

Vaca Muerta: Argentina's energy future

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The Argentine energy industry went through significant changes in the last 30 years. The oil deregulation in the 1990s allowed for the active engagement of the private sector, as well as the arrival of heavy investments and increases in production that allowed not only self-sufficiency, but also the export of hydrocarbons.

At the beginning of the new millennium, the rules changed. The Government began to intervene with important regulation: setting export duties and low domestic prices damaging to the industry, freezing tariffs and restrictions of different kinds, a process that in 2012 led to the expropriation by the government of YPF. Thus, oil and gas production decreased significantly and the country had to migrate once again to the import of hydrocarbons, given the disinvestment that occurred in the sector due to a lack of clear rules.

Today, the country has a new political and economic context more appropriate for investments. In 2015, when the new government came into office, it set itself the goal to once again position Argentina in the world and bring in investments to develop its potential; to this end, the Government took important measures such as the

elimination of exchange restrictions, agreed on the debt with the holdouts, readjusted public tariffs and eliminated import limitations. In addition, the Government created the National Agency for the Promotion of Investments and International Trade with the purpose of being a point of contact for companies that wanted to invest in Argentina, facilitating their position in the country.

Under this new scenario, the interest of local and international companies to invest in unconventional oil and gas methods is quite significant given the high potential of this type of energy, especially in Vaca Muerta, which is the primary unconventional area in the country. Moreover, in recent months, important announcements and commitments to investment were made, where the government agreed with different players to new rules of the game that has made Vaca Muerta even more attractive.

In this report, we have included the most relevant topics for investors: why invest in Vaca Muerta; an analysis of the legal and fiscal framework; and a summary of the main investment commitments.

We hope this information will be useful.



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Vaca Muerta

Argentina's energy future

Argentina has a very high potential for the development of unconventional hydrocarbons, as it ranks fourth as a country with 27 billion barrels or 8% of the world market of unconventional oil deposits; and is second with 802 trillion cubic feet in gas resources with 11% of this kind in the world. What is more, it joins the United States, Canada and China as one of the four countries worldwide that produces this type of hydrocarbons.

Vaca Muerta is the main non-conventional hydrocarbon formation in Argentina. Located in the Neuquen basin, it was originally discovered in 1927, but only achieving its great potential in 2011. Vaca Muerta occupies an area of 36,000 km², somewhat smaller than the territory of Switzerland or the Netherlands. Resources are estimated at 16 billion barrels of oil and 308 trillion cubic feet of gas, which means that, if exploited, the proven reserves of the country would increase more than eight times, securing for the next 150 years our gas consumption and 85 years for oil consumption.

YPF owns 42% of the area, GyP, a state company of Neuquen, has 12%, and the remaining 46% is distributed among other companies that include ExxonMobil, Pan American Energy, Petronas, Pluspetrol, Shell, Tecpetrol and Wintershall, among others.

In 2013, YPF entered into partnership agreements with Chevron in Loma Campana; with Dow in El Orejano; with Petrolera Pampa in Rincón del Mangrullo and Mulichino; with Bidas in Bajada de Añelo; and in 2014 with Petronas in La Amarga Chica. YPF also signed cooperation and strategic agreements with PDVSA, YPFB, ANCAP, Statoil and Gazprom, among others.

One of the subjects that makes investment attractive here is the cooperation of the current Argentine government. To this end, in addition to the provisions that are being deployed, detailed in the introduction to this document, the government launched the following specific measures for the oil industry:

- The New Gas Plan that encourages investments in unconventional reservoirs in the Neuquen basin, guaranteeing for gas marketed in the local market a minimum price of US \$ 7.50 / MMBTU for 2017 and 2018, US \$ 7.00 for 2019, US \$ 6.50 for 2020 and US \$ 6.00 for 2021.
- Agreement with the Provincial Government of Neuquen, so that oil companies and unions would have greater competitiveness in Vaca Muerta and reduce labor costs.
- Project to reduce import tariffs of machinery used for the exploitation of hydrocarbons, which will have a 7% tariff.

The benefits are added to those established in the hydrocarbons law of 2014 (Law No. 27007) that extends the exploration periods (two periods of 4 years, with an extension of 5 additional years) and concessions of 35 years with the possibility to extend 10 more for unconventional hydrocarbons. It also establishes a 12% royalty, plus 3% for each extension of a concession, limited to 18% maximum.

Since the discovery and through the end of 2016, 679 wells have been drilled, of which 506 wells are vertical and 173 horizontal.

G&P periodically carries out tenders for exploration areas. In the most recent in April 2018, Petrolera El Trébol S.A. and Selva María Oil S.A. were granted permits, with investment commitments of US \$ 39 million and US\$ 17 million, respectively.

The biggest challenge is to continue reducing the costs of both capital and operations. Although there are no exact statistics, according to the estimates given by the different companies, 5 years ago drilling a vertical well cost US\$ 11 million, needing 45 days for completion. Today the cost has been reduced to US\$ 7 million and 25 days for completion, which is now competitive, but still higher than the United States at US\$ 6 million. Operating costs also continue to fall. Current estimates are that the equilibrium point of oil is US\$ 40 per barrel and US\$ 6 million of BTU for gas.

Capital attraction will be key to the development of these resources. It is estimated that Vaca Muerta will require an investment of US\$ 120 billion up to 2030 (US \$ 8,000 million per year). In December 2017, production reached 32 thousand barrels of oil per day and 8 million m³ of gas.

The opinion of the Argentine Institute of Oil and Gas (IAPG)

Engineer Ernesto López Anadón, President

"Vaca Muerta has many players who are working and obtaining optimal results with very good productivity. The costs are being lowered and is already an asset that has gained international relevance. For those who are looking for business opportunities to develop reserves, Vaca Muerta represents that attraction."

Why is there a hurry to enter? Because there are still opportunities, areas that were not awarded and possibilities of partnership with other companies. This will allow the investor to be one of the leaders. We have gone from the exploration stage to the development phase in almost all the companies that approached to this project and the tendency is the momentum for expansion. Later entry will also likely be possible, but at a higher cost."



Principales yacimientos	Empresas
<i>Aguada Federal</i>	GyP/ Wintershall
<i>Aguada Pichana Este</i>	TPF/ Total/ Wintershall
<i>Aguada Pichana Oeste, Aguada de Castro</i>	YPF/ PAE/ Total
<i>Bajada del Añelo</i>	YPF/ Shell
<i>Bajo del Toro</i>	YPF/ Statoil
<i>Bandurria Centro</i>	PAE/YPF
<i>Bandurria Norte</i>	Wintershall
<i>Bandurria Sur</i>	YPF/ Schlumberger
<i>Centenario Este</i>	Pluspetrol
<i>Coirón Amargo Sur Este</i>	PAE/ Madalena
<i>Cruz de Lorena</i>	GyP/ Shell
<i>El Orejano</i>	YPF/ Dow
<i>Fortín de Piedra</i>	Tecpetrol
<i>La Amarga Chica</i>	YPF/ Petronas
<i>La Calera</i>	Pluspetrol
<i>La Escalonada/ Rincón de la Ceniza</i>	GyP /Total/ Shell
<i>La invernada/ Bajo del Choque</i>	GyP/ Exxon
<i>Loma Campana</i>	YPF/Chevron
<i>Los Toldos</i>	GyP/ Tecpetrol/ Exxon
<i>Pampa de la Yegua</i>	YPF/ Exxon
<i>Río Neuquén</i>	YPF/ Pampa Energía/ Petrobras
<i>Sierras Blancas</i>	GyP/ Shell/ Medanito

Investments are estimated to rise to US\$ 7 billion in 2018, far more than the US\$ 6 billion allocated in 2017 and more than ten times that invested in 2016.

The Ministry of Energy's plan to stimulate gas production led to announcements of new investments by many of the oil companies, including YPF, Pan American Energy (PAE), Total, Wintershall, Exxon and Tecpetrol.

The Ministry of Transport is moving forward in the search for a solution to the infrastructure problems of the area. This includes an advanced project for a railway line; and explained by the Ministry, the final details are being adjusted to launch an international call for the work: With an investment of US\$ 500 million and it will be carried out under the model as a PPP, or Public Private Participation.

As regards gas transport, Transportadora de Gas del Sur S.A. is in the first stage of a project that will require US\$ 800 million to allow the production of gas from Vaca Muerta to enter the core transport system.

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