

Quest For Success In Vaca Muerta

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Vaca Muerta is home to most of Argentina's 27 Bbbl of unconventional oil and 23 Tcm (802 Tcf) of unconventional natural gas. When asked whether Vaca Muerta's development will come at the expense of other unconventional plays in Argentina, Ernesto López Anadón, president of the Instituto Argentino de Petróleo y Gas, responded, "Yes. Except for a couple of wells that have been drilled in the San Jorge Basin in the D-129 Formation, the bulk of shale exploration and development has been in the Neuquén Basin, specifically in the Vaca Muerta Formation."

A comparison with other unconventional resource plays explains why Vaca Muerta has so much potential. Like the Marcellus Shale in the U.S., which has a total organic carbon (TOC) of 2% to 12%, Vaca Muerta has a TOC of 3% to 10%; like the Wolfcamp play, whose thickness ranges from 200 m to 300 m (656 ft to 984 ft), Vaca Muerta's thickness ranges from 30 m to 450 m (98 ft to 1,312 ft); and like the Eagle Ford, whose reservoir pressure ranges from 4,500 psi to 8,500 psi, Vaca Muerta's reservoir pressure ranges from 4,500 psi to 9,500 psi.

Despite the technical specifications in Vaca Muerta's favor, among the many challenges stopping Argentina from fomenting its own shale revolution are E&P costs. "The challenge with developing unconventional resources is finding ways of making production more economic," said Santiago Sacerdote of Y-TEC, YPF's R&D branch. "You cannot achieve this with a single technology; rather you need to find the right combination. We need to have a better understanding of the geological characteristics of basins and the hydraulic stimulation process."

A 2014 YPF update on Vaca Muerta laid out the industry's goals:

- To increase productivity, companies in Argentina will need to improve their understanding of the subsurface, identify the sweet spots, optimize completions and master horizontal drilling; and
- To reduce well construction costs, companies will need to improve case drilling techniques, look to local sand, increase operational efficiencies and renegotiate labor contracts.

YPF has made progress in reducing well construction costs. In 2011 it cost about \$11 million to drill and complete a well with 3.1 stages in about 43 days; in 2014 it cost about \$7.6 million with five stages in about 25 days. About 46% of the total cost now relates to drilling and 35% to completion.

Drawing from the lessons learned in other shale plays will help operators overcome the learning curve associated with developing the Vaca Muerta. Yet López Anadón added, "Regarding

operational efficiency, it would be difficult to directly apply the lessons learned in the U.S. to Argentine shale fields. Oil and gas companies in the U.S. have access to 12 million horsepower of fracking equipment, whereas companies in Argentina have access to only about 200,000 horsepower. Oil and gas companies will have to overcome the learning curve associated with understanding Vaca Muerta as a formation. However, lessons related to well completion and the development of drilling and working rigs can be applied in Argentina.”

E&P perspective

E&P companies, especially the majors, are known for their willingness to operate in difficult and risky business environments. Yet international players must decide whether they are willing to remain in a country after each marginal increase of a country’s risk profile. The renationalization of YPF was one such event, which forced international players to decide whether they would remain in Argentina lest they be next. But for several E&P companies, the benefits associated with the successful development of Vaca Muerta outweigh the risks.

Days prior to his departure from Shell Argentina as president, Juan José Aranguren, Argentina’s new Minister of Energy and Mining, talked about why the Anglo-Dutch major has remained in Argentina after more than a century, even after YPF’s renationalization. “The main objective of an oil company is to convert resources into reserves,” he said. “Shell entered into Vaca Muerta in 2012 because it would help the country to develop its resources and the company to produce the oil and natural gas that it needed to remain profitable.”



Before YPF's renationalization, its subsidiary AESA participated in projects outside of Argentina, but the company finished its last project abroad in early 2013 to focus on domestic upstream and downstream projects. (Source: AESA)

Gustavo Albrecht, managing director of Wintershall Energía, said, "Wintershall has decided to continue investing in Argentina's oil and gas industry for three main reasons. First, Wintershall is convinced about the potential of the oil and gas sector in the country. Secondly, Wintershall has chosen Argentina to develop its center of excellence for unconventional operations, [and] in the future such expertise could be used in other regions in the world where

Wintershall is active. The third factor is the massive amount of contingent resources in Vaca Muerta.”

But developing Vaca Muerta poses several challenges. Carlos Ormachea, CEO of Tecpetrol, outlines those that stand out to him. “Three stand out at Vaca Muerta. First, Argentina needs a stable financial situation to facilitate the financing of the anticipated projects. The development of these resources will require between \$10 billion and \$15 billion dollars per year. This is difficult to finance from existing operations without fresh money to supplement it.

“The second challenge is to improve cost efficiency. To attract the investment needed in Argentina, the country needs a minimum critical mass of volume and new services in the country.

“Third, companies need a more precise understanding of the opportunities in Vaca Muerta. Vaca Muerta is undoubtedly a substantial asset, but companies must identify the sweet spots, identify whether these are gas or liquids and determine how best to extract the hydrocarbons. The learning process is costly both in terms of money and time. Overcoming the learning curve will be a great challenge,” Ormachea said.

Much relies on YPF’s own success, according to Oscar Anibal Vicente, executive vice president of Petrolera Entre Lomas. “Whether the Argentine oil and gas industry manages to take advantage of the country’s unconventional resources depends on whether YPF manages to pave the way,” he said.



The oilfield service market has natural barriers for newcomers, not only because of the needed investments and infrastructure but also due to Argentina’s volatile regulatory framework. (Source: Bolland y Cía)

Another challenge will be attracting more small- and medium-sized players, like those that helped foster the U.S. shale revolution. Alberto Saggese, CEO of GyP, said, “Without reform, the second largest reserve of shale gas in the world will be in the hands of a dozen companies instead of the hundreds of companies that are needed. Developing Vaca Muerta will require allowing more players to enter the game.”

A significant barrier to entry for independents is financing. Majors willing to take the risk can draw from stockholders and capital markets. Independents often must rely on their own cash flow, especially in Argentina, as Alejandro Joytayan, CEO of Andes Energía, explained. “In the U.S., mid-sized companies financed a significant portion of their unconventional activities with local bank loans. However, Argentina’s banks lack sufficient capital and industry knowledge to fully finance necessary investments in unconventional plays, and Argentina’s current country risk bars local E&P companies from international capital at a reasonable cost. E&P companies interested in unconventional activities must find alternative financing strategies like financing through not only debt but also equity and their own cash flow. Holding producing

conventional assets can provide the cash flow that E&P companies in Argentina need to finance unconventional activities.”