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According to the assesment carried out by hydrocarbons reserves and resources auditor Ryder Scott

# REPSOL YPF RAISES ITS HYDROCARBONS RESERVES AND RESOURCES ESTIMATE IN THE VACA MUERTA PLAY TO 22.807 BILLION BARRELS OF OIL EQUIVALENT (Bboe)

- The gross prospective resources are 21.167 Bboe in an area of 8,071 km² (in which Repsol YPF has a net 5,015 km².)
- The gross contingent reserves are 1.525 Bboe (in an area of approximately 1,100 km<sup>2</sup> of which YPF has a net interest of 834 km<sup>2</sup>. Additionally in the same area, 116 Mboe have been booked as reserves (3P).

Repsol YPF has hired hydrocarbons reserves and resources Ryder Scott to carry out an external audit of its reserves, contingent resources and prospective resources of non-conventional hydrocarbons (shale oil and gas) in the Argentinean Vaca Muerta formation in the Neuquén province. The technical analysis is based on the criteria set out by Argentinean stock market regulator Comisión Nacional de Valores de Argentina and the United States' Securities and Exchange Commission. At the same time, the evaluation of the contingent and prospective resources complies with the requirements of the Comisión Nacional de Valores de Argentina and the Society of Petroleum Engineers' Petroleum Resources Management System.

The Vaca Muerta formation is estimated to cover an area of 30,000 km<sup>2</sup> (7.4 million acres) of which Repsol YPF has a net 12,000 km<sup>2</sup> (3 million acres). Preliminary results indicate that 77% of the area contains oil, with the rest containing dry and wet gas.



The evaluation carried out by Ryder Scott covers a total area 8,071 km<sup>2</sup> (1,994,378 acres), of which Repsol YPF holds a net interest of 5,016 km<sup>2</sup> (1,239,407 acres) in the Neuquén area.

The work carried out breaks down the total volumes of prospective resources, contingent resources, and proved, probable and possible reserves (definitions are detailed in Annex 4)

	Oil (Mbbl)	Condensate (Mbbl)	Gas (Mboe)	Total (Mboe)	Oil (Mbbl)	Condensate (Mbbl)	Gas (Mbep)	Total (Mboe)
Prospective Resources	5,732	396	15,038	21,167	3.966	224	8,161	12,351
Contingent Resources	1,115	0	410	1,525	883	0	330	1.213
Reserves 3P	81	0	35	116	81	0	35	116
Possible	33	0	15	48	33	0	15	48
Probable	25	0	11	35	25	0	11	35
Proven	23	0	10	33	23	0	10	33

Source: Ryder Scott

1 boe = 5.615 million cubic feet of gas

The audit has determined that in an area of 1,100 km<sup>2</sup> there are 1.115 Bbbl of oil in associated contingent resources, and 410 Mboe of gas, making a total of 1.525 Bboe. For the YPF participation the contingent resources would amount to 883 Mbbl of oil and 330 Mboe of gas, resulting in a total of 1.213 Bboe.

To reach these results, Repsol YPF has made a significant technical effort in a record time, leading the exploratory effort for non-conventional resources in Argentina, after analyzing all the successful technologies used in the USA and adapting them to the geological conditions in the country. To do this, the company co-operated with a number of leading shale developers in the US that, because of the expectations generated by the Vaca Muerta shale, have partnered YPF for exploratory activity in a number of areas. Repsol YPF's technical teams have since 2009 developed the project, spending \$300 million on exploration, mapping and initial development in the Vaca Muerta formation. By 31 December 2011, the Vaca Muerta formation had produced 700,000 boe..

The encouraging results obtained so far have prompted Repsol YPF to continue exploring the area to determine the play's full extension and productivity in oil, gas and wet gas. The company aims to drill 20 wells in 2012, solely and jointly with several partners, to continue investigating prospective resources.



With the current results, Argentina has the opportunity to reproduce the revolution in non-conventional hydrocarbons seen in the United States by developing the resources contained in the Vaca Muerta formation.

The development of the 1,100 km<sup>2</sup> explored so far by Repsol, containing gross contingent resources of 1,525 Bboe could make possible a 50% increase in Argentina's current gas production. This would require a total investment by all stakeholders of \$28 billion in the coming years to drill 2,000 producing wells which would require 60 drilling rigs more than currently operating in Argentina.

If the positive results of the exploratory wells underway are confirmed, the country's gas output could rise 50%. This would require 1,000 wells to be drilled in a first phase, with an additional required investment of \$14 billion, necessitating 40 drilling rigs more than Argentina currently has.

These 100 new rigs would more than double the current number of rigs in the Argentine, currently totalling 80.

If exploration proves successful in the Vaca Muerta formation and immediate intensive development began in the area, in 10 years its capacity could double Argentina's existing gas and oil production. This would require a vast investing effort that would reach \$ 25 billion per year in order to develop all the existing prospective resources.

A programme of such magnitude would require an important capital investment in Argentina from international markets; a powerful domestic industry (equipment, services, etc.) and competitive and highly technically qualified human resources since Argentina competes against other similar developments worldwide (USA, China, Australia, Eastern Europe, etc.).

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# ANNEX I INTRODUCTION TO NON-CONVENTIONAL RESOURCES - SHALE GAS AND OIL

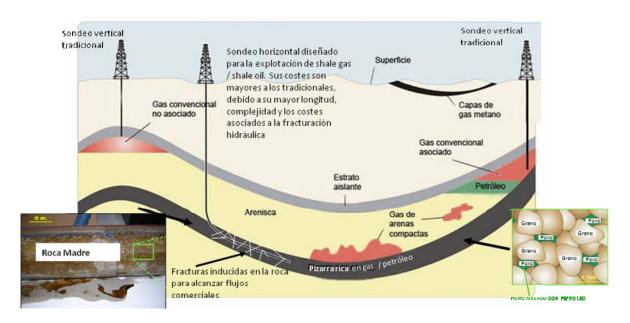
#### Introduction

During more than 100 years the oil industry has explored the subsoil and produced hydrocarbons from storage rocks generated in other rocks called bedrock.

Part of the hydrocarbons generated in the bedrock are expelled and due to pressure variation, migrates to other rocks with storage capacity. The latter are known as coventional reservoirs. The rest of the hydrocarbons generated remain in the bedrock.

Until the end of the twentieth century the oil and gas industry focused on exploiting conventional reservoirs. Decline in production from conventional reservoirs, technological development, and suitable economic conditions paved the way for the start in the exploitation of the hydrocarbons contained in bedrocks (Shale reservoirs). The exploitation of non-conventional resources opens new opportunities; it demands technological challenges and it bears higher costs.

# <u>The exploitation of non-conventional resources opens new opportunities; it demands</u> technological challenges and bears higher costs.





# Features and behaviour of shale oil and gas fields

Any basin having a production of conventional hydrocarbons in the past is a candidate to be explored in search of shale gas and oil.

One of the particular features of this type of fields is well behaviour. They present modest initial productions that decline extraordinarily quickly. In the first year production falls by 50-80% over average production in the first 30 days.

Its rapid depletion forces permanent test drilling to avoid the decline of the field, at a rhythm and intensity so far unknown. This fact, together to the vast extension covered by this type of accumulations, leads to an intensive and continuous activity.

Fracturing tasks are crucial to obtain commercial flows. Massive use and use rates of the techniques needed in those fields were achieved only in the middle of the last decade. New fracturing technologies applied to horizontal test drilling have also been developed. The cost of massive hydraulic fracturing accounts for up to 60% of the total cost of test drilling.

## Behaviour of shale gas/oil fields



# Production of shale gas, shale oil and other liquids in the USA

In the United States and Canada several traditional producing basins have been revisited and there has been a boom of new and numerous opportunities for shale exploitation.

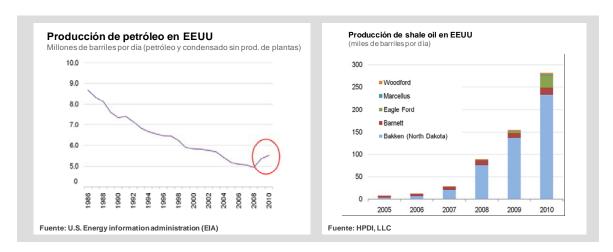
Over the last decade shale gas production in United States boomed and it currently it accounts for 25% of total domestic production, offsetting the decline of conventional fields and reducing the quantity of LNG imports.



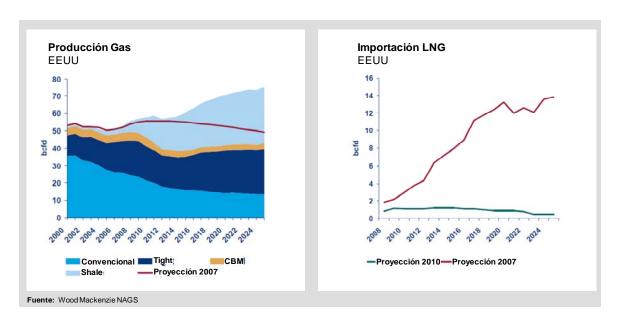
The production of shale oil has increased considerably since 2007 thanks mainly to the boom of the activity taking place in the Bakken play in North Dakota and Eagle Ford in Texas, to which other shale plays have been added in the last 2 years across the country, allowing the reversal of a four-decade declining trend.

As a result of this new concept, U.S. crude oil domestic production is expected to reach 6.7 million barrels per day (Mbpd) in 2020 from the 5.5 Mbpd recorded in 2010 due to the growth of shale oil and despite the decline of the conventional production onshore.

# Shale Oil in U.S.

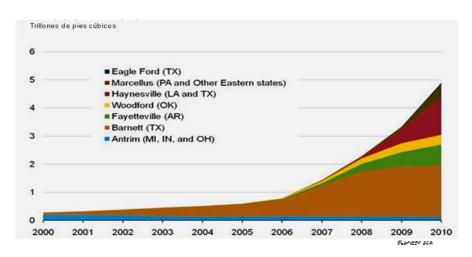


## Shale Gas in U.S.





# Production of Shale Gas in U.S.





#### **ANNEX II**

#### IMMEDIATE POTENTIAL OF THE SHALE DEVELOPMENT AT VACA MUERTA BY YPF

#### Discovery background

Since the development of shale began in the U.S., YPF started applying the same techniques in Argentina. Initially YPF revised all the existing opportunities in the country and selected the Vaca Muerta formation in the Neuquén basin to adapt what was going on in the U.S. to the Argentine geology, which proved to be successful. In the second half of 2010, it drilled 2 wells to which new technologies were applied, not previously used before in Argentina, and it discovered the capacity of Vaca Muerta to produce commercial grade gas and oil.

By the end of January 2012, YPF SA had drilled 28 new wells and re-completed 1 existing well in the Loma La Lata and Loma Campana blocks, advancing in its mapping and development plan of non-conventional resources in the Vaca Muerta formation.

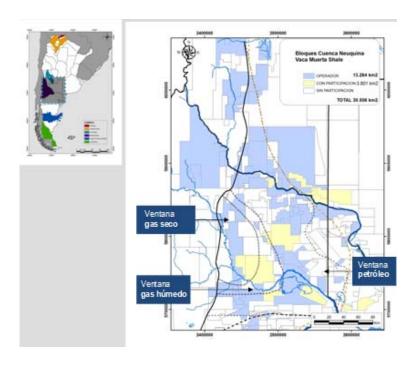
Out of the total aforementioned drilling, 24 are vertical wells completed with stimulation treatments of between 2 and 4 stages of hydraulic fracturing. Currently 20 of them produce crude oil of excellent quality from natural flows, with initial rates, restricted to a 4 mm bore, between 180 and 600 boed. It is worth mentioning that 6 of them are producing without the need for stimulation. The remaining 4 wells are awaiting termination.

Additionally, 4 horizontal wells have been drilled during the last months of 2011; evaluation is still pending.

#### Vaca muerta Shale

The Vaca Muerta formation spreads over an area of about 30,000 Km2 (7.4 million acres), from which YPF holds an interest in 12,000 Km2 (3.0 million acres - 40% of the total). Initial results would indicate that 77% of its area would be in the oil area and the rest would be distributed between wet gas and dry gas.



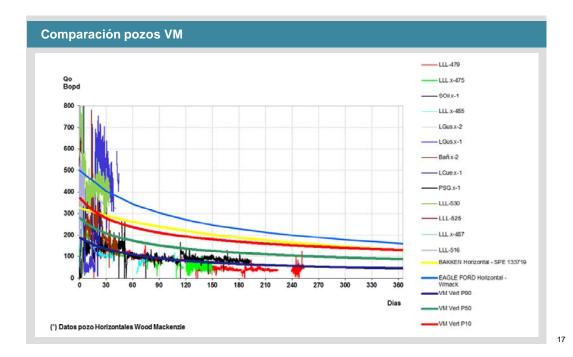


The analogy to shales from the U.S. shows Vaca Muerta has better features:

	Vaca Muerta	Barnett	Haynesville	Marcellus	Eagle Ford (*)	Bakken			
Contenido orgánico total (%)	6	5	2	12	4	12			
Espesor (mts)	200	91	76	61	61	30			
Profundidad (mts)	3.000	2.286	3.658	2.057	2.287	1.829			
Area (Km²)	30.000	16.726	23.310	245.773	5.180	51.800			
Presión de reservorio (psi)	9.000	3.525	10.800	3.375	4.502	4.200			
Gradiente de presión (psi/ft)	0,65 – 1,0	0,47	0,90	0,50	0,60	0,70			
Petróleo Original in Situ (Mbbl/km²)	33 - 58	-	-	-	22	3,9			
Gas Original in Situ (Bcf/km²)	-	25,3	30,8	6,1	-	-			
Fuente: SPE, EIA, WM, UG Harts e YPF (*) ventana de petróleo									

And the well results to date in terms of production verify these predictions, showing that vertical wells with 4 fractures produce similarly to horizontal wells with more than 25 fractures in comparable fields in the U.S.



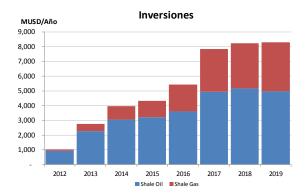


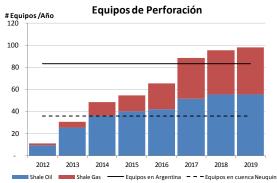
In light of the results achieved by YPF to date, Argentina has the opportunity to replicate the successful case taking place in the U.S. by means of massive development of non conventional oil and gas resources from Vaca Muerta.

The development of the area delineated by YPF, 1,100 Km2, with gross contingent resources of 1.525 Bboe, would make it possible to increase current oil production in Argentina by 50%. To achieve this it would be necessary to develop an investment plan (100% interest) of about \$28 billion in the coming years for the drilling of almost 2,000 productive oil wells, which would imply 60 additional drilling equipment units besides the existing ones in the country.

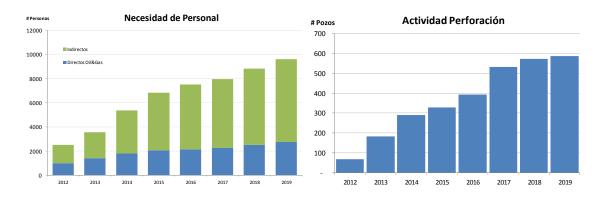
In case these positive results are confirmed in the exploratory wells under way in the gas area, the country's gas production could rise by 50%. In order do so, it would be necessary to drill more than 1,000 wells involving an investment of over \$14 billion in coming years and demanding, 40 additional drilling equipment units besides the existing ones in the country at present.







That would have a material impact on the creation of more than 7,000 new jobs in coming years and it would demand 100 drilling equipment units and more than 2,000 km of pipes per year.

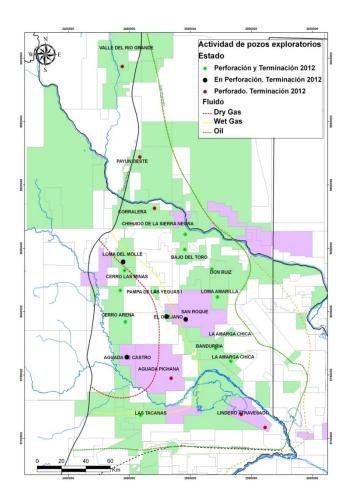




# ANNEX III EXPECTATIONS ON SHALE POTENTIAL OF VACA MUERTA IN THE NEUQUINA BASIN.

YPF, alone and jointly with partners, will carry out the drilling and workover of 20 wells in 2012 to further research the potential prospective resources.

It is worth mentioning that certified prospective volumes represent about 30 years of oil supply and 50 years of gas supply at the current consumption rates in the country.

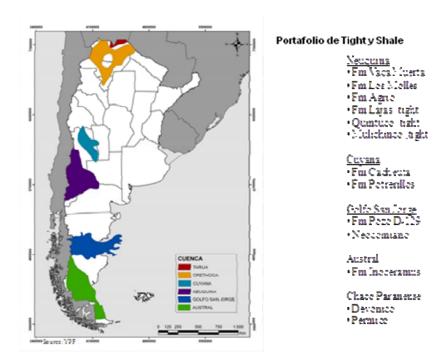


If exploration proved to be successful in the whole Vaca Muerta formation and immediate intensive development began in the area, current oil and gas production capacity of Argentina could double in 10 years time. In order to achieve this, it would be necessary to make a vast investing effort that would reach \$ 25,000 million per year to be able to develop the whole existing prospective resources.



Evidently the facts revealed by the exploration results under way that the sector is carrying out will show the true production potential.

It is in any case important to highlight that this opportunity is the first of an array of existing niches for non-conventional resources in Argentina that are being explored by YPF and other companies, which might in future years expand the growth scenario for the production of reserves and hydrocarbon resources in Argentina.



## Vaca Muerta opportunity and environment conditions.

The development of the Vaca Muerta formation is a singular opportunity for Argentina.

As with Brazil's offshore discoveries, Argentina has the opportunity of creating a new industry of shale and what this involves; manufacturing of drilling and workover equipment in the country, creation of companies that engage in the construction of wells, valves, tubes, equipment, etc. at the new scale this undertaking demands to create a competitive cost scenario.

Also, the professional development of human resources able to meet the employment demand that will take place in coming years, highly qualified professionals trained in the country, is a challenge we should deal with.

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As in U.S. the opportunity of energy self sufficiency emerges enabling a reduction of the level of energy imports with a gas and crude oil price that make these developments viable at a cost lower than the cost of importing such products.

Additionally, the attraction of international capitals to Argentina as a source of financing the enormous economic resources that this project will require in coming years is a mandatory condition for a project of such magnitude.

The development of non conventional resources opens a new paradigm for the hydrocarbon industry in Argentina; an orderly development will be a key piece to sustain the economic growth of the country in the next decades. In order to make this come true, consent capacity among the sector, workers included, and the national and provincial governments is crucial.

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#### **ANNEX IV**

**Reserves**: Estimate of the quantity of oil, gas and other products that can be produced in a profitable manner by means of development projects. Also, there should be, or have, a reasonable expectation of obtaining exploitation rights, necessary facilities to market the oil and gas as well as all the necessary permits and financing to implement the projects.

**Contingent resources**: Refer to potentially recoverable quantities of hydrocarbon on the basis of a previous exploratory activity that includes discoveries. These resources cannot be considered commercial at the moment of evaluation (i.e. they can be economically viable, but pending exploitation permit, application of certain technologies, etc.).

**Prospective resources**: Refer to potentially recoverable quantities of hydrocarbon on the basis of an accumulation from which preliminary data is available but where no discovery wells have been drilled.