad del Cema (UCEMA). Conferencia. El futuro del petróleo y el gas en Argentina: Tecpetrol CEO Carlos Ormachea, CEO.” November 21, 2018.

¹⁰³ In August 2017 Tecpetrol announced plans to produce 8.5 million cubic meters a day in Fortín de Piedra in 2018. However, the company exceeded its production forecast, producing 17.5 million cubic meters a day. Peco, Silvia.Ambito.com. “Alcotan los subsidios al gas y Techint amenaza al Gobierno.” January 31, 2019.

receive ARS 5,600 million fewer pesos for production in 2018 than it had forecasted, and beginning legal action against the Argentinian government.¹⁰⁴

The company's CEO, Carlos Ormachea, noted that "the change of criteria has a negative impact on the flow of funds of the company," so he decided to "revise the terms of the development plan of the area, in order to readjust the flow of funds to the new scenario and improve their financial indicators."¹⁰⁵

The new subsidy policy is estimated to decrease the company's cash flow from its Fortín de Piedra block by US\$150 million in 2018, and US\$ 250-300 million a year in 2019-2020.¹⁰⁶

Tecpetrol was expected to be the largest recipient of the unconventional natural gas production subsidy in 2018. YPF, Compania General de Combustibles (CGC), Capex, Wintershall, PAE, and Total are also recipients of the subsidy.^{107,108}

Tecpetrol finances in 2018 were boosted by the currency devaluation and subsidies for natural gas production in the Neuquén Province.¹⁰⁹ According to its Q3 financials, the company's Q3 2018 sales, which totaled US\$10.5 billion, was "mainly caused by a significant rise in gas production accompanied by an increase in sales prices and the effect of the exchange rate fluctuation of the Argentine peso ("ARS") with respect to the US dollar ("USD")... This increase in production levels is explained by the development of the Fortín de Piedra area in Neuquina basin. In both periods, gas production was entirely sold to the domestic market. As regards gas net sales, they increased... considering the Company adhered to the "Program of Incentives to Investments in Natural Gas Production Developments from Unconventional Reservoirs" for gas from Fortín de Piedra."¹¹⁰

Tecpetrol is one of the first company's in Argentina to step up its investments. It did this as the company experienced a number of upside conditions related to currency exchange rates, opportunities in the domestic market and subsidies under Argentina's new gas plan. Argentina's reversal of its policy has a particularly negative impact on Tecpetrol because the

¹⁰⁴ ArgentinaTopnewsCloud.com, "Vaca Muerta: the oil company reduces its production and workers by cutting subsidies." February 17, 2019.

¹⁰⁵ Peco, Silvia.Ambito.com. "Alcotan los subsidios al gas y Techint amenaza al Gobierno." January 31, 2019.

¹⁰⁶ Gallardo, Martina and Waltz, Marianna. Moody's Investor Services. "Argentina oil and gas. Change in compensation policy to slow momentum for unconventional natural gas." February 4, 2019.

¹⁰⁷ Energia16. "Argentine tax plan is affecting oil companies working in Vaca Muerta." September 16, 2018.

¹⁰⁸ Diamante, Sofia. La Nation. "Techint advierte que podría reducir sus inversiones en Vaca Muerta por una decisión del Gobierno." January 30, 2019.

¹⁰⁹ Tecpetrol. "Interim Financial Statements at September 30, 2018."

¹¹⁰ Ibid.

subsidy rules were changed after the company had already invested heavily. The impact of the changes in Argentina's subsidy policies, and the company's response, will have a negative impact on its cash position. It will materially alter the financial outlook it conveyed to its investors.

- b) Chevron: A cornerstone foreign oil and gas company in Vaca Muerta has invested very little of its own money and warns against subsidy reductions.** The YPF-Chevron partnership in Loma Campana is the largest, most productive and most visible project to date. When the joint venture was announced in 2013, initial outlays were expected to be US\$1.24 billion.¹¹¹ Since then, Chevron committed to invest only US\$53 million and has deployed US\$77 million through 2017.

In 2015, the project was in full development,¹¹² and has outpaced its initial production forecasts for natural gas.¹¹³ Chevron's corporate reporting combines Brazil and Argentina, so it is unknown whether the investments are contributing positively to the company's bottom line.

In its Q3 2018 earnings call, Chevron made no direct reference to Argentina but emphasized the importance of subsidies to continued investments in various countries. "And you're right, in some locations around the world, you'll see a tightening of fiscal terms, but in other locations around the world, you see the fact that the host governments are realizing that. In order to incent foreign investment, they need to revise the fiscal terms in a more kind of favorable to the investor like a Chevron would be, situation."¹¹⁴ The company did refer to the potential of Vaca Muerta in response to a question from an analyst during its Q4 2018 earnings call.¹¹⁵

- c) Retamco, a small company departs.**¹¹⁶ U.S.-based Retamco promised a long-term commitment of US\$1 billion to support the development of the reserves it was awarded for development in Vaca Muerta in November 2017. According to published reports, after the company invested US\$1.1 million and then requested more time to raise capital, the deal is now dead.¹¹⁷ There is no indication whether Retamco jumped or was pushed and it is possible that the Argentine government may have pulled the plug.

¹¹¹ Chevron Press Release. [Chevron, Argentina's YPF Sign Accord to Develop Vaca Muerta Shale](#). July 16, 2013.

¹¹² Secretaria de Gobierno de Energia. [Argentina Energy Plan](#). October 2018. p. 10. This includes a map and list of projects, created by Wood Mackenzie and MINEN.

¹¹³ Chevron and YPF have offered upbeat press accounts during their partnership in The Oil and Gas Year. [Chevron to invest \\$200 million in Argentina](#). April 4, 2018.

¹¹⁴ The Motley Fool. [Chevron \(CVX\) Q3 2018 earnings results call transcript](#). September 30, 2018.

¹¹⁵ Seeking Alpha. ["Chevron Q4 2018 earnings call transcript."](#) January 16, 2019.

¹¹⁶ Tom Sanzillo and Kathy Hipple. [IEEFA Argentina: Setbacks in plan to use Vaca Muerta oil and gas reserves to kickstart economy](#). January 9, 2018.

¹¹⁷ Oil&GasYear.com. ["Retamco exits Argentina block."](#) January 4, 2019.

Steve Gose, Retamco's owner, established his business in Texas, but went bust in the early 1980s.^{118,119} Retamco, his operation in Montana, started in 1995 and has holdings in North Dakota, Wyoming and Colorado. It was the first U.S. independent oil company to ink a deal when it won its Vaca Muerta bid in 2017. That was important because Argentina needs both large-scale major corporations and smaller independent companies that can bring rigs into Vaca Muerta and piggyback off the structure of the larger investments.

Last year, Reuters reported that the two small independents doing business in Argentina were experiencing problems raising capital.¹²⁰ The faltering economic situation, skyrocketing interest rates and the devaluation of the Argentine peso during 2018 apparently chased away Retamco's investor network. The problems eventually proved insurmountable. The loss of the company's involvement in Vaca Muerta is a setback, although Argentine officials have said they will find other developers.

d) Apache abandons investment early. Apache Corporation,¹²¹ a Houston-based early investor, bought Pioneer's Vaca Muerta assets in 2006 for US\$675 million.¹²² In 2014, as the government began its process of soliciting new companies under the Vaca Muerta program, Apache sold its assets to YPF for US\$500 million cash and US\$85 million in existing debt.¹²³ At the time, Apache's CEO stated that the company could do better with North American investments.¹²⁴ Today Apache has operations in the United States, United Kingdom and Egypt.¹²⁵

e) Royal Dutch Shell: Large investor is optimistic but highlights infrastructure concerns. Between 2013 and 2017, Royal Dutch Shell ("Shell") made a commitment of US\$800 million for exploration and development in Neuquén Province to develop unconventional resources. And in fact, the company has spent 76% of its US\$800 million commitment through 2017.

Shell has focused its Argentinian efforts in Vaca Muerta, in such shale oil projects as Coirón Amargo Sur Oeste and Sierras Blancas/Cruz de Lorena. The company announced plans for Coirón Amargo Sur Oeste in mid-2015, and a joint venture with YPF in Sierras Blancas/Cruz de Lorena in late 2017.¹²⁶

¹¹⁸ Eagle Ford Shale. "TXCO Resources."

¹¹⁹ Pendleton, Scott. The Christian Science Monitor. "Former Millionaire works to rebuild natural-gas empire." June 20, 1994.

¹²⁰ Castilla, Juliana. Reuters. "Argentina's shale potential hit as small firms struggle for funds." June 19, 2018.

¹²¹ Apache. Press Release. [Apache completes sale of Argentina assets to YPF](#). March 12, 2014.

¹²² Oil & Gas Journal. [Apache buying Pioneer's Argentine operations](#). January 18, 2006.

¹²³ Apache. Press Release. [Apache completes sale of Argentina assets to YPF](#). March 12, 2014.

¹²⁴ The Motley Fool. Arjun Sreekumar. [Is the Argentina asset sale good for Apache?](#) February 16, 2014.

¹²⁵ Apache. [Map of Operations](#).

¹²⁶ Vista Oil and Gas. [Investor Presentation](#)." May 2018.

In 2018, Shell opted to sell its downstream holdings in Argentina. As part of its financial disclosure, the company stated: "Shell sees substantial long-term growth potential in Argentina's shale resources."¹²⁷ The company has also recently stated that the infrastructure needs of Argentina are an important unmet need and that Vaca Muerta's geological advantage in the global market is not enough to warrant a more exuberant investment outlook: "It will take many other ingredients than the rock to make it a global super basin," said Ed Kruijs, Shell technical manager, Argentina.¹²⁸

During Shell's Q3, 2018 earnings call, the company expressed that it is in a "good position" regarding how its Vaca Muerta assets position the company in the shale market.¹²⁹ During its Q4, 2018 earnings call, the company made a single mention of Argentina, to note that it has moved a project into development.¹³⁰

- f) ExxonMobil: Industry leader waits for the long term.** ExxonMobil has committed to spend US\$349 million and actually spent US\$336 million through 2017, or 96% of its commitment. In 2018, the company actually spent US\$323 million. ExxonMobil is the world's largest publicly traded oil company. It had a US\$25 billion capex budget in 2018, and a projected US\$30 billion capex budget for 2019. During its Q3 2018 earnings call, the company extensively discussed its fracking opportunities in the Permian Basin, located in West Texas and New Mexico. And during that call, the company spoke at great length about recent discoveries in Brazil and an additional allocation of US\$1 billion capex beyond what had been budgeted in 2018. Vaca Muerta was not mentioned as a current priority project. During its Q4 2018 earnings call, the company again did not mention either Vaca Muerta or Argentina.¹³¹

ExxonMobil's James Blaine, project executive for international projects, said, "We are in a position within our company where we are competing for capital," adding that while the cost of the Argentine operations run by its XTO division are high compared with the Permian, "these are early days."¹³² "We do see a path to success. The question is, how fast will we get there?"

- g) Total S.A.: Uncertain outlook in the face of subsidy reductions.** Through 2017, Total S.A. had committed US\$1.5 billion and deployed approximately 84% of its commitment. Total's commitment represented 32% of all foreign company commitments to develop unconventional resources in Neuquén Province through 2017. Total received US\$290 million in subsidies in 2016

¹²⁷ Shell Press Release. [Shell to sell its downstream business in Argentina to Raizen](#). April 24, 2018.

¹²⁸ Journal of Petroleum Technology (JPT). [Argentina's shale play is beginning to live up to expectations](#). May 22, 2018.

¹²⁹ Seeking Alpha. [Royal Dutch Shell, Q3 2018 results - earnings call transcript](#). November 1, 2018.

¹³⁰ Seeking Alpha. ["Shell Q4 2018 earnings call transcript."](#) January 31, 2019.

¹³¹ Gallardo, Martina and Waltz, Marianna. Moody's Investor Services. "Argentina oil and gas. Change in compensation policy to slow momentum for unconventional natural gas." February 4, 2019.

¹³² JPT. [Argentina's shale play is beginning to live up to expectations](#). May 22, 2018.

and 2017, making it the third largest beneficiary of programs linked to oil and gas.¹³³

During its Q4 2018 earnings call, Argentina was mentioned only once, to note that a project had been sanctioned there in 2018.¹³⁴

Total will be impacted by the change in natural gas subsidies, announced in January 2019. The company participates, either as lead operator or 25% partner, in two of the largest five projects affected by new policies. Moody's has acknowledged that the reduction in production subsidies are credit negative for producers.¹³⁵

Even before the change in subsidy policy, Total Austral S.A. had stated it will continue its operations in Vaca Muerta only because of the "Argentinian authority's provision of new shale gas pricing."¹³⁶ During the company's Q3 2018 earnings call, Total's CEO stated in response to questions about Argentina: "we are reevaluating this situation about gas price and devaluation of the currency... We will not inject cash money in Argentina at the moment, and we are monitoring the situation because of the economic environment of the country."¹³⁷

- h) Equinor: Large European oil and gas company tests the waters.** In 2017, Norway's state-owned energy company Equinor (formerly Statoil), entered into a joint venture agreement with YPF to develop the Bajo del Toro site in the Neuquén Basin, becoming a 50% partner with YPF. As part of the agreement, the company agreed to reimburse YPF US\$30 million for expenses, and has promised to pay some portion, along with YPF, of US\$270 million for future capex. This will be spent on drilling two horizontal wells in the initial phase, and six in the second phase.¹³⁸ This project is still in the pilot phase.
- i) Wintershall:¹³⁹ Opportunistic investor receives subsidies in excess of outlays.** Wintershall has made a commitment of US\$215 million and spent US\$195 million, or 75% of its commitments from 2013-2017.

Wintershall Energía S.A. in 2016, and again in 2017, took in far more in subsidies from the Argentine government than it spent on investments

¹³³ FARN. [Los subsidios a los combustibles fósiles en Argentina 2017-2018](#). May 2018. See Also: Table X Top 5 Beneficiaries.

¹³⁴ Seeking Alpha. ["Total's \(TOT\) CEO Patrick Pouyanne on Q4 2018 results – earnings call transcript."](#) December 8, 2019.

¹³⁵ Gallardo, Martina and Waltz, Marianna. Moody's Investor Services. "Argentina oil and gas. Change in compensation policy to slow momentum for unconventional natural gas." February 4, 2019.

¹³⁶ Seeking Alpha. [Total SA Q3 2018 earnings call transcript](#). October 22, 2018.

¹³⁷ Ibid.

¹³⁸ Newsbase. [More Vaca Muerta Investment Pledges](#). February 6, 2018.

¹³⁹ PAE is also concerned about the potential oversupply and taking steps to improve exports to Chile. S&P Global. [BP, Pan American eye exporting Argentine shale gas as LNG via Chile](#). November 15, 2018.

during those two years.¹⁴⁰ During those two years, Wintershall was the fourth largest recipient of subsidies, after YPF, PAE, and Total. In 2016, Wintershall invested US\$74 million, and received US\$105 million in subsidies. In 2017, Wintershall invested only US\$64 million,¹⁴¹ and received US\$87 million in subsidies. Wintershall has described opportunities in Argentina in glowing terms on its website.¹⁴²

- j) **BP: A supermajor, largest foreign recipient of subsidies in 2016 and 2017, faces significant implications from decreasing subsidies.** Pan American Energy (PAE), a subsidiary of British Petroleum, planned a US\$1.736 billion investment in Neuquén Province through 2018. It received US\$1.17 in subsidies in 2016 and 2017, which was the largest payment to any foreign company, second only to majority state-owned YPF.¹⁴³ Between them, PAE and YPF accounted for 71% of all production subsidies paid in 2016 and 2017.

Like Wintershall (discussed above), it received more in production subsidies in 2016 and 2017 than it spent during those years. In 2016, it received US\$1.008 billion, while spending only US\$977 million.¹⁴⁴

PAE is the lead operator in Bandurria Centro, which reached full development in 2016, and Aguada Pichana Oeste/Aguada de Castro, a large unconventional gas block in Vaca Muerta, at nearly 150 thousand acres.¹⁴⁵ It is expected to reach full development in 2018. PAE is also the lead operator in Coirón Amargo Sur Este, which remains in the pilot phase.

During an interview with Bloomberg TV in 2016, CEO Bob Dudley spoke enthusiastically about the potential of the shale play. Since then the company has made no disclosures to its investors. British Petroleum, in both its Q3 and Q4 2018 earnings calls, did not mention either Argentina or Vaca Muerta, though it described oil and gas production in West Siberia and

¹⁴⁰ It is likely that additional research will uncover additional private foreign companies that have received subsidies that exceeded their invested amounts.

¹⁴¹ Secretaría de Gobierno de Energía– MINEM. [Inversiones realizadas en base a DDJJ presentadas por las empresas](#). Additional information about exact amounts of subsidies paid to companies was supplied by the Minister of Energy in response to a request from FARN, and is attached as an Appendix II.

¹⁴² According to a July 18, 2017 Wintershall [Press Release](#) “Wintershall is always in the process of optimizing its portfolio—either by acquisitions or divestments. Regarding its activities in Neuquén Province, the Company is emphasizing the development of resources in the operated blocks Aguada Federal and Bandurria Norte where pilot plans are currently under execution. It will continue participating in projects in Aguada Pichana and San Roque blocks. In the past three years Wintershall invested about US\$1 billion in Argentina.”

¹⁴³ FARN. [Los subsidios a los combustibles fósiles en Argentina 2017-2018](#). May 2018 (Exchange rates assumed for the analysis are 15 ARS/\$ in 2016, and 17 ARS/\$ in 2017.), and compiled by MINEM data, 2018.

¹⁴⁴ Compiled by MINEM data, 2018.

¹⁴⁵ Gallardo, Martina and Waltz, Marianna. Moody's Investor Services. “Argentina oil and gas. Change in compensation policy to slow momentum for unconventional natural gas.” February 4, 2019

Senegal. It does not mention Argentina or Vaca Muerta on its website. Under the tab, "BP Worldwide," Argentina is not listed.¹⁴⁶

The Argentine government's change in its unconventional natural gas subsidy program will have significant "implications" for PAE, according to a recent Moody's report, which described the policy decision as "credit negative for Argentine producers, lowering their projected cash flow for 2018-21 to levels that will support far less of their capital spending."¹⁴⁷ The Moody's report specifically mentions PAE as one of the producers that will be most affected.¹⁴⁸

k) Petronas: Company signs investment in 2014 and has not contributed any investment dollars. Petronas, a Malaysian company, has had a joint venture with YPF since 2014,¹⁴⁹ La Amarga Chica, which was a pilot project involving drilling horizontal wells and transport facilities for shale oil. The project was expected to receive full development sanction in 2018.¹⁵⁰ After its final stage, the companies would decide on the start of the full development of the area.¹⁵¹ In early 2018, the company and YPF announced a US\$192 million investment.¹⁵² Petronas recently signed a deal with YPF to spend US\$2.3 billion over the next four years to develop La Amarga Chica in Vaca Muerta.¹⁵³

Although these joint announcements¹⁵⁴ have been from both YPF and Petronas, Petronas' planned and actual expenditures are not reported in the MINEM database, although La Amarga Chica is included, with YPF as the operator. Petronas' actual participation in the joint venture is unspecified.

VI. Risk Factors Cloud Outlook

Individual and Cumulative Risk Factors Challenge Success of Vaca Muerta Plans

The prospects for success in Vaca Muerta are closely tied to the economic and fiscal progress of the Argentine government. Thus far, the government is the primary financier and policy driver of progress. The effort faces challenges related to the

¹⁴⁶ PB.com. "BP Worldwide."

¹⁴⁷ Gallardo, Martina and Waltz, Marianna. Moody's Investor Services. "Argentina oil and gas. Change in compensation policy to slow momentum for unconventional natural gas." February 4, 2019.

¹⁴⁸ Ibid.

¹⁴⁹ World Oil. [Petronas signs \\$550 million Argentine shale venture with YPF](#). December 10, 2014.

¹⁵⁰ Business Insider. [Argentina. YPF and Petronas will invest US \\$192 million in Vaca Muerta](#). February 2, 2018.

¹⁵¹ Ibid.

¹⁵² Mondaq. [Argentina. YPF and Petronas will invest US \\$192 million in Vaca Muerta](#). April 12, 2017.

¹⁵³ Yahoo News. Zacks Equity. [YPF Sociedad ties up with Petronas to invest in Vaca Muerta](#). December 6, 2018.

¹⁵⁴ Mondaq. [Argentina. YPF and Petronas will invest US \\$192 million in Vaca Muerta](#). April 12, 2017.

government's financial health: subsidy commitments are planned to phase out; the finances of YPF, the country's largest integrated oil and gas company, are fragile; and future investments from foreign partners are uncertain, predicated on subsidies and numerous other factors.

These risks are substantial and the project faces a series of other issues that make success uncertain. The landscape going forward will teem with considerable obstacles.

Financial Risks: Macroeconomic Factors

Argentina is in a recession that is not expected to end before 2020. Inflation continues to be high.

Argentina's economy contracted in 2018, and is expected to contract again in 2019 by -1.7%, before rebounding in 2020. Inflation is expected to continue.¹⁵⁵ The IMF expects to play a key role in financing the federal government through 2020.¹⁵⁶ Agriculture, the largest economic sector in the economy, suffered from a severe drought in the second quarter of 2018.

Argentina's macroeconomic outlook may continue to slow investment in the world's largest private oil and gas concerns.

Argentina's recently enacted budget reflects a consensus to address the dire macroeconomic conditions created by its devalued currency, rampant inflation and high interest rates. The budget created the rationale for the IMF to move forward with assistance and was generally seen as positive.¹⁵⁷ However, economic performance since the signing of the most recent IMF agreement has been weak. Economists anticipate a recession in early 2019.¹⁵⁸ The new budget transfers financial burdens onto regional governments and has become a cause for concern.¹⁵⁹ Some have criticized the plan as being overly optimistic if not misguided.¹⁶⁰ Argentina's plan may be too reliant on the degree to which it is depending on exogenous factors like commodity prices in the oil and gas markets to help rebalance its economy. As the economy slows, so will the progress assumed in the Argentine fiscal plan. Part of the expected progress relates to the increase in investment and production in the energy sector. In addition, investment perception continues to be colored by market perceptions of political and policy disarray and the history of default and protracted conflict with financial markets.

¹⁵⁵ IMF. "Argentina – Second annual review under the stand-by arrangement." December 2018.

¹⁵⁶ Ibid. p. 42.

¹⁵⁷ Moody's Investor Service. Government of Argentina- 2019 budget approval paves the way for continued IMF support. Issuer-In-Depth, November 16, 2018. (PBC 1150552).

¹⁵⁸ Moody's Investor Service. Government of Argentina- B2 Stable, Issuer-In-Depth, October 18, 2018. (PBC 1135720).

¹⁵⁹ Moody's Investor Service. Cross-Sector Argentina, Issuer-In-Depth, May 4, 2018. (PBC 1124236).

¹⁶⁰ Center for Economic Policy and Research (CEPR), Mark Weisbrot and Lara Merling. Argentina's Deal with the IMF: Will "Expansionary" Austerity Work? December 2018.

As an illustration of how investor perceptions may be influenced by how the policy environment is perceived, a recent Moody's analysis commented on a change in subsidies, announced in January 2019, but retroactive for 2018 production. "This change in government policy for investments in unconventional natural gas developments is negative in credit terms for Argentine producers, since this represents a decrease in their projected cash flows for the period 2018-2021."¹⁶¹

Argentina may not develop into the "market hot spot" that it is promising investors.

The Argentine Energy Plan expects prolific production growth over the next five years and even more thereafter. In the current market, most major oil and gas companies are investing in places other than Argentina. Those companies are themselves in a period of uncertainty coming through a cycle of major value destruction. Wary investors are less patient with far flung, large-scale speculative investment strategies. Major oil and gas companies' capex commitments are in Brazil, the Permian Basin, Middle East, Africa and other oil and gas reserves. Argentina is considered a long-term play among foreign companies considering substantial capital commitments.

In the United States, the market price for natural gas has dropped as unconventional oil and gas have flooded the market. Argentina's efforts may prove similarly unviable for producers.

Although the fracking industry has produced record levels of natural gas in the United States, profits have not kept pace.¹⁶² Prices for natural gas have dropped and producers have failed to meet investor needs for steady, stable profit-making.¹⁶³ Despite recent claims of an industry turnaround, analysis of recent results of US-based fracking-focused companies shows that financial performance is not currently—nor has ever been—cash-flow positive. IEEFA's detailed report analyzed the cash flows of 33 selected fracking companies in the United States through Q2 2018, and concluded that, in aggregate, the companies had not been cash-flow positive at any point in their history.¹⁶⁴ Analysis of Q3 results of the same companies indicate that cash-flow remained negative—even though natural gas prices improved in Q3.¹⁶⁵

¹⁶¹ Gallardo, Martina and Waltz, Marianna. Moody's Investor Services. "Argentina oil and gas. Change in compensation policy to slow momentum for unconventional natural gas." February 4, 2019.

¹⁶² Wall Street Journal. [Big fracking profits at \\$50 a barrel? Don't bet on it.](#) December 4, 2018.

¹⁶³ Desmog. [How Wall Street enabled the fracking 'revolution' that's losing billions.](#) May 4, 2018 and Wall Street Journal. [Wall Street tells frackers to stop counting barrels, start making profits.](#) December 13, 2017.

¹⁶⁴ IEEFA. Tom Sanzillo et al. [Red Flags on US Fracking.](#) October 2018.

¹⁶⁵ IEEFA. Kathy Hipple et al. [More red flags on Fracking.](#) October 2018.

Argentina may not be able to attract sufficient foreign capital to effectively develop Vaca Muerta.

The development of Vaca Muerta to date has largely been dependent on the investment by the Argentine government and Argentine-based companies. Current commitments from large foreign companies constitute roughly one-third of all financial commitments to the region. Most of the large companies see Vaca Muerta as a long-term investment that is currently not ready for immediate deployment of substantial capital, despite existing development agreements with the government. The government continues to seek new players¹⁶⁶ in the region.¹⁶⁷ Although Vaca Muerta offers an extraordinary reserve opportunity for hydraulic fracturing, the country faces competitive and macroeconomic pressures globally and a series of challenges related to availability of proppant, infrastructure, labor issues, pressure pumping, and domestic political and regulatory issues.¹⁶⁸

Financial Risks: Microeconomic Factors

The high cost of production¹⁶⁹ of Vaca Muerta relative to other shale investments may prove a disincentive to investment.

YPF has reported significant reductions in production costs in Vaca Muerta.¹⁷⁰ While costs have come down, they remain higher than production costs in the U.S. The current perception of most major investors in the region is that they can more efficiently and profitably invest in the current market in the Permian, Eagle Ford and other oil and gas reserves in the United States.

The market price for natural gas at Henry Hub (Argentina's current benchmark price) is unlikely to achieve the Argentine government's break-even point.

According to Argentina's Energy Plan, the break-even price for natural gas development is US\$4/mmbtu.¹⁷¹ The United States Energy Information Administration does not project Henry Hub prices reaching US\$4/mmbtu until 2025. In addition, the government of Argentina currently subsidizes the price of natural gas, for some producers, at US\$7.50/mmbtu, with a declining subsidy schedule until a 2021 phase-out. Oil company demands for sustained subsidy levels are in direct conflict with the fiscal priorities of Argentina. The likelihood is that the market price of natural gas and probably oil going forward will be insufficient to stimulate an intensified period of capital allocation by oil and gas interests into Argentina. Further, the break-even price model has limitations related to price

¹⁶⁶ S&P Global. [Argentina's Vaca Muerta frontier blocks lure juniors in competitive market](#). October 5, 2018.

¹⁶⁷ Kallanish Energy. [Argentina seeks US investment in Vaca Muerta](#). November 16, 2018.

¹⁶⁸ JPT. [Three trends shaping global production](#). November 20, 2018.

¹⁶⁹ EIA. [Argentina seeking increased natural gas production from resources to reduce imports](#). February 10, 2017.

¹⁷⁰ Nasdaq. Zacks Equity Research. [YPF to boost production in Vaca Muerta in 2018, costs fall](#). March 8, 2018.

¹⁷¹ Secretaria de Gobierno de Energia. [Argentina Energy Plan](#). October 2018. Appendix.

changes and profit expectations. It is an unreliable indicator for prospective profitability.

Fiscal Risks

The Argentine government may be unable to afford ongoing subsidies for the oil and gas sector, which would slow progress toward production goals.

The risk to the Argentine government is that it will have to reverse its fiscal plans to reduce subsidies for oil and gas producers. The continued development of Vaca Muerta will likely require large subsidies for the foreseeable future. The government has announced it will be phasing out "inefficient" subsidies and has made long-term budgetary commitments to reduce energy subsidies.

In January 2019, the Argentine government changed its unconventional natural gas subsidy policies for 2018, restricting the amount of subsidies to the projects' original estimated production, rather than their actual production levels. Moody's, a preeminent credit rating agency, called the policy change "credit negative," as it will "lower their projected cash flow for 2018-21 to levels that will support far less of their capital spending."¹⁷² Tecpetrol, YPF, PAE, Total, and Wintershall will all be affected by this particular change in subsidy policy. Argentina's energy infrastructure needs may be crowded out by broader needs for public capital investment for transport and logistics. Reliance on Public Private Partnerships (PPPs) with foreign investors increases the upfront costs to develop Vaca Muerta.

Public infrastructure needs are critical to the economy and energy sector. Energy infrastructure needs are in four areas: rail, roads, midstream and gas storage. Infrastructure projects are expected to play an important role in the energy, transportation, and logistics sector, with "investments in these sectors over the next four years expected to reach US\$30 billion."¹⁷³ The government's capacity to borrow to meet the need is constrained, and so it is supporting alternative investment tools under the general term Public Private Partnerships ("PPPs").¹⁷⁴

Argentina's plan for increased use of PPPs,¹⁷⁵ however, may not attract the level of capital needed due to risk perception of investments in Argentina.¹⁷⁶ The intersection of numerous risk factors results in a continuous on-again, off-again

¹⁷² Gallardo, Martina and Waltz, Marianna. Moody's Investor Services. "Argentina oil and gas. Change in compensation policy to slow momentum for unconventional natural gas." February 4, 2019.

¹⁷³ Bonds & Loans. [HSBC on Argentina: It's Time for Growth to Come Out of Hiding](#). September 22, 2017.

¹⁷⁴ Ibid.

¹⁷⁵ Investment Policy Hub. Facundo Perez-Aznar. [The recent Argentine PPP law: benefits and challenges](#). June 11, 2018.

¹⁷⁶ CGTN America. [Argentina turns to public private partnerships for infrastructure investment](#). July 23, 2018.

view from institutional investors.¹⁷⁷

In terms of transport, the natural gas and oil transference out of Vaca Muerta is inadequate to handle the current and expected level of production.

In the energy sector, failure to meet these infrastructure needs will lead to an oversupply of oil and gas and an inability to move product into markets. Stresses are already apparent as YPF recently announced that production cuts were needed to address slowing economy and inadequate export infrastructure.¹⁷⁸

The government has already needed to recalibrate its strategy for PPPs, due to the increased country risk, and the higher cost of financing these projects due to falling bond prices. Macri officially suspended US\$21 billion of investments in projects planned through PPPs between 2019 and 2023. The future of PPP projects will be resumed only when Argentine bond yields are "normalized," according to the Minister of Transport.¹⁷⁹

Tax, royalty and import-export policies at the municipal, provincial and federal levels may change, thereby increasing production costs.

Companies doing business in Argentina have historically been negatively affected by changes in tax policy at all levels of government.¹⁸⁰ This has added to the perception that the investment climate in Argentina is uncertain.

Market Risks

If successful, Argentina may develop an oversupply of natural gas that neither current domestic nor export markets can absorb.

Argentina's plan is to increase natural gas production from current levels of 132 MMm³/day to 400MMm³/day by 2030.¹⁸¹ The country, however, is served by a relatively small export market within the region that has historically experienced disruptions.¹⁸²

At current levels, the country may already face a glut. The reason is simple. The demand for natural gas, the main component of Argentina's energy matrix, is highly seasonal. The demand for the home heating market increases seasonally, while production can provide a year-round steady supply.

This year, Vaca Muerta's production of natural gas was sufficient during the summer months to supply Argentina's domestic needs. In fact, the country produced an

¹⁷⁷ Pensions and Investments. [Investors Urged to hold tight on emerging market investments](#). November 26, 2018.

¹⁷⁸ Rigzone. From Bloomberg. [YPF is said to shut gas wells as Argentine economy flops](#). October 2, 2018.

¹⁷⁹ Ambito.com. ["Licitaciones PPP quedarán supeditadas al rendimiento de los bonos"](#) December 20, 2018.

¹⁸⁰ Vista Oil and Gas. [Disclosure Document](#). February 19, 2018. p. 118.

¹⁸¹ Secretaría de Gobierno de Energía. [Argentina Energy Plan](#). October 2018. MINEN.

¹⁸² S&P Global. In [Argentina, gas is an emerging threat for refiners: Fuel for Thought](#). July 2, 2018.

oversupply of natural gas,¹⁸³ according to an analyst at Wood Mackenzie, energy consultants.

“Given the expected weak summer demand and the ongoing economic crisis, state firm YPF may even resort to curtailing gas production,” according to a report in OilPrice.com.¹⁸⁴

The seasonal oversupply of natural gas has led to calls for cars to switch to natural gas as a fuel source.¹⁸⁵ According to YPF, gas producers are looking for new markets, such as cars, to increase demand for natural gas. “We can’t think of gas only for traditional consumption” like heating, said Pablo Bizzotto, executive vice president of upstream at state-run YPF.

According to data from Enargas, the national gas regulator, recent oil price increases have encouraged motorists to convert to compressed natural gas (CNG), with 50,000 conversions reported in the first five months of 2018, compared to fewer than 40,000 during the same period in 2017.¹⁸⁶

The 2018 energy plan calls for massive increases in conversions to Liquid Natural Gas (LNG) or CNG for the country’s vehicle fleets by 2030.¹⁸⁷ The conversion assumptions in the report are ambitious. By 2030, the report posits, 80% of the nation’s buses, and 20% of the nation’s cars will be converted to CNG, and 20% of the trucks will have replaced diesel with LNG.¹⁸⁸

Global demand for oil and natural gas is likely to increase in the near term. But Argentina’s role as a new entrant lacks a compelling investment rationale in the face of established market competition.

While global demand for oil and natural gas is forecast to increase in the near-term, there is fierce competition from established oil and gas companies throughout the world. Many competitors are closer to East Asia, and can better supply that growing market. Many competitors have state-of-the art infrastructure to support their exports. Many have existing relationships with customers. As a new entrant, Argentina lacks a sufficiently compelling rationale for investors to take on the risk posed by such competitors.

The growth of renewable energy, energy efficiency and alternative transport technology globally may reduce global demand and with it, demand for natural gas and oil from Argentina.

Analysts continue to be surprised by the accelerating growth of renewable energy and electric vehicles throughout the world. Although short-term demand for both

¹⁸³ Financial Times. [Argentina’s Vaca Muerta shale oil and gas offers tough lessons](#). September 23, 2018.

¹⁸⁴ OilPrice.com. [Is Argentina Producing Too Much Natural Gas?](#) October 3, 2018.

¹⁸⁵ S&P Global. [In Argentina, gas is an emerging threat for refiners: Fuel for Thought](#). July 2, 2018.

¹⁸⁶ Ibid.

¹⁸⁷ Secretaría de Gobierno de Energía. [Argentina Energy Plan](#). October 2018. p. 75.

¹⁸⁸ Secretaría de Gobierno de Energía. [Argentina Energy Plan](#). October 2018.

natural gas and oil continues to increase,¹⁸⁹ demand forecasts, once uniformly bullish, are now more mixed,¹⁹⁰ reflecting technological changes and competition that is unprecedented.

Globally, wind and solar energy have grown at levels that far exceed expectations.¹⁹¹ For example, BP's chief economist recently apologized for a mistaken forecast, underestimating the speed of the energy transition, particularly in India and China.¹⁹² In the United States, wind and solar energy growth is running about 40 years ahead of the Energy Information Administration's market growth estimates.¹⁹³

In the U.S., wind and solar already have begun to put downward pressure¹⁹⁴ on natural gas prices and demand in the electricity sector. The growth of wind and solar is based on its highly competitive pricing structure. Record-low auction prices for solar and wind, as low as 3 cents per kilowatt-hour (kWh), make headlines regularly, and are reported across the globe, from India to Chile.

Meanwhile, the auto industry—a key driver of oil demand—increasingly sees its future in electric vehicles (EVs). Every major auto company is now recognizing the need to adapt and move forward with EV products and innovations.¹⁹⁵ The quickening rate of market absorption of electric vehicles has been spurred on by major inroads in the Chinese market. And the growing technological successes of autonomous vehicles also could speed the transition to EVs, further crimping petroleum demand. Technological progress in electric vehicles has now spurred many countries to introduce bans on cars with internal combustion engines (ICEs), with assurances that reliable and affordable EVs will meet the needs of their citizens.¹⁹⁶

Political and Legal Risks

The national government may lose public support as inflation, high interest rates and currency devaluation result in tightening social expenditures and erosion of wages.

The Macri government may continue to lose public support going into elections in 2019, as it is linked with high inflation and interest rates and extraordinary currency devaluation. Tightening fiscal outlays for social expenditures—such as reductions in subsidies for energy consumption—could cause political disruption.

¹⁸⁹ EIA. [Both natural gas supply and demand has increased from year-ago levels](#). October 2, 2018.

¹⁹⁰ Oil and Gas Journal (OGJ). [IEA moderates global demand outlook](#). October 12, 2018.

¹⁹¹ IEEFA. Gerard Wynn. [Power-Industry Transition, Here and Now](#). February 2018; IEEFA. Tim Buckley. [China's Global Renewable Energy Expansion](#). January 2017; and IEEFA. Tim Buckley & Kashish Shah. [Solar is Driving a Global Shift in Electricity Markets](#). May 2018.

¹⁹² EURACTIV. [BP confesses 'mistake' in forecasting renewable energy growth](#). April 25, 2018.

¹⁹³ EcoWatch. [Renewable Energy Growth: 40 Years Ahead of EIA's Forecast](#). May 30, 2017.

¹⁹⁴ Utility Dive. [Renewables challenge natural gas plants on price in latest Lazard analysis](#).

December 20, 2016.

¹⁹⁵ Wall Street Journal. [Auto Industry's Cure for Electric Car Blues: Be More Like Tesla](#). March 9, 2018.

¹⁹⁶ Los Angeles Times. [China is banning traditional auto engines. Its aim: electric car domination](#). September 12, 2017.

Continued erosion of wages takes place against a backdrop of an uncertain financial future for the country as economists are forecasting a slowdown or recession. The intensity and duration of the downturn is a matter of increasing debate.¹⁹⁷ Argentines, struggling to manage their household budgets, will likely blame the current government.

IMF involvement remains deeply problematic for Argentinians, who may blame rising energy costs on international lenders and foreign companies.

The loan from the IMF was deeply unpopular to many Argentinians,¹⁹⁸ who are haunted by the austerity measures imposed by that organization in 2001. These austerity measures, which the IMF now concedes were too extreme, led to widespread poverty. As subsidies for energy consumption and transportation are reduced, public opposition is likely to mount, and international lenders and foreign companies may become targets. Public opposition to high energy prices could result in changes to the government's investment policies. The widespread perception that Vaca Muerta development will boost Argentina's economy and produce reasonable energy costs in the country may not be realized.

The lack of a cohesive energy policy in Argentina threatens to pit consumer and citizen interests against those benefiting from the development of Vaca Muerta. Public opposition is likely to mount as consumer prices for fossil fuel products rise in spite of the country appearing to have an abundance of oil and natural gas. The profitability of the companies involved will remain under continued scrutiny.

Argentina's economic and fiscal plan is to bring household consumer outlays for energy in line with global market prices. This will mean a phase-out of consumer subsidies. At least in the short term, there will be a rise in actual cash outlays from household and small business budgets. The increases in actual cash outlays for small consumers will be substantial. Whether or not the transition to global prices will result in lower household costs remains to be seen. The process of getting to market prices will not be easy.

The government of Argentina faces litigation from indigenous organizations that may hamper development.

An indigenous rights lawsuit has moved into international courts. The Campo Maripe indigenous group, which claims ancestral property rights in Vaca Muerta, has "accused YPF of failing to carry out proper consultation with them as required by the binding International Labor Organization (ILO) Convention 169, of which Argentina is a signatory,"¹⁹⁹ While there are ongoing negotiations between the

¹⁹⁷ OJ. IEA moderates global demand outlook. October 12, 2018 and Center for Economic Policy and Research (CEPR), Mark Weisbrot and Lara Merling. [Argentina's Deal with the IMF: Will "Expansionary" Austerity Work?](#) December 2018.

¹⁹⁸ The Guardian. [Fear and loathing in Buenos Aires: will Argentina's IMF gamble pay off?](#) May 9, 2018.

¹⁹⁹ Wilson Center. Patricia Vasquez. [Argentina's Oil and Gas Sector: Coordinated Federalism and the Rule of Law.](#) May 2016.

provincial government and YPF to find a solution, the court case is proceeding through the judicial system.²⁰⁰ Throughout the world, indigenous groups whose land must be crossed to transport oil and gas, are increasingly challenging pipeline construction projects. For example, indigenous groups have successfully sued to halt pipeline construction in the United States and Canada. Recent legal rulings in Canada have temporarily halted pipeline construction that would transport Canadian oil sands out of remote areas in northern Alberta.

Indigenous groups are also beginning to organize internationally. In October 2018, for example, leaders of indigenous rights groups, representatives from human rights organizations, and academics met for a two-day conference in Chile to share ideas about how to press for greater recognition of indigenous groups rights.

Foreign companies, many familiar with litigation related to indigenous peoples' rights, considering capital investments clouded by litigation risks from indigenous groups, will be wary of potential issues that might interfere with development timelines.

Fracking has become a human rights issue in Latin America.

Representatives from many organizations and communities throughout Latin America are increasingly opposing fracking on human rights grounds. They recently presented evidence on the impact of fracking on the environment and human rights to the Inter-American Commission on Human Rights (IACHR) in Boulder, Colorado. The hearing was held in response to a petition signed by 169 organizations from 11 countries in the Americas, with the goal of preventing human rights violations in the context of unconventional oil and gas production.²⁰¹

The Latin American Alliance Against Fracking has compiled data about the nearly 5,000 fracking wells throughout the continent. And opposition to shale development in Vaca Muerta is expected to only intensify in the years ahead.

Environmental Risks

Argentine government faces pressure to turn to renewable energy and other economic development strategies without depending on fossil fuels to grow the economy.

The expanding global climate protection movement has emerged as a material financial risk to the oil and gas industry and the further development of fossil fuels. In addition to traditional lobbying and direct-action campaigns, climate activists have joined with an increasingly diverse set of allies—particularly the indigenous rights movement—to put financial pressure on oil and gas companies through divestment campaigns, corporate accountability efforts, and targeting of banks and

²⁰⁰ AIDA. *Defending communities from fracking's advance in Argentina*. April 27, 2018.

²⁰¹ FARN. "Sociedad civil advierte ante cidh violaciones a los derechos humanos ocasionadas por el fracking en Latinoamérica." October 4, 2018.

financial institutions. These campaigns threaten not only to undercut financing for particular projects, but also to raise financing costs for oil and gas companies across the board.

Although U.S. federal climate policy is in a period of retrenchment, climate and fossil fuel activism continues to score major policy victories around the globe, creating profound and growing policy challenges for the oil and gas industry.

Organized protests against environmental degradation in Vaca Muerta have begun to receive international attention.

Citizen opposition to local environmental destruction underscores the need for greater investment in infrastructure to support Vaca Muerta development but also raises the larger question of who will carry these costs during a period of budget austerity. In October 2018, Greenpeace and the Argentinian environmental group, FARN, released satellite images of an oil spill at Bandurria Sur unconventional oil field, operated by YPF, with its partner, Schlumberger.²⁰²

In December 2018, a toxic fracking waste dump, the Treator plant, was discovered in Vaca Muerta. The Treator plan is used by YPF, Total, Exxon, Pan American Energy, and Pampa Energía to dump and store toxic waste produced by fracking.²⁰³

When a German photojournalist, Stefan Borghardt, tried to photograph the site in January 2019, he was arrested and beaten, and his equipment confiscated.²⁰⁴

In February, 40 protesters blocked the entrance to the toxic waste site, a story that was picked up by Bloomberg News. Even when the article focused on the “vast shale play,” it cited the protest and the toxic waste site—something investors will need to consider as they weigh their future options.²⁰⁵

Water resources in Vaca Muerta are insufficient to meet rising demands from fracking in the region further dampening production growth.

Companies are being forced to create water delivery systems that add costs to the production process.²⁰⁶ Hydraulic fracking requires a steady, abundant supply of water during the extraction process. The Vaca Muerta region does not have an immediate supply of water to meet the scale of need.

Disrupting watersheds to support fracking also carries high risks of damage to the ecosystem, particularly to the south of Vaca Muerta, in Patagonia, a well-known

²⁰² Greenpeace.org. “Imágenes exclusivas del derrame de petróleo en Vaca Muerta.” October 26, 2018.

²⁰³ Observatorio Petrolero Sur. “Police arrest and assault German photojournalist at fracking waste site in Argentina.” January 11, 2019.

²⁰⁴ Ibid.

²⁰⁵ Gilbert, Jonathan. Bloomberg News. “Vista Oil & Gas is opening the spigots on the Argentina’s vast shale play.” February 27, 2019.

²⁰⁶ BN Americas. Tackling water and supply issues key to slashing Argentina shale costs. March 9, 2017.

tourist destination. The implications for the region's wildlife, land and water resources are poorly understood as a thorough environmental assessment of the impact of fracking in Vaca Muerta has never been conducted, according to local environmental groups.

Technological Risks

Profit margins for oil service companies are too low in Argentina to support investments in new pumping technology.

The pumping technology being used in Argentina is largely old and in need of replacement. Oil service companies are currently facing market headwinds that prevent them from taking on new investments. These companies require high margins that will increase pressure on costs. The result is a weakened outlook for improved technology in this major area of production efficiency.²⁰⁷ Absent substantial investment²⁰⁸ by large global oil and gas interests, this issue is likely to remain a stumbling block to development.

VII. Conclusion

Vaca Muerta has been described as the next Permian Basin, its potential enhanced by such technological advances as horizontal drilling and hydraulic fracturing (fracking). The government of Argentina is determined to develop these oil and gas reserves, among the world's largest, portraying Vaca Muerta as the solution to the country's energy and economic issues. To promote development, the government has largely directed production subsidies toward unconventional natural gas production in Neuquén Province, home to most of Vaca Muerta. The area remains largely undeveloped, with little infrastructure to transport either oil or gas. Most projects are in the pilot phase.

To accelerate development in Vaca Muerta, the government will require substantial investments from foreign companies. These companies are needed to supply both technical expertise and financial support. The government has been—and continues to be—engaged in an all-out effort to attract additional foreign partners.

Many international energy companies already have a presence in Vaca Muerta, often through partnerships with YPF, the majority government-owned oil and gas company. To date, development plans in Vaca Muerta have been largely financed by government subsidies and YPF. YPF itself has been heavily dependent on government subsidies. In 2017, for example, subsidies accounted for 79% of YPF's operating income and 100% of its profits.

²⁰⁷ Oilfield Technology. [Will the vast potential of Argentina's Vaca Muerta shale play ever be unlocked?](#) November 16, 2018.

²⁰⁸ In June 2018, the United States Department of Energy (USDOE) Secretary offered to the Argentine government to use USDOE's resources to coordinate greater participation from U.S. based pipeline and services companies.

Despite massive subsidies that have substantially helped its financial performance, YPF's finances remain fragile. Production across its business segments has declined over the past two years. Revenues and operating income are down in US dollars from peak-2014 levels, despite what is shown in the devalued peso-denominated financial reports. And capex has been declining and were expected to decline further in 2018.

This decline and the restraint shown by foreign partners signals that production and investment goals will not be met. Foreign partners have contributed 34% of investments in unconventional production in Neuquén Province between 2013 and 2017. YPF is responsible for nearly two-thirds of the total. Further, most foreign companies' production efforts are in the pilot phase, and development is proceeding slowly by comparison with the comparable evolution of the Permian Basin.

Despite substantial subsidies to fossil fuel companies, which exceeded US\$4 billion in 2016 and 2017, oil production has remained flat in 2018, and natural gas production has declined. Subsidies are expected to decline, based on both government forecasts and requirements by the IMF, which loaned the country a record US\$57 billion earlier this year.

Many foreign companies describe the investment opportunity in Vaca Muerta in cautious terms. They provide a variety of reasons for their skittishness, delays and reversals.

The picture that emerges is that development of Vaca Muerta faces a series of headwinds, any one of which could cause further delays, and the cumulative impact is daunting. These include:

- A precarious economy, characterized by an extraordinary currency devaluation, high inflation and interest rates,
- Inadequate infrastructure,
- Declining subsidies, as set forth in the IMF loan agreement,
- Fiscal constraints on public funds to develop Vaca Muerta,
- Increasingly uncertain demand scenario for oil and gas as growth in renewable energy and electric vehicles outpaces forecasts,
- High production costs relative to international competitors that limit investment returns,
- Market competition from international competitors, and
- Litigation and environmental risks.

**Appendix I: Planned Expenditures: Foreign Versus Argentine-based Operations (2013-2018),
Unconventional Type in Neuquén Province**

Company	Exploration	Complementary Exploration	Production	Total	Argentina	Foreign
AMERICAS PETROGAS ARGENTINA S.A.	169.44	0.00	3.75	173.18	0	173
APACHE ENERGIA ARGENTINA S.R.L.	3.95	0.00	62.99	66.94	0	67
ARGENTA ENERGIA S.A.	45.81	0.00	0.00	45.81	0	46
CAPEX S.A.	31.67	6.80	118.80	157.27	157	0
CHEVRON ARGENTINA S.R.L.	0.00	49.64	40.10	89.74	0	90
EXXONMOBIL EXPLORATION ARGENTINA S.R.L.	115.86	0.00	556.70	672.56	0	673
GAS Y PETROLEO DEL NEUQUEN S.A.	6.90	0.00	0.00	6.90	7	0
MEDANITO S.A.	0.00	0.00	2.23	2.23	2	0
O&G DEVELOPMENTS LTD S.A.	570.74	0.00	457.40	1028.14	0	1028
OILSTONE ENERGIA S.A.	0.00	0.00	5.16	5.16	5	0
PAN AMERICAN ENERGY (SUCURSAL ARGENTINA) LLC	0.00	215.81	1520.08	1735.89	0	1736
PETROBRAS ARGENTINA S.A.	90.84	148.17	741.25	980.26	0	980
PLUSPETROL S.A.	2.01	0.00	150.01	152.02	152	0
ROCH S.A.	24.00	0.00	0.00	24.00	24	0
SAN JORGE PETROLEUM S.A.	0.00	0.20	0.00	0.20	0	0
TECPETROL S.A.	48.49	14.44	709.62	772.55	0	773
TOTAL AUSTRAL S.A.	733.14	0.00	1129.33	1862.47	0	1862
WINTERSHALL ENERGIA S.A.	89.39	0.00	191.75	281.14	0	281
YPF S.A.	484.91	77.15	11232.85	11794.91	11795	0
YSUR ENERGÍA ARGENTINA S.R.L.	0.00	0.00	40.13	40.13	40	0
Grand Total	2417.14	512.20	16962.14	19891.48	12183	7709
					.61	.39

Appendix II: Actual Investments, Unconventionals, Neuquén Province, 2012-2017

Company	Exploration	Complementary Exploration	Production	Total	Argentina	Foreign
AMERICAS PETROGAS ARGENTINA S.A. (Canada)	68	0	7	75	0	75
APACHE ENERGÍA ARGENTINA S.R.L.	0	23	71	95	95	0
ARGENTA ENERGÍA S.A.	7	0	0	7	7	0
CAPEX S.A.	6	17	104	127	127	0
CHEVRON ARGENTINA S.R.L.	0	4	73	77	0	77
EXXONMOBIL EXPLORATION ARGENTINA S.R.L.	130	0	205	336	0	336
O&G DEVELOPMENTS LTD S.A. (Shell)	388	0	229	617	0	617
PAN AMERICAN ENERGY LLC (BP)	0	72	823	895	0	895
PETROBRAS ARGENTINA S.A. (Brazil)	66	100	535	701	0	701
PETROLERA ENTRE LOMAS S.A.	0	0	6	6	6	0
PETROLERA PAMPA S.A.	4	0	0	4	4	0
PLUSPETROL S.A.	20	0	98	118	118	0
ROCH S.A.	12	0	0	12	12	0
TECPETROL S.A. (Spain)	91	9	557	657	0	657
TOTAL AUSTRAL S.A. (France)	363	0	795	1159	0	1159
WINTERSHALL ENERGÍA S.A. (German)	72	0	123	195	0	195
YPF S.A.	255	74	8438	8767	8767	0
ENERGICON S.A.	0	0	0	0	0	0
YSUR ENERGÍA ARGENTINA S.R.L.	0	0	22	22	22	0
Grand Total	1482	299	12086			
Percentages					.660274	.339726

Appendix III: YPF Selected Financial Data, 2012-2018

	Unit	2012	2013	2014	2015	2016	2017 ⁱ	2018 ⁱⁱ
Production								
Crude oil production	Kbbl	83231	84780	89296	91139	89544	83048	82904
NGL production	Kbbl	17407	17584	1776	17944	1930	18381	14144
Gas production	Mm3	12221	12359	15483	16124	16308	16082	15339
Total	Kboe	177499	180094	204450	210492	211338	202576	193519
Henry Hub	US\$/Mbtu			4.42	2.66	2.46	3.11	3.09
Brent	US\$/bbl			99.02	52.35	43.56	54.25	71.06
Sales								
Petroleum Domestic	Km3	15745	15988	16634	17029	16463	16372	16206
Petroleum Export	Km3	1572	1502	1541	1461	419	1536	1826
Total	Km3	17317	17490	18457	18490	18031	17908	18032
Petrochemical Domestic	Ktn	1015	1003	1076	1023	1120	1138	1128
Petrochemical Export	Ktn	334	281	254	301	202	206	410
Total	Ktn	1349	1284	1330	1324	1322	1344	1538
Financials		2012ⁱⁱⁱ	2013	2014	2015^{iv}	2016	2017	2018^v
Argentina Pesos (in Millions)								
Revenues		67174	90113	141942	156136	210100	252813	435820
Operating Income		7903	12015	19742	16588	-24246	16073	43780
Capex		16485	29848	58881	61161	62805	58009	95358
End of Year Cash		950	4533	6731	14613	7944	9687	6678
Cash/Cash Equivalents		9758	10713	9758	15387	10757	28738	46028
United States Dollars (in Millions)								
Revenues			16514	17576	16957	14262	15291	15544
Operating Income			2202	2445	1846	-1613	975	1678
Capex			5160	7290	6607	4255	4460	3347
End of Year Cash			830	833	1585	539	587	238
Cash/Cash Equivalents			1962	1208	1669	730	1741	1641
Average Exchange Rate			5.46	8.08	9.22	14.73	16.51	28.04

Sources for Appendix III:

- ⁱ. All Production, Price, Export and Exchange Rate data is taken from YPF Fourth Quarter Earnings Release for each year, 2012 through 2017. Each 4Q report contains current year and prior year data. The tables are presented in these press releases as Tables with the titles: Main Dollar Denominated Financial Magnitudes and Main Physical Magnitudes: <https://www.ypf.com/english/investors/Lists/InformacionFinanciera/FY-2017-Q4-2017-Earnings-Release.pdf>; <https://www.ypf.com/english/investors/Lists/InformacionFinanciera/FY-2015-and-Q4-2015-results-release.pdf>; <https://www.ypf.com/english/investors/Lists/InformacionFinanciera/YPF%20Full%20year%202013%20and%20Q4%202013%20Results%20Press%20Release.pdf> and <https://www.ypf.com/english/investors/Lists/InformacionFinanciera/YPF%20Full%20year%202012%20and%20Q4%202012%20results%20press%20release.pdf>
- ⁱⁱ. All Production, Price and Export Information: <https://www.ypf.com/english/investors/Paginas/Financiamiento.aspx>. Financial Tables 4Q-2018/Volumes.
- ⁱⁱⁱ. All Financial Information for 2012, 2013 and 2014 from: <https://www.ypf.com/english/investors/Lists/InformacionFinanciera/Financial-Statements-12-31-2014.pdf>, pp. 3 and 6.
- ^{iv}. All Financial Information for 2015, 2016, 2017 from: <https://www.ypf.com/english/investors/Lists/InformeAnualForm20/20-F-2017.pdf>, pp. 8-9.
- ^v. All Financial Information for 4Q2018 from: <https://www.ypf.com/english/investors/Lists/InformacionFinanciera/YPF-S.A.-Consolidated-Results-Q4-and-FY-2018.pdf>

Appendix IV: Government Programs for Direct Subsidies to Oil and Gas Companies, 2016 and 2017

- Actions aimed at guaranteeing conditions for Propane Gas Supply Induced for Distribution Networks
- Support for Small Crude Oil refiners - REFIPYME
- Export Stimulus of Crude Oil Surplus
- Stimulus for the Development of New Natural Gas Projects
- Incentive to the Production of Crude Oil - Oil Plus
- Stimulus Program for the Injection of Natural Gas Surplus (Gas Plan)
- Stimulus Program for Natural Gas Injection for companies with reduced injection

Source: This compilation is based on MINEM data.

About IEEFA

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