

SOUTH AMERICA



Connecting remote areas: a unit of Galileo Technologies' Gas 3.0 distribution system the Vaca Muerta shale in Argentina

Photo: GALILEO TECHNOLOGIES

Vaca Muerta puts Argentina on shale map

Country's **unconventional sector** has yet to hit the **heights** of the **US boom**, but prolific **formation** has the **potential** to equal **successes** seen in North America

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THE Vaca Muerta shale formation in Argentina is arguably the most developed unconventional oil and gas play outside North America, and has attracted billions of US dollars in investments since the beginning of the decade.

While the business-friendly government of President Mauricio Macri has pushed for incentives since he took office in 2015, operators in the region, including domestic producer YPF, agree that more needs to be done to improve competitiveness.

"Vaca Muerta has a productivity level superior to the majority of unconventional formations in the US, and this can balance a bit the differences in scale that will always exist between the two countries," YPF upstream executive vice president Pablo Bizzotto said recently at an Oil & Gas Council conference in Buenos Aires.

YPF is leading the charge in unlocking the play's shale potential. The company has forged part-

nerships with world-class operators such as Chevron, ExxonMobil, Shell, BP and Total to produce from a series of pilot projects in the prolific Neuquen basin.

Since January 2017, new pilot and development agreements in the Vaca Muerta have been announced with increasing frequency, including a \$2.3 billion commitment made by Tecpetrol to drill 150 wells at the Fortin de Piedra block by 2019, demonstrating a significant uptick in interest in the play.

Output increasing

The shale boom in Argentina has not yet fully developed, but research firm Wood Mackenzie expects output from the seven most advanced developments in Vaca Muerta to increase 43% this year to 77,000 barrels of oil equivalent per day, and to double 2016 levels by 2018 to 113,000 boepd.

"Our scenarios demonstrate that production could peak between 700,000 boepd and 1.25

million boepd by 2031," says Wood Mackenzie Latin America upstream oil and gas research analyst Elena Niklova.

Another consultancy, Rystad Energy, predicts production in Vaca Muerta will increase 32% annually to reach 165,000 boepd in 2020, with many players expected to target the gas window, following a recent government-backed price incentive policy.

In order to reach such highs, companies have been working to improve drilling efficiency and reduce unit costs, and are counting on the Macri administration, which recently fended off opposition in mid-term congressional elections, to continue reforming the energy sector.

Even though the Vaca Muerta source rock has been hailed as among the best for unconventional resources in the world, operators in Argentina are still trailing their peers in the US by a wide margin.

"Recent studies show that as

operators in Vaca Muerta continue to move up the learning curve, strong well performance and lower costs can unlock scale comparable to that of US shale plays," says Wood Mackenzie.

YPF currently has 596 producing wells in operation in the Vaca Muerta, including 168 horizontal wells with multiple fracture stages. The first horizontal well with a 2500-metre lateral length in its flagship Loma Campana block, operated in a 50:50 joint venture with Chevron, produced on average 1070 bpd of oil in October, almost twice what had been seen from shorter laterals.

Pioneering lateral

In November, the company started drilling a pioneering 3200-metre lateral length well in Loma Campana, hoping to yield even better results.

Back in 2015, the first horizontal development well drilled in Loma Campana had an average cost of \$25 per boe. The most recent wells

drilled in the block cost \$13 per boe, and YPF intends to get costs down to \$10 per boe before long.

"We were able to optimise costs in an aggressive way and improve productivity of our horizontal wells. I believe we can be competitive when compared to the US, as we get to know the subsurface better and services companies continue to work in reducing fracturing costs," says Bizzotto.

Shell, which together with YPF is developing the Bajada de Anelo block, has bullish plans for Vaca Muerta, but the Anglo-Dutch supermajor is pushing for a more developed Argentinian services industry to help achieve its goal to increase production to 40,000 boepd by early next decade.

"You have to move away from the idea that everything needs to be imported from North America, and I think the government can do more to stimulate and ensure that the local services industry gets even more competitive," Laurens Gaarenstroom, Shell general

Vast resources come with huge challenges and need innovation

UNLIKE the Permian, Eagle Ford, Bakken and other shale formations in the US that were mainly developed by mid-sized and independent oil companies, the Vaca Muerta unconventional play in Argentina saw a flood of supermajors entering the country in its early days.

After a late entry in the US unconventional arena, companies such as ExxonMobil, Chevron, Dow Chemical, Shell and Total flocked to Argentina to sign cooperation agreements with local player YPF to develop shale opportunities in Vaca Muerta.

One of the few independent companies in Vaca Muerta, Phoenix Global Resources, is beginning to invest in the northern portion of the Neuquen basin to make the transition from conventional to unconventional resources.

"We have vast resources in Vaca Muerta, but huge challenges to develop it. Vaca Muerta is a heterogeneous rock and there are some geomechanical complexities within the 1000-foot section of the rock," Phoenix chief executive Anuj Sharma said recently at an Oil & Gas Council conference in Buenos Aires.

"That is why we need more independent oil companies to push for innovation. Unless there are more independent players working in Vaca Muerta, services companies will be reluctant to bring more crew and equipment."

Total Austral, a subsidiary of French oil company Total that produces from the Aguada Pichana block, agrees it is important to open the way for new play-

ers to come in and help develop Vaca Muerta. "The core area of Vaca Muerta is the size of Belgium. I think the industry needs more players, investments, services companies and efficiency," Total Austral director general Jean-Marc Hosanski says.

"I believe there are a lot of synergies that can be achieved, and I think we need to have a very open minded approach as to how we can work together to bring costs down."

At Aguada Pichana, the partners agreed recently to split the block in two to speed development, with Total Austral in charge of the eastern portion with a 41% stake, and Pan American Energy controlling the western section with a 45% stake.

The agreement for Aguada Pichana East calls for investments worth \$675 million from 2017 to 2021, with \$300 million going to the drilling of up to 20 wells.

Total Austral started developing tight gas in Aguada Pichana in 2008, and since 2013 has been tapping unconventional resources.

From 2014 to 2016, the partners

invested about \$500 million. "The need to focus on the most profitable developments, the need to accelerate investments, and the ability and opportunity to share expertise and technology with other partners were important factors for us to accept this change and split Aguada Pichana in two blocks," Hosanski says.

"It gave us the opportunity to increase our participation in the first development phase, and that was one of our objectives."

YPF, which signed development agreements with a number of supermajors in recent years, thinks the phenomenon that saw smaller players tackling unconventional in the US will happen at a later stage in Argentina.

"We are now in a moment in Argentina where companies are making huge investments in infrastructure and logistics, and small-sized companies may have a hard time carrying out such activities. We are developing a big cluster of unconventional resources," YPF upstream executive vice president Pablo Bizzotto said.



Complexities: Total Austral director general Jean-Marc Hosanski (left) and Phoenix Global Resources chief executive Anuj Sharma (right)



Photos: OIL & GAS COUNCIL

Galileo changing the game with tech

WITH production from Argentina's Vaca Muerta shale formation expected to rise at a rapid pace in the coming years, local services provider Galileo Technologies hopes to make the most of its pioneering hardware to monetise gas discoveries from remote locations.

Using cutting-edge proprietary technological solutions, Galileo has come up with its Gas 3.0 project by proposing the installation of "virtual pipelines" to connect producing fields to consumers without the need to lay pipes.

"We noticed there was a distinct gas model in the world, and that this model has reached its limit, so we are bringing unique solutions to connect resources and monetise the gas," says Galileo chief executive Osvaldo del Campo.

"We intend to manage a model that allows the transportation of gas to the market in a more cost-effective way than conventional solutions."

According to Del Campo, Galileo's virtual pipeline system reduces the investment required to perform gas gathering on geographically dispersed wells and gives the operator the possibility to sell gas directly to the consumer.

In order to achieve that, Galileo supplies cryobox-trailer liquefied natural gas stations as an alternative to produce from stranded wells. Once gas is transformed into LNG on-site, these portable

and small-scale units are transported by road in cryogenic containers to their final destination for regasification.

"We have several business models. There are cases where we buy the gas to monetise it. We also provide transportation and liquefaction services, and there are times where we sell the technology and the client operates it," Del Campo tells Upstream.

He says the technology developed by Galileo is competitive compared with some existing pipelines in Argentina, and much cheaper than building new pipelines.

"A pipeline has numerous problems, because it is a costly solution that sometimes is not used to its full capacity," explains Del Campo.

"Our technology adapts to the clients' needs, and our cryobox-trailers can be relocated within hours to liquefy natural gas at any site without any heavy lifting equipment."

In Anchoris, in Mendoza province, Galileo built its first LNG-fired thermoelectric plant sourced from wells that are not connected to any pipeline network.

Operated by Methax, a subsidiary of Galileo, the 41-megawatt plant is the first gas-to-wire pipeline-free project in the world, using over 200,000 cubic metres per day of gas that was previously off the grid to cover the needs of 125,000 inhabitants.

Del Campo says Galileo is using

14 cryobox-trailers to produce LNG from stranded gas wells in the Malargue region in Mendoza to supply its plant.

The company already possesses a fleet of 70 cryogenic containers to transport LNG for regasification, but that number is expected to grow, as Galileo further expands its operations.

Del Campo says: "We started as a technology company 30 years ago and we have always worked on the development of new products. We invest a high percentage of our revenues in research and development, but we slowly started to become a services provider, which allowed us to expand our business, and now the services segment is the most important part of the company."

Galileo is expected to end 2017 with \$150 million in revenues, and Del Campo says the company is expanding at a rate of between 20% and 30% per year.



'Virtual pipeline' system: Galileo Technologies chief executive Osvaldo del Campo

Photo: GALILEO TECHNOLOGIES



Competitive: YPF upstream executive vice president Pablo Bizzotto

Photo: OIL & GAS COUNCIL