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# Field Trip 2011

## Vaca Muerta “Shale oil”

Mr. Tomás García Blanco – YPF Upstream Executive Director



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YPF

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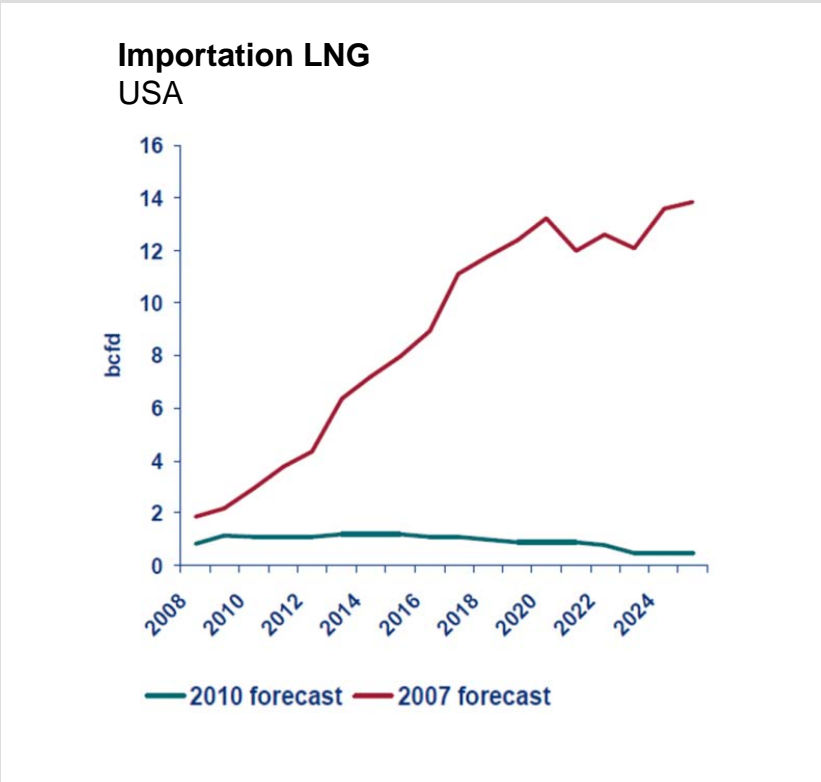
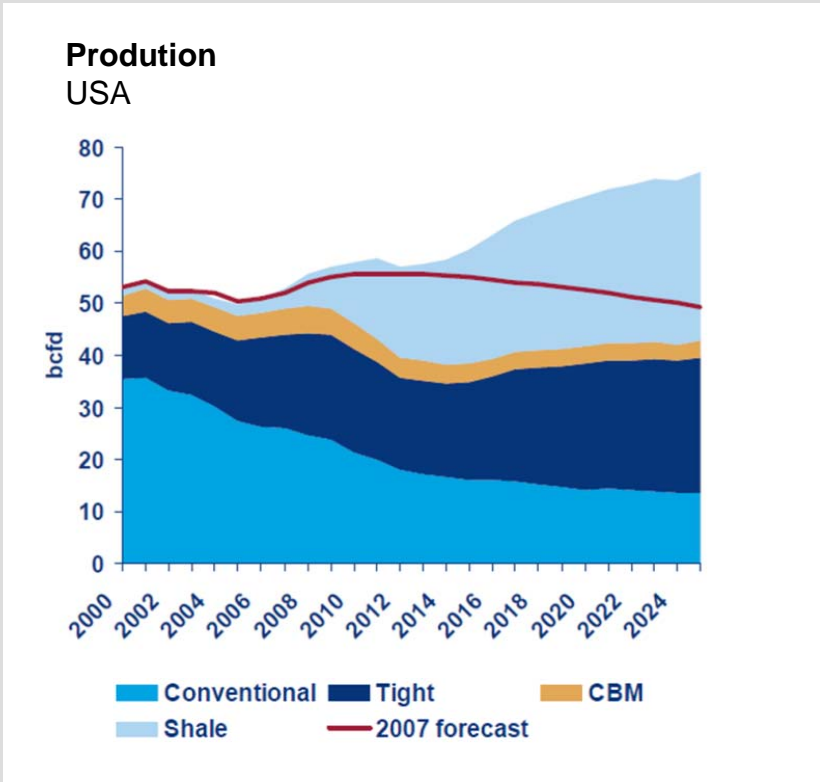
The information contained herein has been prepared to assist interested parties in making their own evaluations of YPF.

# Shale in the USA: Impact on Gas Supply



The development of Shale Gas resources in the USA has totally changed the energy balance and largely eliminated the need to import LNG

23% of US gas production currently comes from Shale Gas.



Fuente: Wood Mackenzie NAGS

# Shale in the USA: Impact on Oil Production



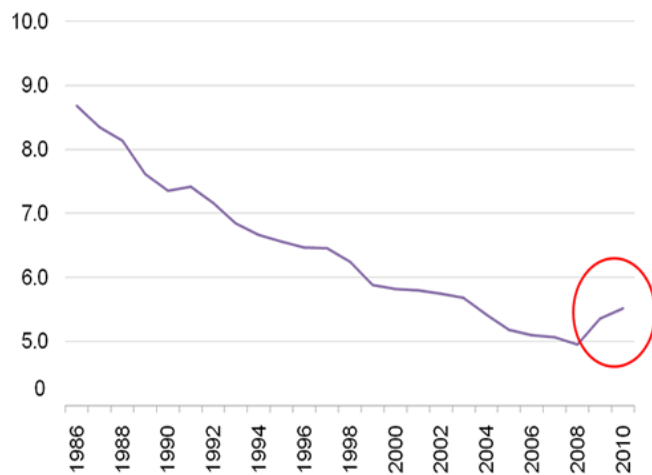
EIA, Today in Energy, Apr 27, 2011

“...While much of the increase in 2009 was associated with deepwater developments in the Federal Gulf of Mexico, the increase in 2010 was led by escalating horizontal drilling programs in U.S. shale plays, notably the North Dakota section of the Bakken formation.”

“Domestic Oil Production Reversed Decades-Long Decline in 2009 and 2010”

## Production of Oil in USA

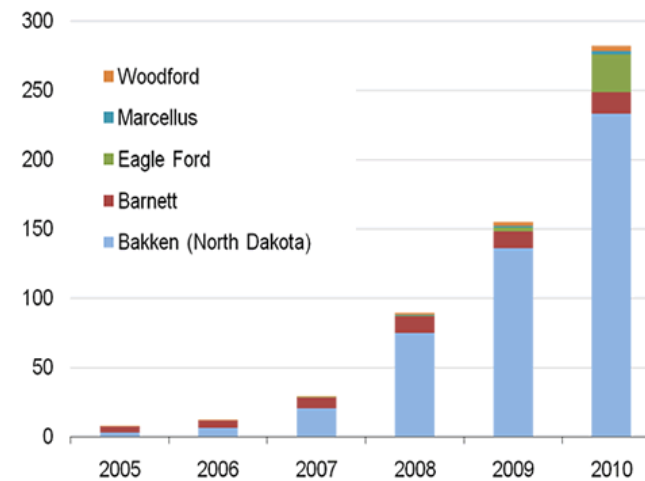
Million of barrels per day (oil and condensate without plant products)



Source: U.S. Energy information administration

## Production of oil from “Shale” reservoirs

Bopd (thousands)

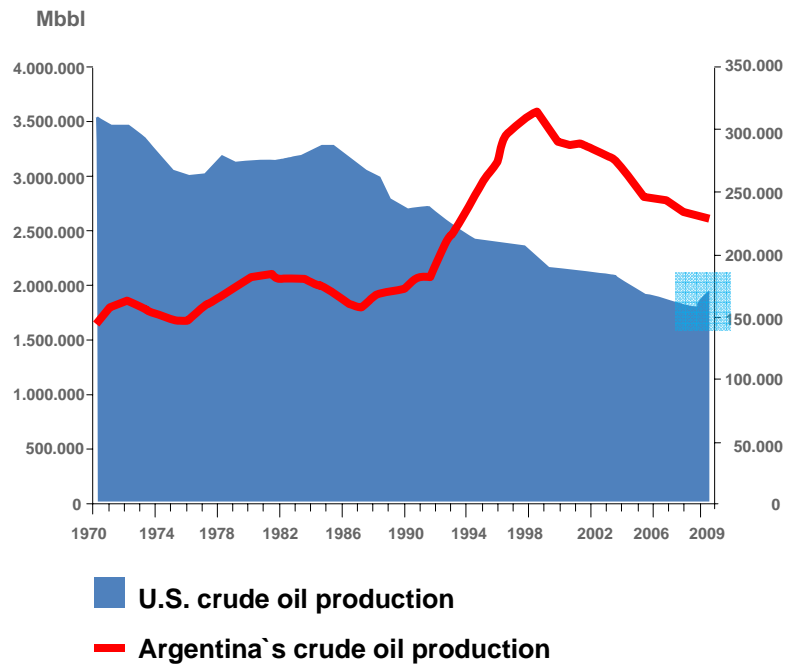


Source: HPDI, LLC

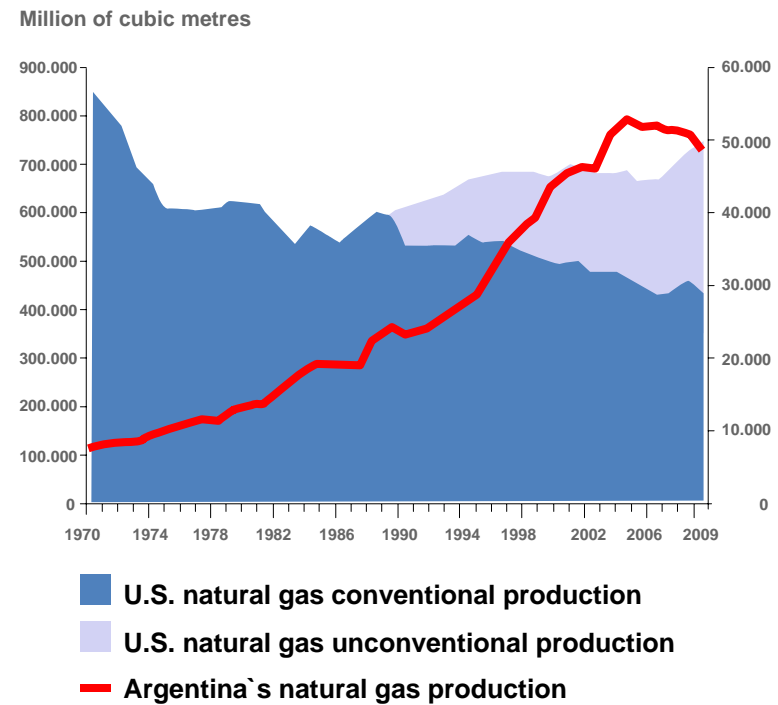
# Could Argentina replicate U.S. experience?

## Evolution of the oil and the natural gas in U.S. and Argentina

### U.S. and Argentina's crude oil production

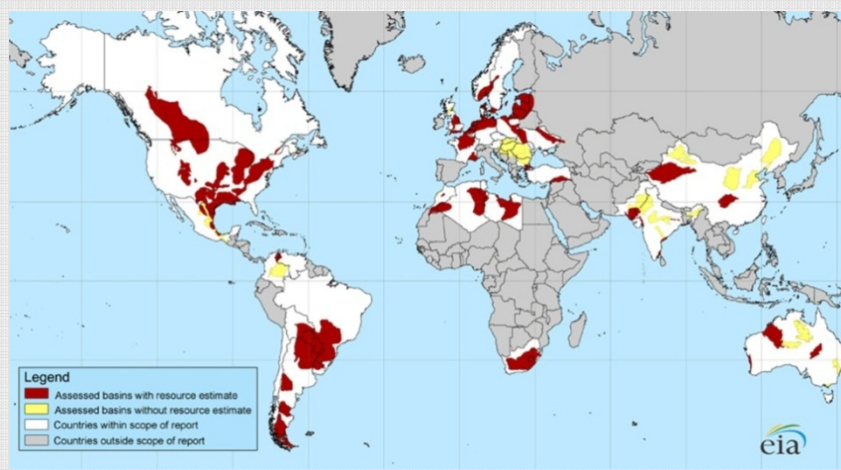


### U.S. and Argentina's natural gas production



# Shale gas: Worldwide Resources

## MAIN SHALE GAS BASINS



Continent	Risked technically recoverable (Tcf)
North America	1.931
South America	1.225
Europe	624
Africa	1.042
Asia	1.404
Australia	396
<b>Total</b>	<b>6.622</b>

### 12% of total world resources reported in Argentina


The EIA report (April 2011, “World Shale Gas Resources”) estimated Argentina as having the third largest resource base (The study excluded the Middle East, Russia, SubSaharan Africa))

Conventional and unconventional resources are estimated as being roughly equivalent (6,622 vs. 6,609Tcf) (study excluded the Middle East, Russia, SubSaharan Africa)

# Shale oil Plays in the World

## Projects and recoverable resources





**United States**  
24 Bbbl of shale oil resources

**Argentina**  
YPF pioneering the development of Shale Oil in Vaca Muerta.

**Brasil**  
The potential of the onshore Parana basin remains to be evaluated.

**Egypt**  
Resources estimated between 700 Mbbbl and 2,2 Bbbl in East Bahariya.

**Australia**  
17.8 Bbbl of resources estimated for the Falcon Australia Beetaloo Basin Project.

**Poland and Sweden**  
Defining the Unconventional potential portfolio, production forecast for 2014.

**China**  
Recent discovery of Shale Oil by PetroChina in the Liaohe depression, north east Bohal Gulf Basin joint ventures with US companies with proven track record.

**France**  
The Paris Basin should have recoverable shale resources of 4 Bbbl, projects on hold due to environmental issue.

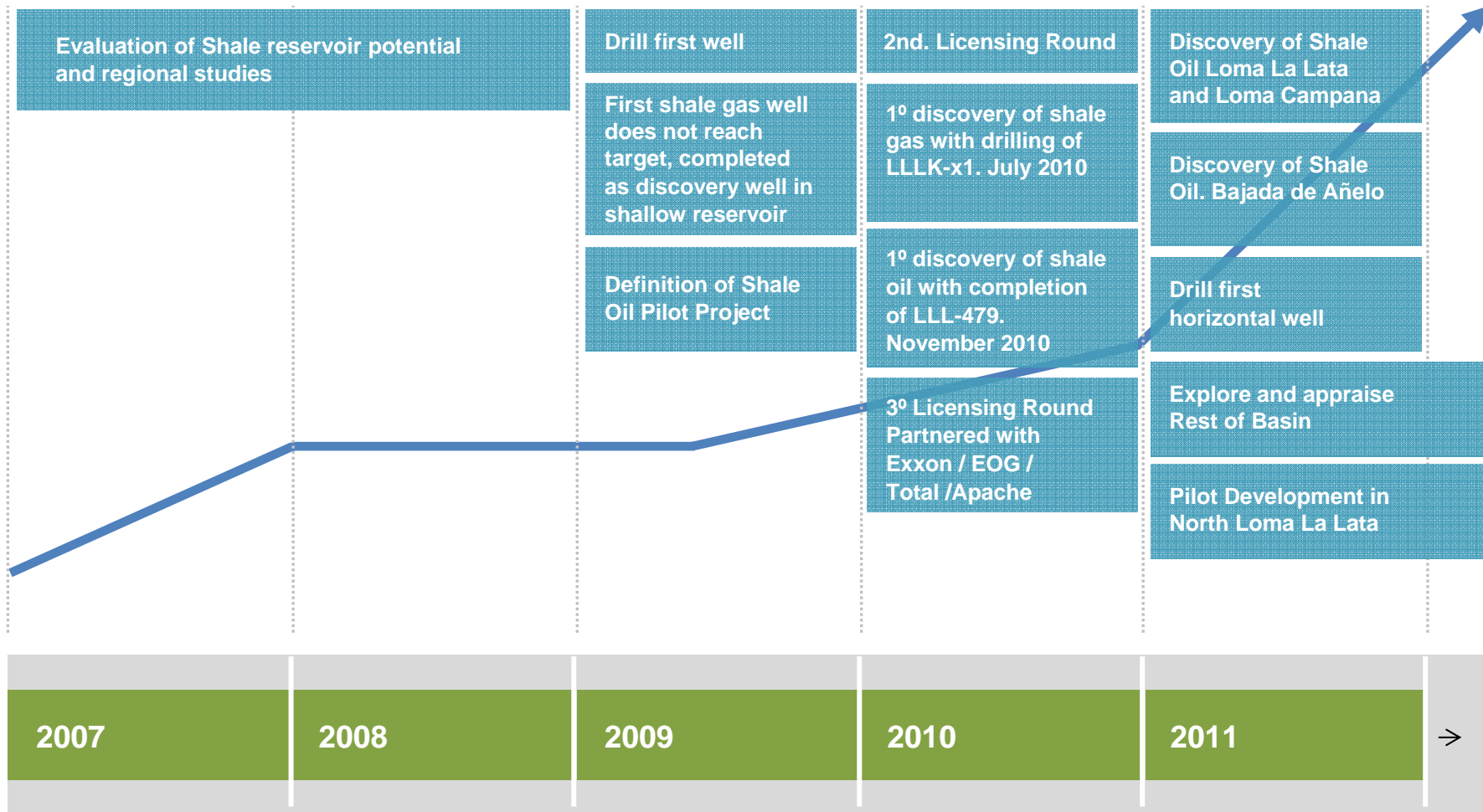
**Canada**  
Main effort centered on Shale gas with potential for LNG export. Shale Oil less important for the moment.

**Shale Oil resources**

<b>USA</b> 24 Bbbl	<b>France</b> 4 Bbbl	<b>Australia</b> 17.8 Bbbl
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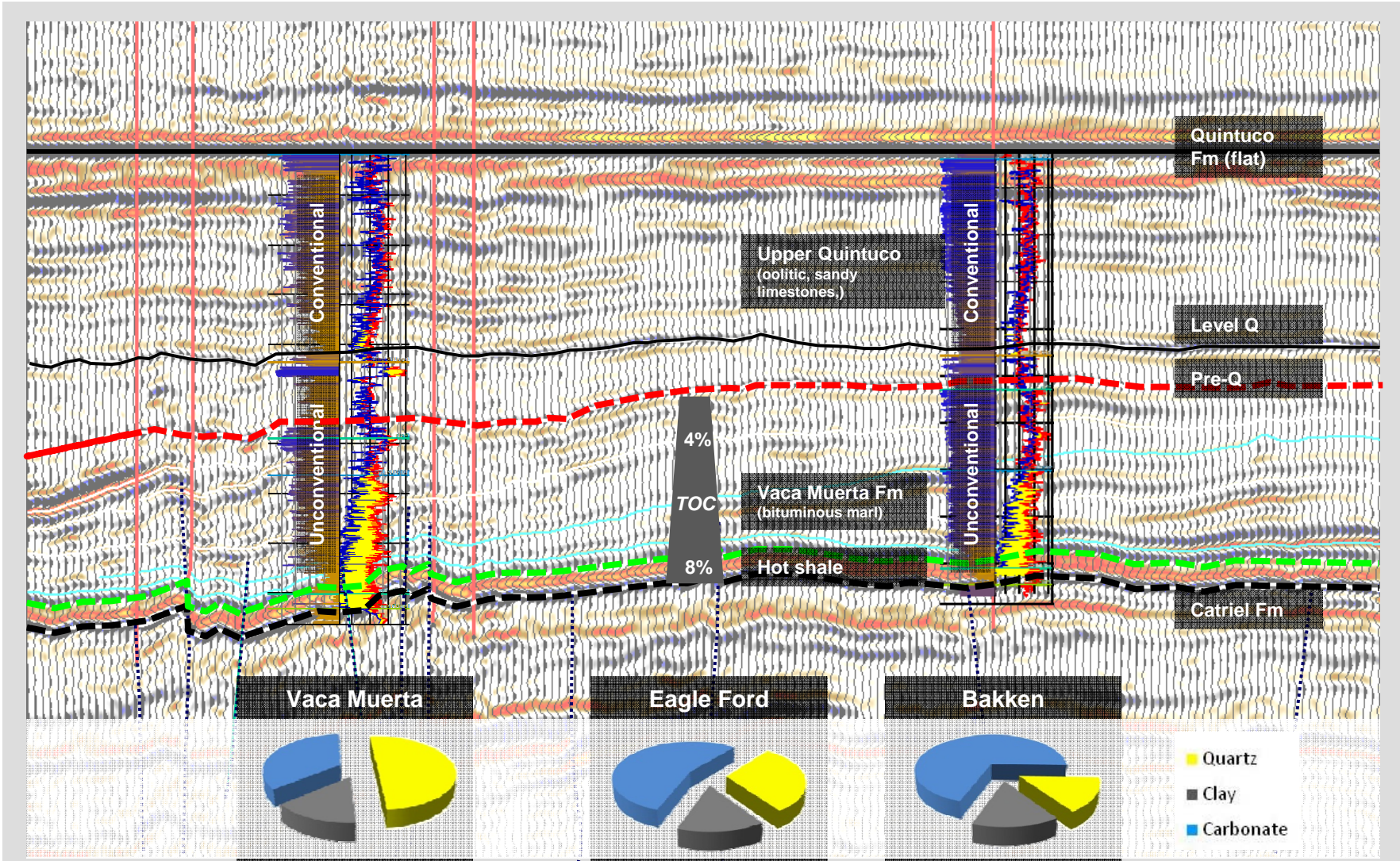
*Fuente Análisis Interno YPF*

# YPF Activity in Vaca Muerta: History of a discovery



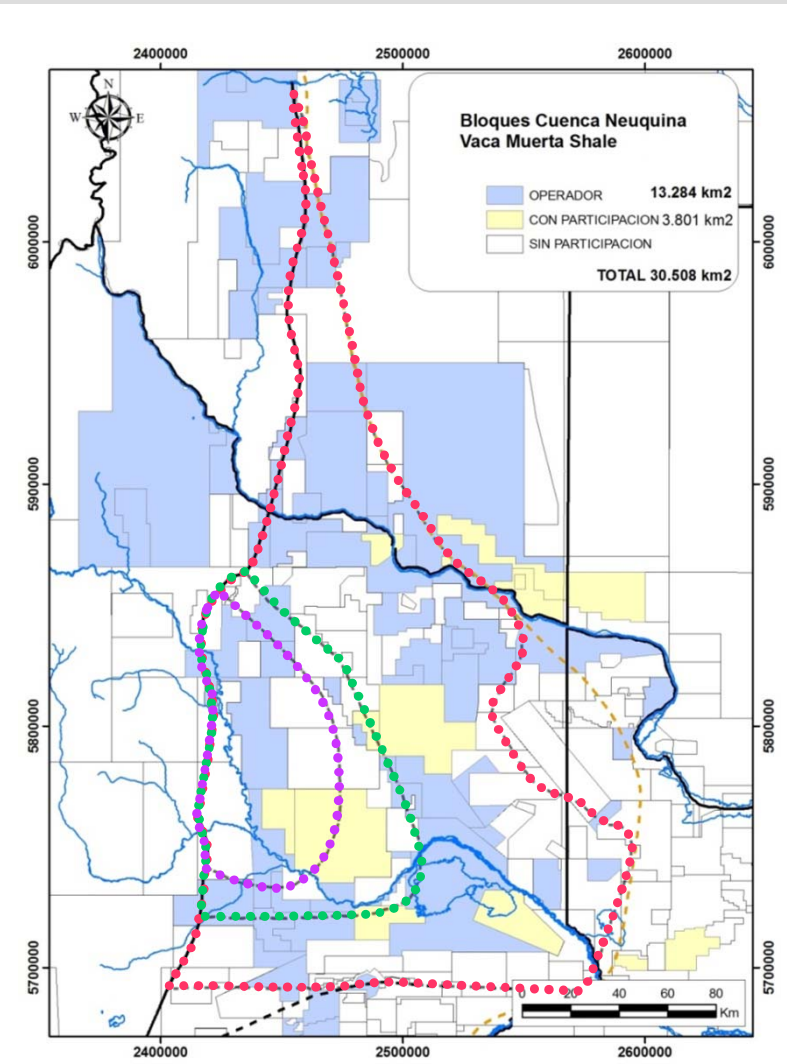
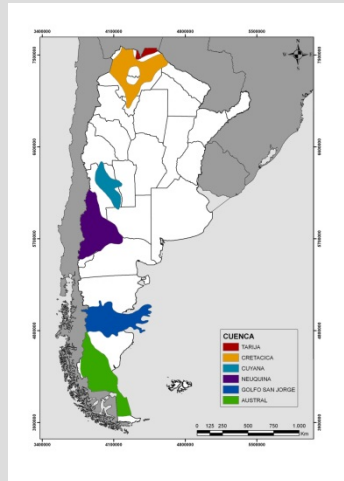


# Vaca Muerta Shale



Source: YPF

# The YPF Position - Vaca Muerta Play

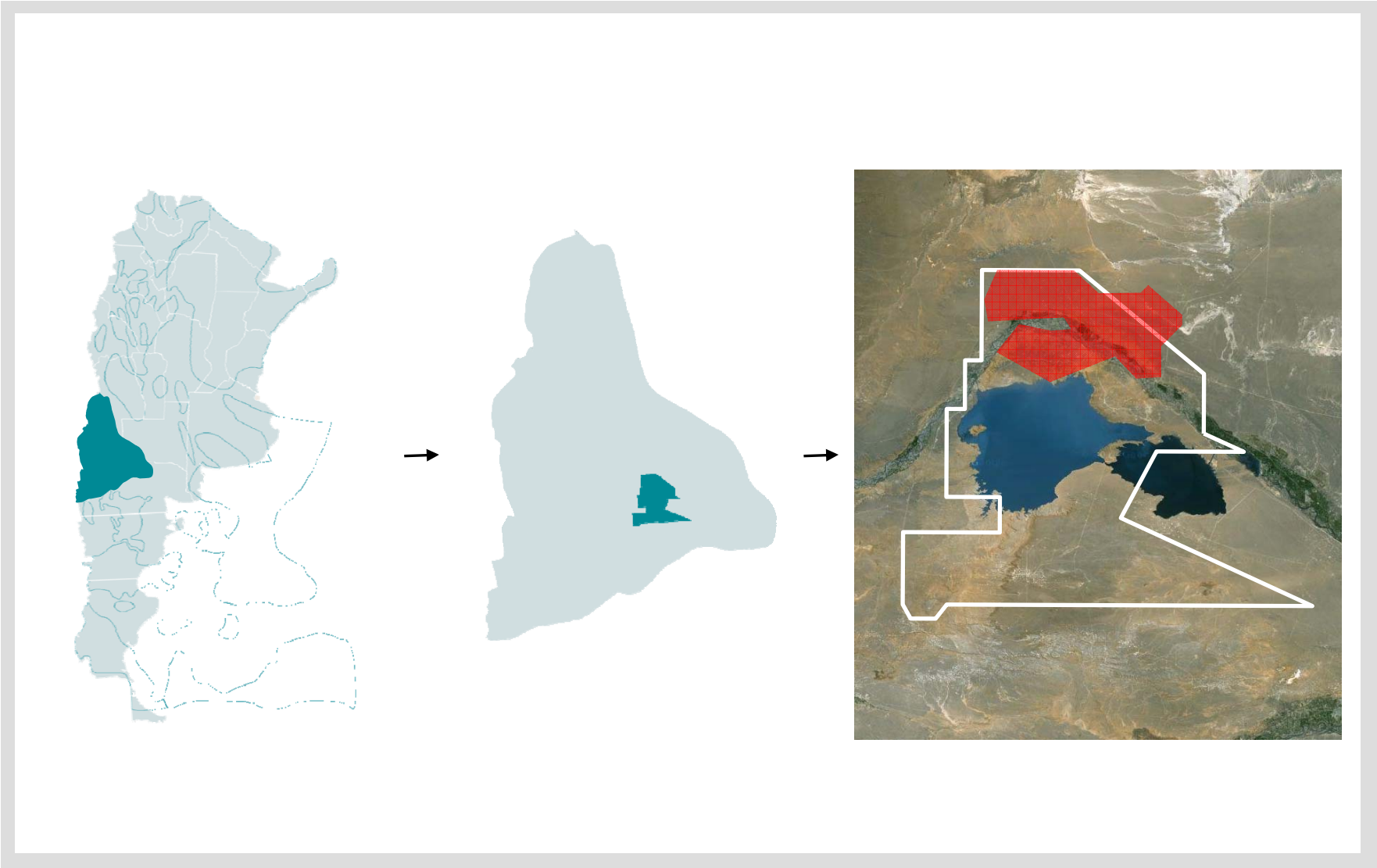


- Oil Window
- Wet Gas Window
- Dry Gas Window

Source: YPF

- Vaca Muerta is present in an area of 30,000 Km<sup>2</sup> (7.4 million acres)
- Of this area, YPF participates in 12,000 Km<sup>2</sup> (3.0 million acres - 40% of the total)
- 9,311 km<sup>2</sup> oil
- 670 km<sup>2</sup> wet gas
- 2,019 km<sup>2</sup> dry gas

# YPF Discovery of Shale Oil Northern Loma La Lata



# YPF Discovery of Shale Oil Northern Loma La Lata Results by the end of September



## VERTICAL WELLS IN PRODUCTION



Initial well rates; The wells are restricted by 4mm chokes

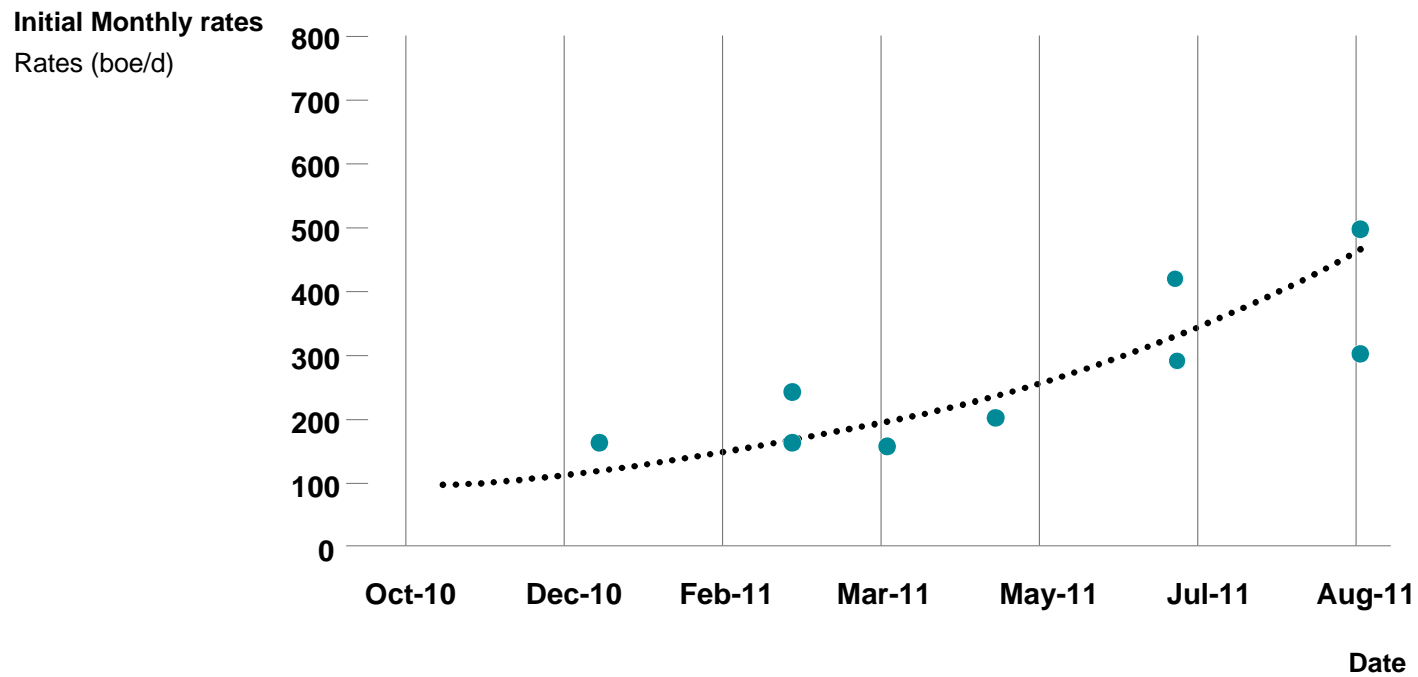
- 17 vertical wells on production with 3 to 4 fracs per well
- The wells were drilled in the Loma de la Lata, Loma Campana and Bajada de Añelo Blocks
- Initial choked vertical well rates range between 200 and 600 bopd

Source: YPF

# Evolution in fracture productivity as of october 2011



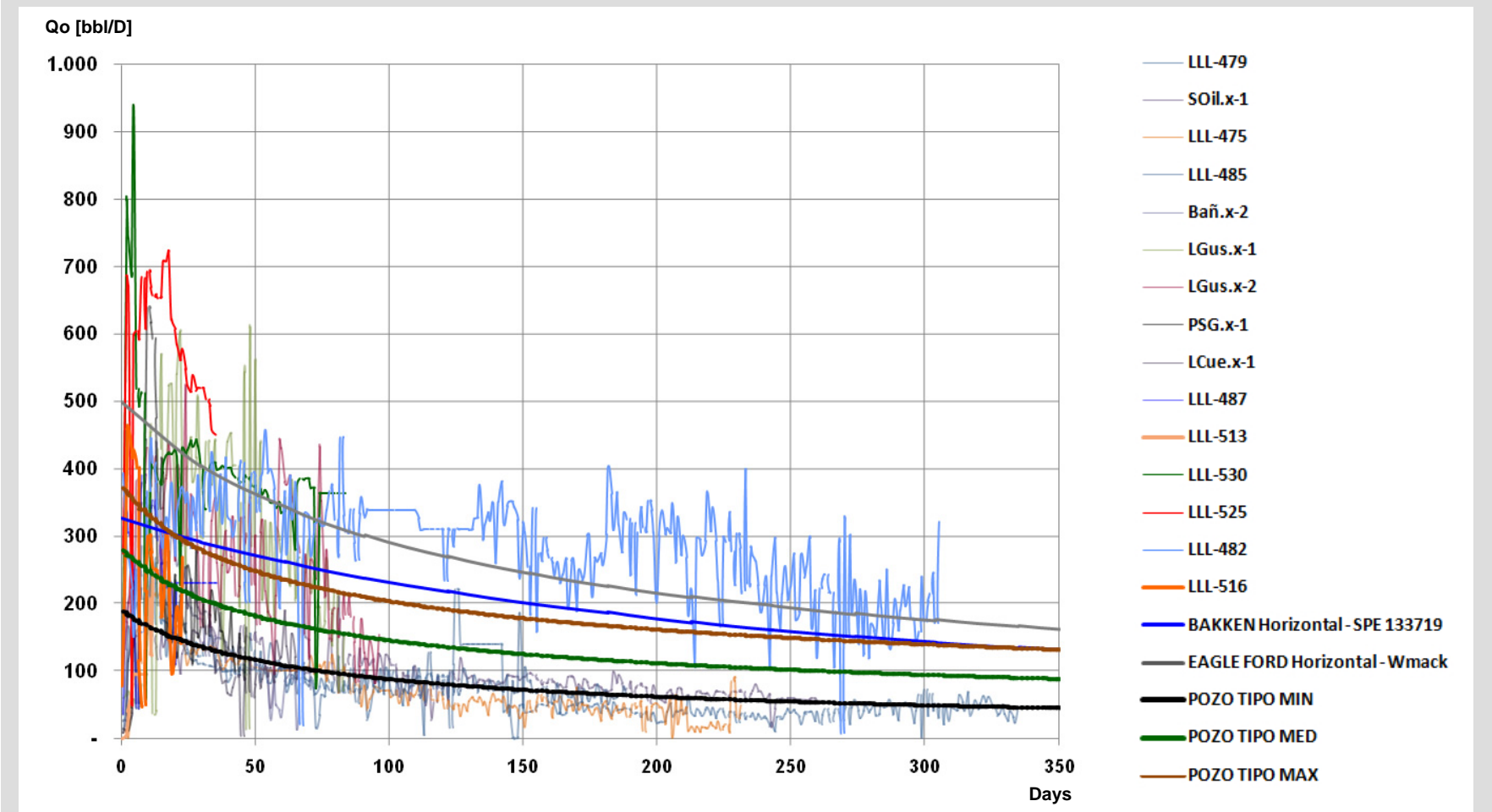
## PRELIMINARY RESULTS VACA MUERTA



# Vaca Muerta Analogues. Eagle Ford and Bakken Shale productivity (\*)

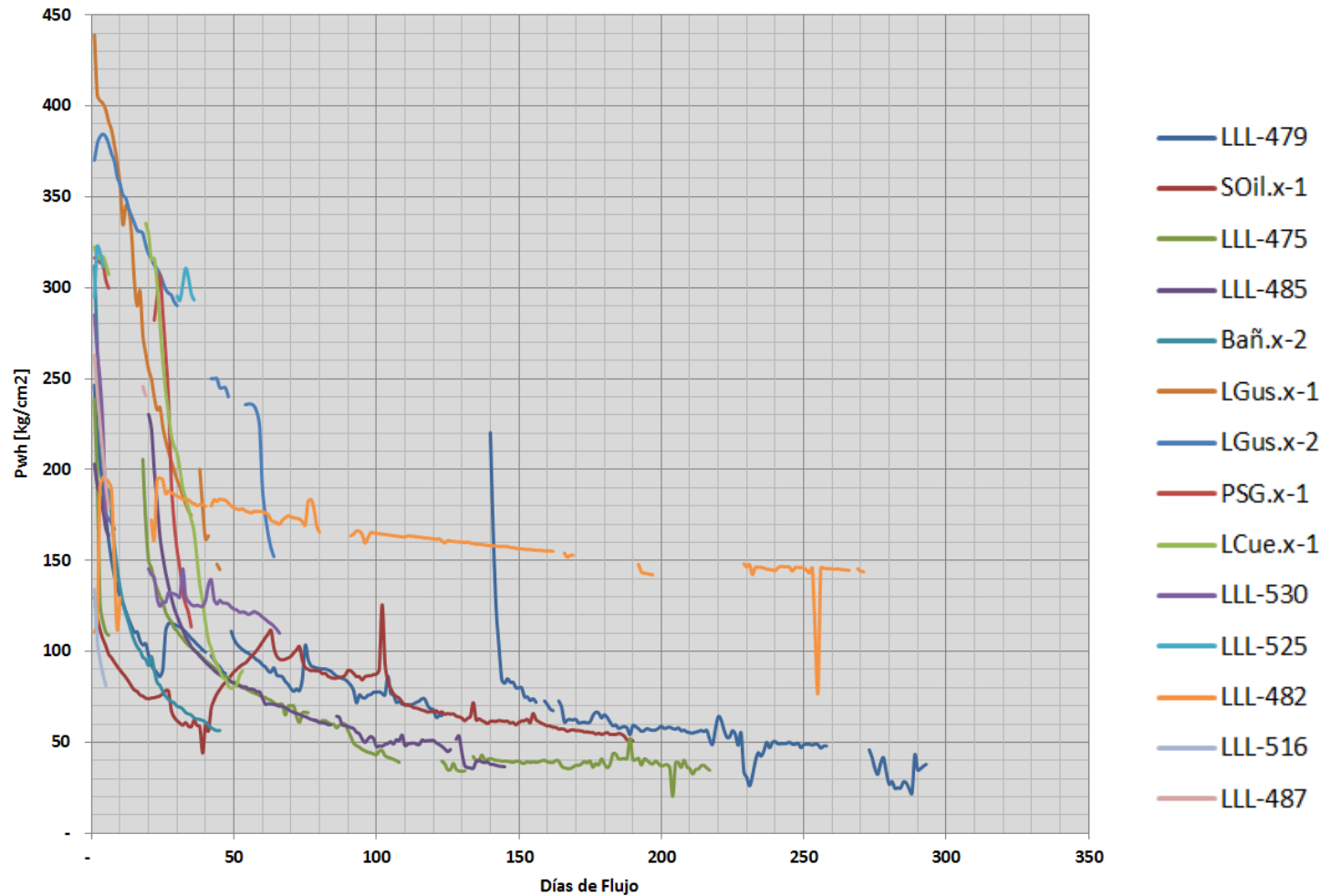


## Comparison with Vaca Muerta



Source: YPF (\*) Wood Mackenzie

# Evolution in well head pressure producing under natural flow condition



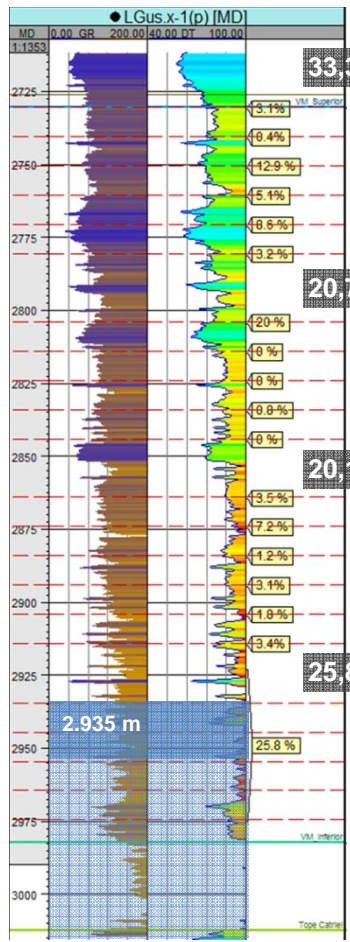
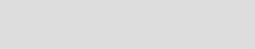
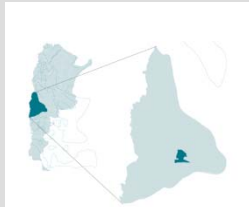
Source: YPF

# Vaca Muerta

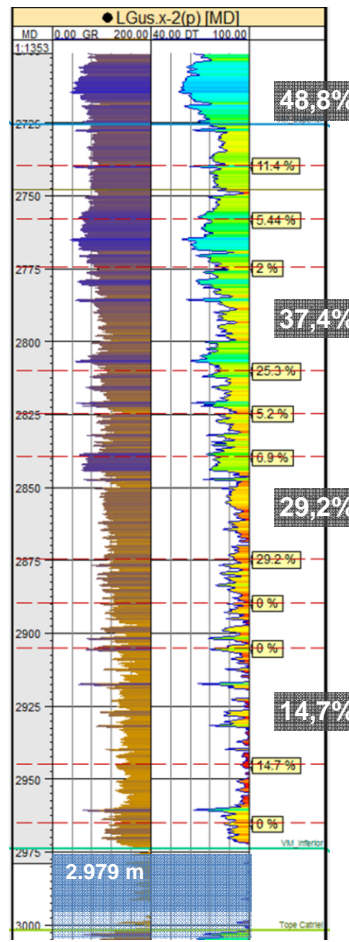
## The complete 200m section is productive



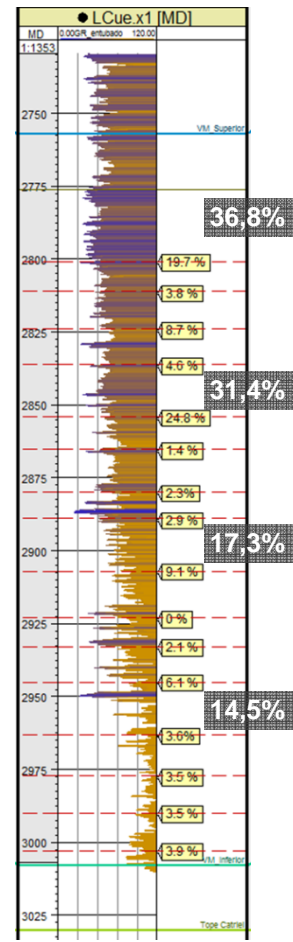
### Results of PLTS



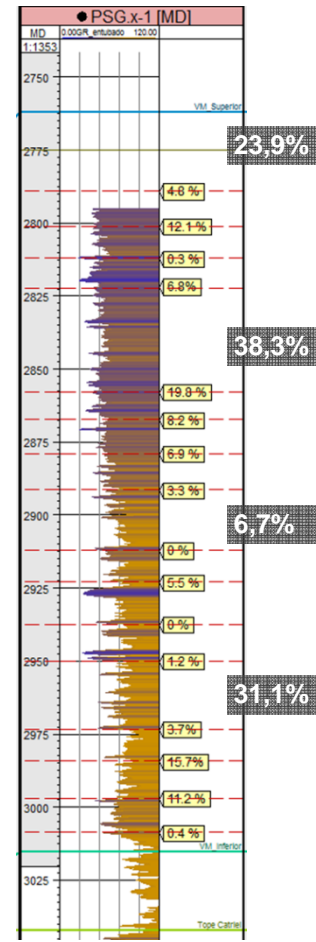
26/08/2011



15/08/2011



16/08/2011



04/09/2011

Source: YPF

# Vaca Muerta: high quality oil and gas



## Oil and gas properties



Source: YPF

## Characteristic

- Pres. = 550 - 650 kg /cm<sup>2</sup> at 2,800 m
- °API: 40 - 45
- Pb: 120-200 Kg/cm<sup>2</sup>
- GOR: 100-500 m<sup>3</sup>/m<sup>3</sup>
- Bo @ Pb: 1,5 – 1,7
- Viscosity @ Pb: 0.3 – 0.8 cP
- No H<sub>2</sub>S, Minor CO<sub>2</sub>

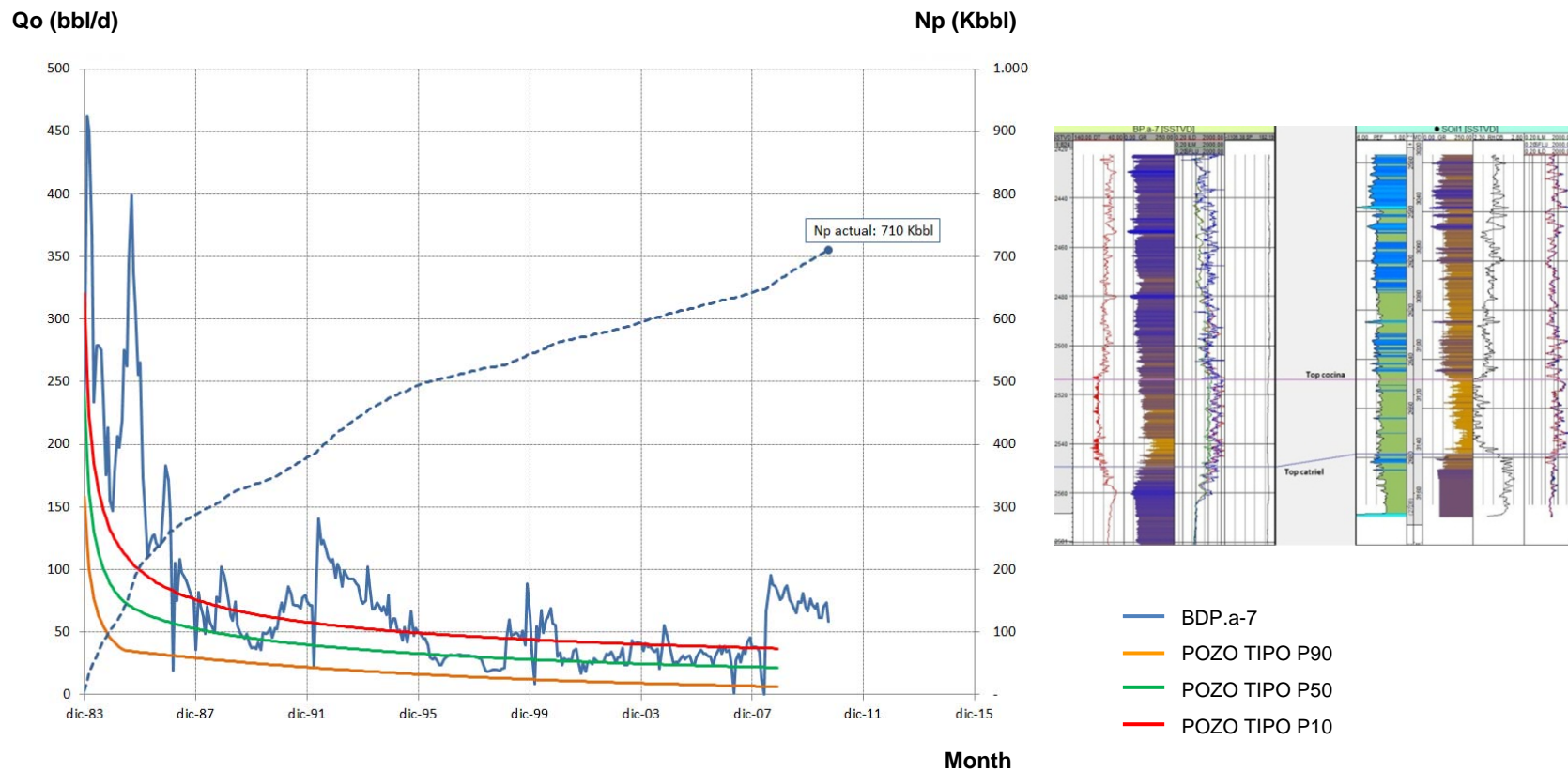
## Plant products – Gas

	m <sup>3</sup> /mm <sup>3</sup>	bbl/mcft
<b>C2</b>	<b>45.25</b>	<b>79.29</b>
<b>C3</b>	<b>366.07</b>	<b>65.19</b>
<b>C4</b>	<b>199.58</b>	<b>35.54</b>
<b>C5</b>	<b>64.92</b>	<b>11.56</b>
<b>C6</b>	<b>16.79</b>	<b>2.99</b>
<b>C7+</b>	<b>11.63</b>	<b>2.07</b>
<b>C5+</b>	<b>93.34</b>	<b>16.62</b>

# Prior production - naturally flowing well

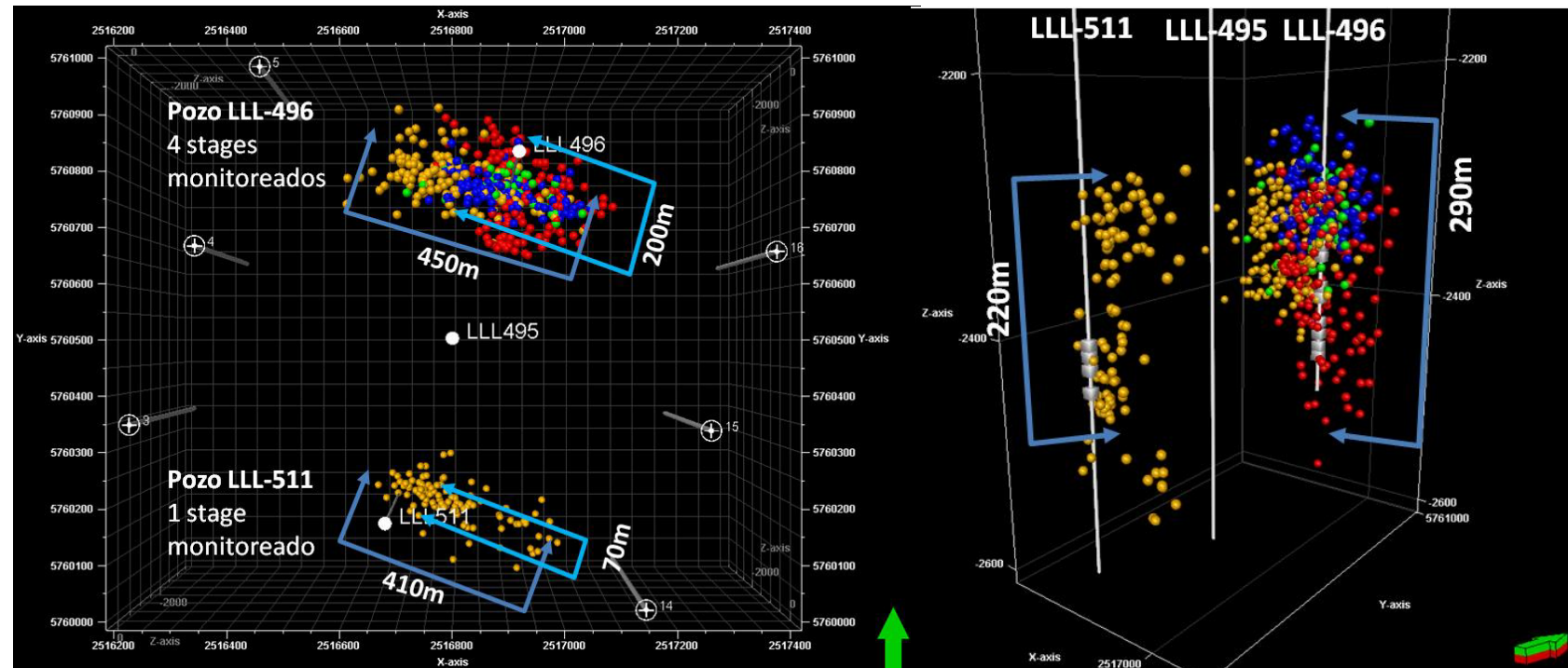
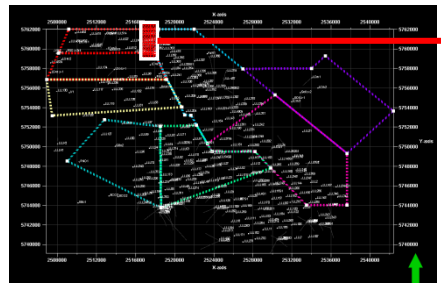
## >700,000 stbo in 25 years

### Unfractured well in Vaca Muerta



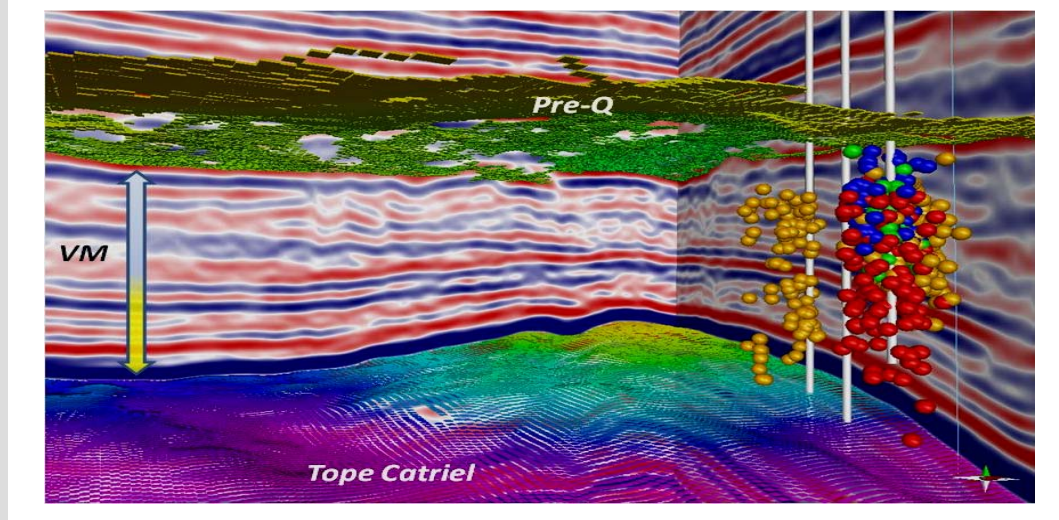
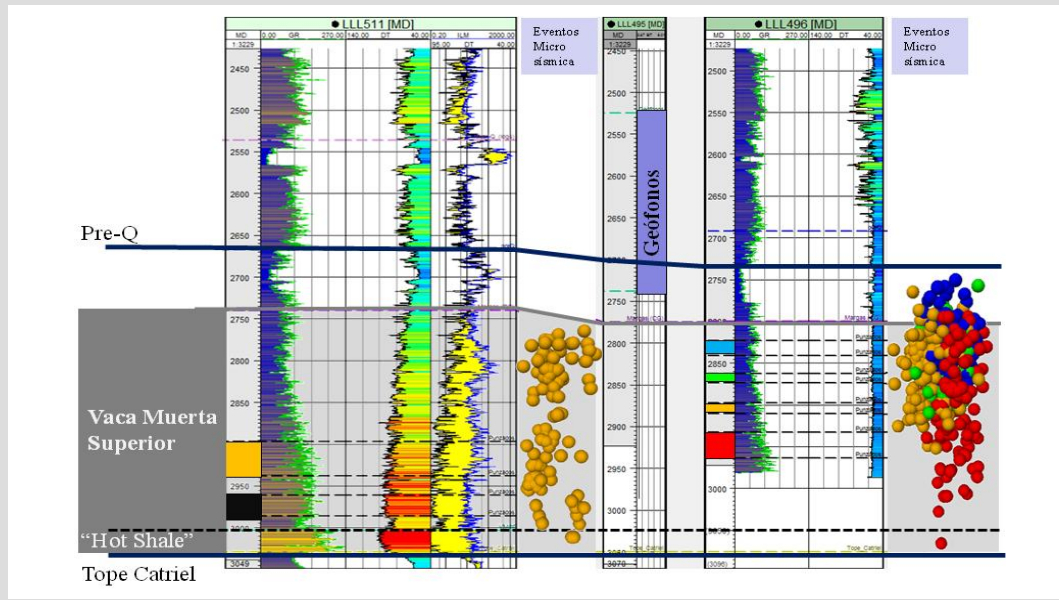
Source: IAPG

# First Microseismic results



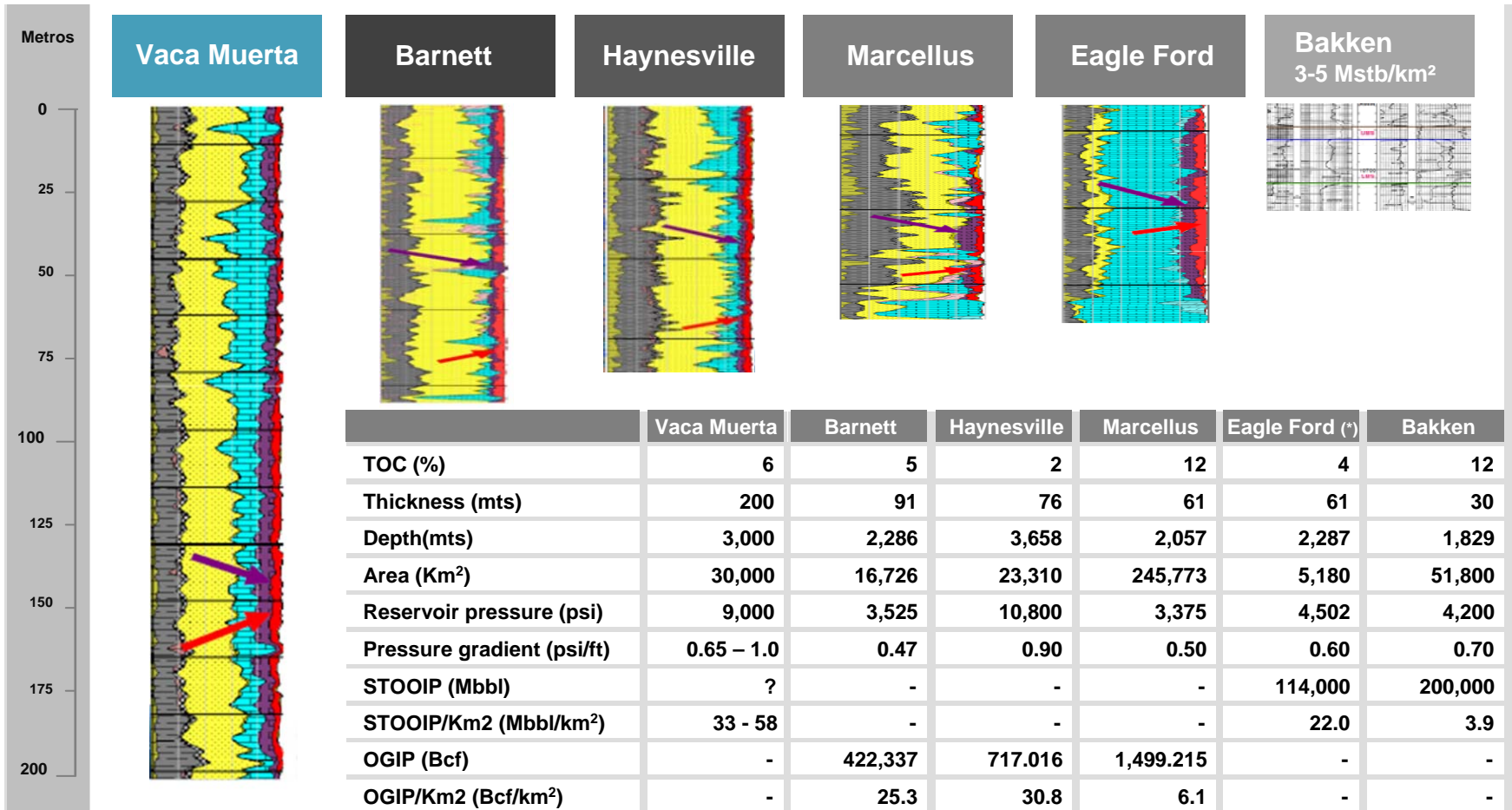
Source: YPF

# First Microseismic results



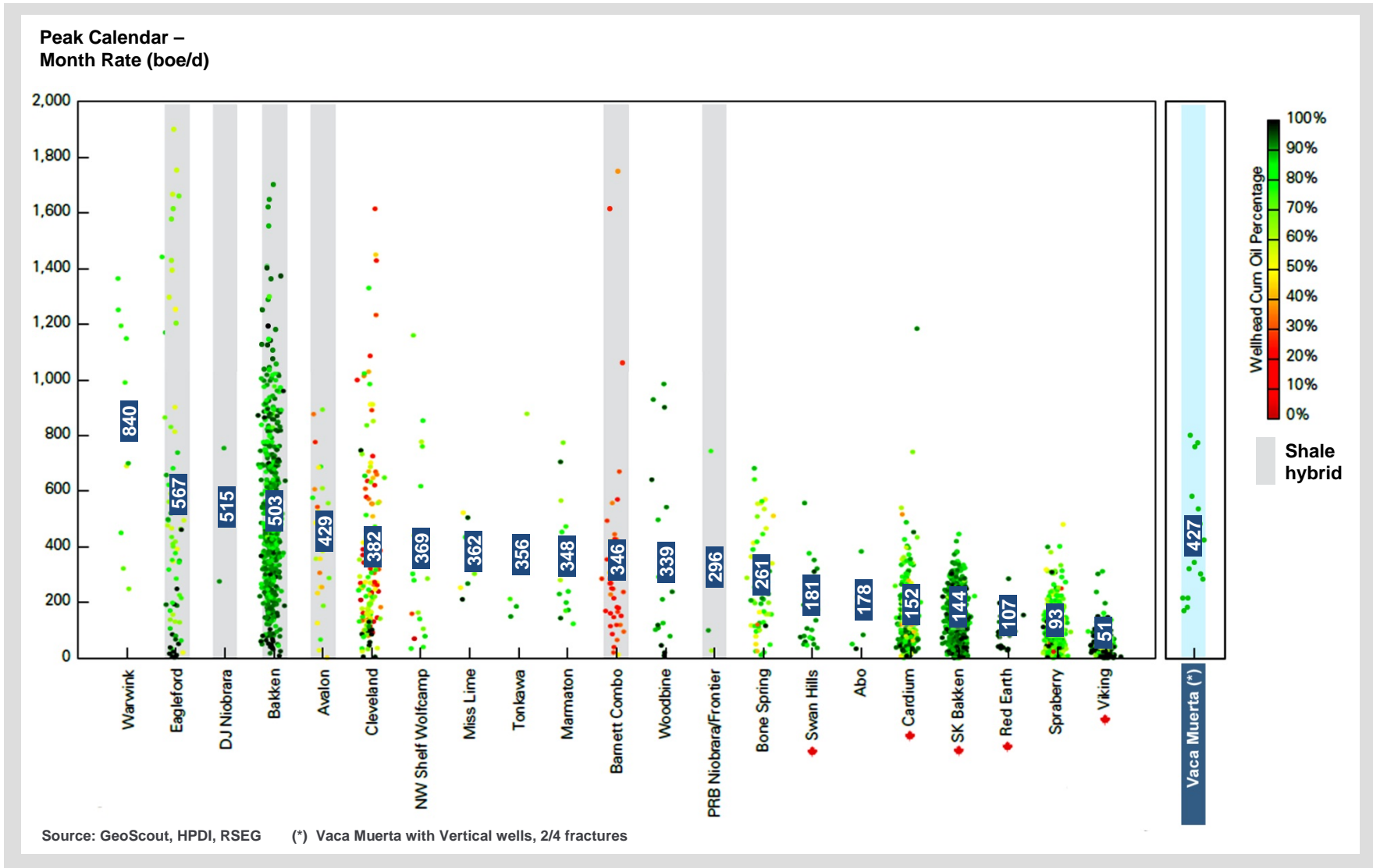
Source: YPF

# The comparison with Shale Plays in the USA shows Vaca Muerta to have very good properties

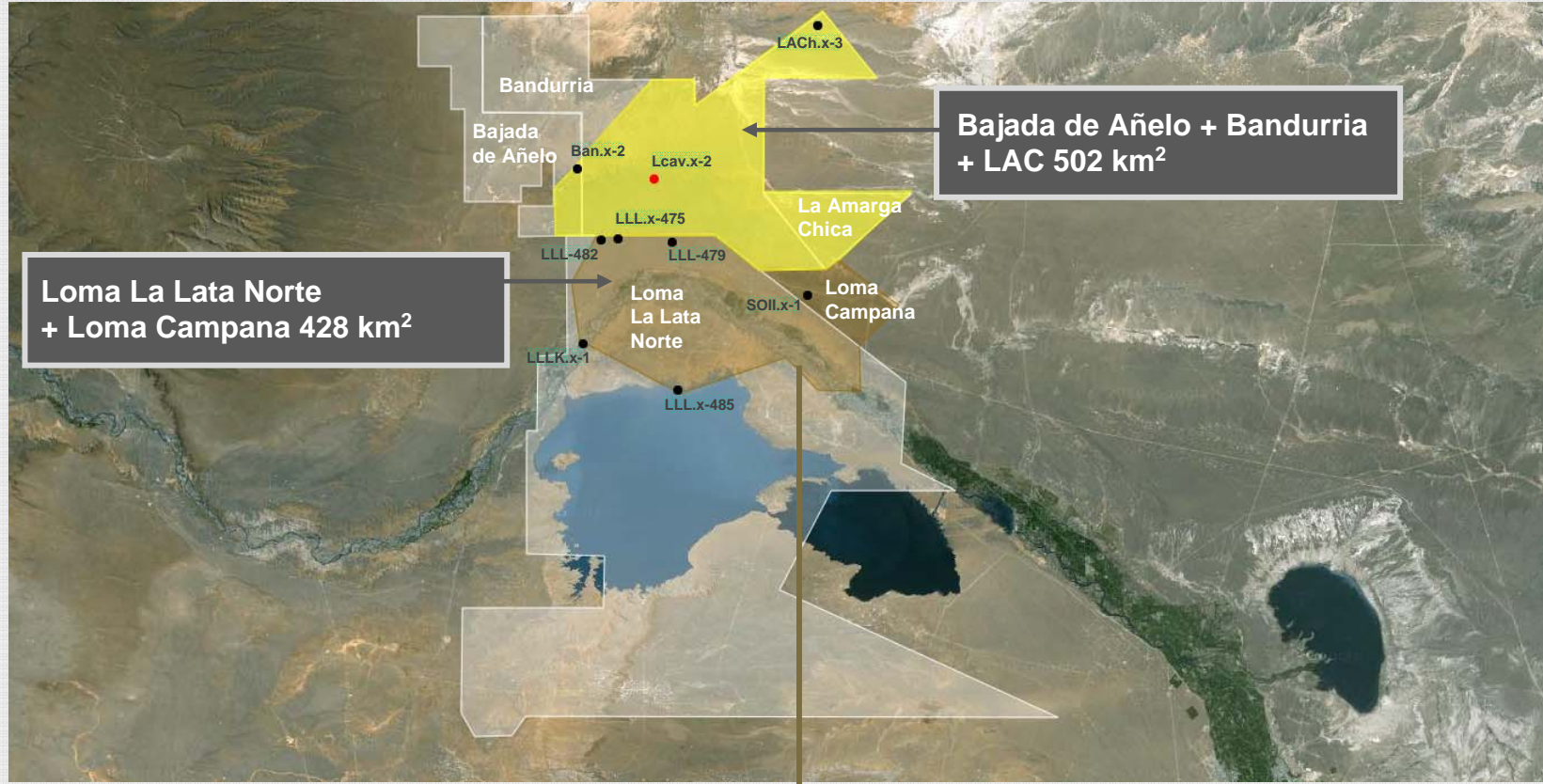


Vaca Muerta: High Quality Crude in over pressured conditions, and with high thickness

# Calendar Moth Initial Production rates for individual wells (drilled post-Jan 1, 2009 and 6:1 gas/oil ratio)



# Resources – 930km<sup>2</sup> (428km<sup>2</sup> + 502km<sup>2</sup>)



**Loma La Lata Norte + Loma Campana 428 km<sup>2</sup>**

**Bajada de Añelo + Bandurria + LAC 502 km<sup>2</sup>**

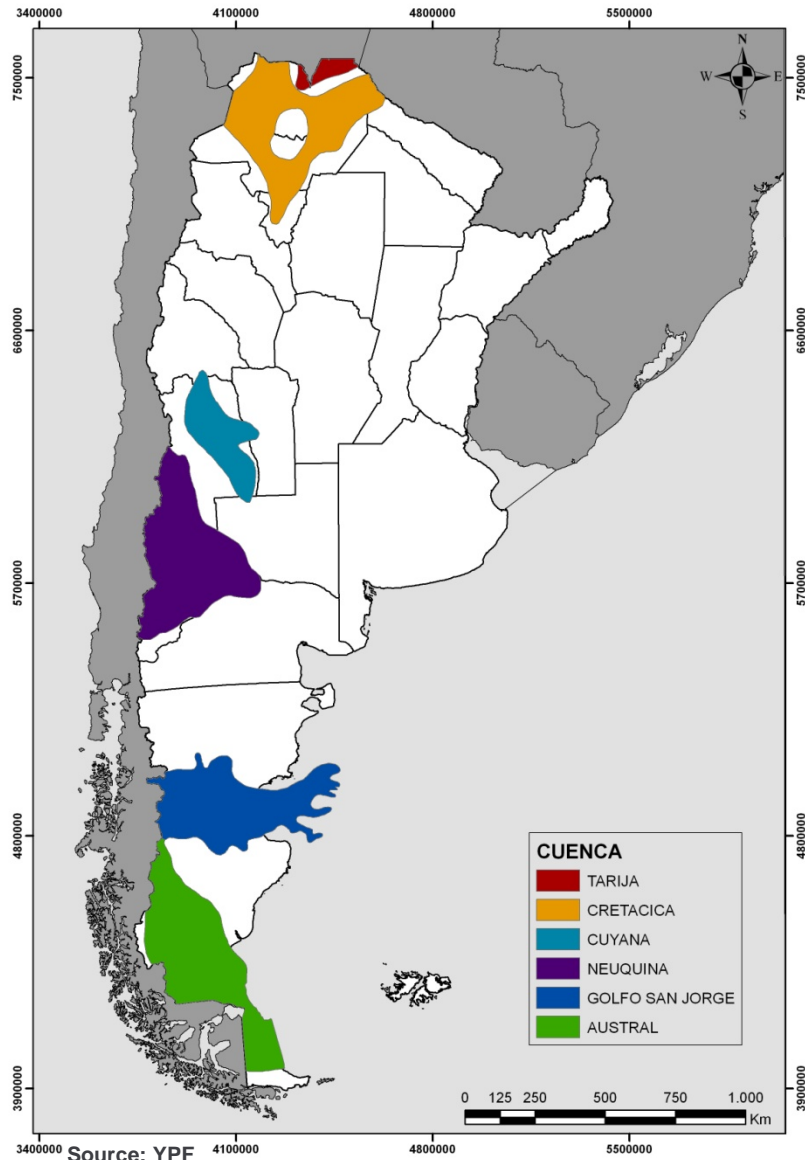
	Gross				Net			
	Surface (km <sup>2</sup> )	Oil (Mbbbls)	Gas (BCF)	BOE (Mboe)	Surface (km <sup>2</sup> )	Oil (Mbbbls)	Gas (BCF)	BOE (Mboe)
<b>Loma La Lata Norte + Loma Campana</b>	<b>428</b>	<b>741</b>	<b>1040</b>	<b>927</b>	<b>428</b>	<b>741</b>	<b>1040</b>	<b>927</b>

Source: YPF

# YPF Shale & Tight Exploration Plan in Argentina

## Vaca Muerta is just the first step...

YPF



### Shale and Tight Portfolio

#### Neuquina

- Fm Vaca Muerta
- Fm Los Molles
- Fm Agrio
- Fm Lajas (tight)
- Quintuco (tight)
- Mulichinco (tight)

#### Cuyana

- Fm Cacheuta
- Fm Potrerillos

#### Golfo San Jorge

- Fm Pozo D-129
- Neocomiano

#### Austral

- Fm Inoceramus

#### Chaco Paranense

- Devonico
- Permico

## Conclusion

The discovery of shale oil & gas in the USA has started a new cycle in the oil & gas industry and is changing the scenario for exploration activity in many countries throughout the world.

In Argentina, the discovery of Vaca Muerta shale and the data from the 27 vertical wells drilled till now, indicate that this shale has excellent Properties compared to USA plays on production.

The results obtained to date confirm independent reports, which present Argentina as having great potential for shale Oil and gas and should allow Argentina to successfully repeat US Shale Gas and Oil experience.

# Conclusion

**YPF**

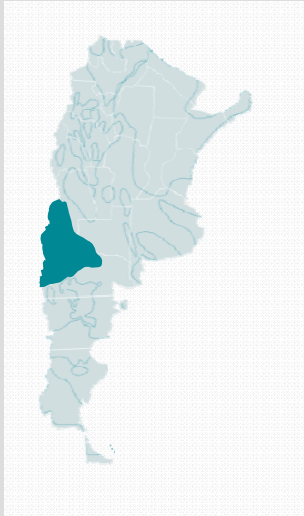
**In Argentina, YPF is pioneer in unconventional oil exploration and development with the discovery of the Vaca Muerta Shale Oil Play**

**Results to date show the potential of 927 Mboe for high quality crude oil resource development in an area of 428 km<sup>2</sup> (105,000 acres) in Loma Campana and the North of Loma La Lata Blocks and extra 502 km<sup>2</sup> extension to the north with resources under estimation.**

**Based upon exploration activity undertaken by YPF, its partners and other companies in the Neuquen basin, the true potential of the Vaca Muerta Shale Oil & Gas Plays should be revealed within the next 18 months.**

**In the next 4 years YPF will explore the rest of tight and shale opportunities in Argentina and we will discover if we should replicate the “USA shale and tight model”.**

# Neuquen - Argentina



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