**SCENARIOS FOR THE EXPLOITATION OF NON-CONVENTIONAL HYDROCARBONS IN ARGENTINA. VACA MUERTA’s CASE**

**Object**

The purpose of this paper is to analyze different scenarios for the exploitation of unconventional oil and gas resources located in the Vaca Muerta field, in the southwest of Argentina and verify their economic feasibility from the point of view of companies and State.

The scenarios are as follows: a) current situation with limited investments in Vaca Muerta, decreasing conventional production; b) development of unconventional deposits (Vaca Muerta) to supply domestic demand, with exports of oil surpluses to world markets and regional exports of natural gas to neighboring countries and c) massive investments with export surpluses to international markets, in the case of natural gas via LNG.

**Description**

The Vaca Muerta oil and natural gas field in the province of Neuquén, Argentina is one of the highest expectations in the oil industry and its exploitation could generate economic resources to the country, for continued economic growth in the next twenty years.

According to estimates from the United States Energy Information Administration, this field has resources of 802 Tcf of natural gas and 27 Billion barrels of light oil. Las reservas probadas en 2018 fueron de 12,2 Tcf para el gas natural y 2 Billion barrels para el petróleo. The development of these resources implies multiplying 65 times and almost 14 times the existing reserves of gas and oil respectively.

This explains the high expectations that the availability of these resources generates in the country. However, some preliminary estimates indicate that for intensive development the investments required exceed USD 10,000 million / year, which exceeds any previous experience and of course is beyond the reach of the country, requiring the contribution of international capital over the next 20 years.

Between December 2015 and December 2019, total oil production in Argentina fell 4% to 514 thousand barrels / day. Conventional production in this period decreased by 21%, while the production of shale oil from Vaca Muerta allowed to compensate almost completely that fall, increasing 280% from just under 30,000 barrels / day at the end of 2015, to 112 thousand barrels / day in 2019 and explaining 22% of oil production in the country.

The natural gas phenomenon has been similar, with total production growing in the four-year period by 17.5%, from 116 million m3 / day in December 2015 to 135 million m3 / days in 2019, and all growth is explained by the shale and tight gas coming mostly from Vaca Muerta which at the end of 2019 represented 45% of the country's total production, in a context in which conventional production fell by 16%, while unconventional production grew 156%, completely reversing the decline.

Given this reality, and demonstrated the productive potential, the question is what should be the pace of investment necessary to maintain this growth and increase it according to the scenarios to be analyzed, the activity in the reservoir and the construction of infrastructure necessary to access the markets. What is the cost of production at the wellhead, considering the existing Gas-Oil Ratio, and as a result the competitiveness of unconventional production in Vaca Muerta for the supply of the domestic market and the export of surpluses?

**Escenarios**

The following scenarios are analyzed by calculating the parameters related to costs, prices and investments of the different levels of production:

1. ***Trend Scenario***: maintains the same investment levels of the last five years. The resulting production levels will be estimated. Based on this and taking as an exogenous variable the internal demand, we obtain the international commercial position in oil and natural gas, exporting or importing;
2. ***Moderate Scenario***: 30% increase in investments and results in costs, production and position in international trade. Surplus exports of natural gas to regional markets (Chile and Brazil).
3. ***Maxima scenario***: Mass investments, domestic market supply and oil exports for 500 thousand barrels / day and access to the international LNG market.

**Results**

En cada escenario se correrá un modelo de evaluación de proyectos, para un periodo de veinte años, que tiene en cuenta las inversiones totales para el desarrollo de yacimientos, y la construcción de infraestructura necesaria en cada caso para el acceso de la producción al mercado interno, a los mercados regionales en el caso del gas natural y a los mercados internacionales de petróleo y de GNL.

The model calculates the Net Present Value of each scenario for a long-term capital cost: taking into account the total production and its estimated valuation, the cost of oil and natural gas production, its competitiveness in the international markets, CAPEX and OPEX of the infrastructure, and the benefits in terms of foreign exchange contribution to the State and profitability for companies.

The results of this exercise will be an input for the formulation of public policies and the decisions that Argentina must adopt regarding oil and natural gas, to develop the potential of its resources and the activity of the industry as a contribution to the national economy.