

SHALE OIL AND GAS

**ABA International Section Fall Meeting in
Buenos Aires, Argentina**

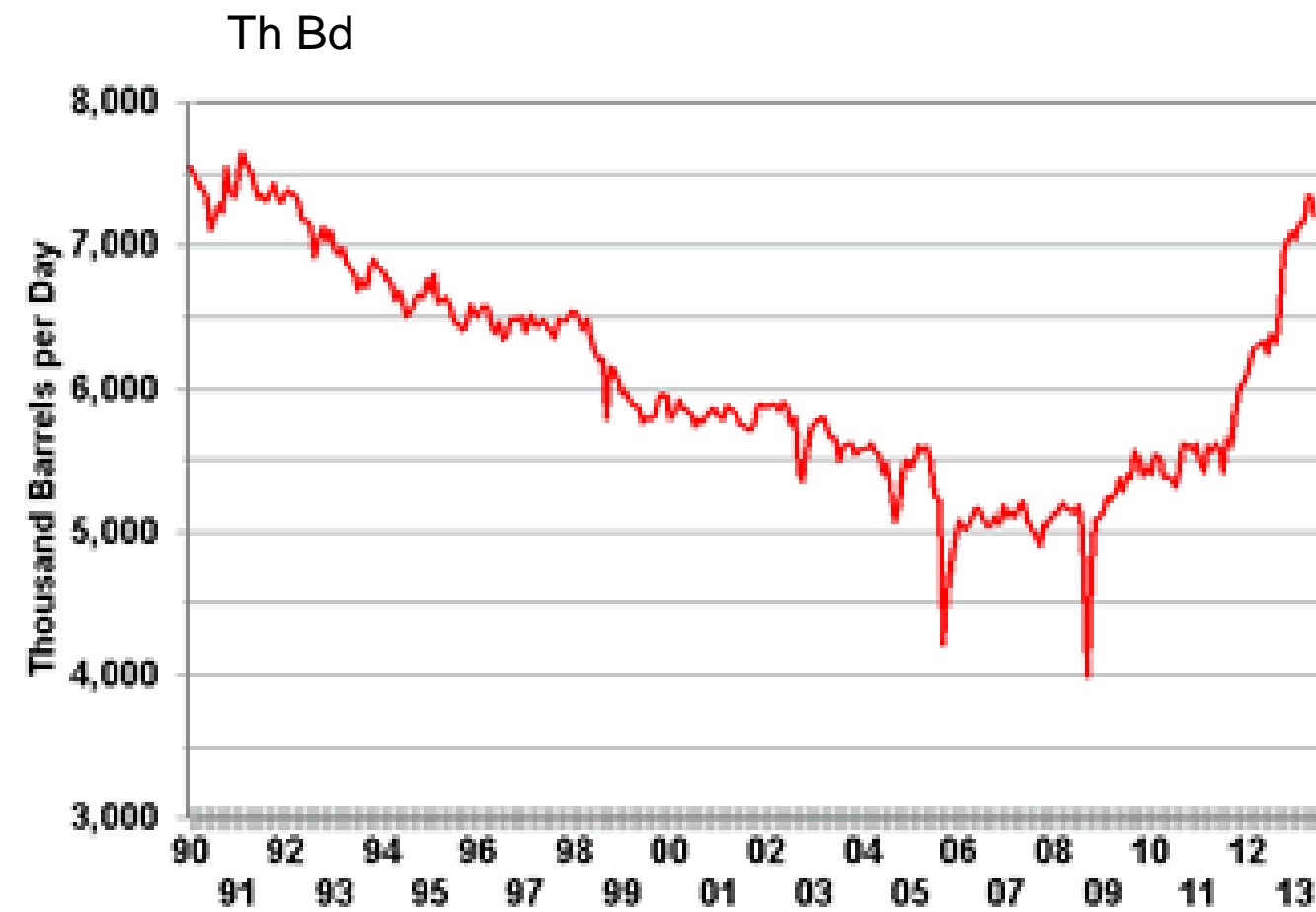
October 22, 2014



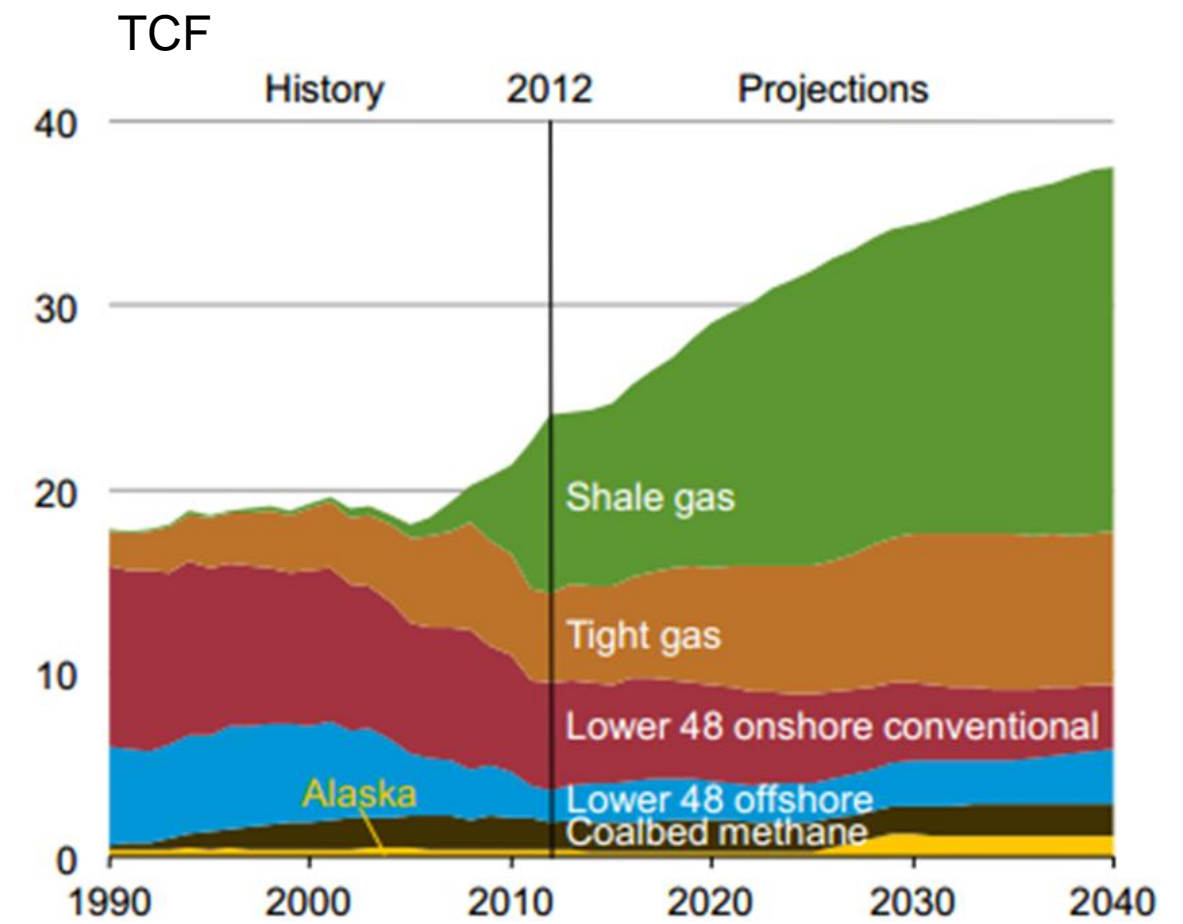
Ricardo W. Beller

IMPACT OF UNCONVENTIONAL HC IN THE US

Oil

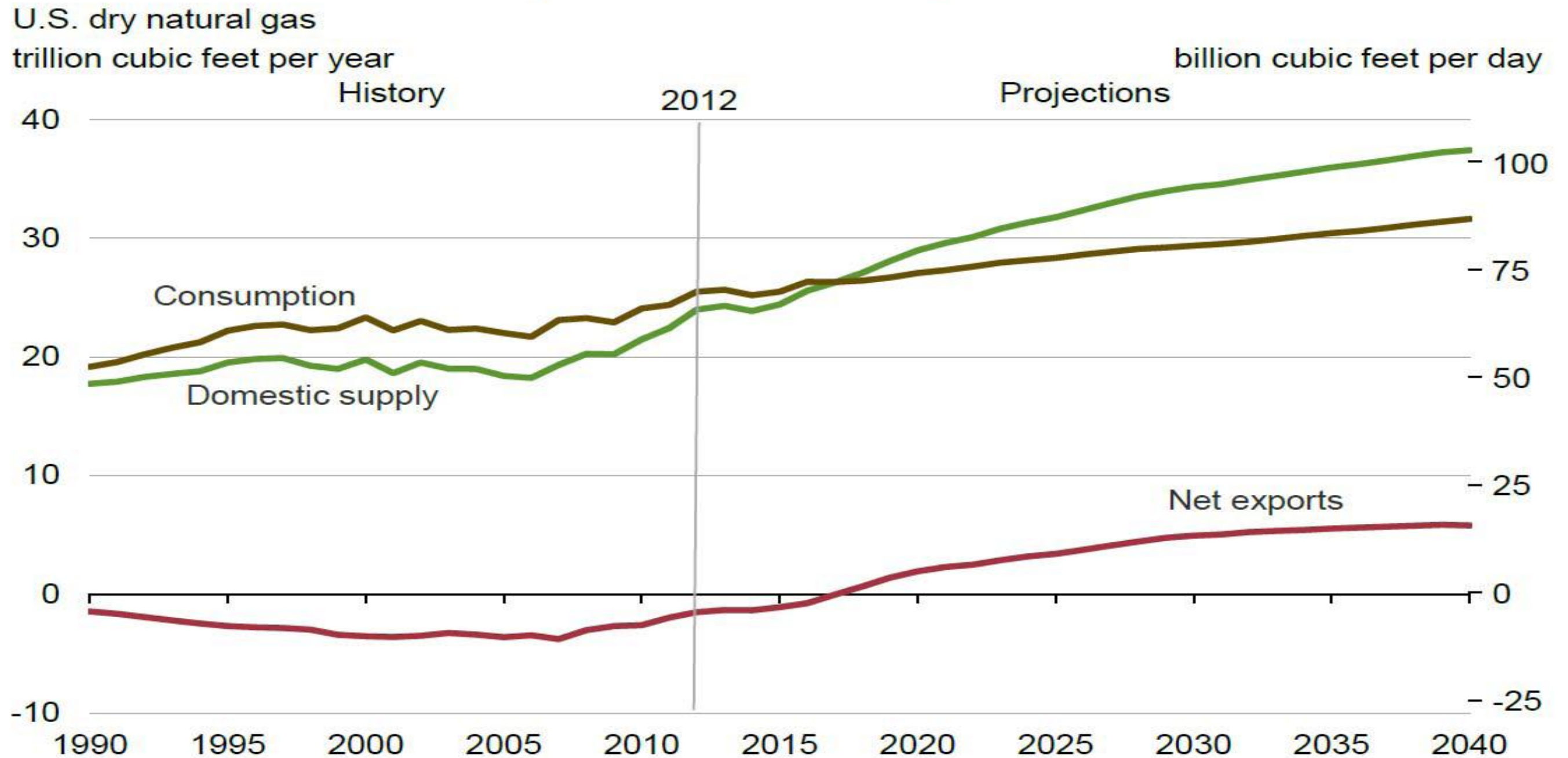


Natural Gas



USA GAS PRODUCTION AND IMPORTS

U.S. becomes a net exporter of natural gas in the near future



Source: EIA, Annual Energy Outlook 2014 Early Release

GLOBAL SHALE OIL AND SHALE GAS RESOURCES

Top ten countries with technically recoverable shale resources

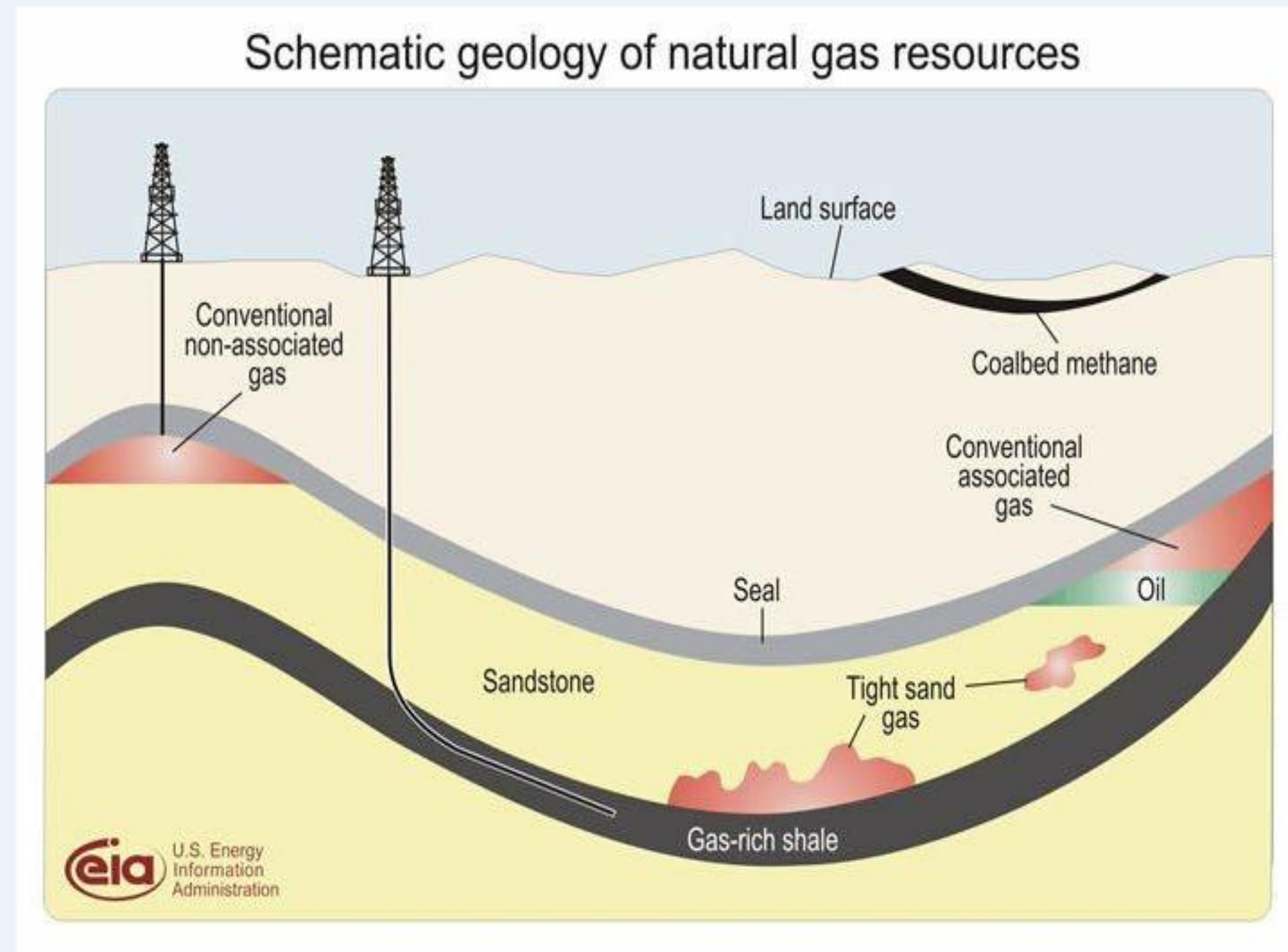
Shale oil		
rank	country	billion barrels
1	Russia	75
2	United States	58
3	China	32
4	Argentina	27
5	Libya	26
6	Venezuela	13
7	Mexico	13
8	Pakistan	9
9	Canada	9
10	Indonesia	8
World total		345

Shale gas		
rank	country	trillion cubic feet
1	China	1,115
2	Argentina	802
3	Algeria	707
4	United States	665
5	Canada	573
6	Mexico	545
7	Australia	437
8	South Africa	390
9	Russia	285
10	Brazil	245
World total		7,299

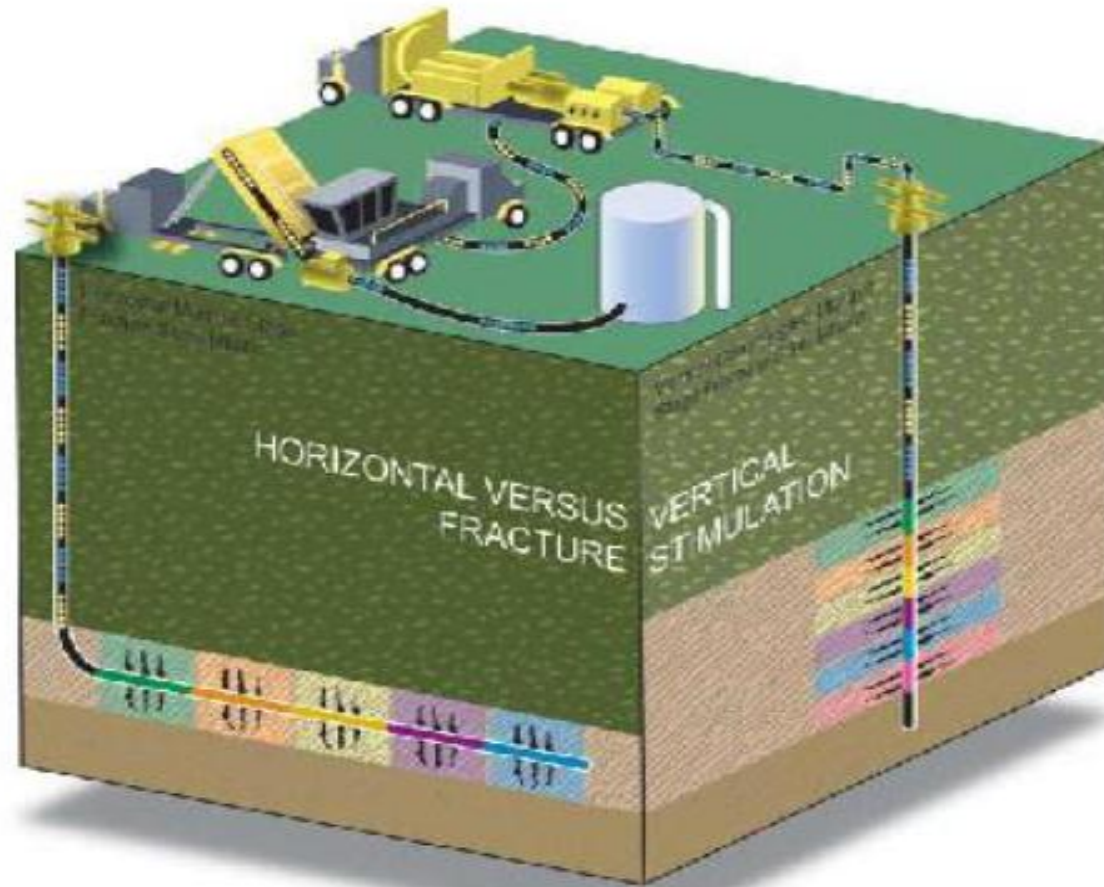
Note: ARI estimates U.S. shale oil resources at 48 billion barrels and U.S. shale gas resources at 1,161 trillion cubic feet.

Source: United States: EIA and USGS; Other basins: ARI.

Unconventional Hydrocarbons Defined



DEVELOPMENT OF UNCONVENTIONAL PLAYS

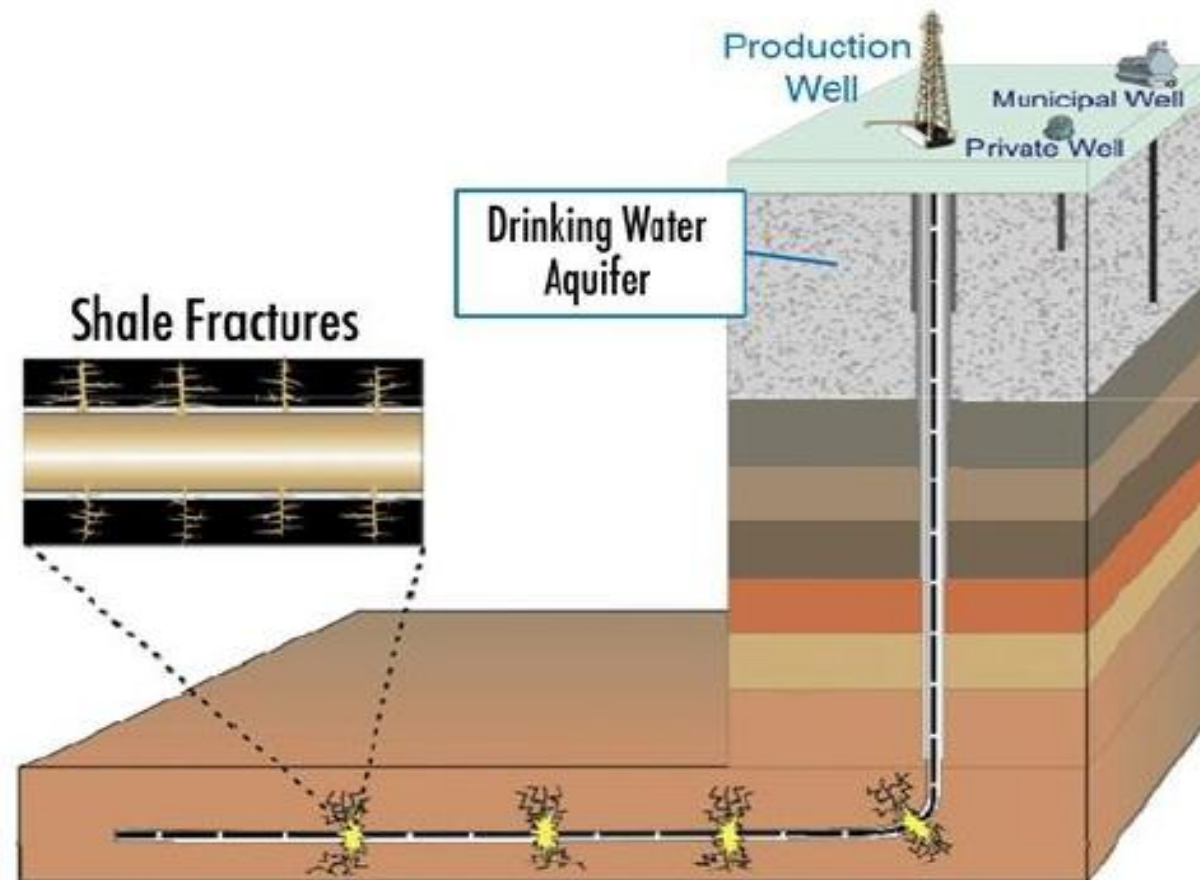


jahschem.wikispaces.com/Marcellus+Shale

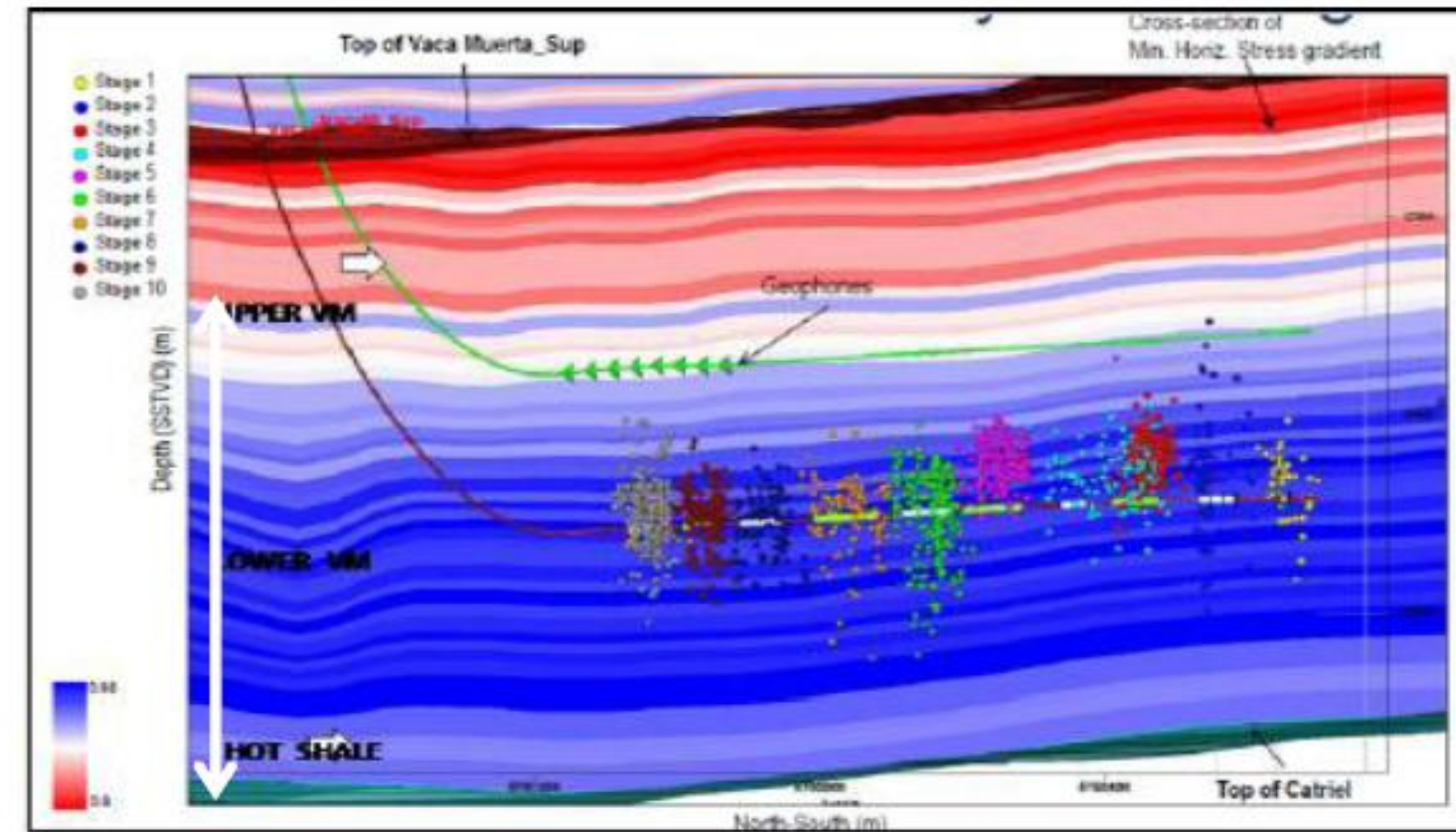


- Low productivity means thousand of wells, mostly horizontal
- Clusters developed to reduce impact
- Unconventional resources need unconventional drilling

DEVELOPMENT OF UNCONVENTIONAL PLAYS



Source: EPA



SPE 164537

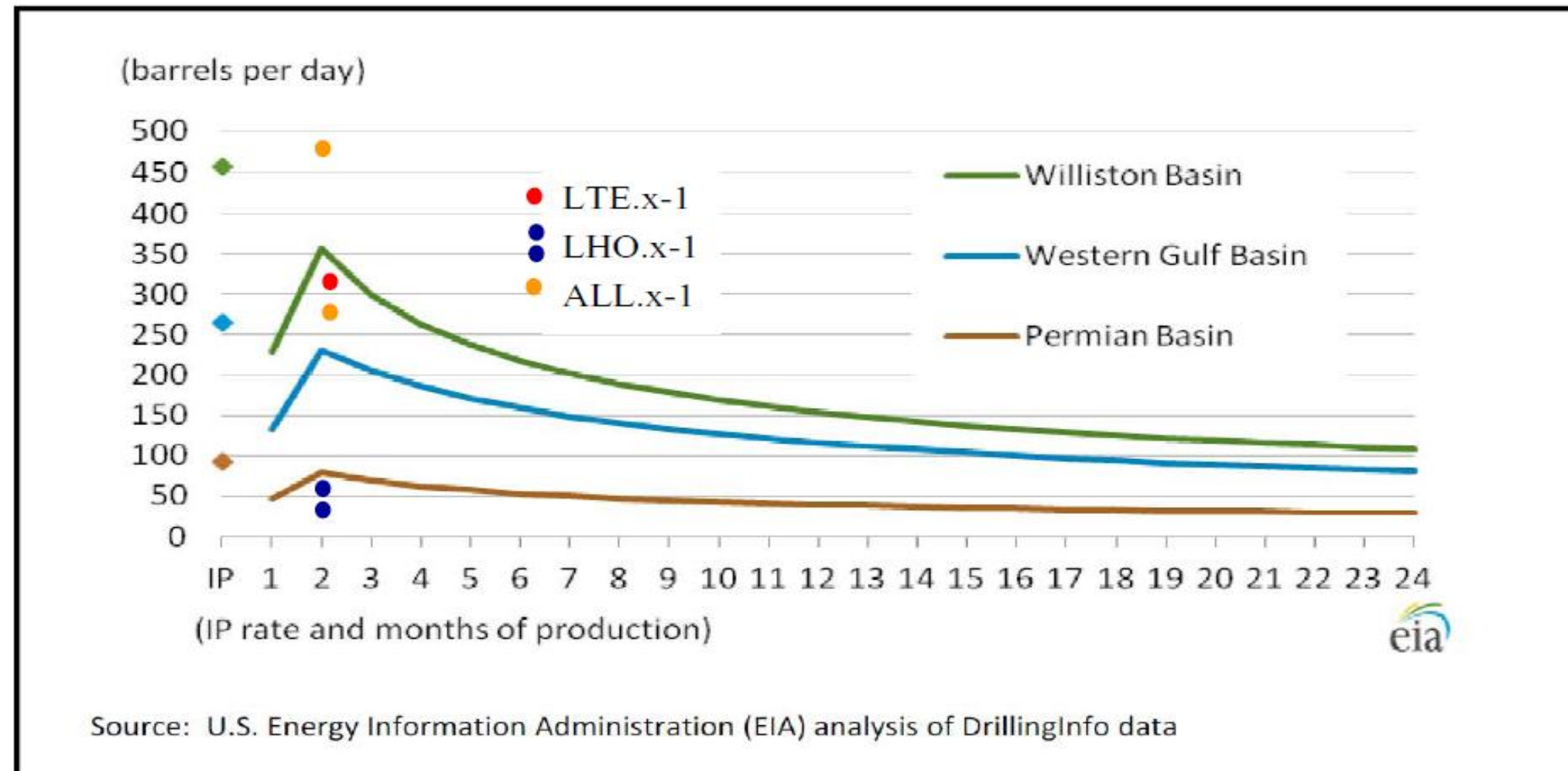
- Fractures are performed in several stages (5-20)
- Fractures are confined to well vicinity (10-50 m)
- There are technologies to map -real time- fracture extension

DEVELOPMENT OF UNCONVENTIONAL PLAYS



- Hydraulic fracturing is the key technology
- Very well known, applied in Argentina for +50 yrs
- Unconventional fracking means huge, complex operations

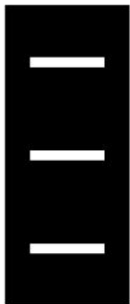
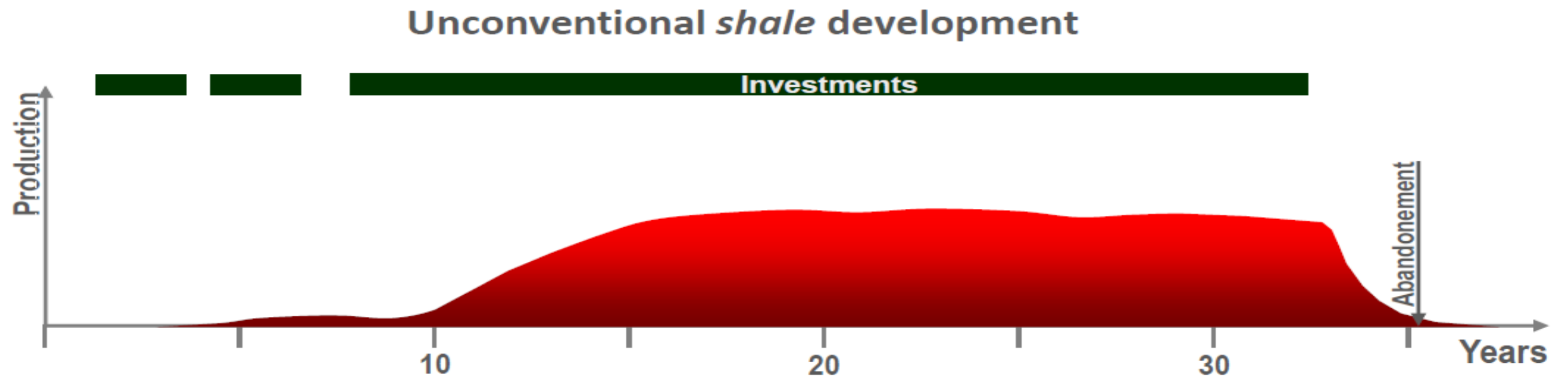
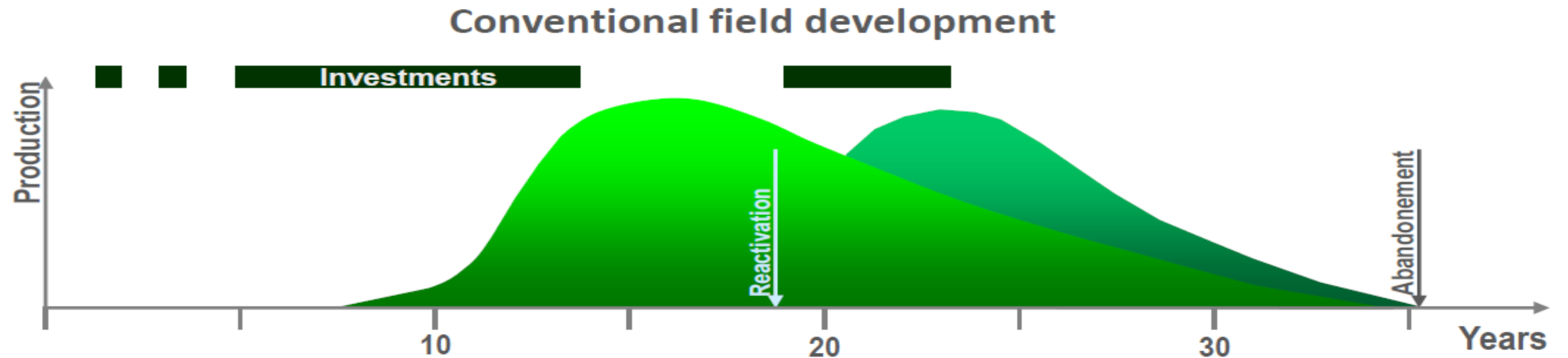
SHALE OIL & GAS PRODUCTION



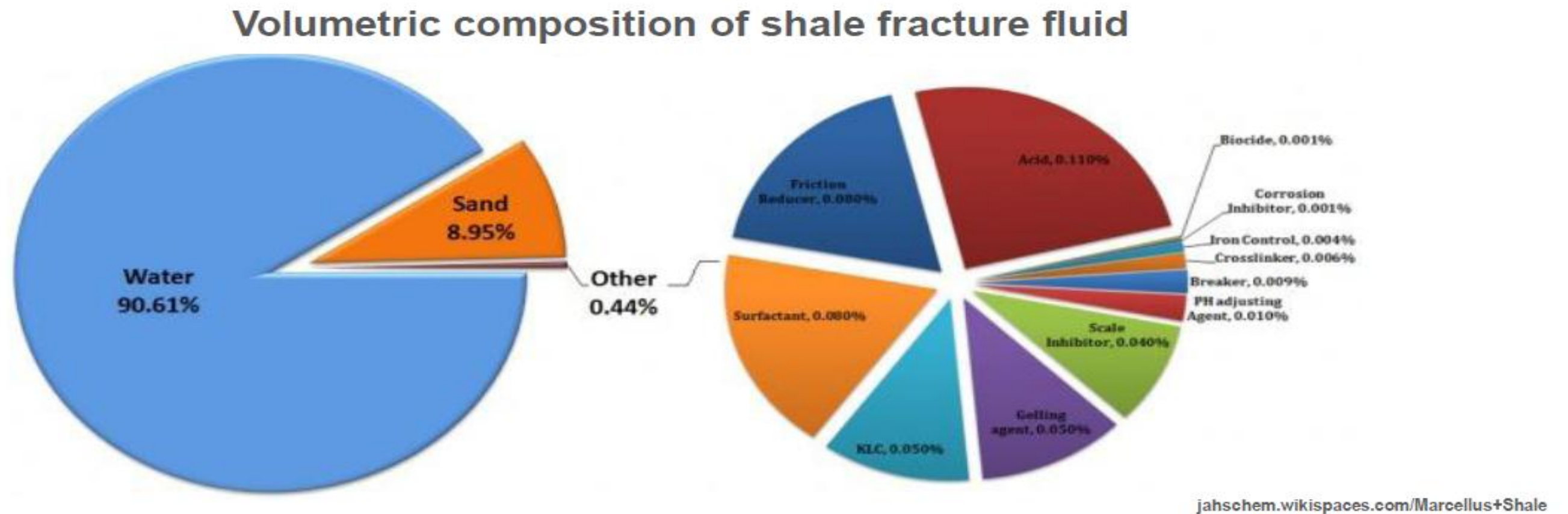
- Strong correlation between initial production and final recovery
- High initial declination rate, ~ 75% in the first year typical
- 30+ Yr life, but 40% of cumulative production in the first 5.

DEVELOPMENT OF UNCONVENTIONAL PLAYS

Projects structure

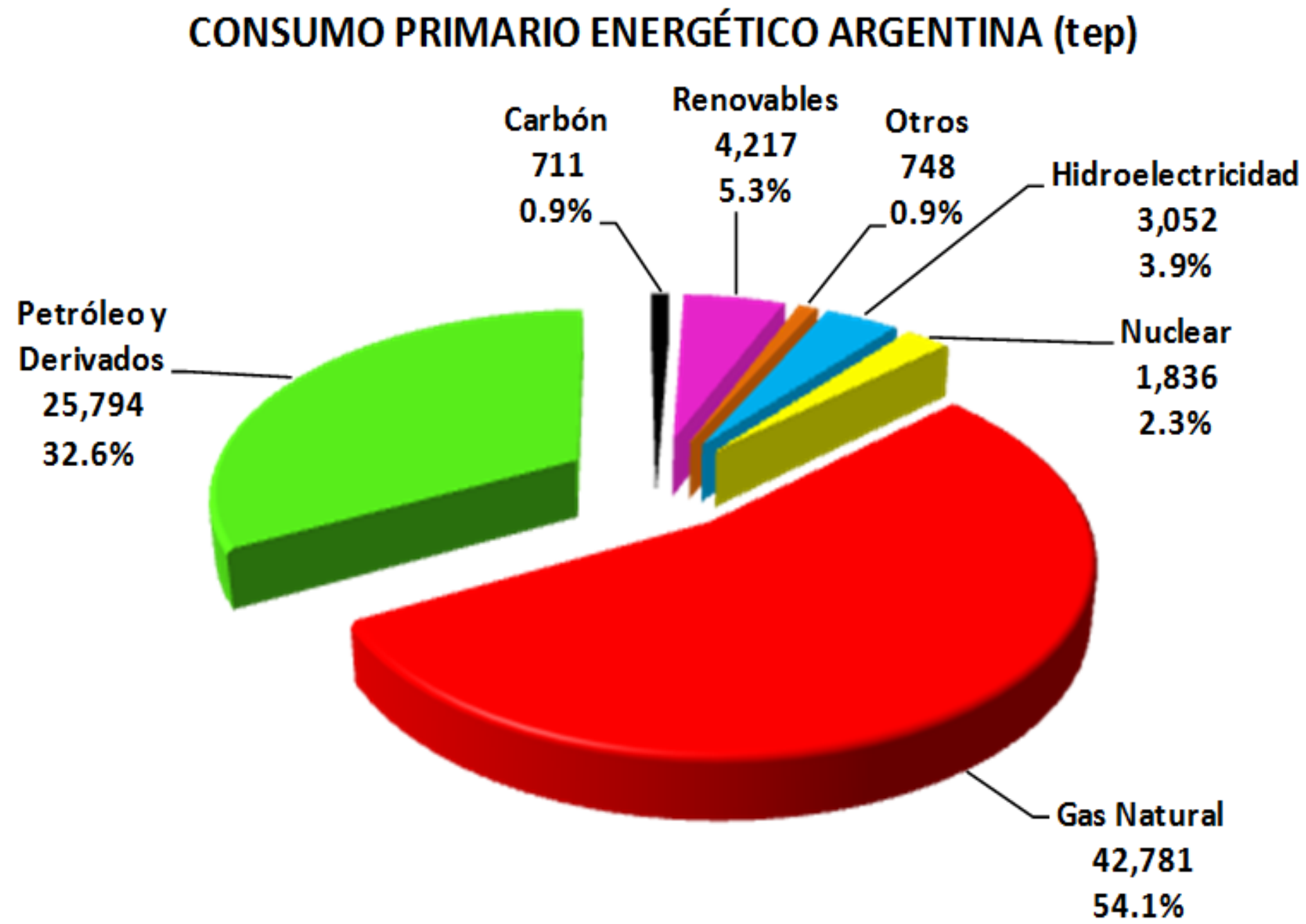


DEVELOPMENT OF UNCONVENTIONAL PLAYS



- Huge amounts of water required (5-15 Mm³ per well)
- Small quantities of chemicals, unharmed
- Usually ~30% of fluid returns to surface to be disposed

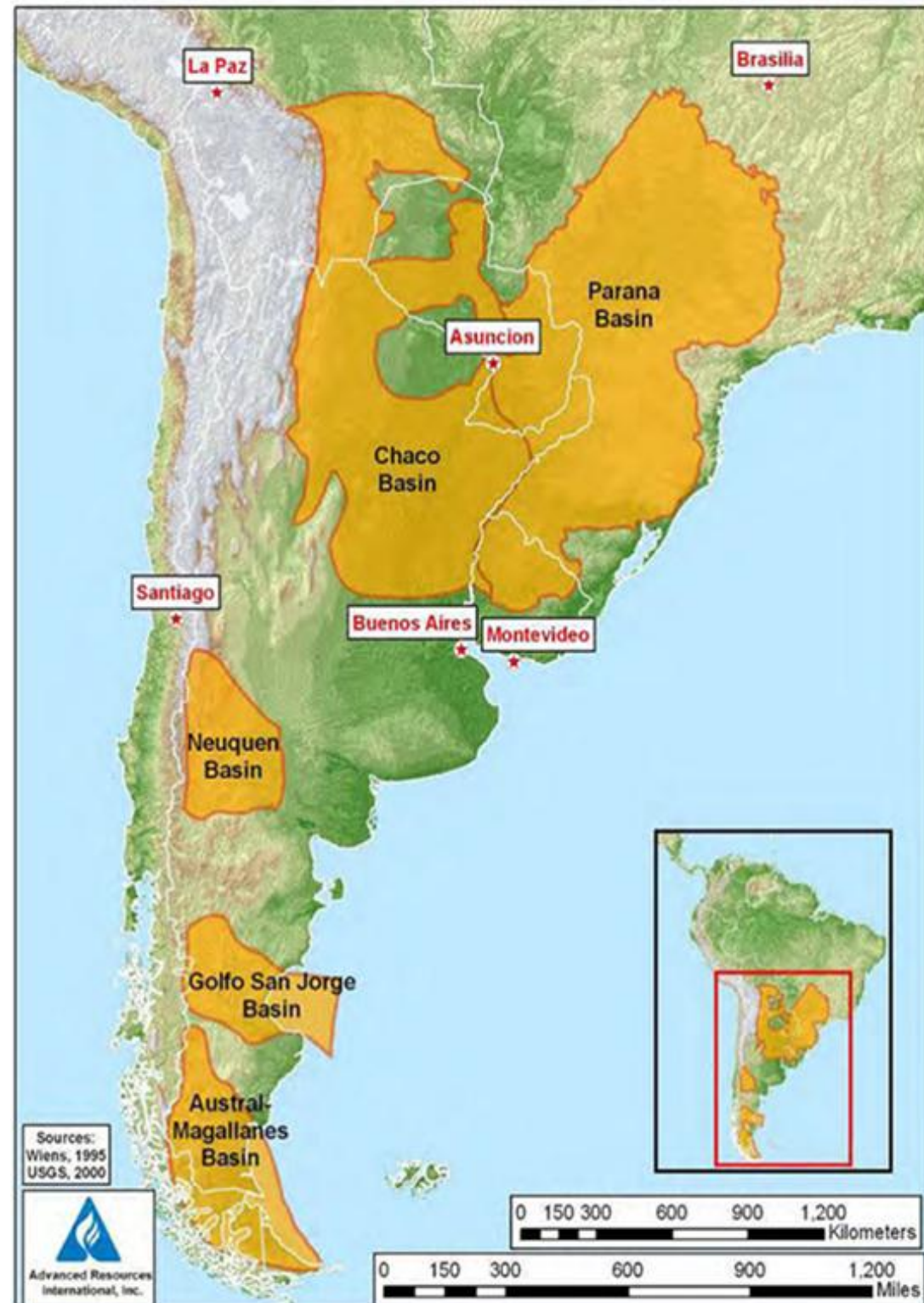
Argentine Energy Matrix



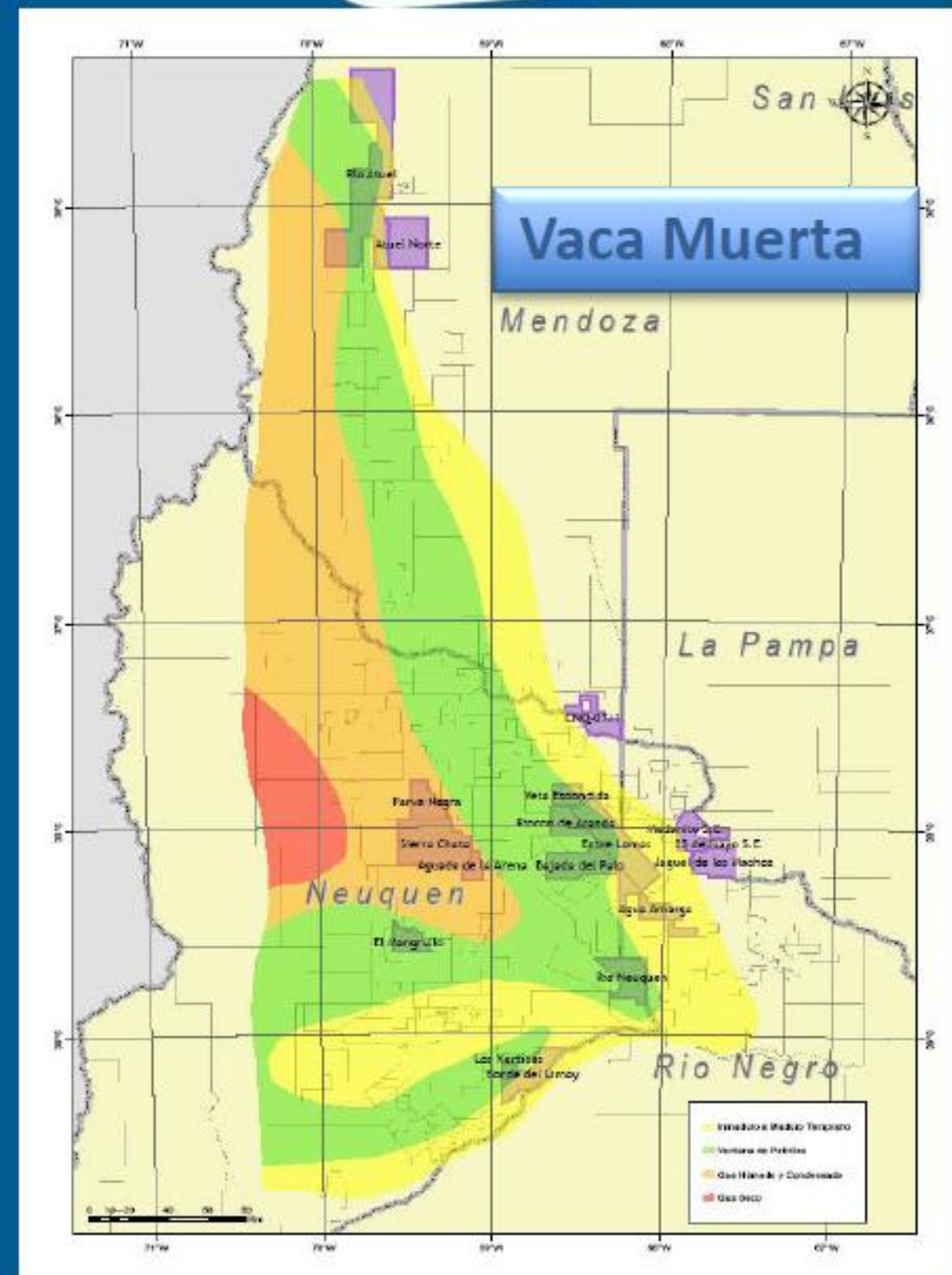
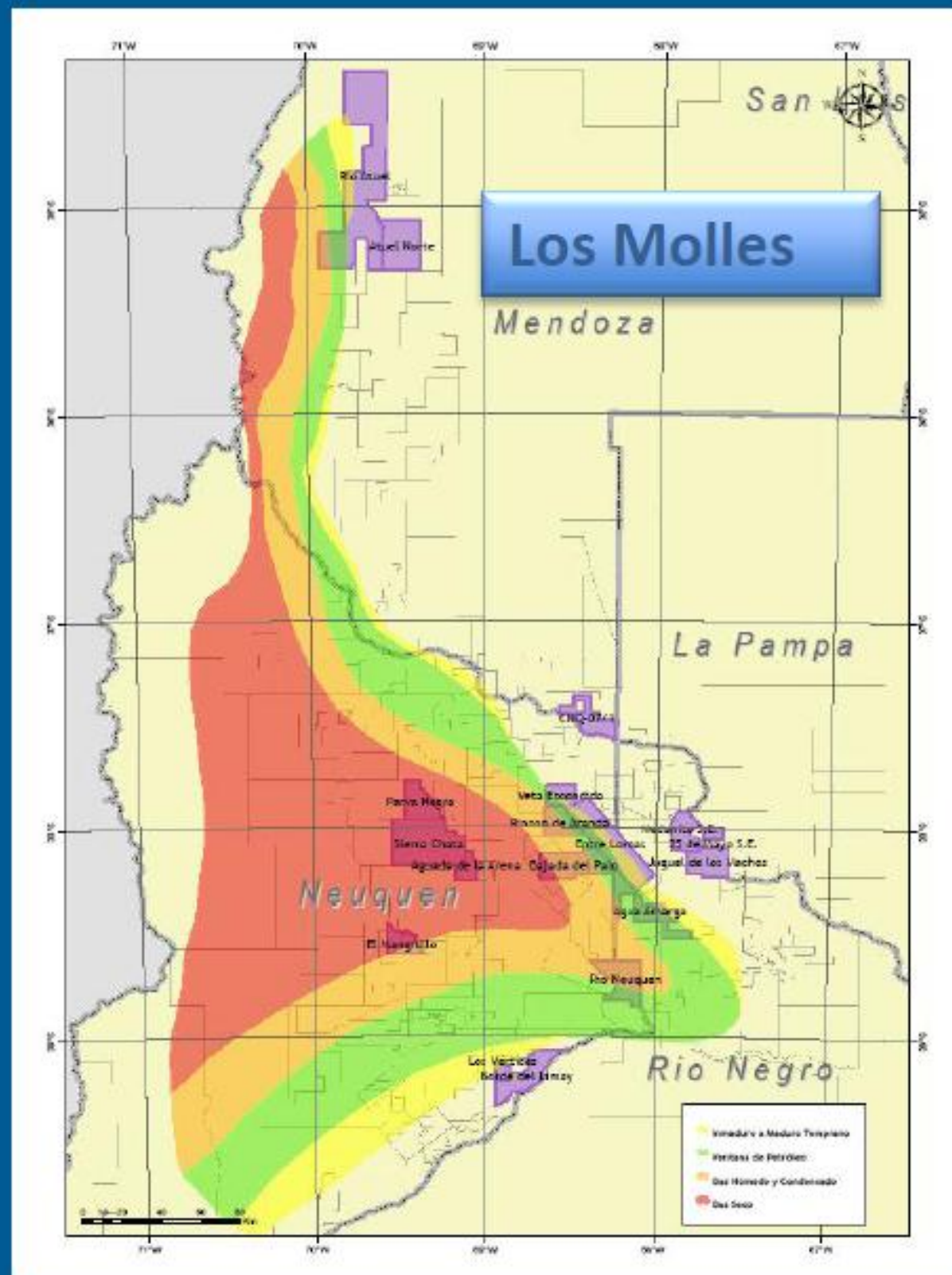
ARGENTINA SEDIMENTARY BASINS



Unconventional Resources

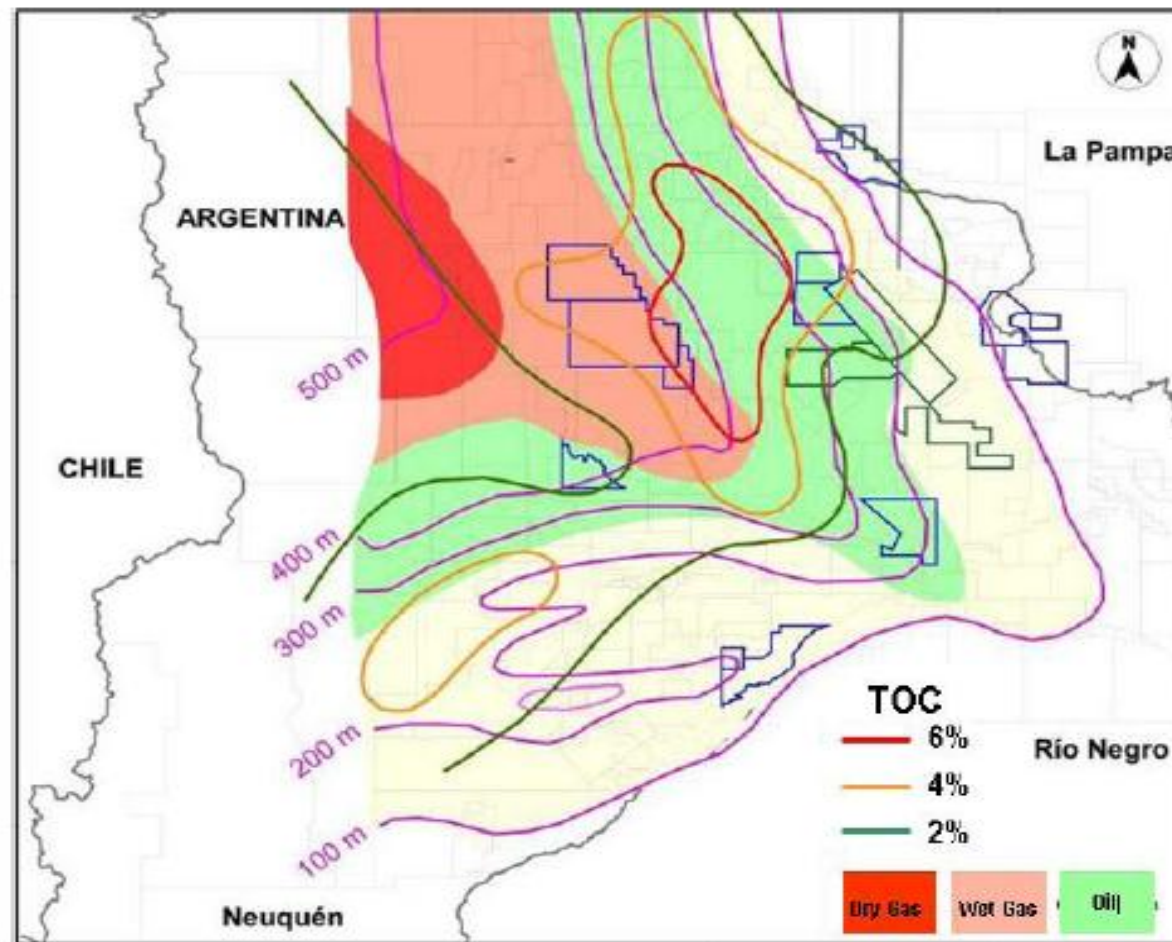


- 802 TCF
- Neuquena Basin: Vaca Muerta and Los Molles plays
- Production (est. March 2014):
 - Tight sands (2006): 10Mm³/d
 - Shale gas (2011): 0.8Mm³/d

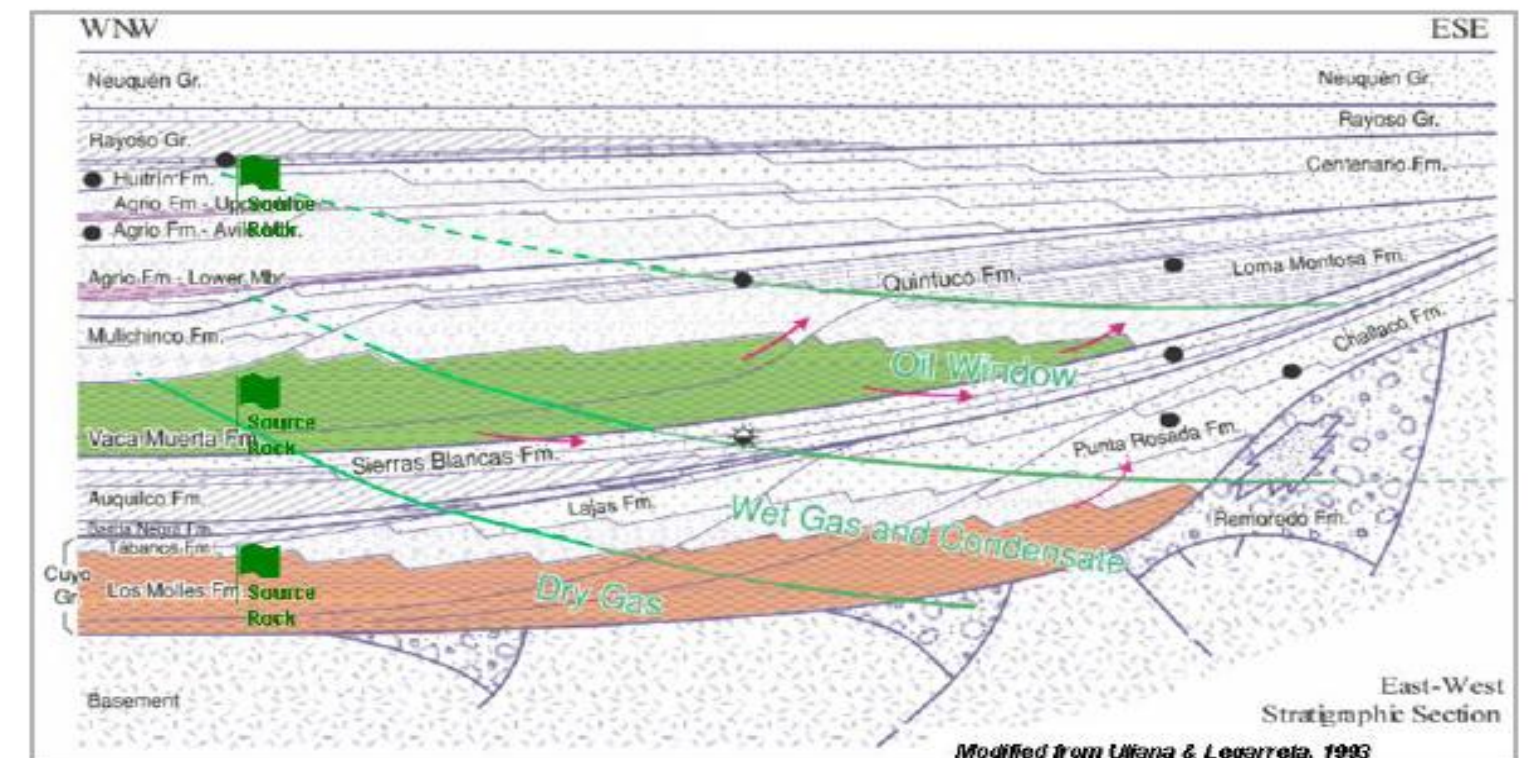


CHARACTERIZING THE UNCONVENTIONAL

Vaca Muerta, our most important shale play

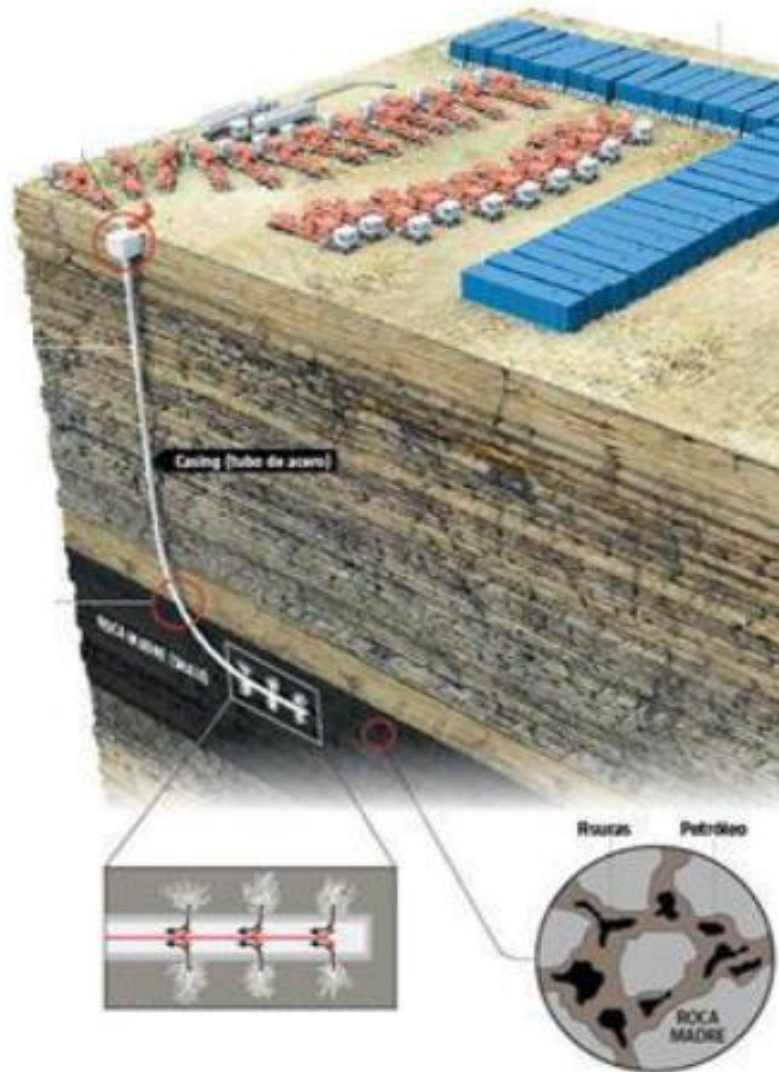


- Extension and properties compare favorably with most world class plays
- Accessibility and infrastructure
- Availability of water



UNCONVENTIONAL PLAYS IN ARGENTINA

Vaca Muerta, the promise of shales



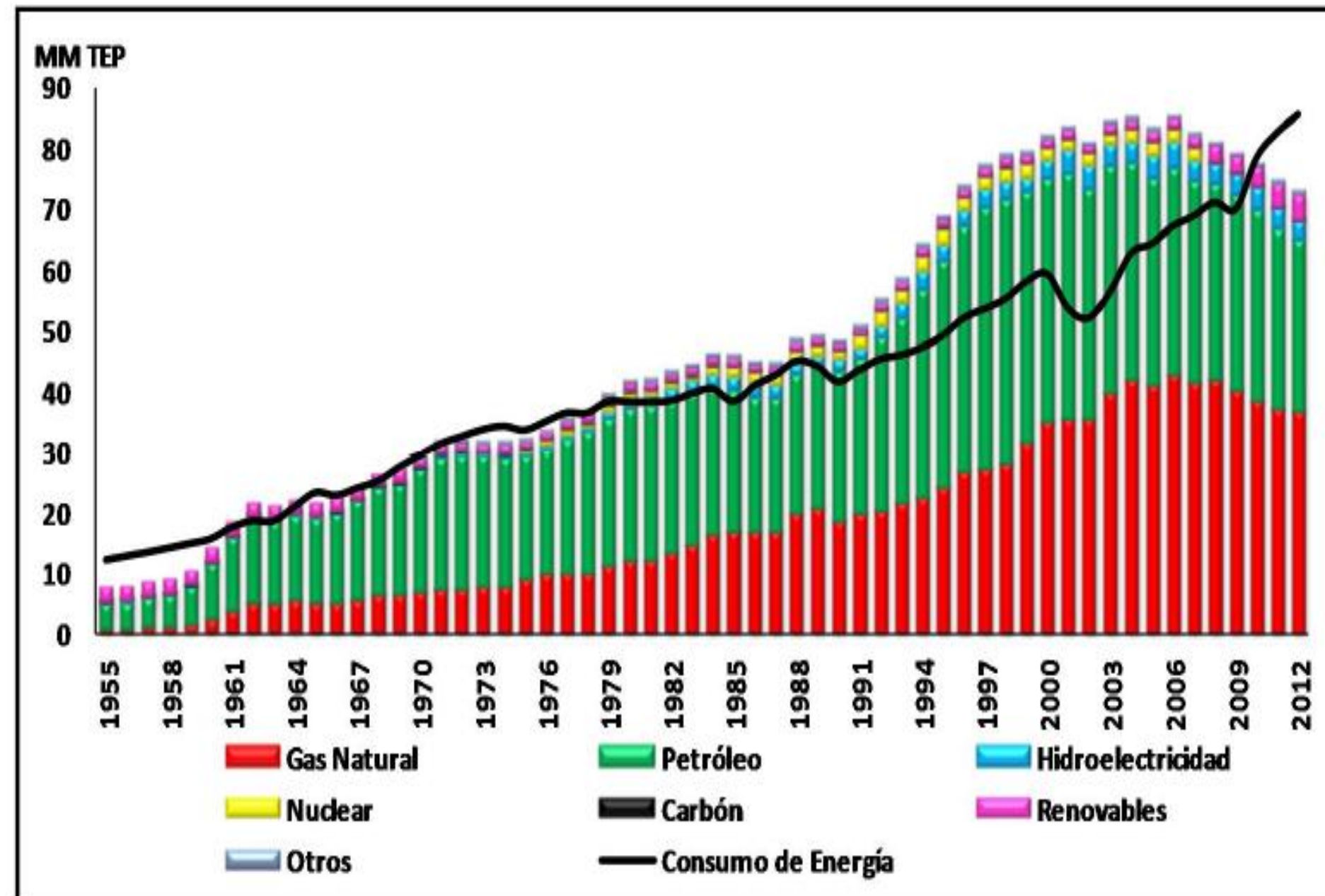
- Oil and gas deposits remaining within source rock (*shales*)
- Present in every basin, but not always accessible
- Fine grained rocks, high organic content, "nano" permeabilities
- No fluid contacts
- Usually over pressurized
- Proved, available technologies
- Competitiveness to be proved
- Currently ~ 20000 boed

Argentine Energy Crisis

- Sovereign Debt Default – No Access to International Financing
- “Pesification”
- Freezing of Tariffs
- Lower Reserves and Production
- Oil and Gas Export Tax
- Increase of Regulations and Government Intervention
- Inflation
- International Trade Balance Deficit
- Foreign Exchange Restrictions – Cepo
- Nationalization of YPF (Repsol)



Argentine Energy Supply and Demand



VACA MUERTA - CHALLENGES

- Argentina may not be prepared for such a big enterprise.
 - Access to long-term financing at a competitive rate
 - Need to restore Institutions and Rule of Law
 - Fiscal and Economic Stability
 - Development of Infrastructure to reduce cost
 - Development of Entrepreneurial and Managerial Capacity
 - Need of Qualified Engineers and Technicians
 - Cooperation of Labor Unions
 - Increase of Service and Equipment Providers
- Competition from other attractive countries (Brazil, Mexico, Colombia, among others).



VACA MUERTA - PROS

- Extension and geological properties are very favorable.
- Knowledge. Drilled for at least 50 years.
- Water available for fracking.
- Area unpopulated and not used for agricultural production.
- Existing Infrastructure is currently underutilized.
- Positive experiences of the USA contribute to learning curve.
- Large number of vertical exploratory wells, plus a few horizontals.
- Main player YPF, but not alone. Chevron, Petrobras, Total, Shell, ExxonMobil, Pluspetrol, Wintershall, Pan American Energy, Americas Petrogas, Tecpetrol, among others, also present.



DEVELOPMENT OF UNCONVENTIONAL PLAYS



La Guía Petrolera, March 6th, 2014

- +20 drilling rigs currently in activity in Vaca Muerta
- ~ 450 wells drilled, ~ 250 producing oil and gas, +20000 boe/d
- YPF well ahead walking the learning curve

¡Thank-you!

Ricardo W. Beller

Av. Leandro N. Alem 928

C1001AAR Buenos Aires - Argentina

Tel: (54-11) 4310-0100 / Fax: (54-11) 4310-0200

e-mail: rwb@marval.com.ar

www.marval.com

