

Vaca Muerta: “Getting Ready for Full Development”

May 2018



Energía que evoluciona

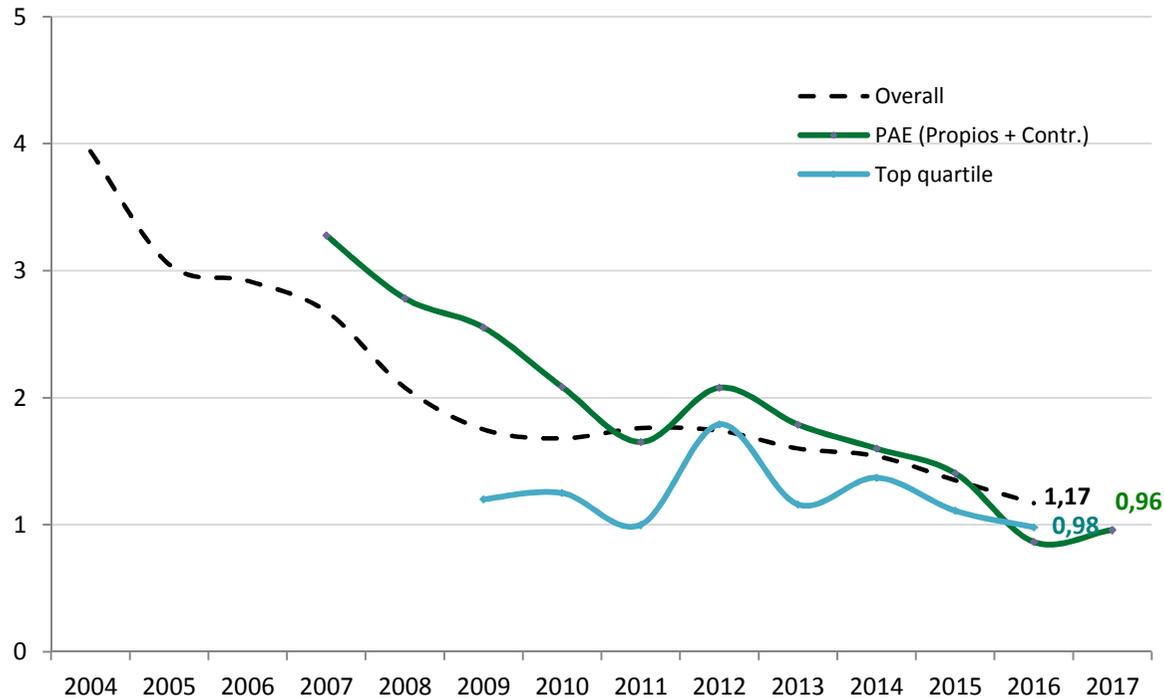
Agenda

Vaca Muerta: “Getting Ready for Full Development”

1. Who we are?
2. What we are doing?
3. How we are doing it?
4. Future Challenges

TRICF PAE vs IOGP

Total Recordable Incident Case Frequency – PAE
/Contractors
per million man hours worked

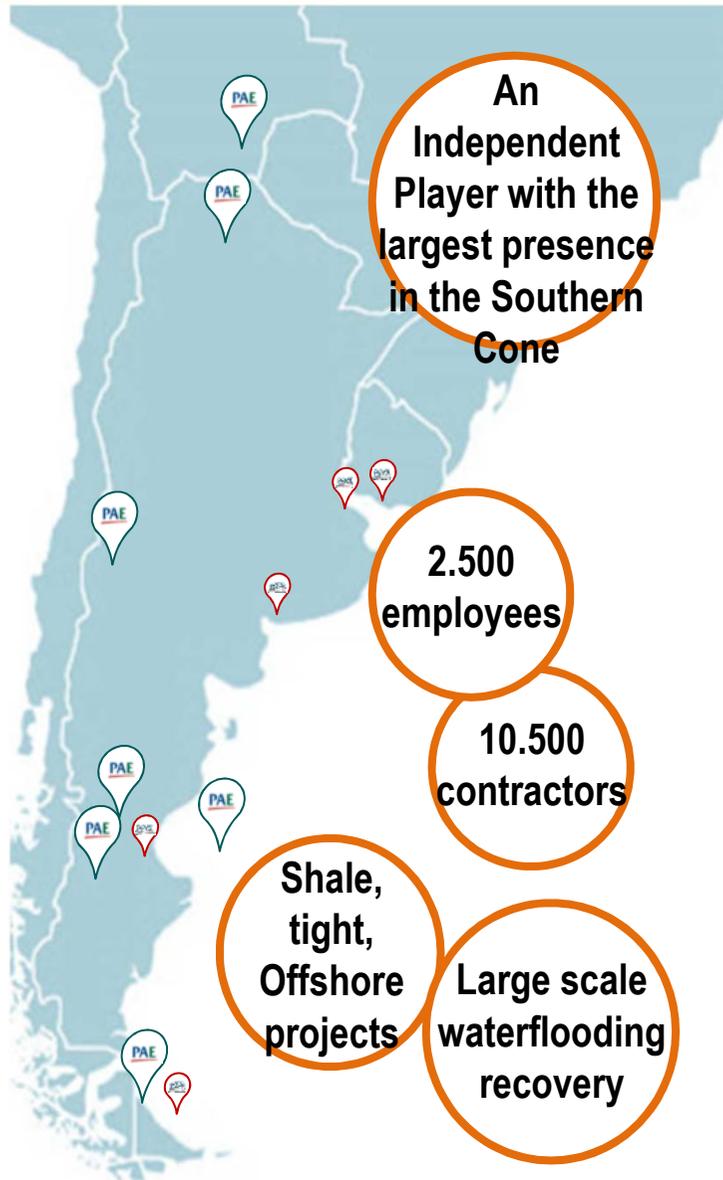


Año	IOGP		PAE	
	Top quartile	Promedio	x 200,000hh	x 1.000,000hh
2016	0,98	1,17	0,173	0,865
2015	1,11	1,35	0,281	1,41
2014	1,37	1,58	0,32	1,6
2013	1,16	1,64	0,358	1,79
2012	1,79	1,94	0,416	2,08
2011*	1,00	1,92	0,33	1,65
2010	1,25	1,68	0,417	2,08
2009	1,2	1,75	0,511	2,55
2008	N/A	2,08	0,556	2,78
2007	N/A	2,68	0,656	3,28

(*). Desde el año 2011 la medición de IOGP distingue entre compañías con < 50Mm HH de aquellas con > 50MM HH.

TRICF PAE al 31/12/2017: **0,192**
(0,96 por cada 1.000.000 de HH)

Who we are - An Upstream, Midstream & Downstream active player



Upstream

 **108 Mbd**
Oil production

 **23,6 MMmcd**
Natural gas production

 **1.562 MMbpe**
2017 Certified Proved Reserves (SEC)

 **786 MMbpe**
2017 Certified Probable & Possible Reserves (SEC)

 **18%** Argentina Market Share

 **70/30** oil to gas P1 + P2 reserves ratio

Midstream y transformation

 **3 Oil tanking**
terminals

 **Main Pipelines**
participation

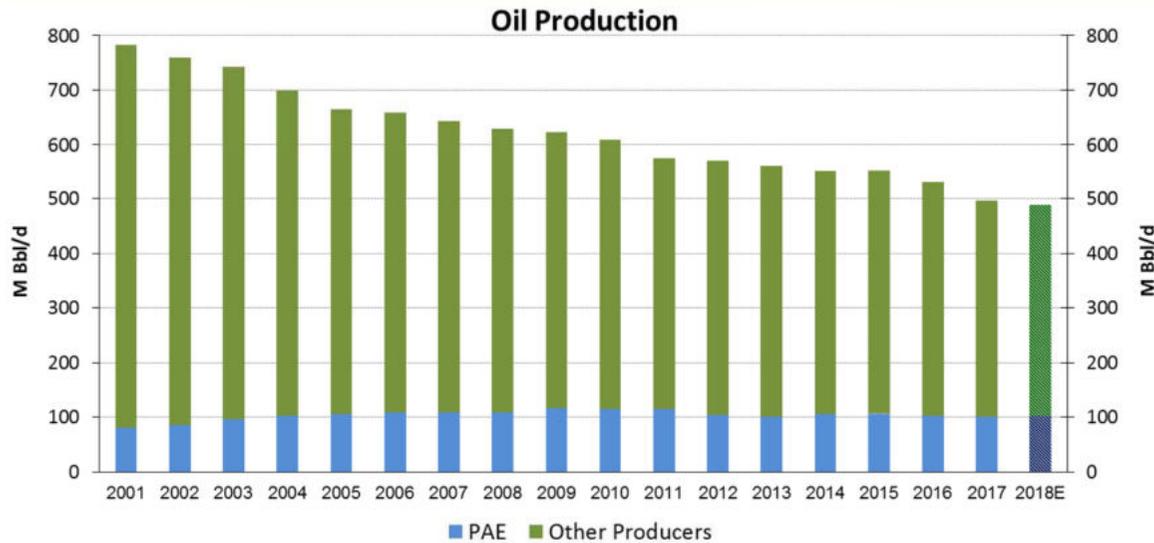
 **Power Generation**
Thermal & wind generation

Downstream

 **1 Crude Oil Refinery**
750 retail sites in Argentina, Uruguay & Paraguay

May, 2018

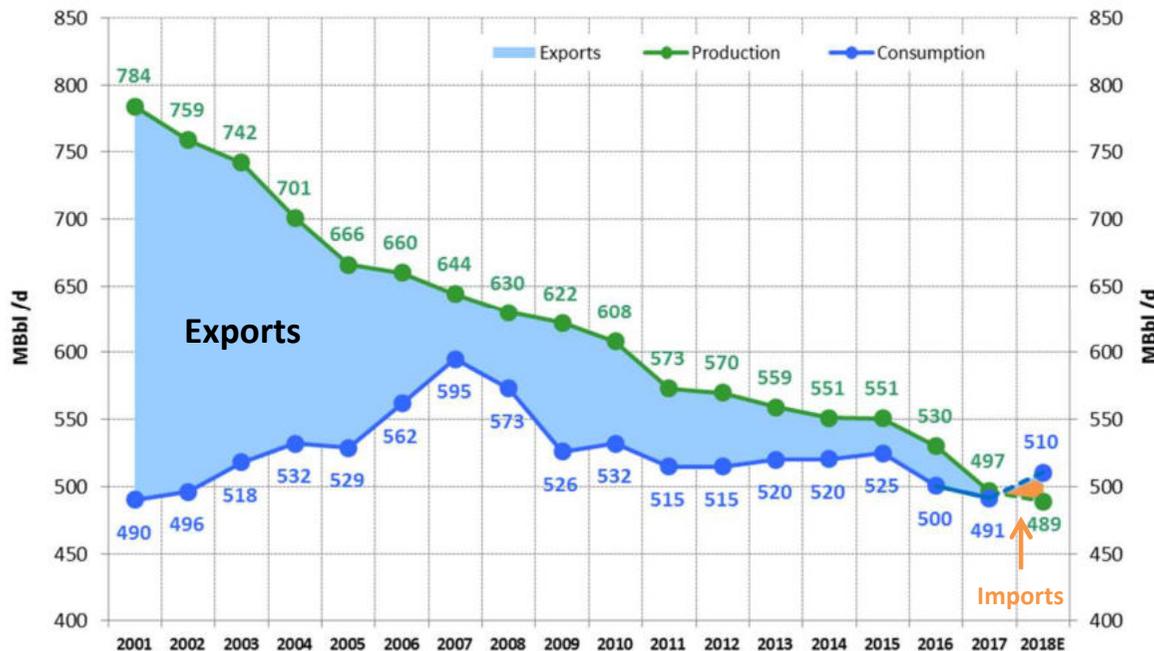
Argentina - Oil Production vs Consumption



- 2017 vs. 2001**
- **PAE Growth: 24%**
 - **Other Producers Decline: - 44%**
 - **Argentina Decline: - 37%**

2017

Crude Oil Exports: 10 MMBbl
(PAE 9 MMBbl)



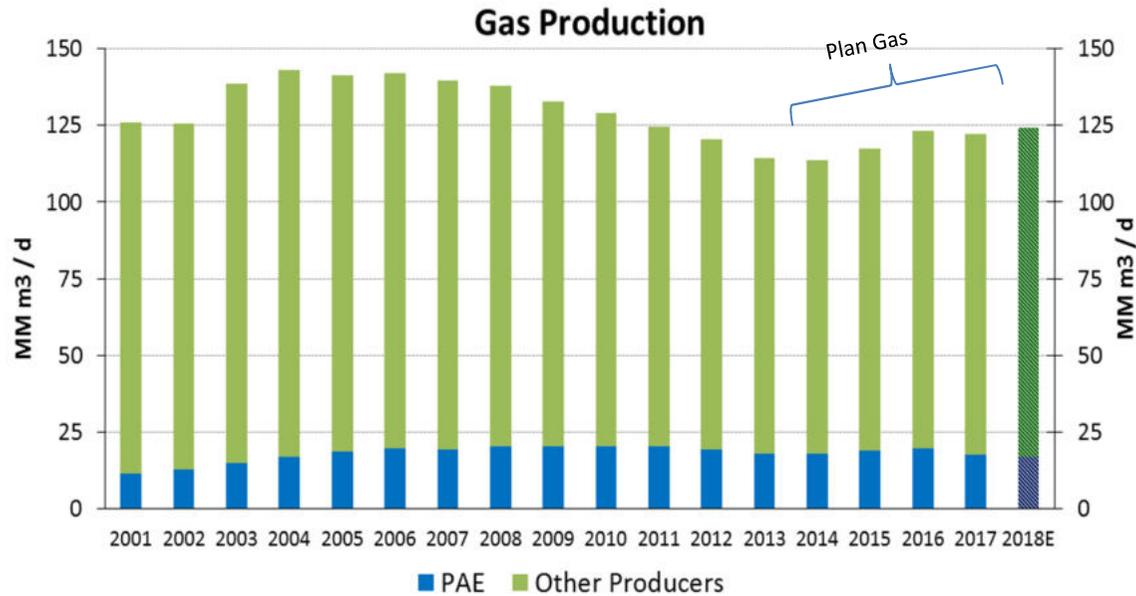
Imports by product: 23,9 MMBbl

- Diesel: 13,4 MMBbl
- Gasoline: 2,6 MMBbl
- Light Crude: 7,9 MMBbl

Note: Volumes of Diesel imported for power generation, not included

Note: Argentina has a surplus of heavy crude oil that is exported, but it does not produce enough light crude oil which is imported.

Argentina - Gas Production vs Consumption



2017 vs. 2001

- **PAE Growth: 62%**
- **Other Producers Decline: - 9%**
- **Argentina Decline: - 3%**

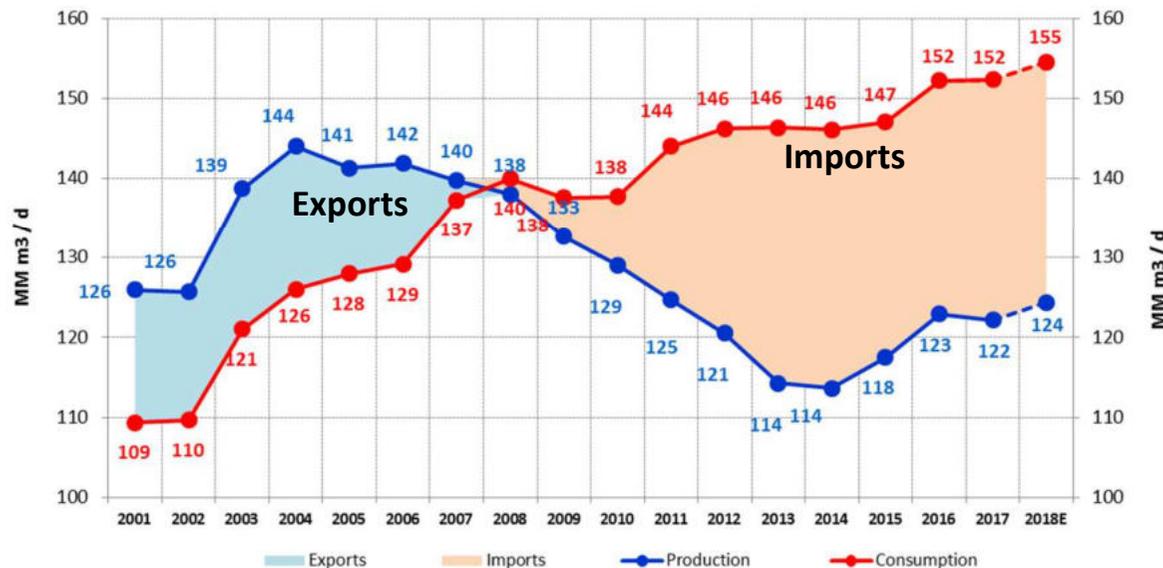
2017

Gas Imports from Bolivia

18,1 MMm3/day

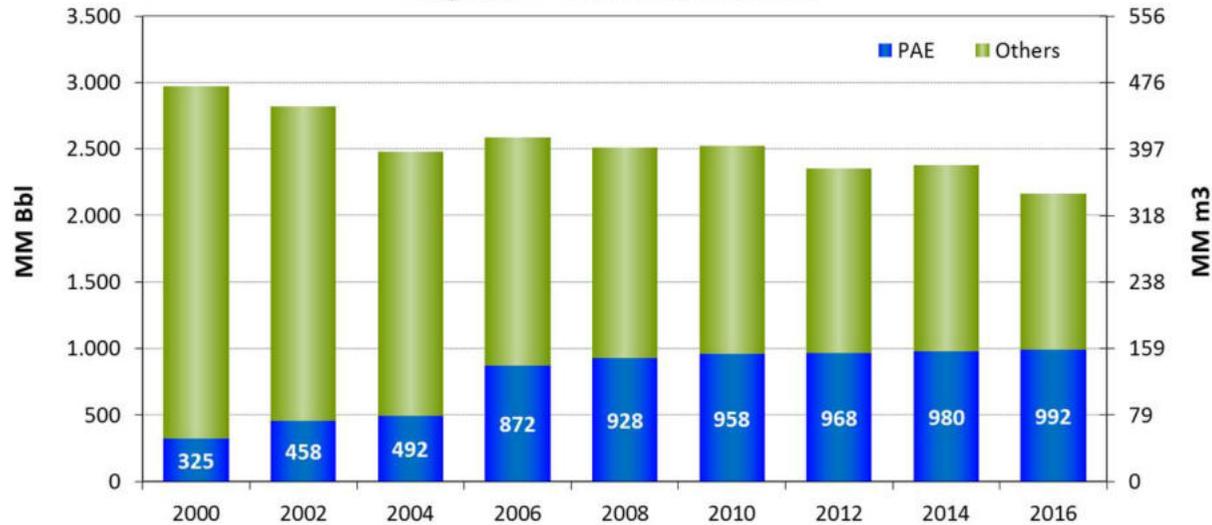
LNG Imports

12,2 MMm3/day



Who we are - Reserves

Argentina - Oil Proved Reserves

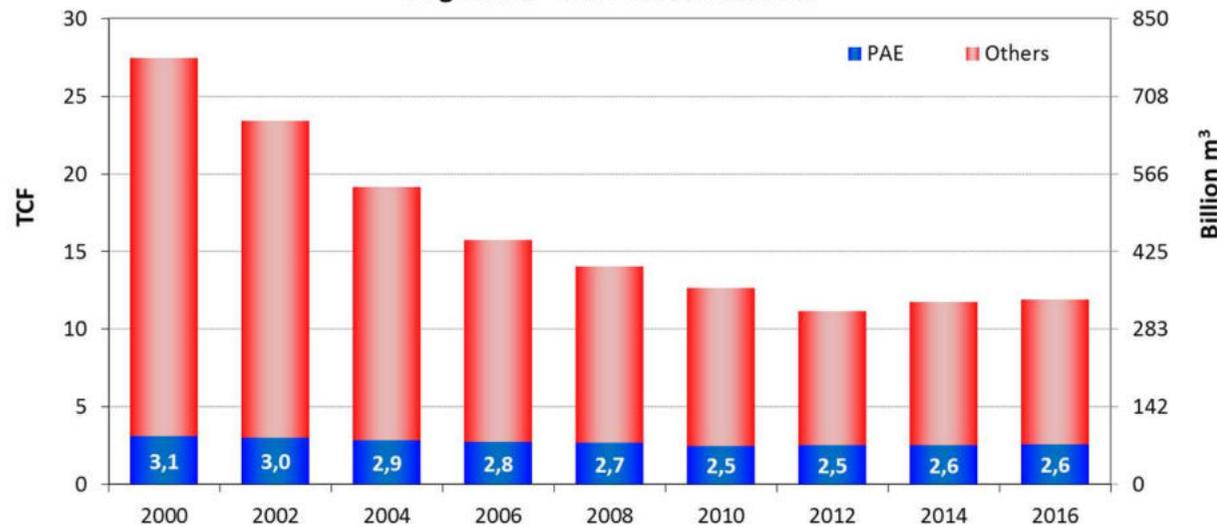


2016 vs 2000 Oil Proved Reserves:

Argentina -27%

PAE +205%

Argentina - Gas Proved Reserves



2016 vs 2000 Gas Proved Reserves:

Argentina -57%

PAE -16%

Upstream Assets



Basin	2017 Production - Net PAE		
	Oil (M Bbl/d)	Gas (MMm3/d)	Total (M BOE/d)
Golfo San Jorge	95,7	8,8	149,5
Austral	2,2	5,2	34,1
Neuquina	1,5	4,1	26,4
Noroeste	6,5	5,8	41,6
TOTAL	105,9	23,9	251,5

Note: LPG and Cerri not included, Noroeste includes Caipipendi

Basin	2017 SEC Proved Reserves - Net PAE		
	Oil (MMbbl)	Gas (Bcm)	Total (MM BOE)
Golfo San Jorge	935	31	1.125
Austral	9	24	152
Neuquina	9	17	109
Noroeste	24	25	175
TOTAL	977	96	1.562

Note: Noroeste includes Caipipendi.

References

- On-Shore / Operated Asset
- On-Shore / 3rd Party Operated Asset
- Off-Shore / Operated Asset
- Off-Shore / 3rd Party Operated Asset
- ▲ Renewable energy / Operated Asset

Who we are - Offshore Mexico & Cuenca Marina Austral

Mexico

- Hokchi Block: Awarded in Round 1, with an area of 40 km² and located 30 km from Dos Bocas Harbour. An oil prospect with reservoir at 2500 meters depth.



Five wells drilled

Largest investment from a Private Latin American Company during 2017



Blocks 3 & 5 not awarded

Cuenca Marina Austral

- Partnership with TOTAL & Wintershall.

Largest offshore Operation in Argentina

Vega Pleyade Project: Initial Production in 2016



Imagen: Total Austral

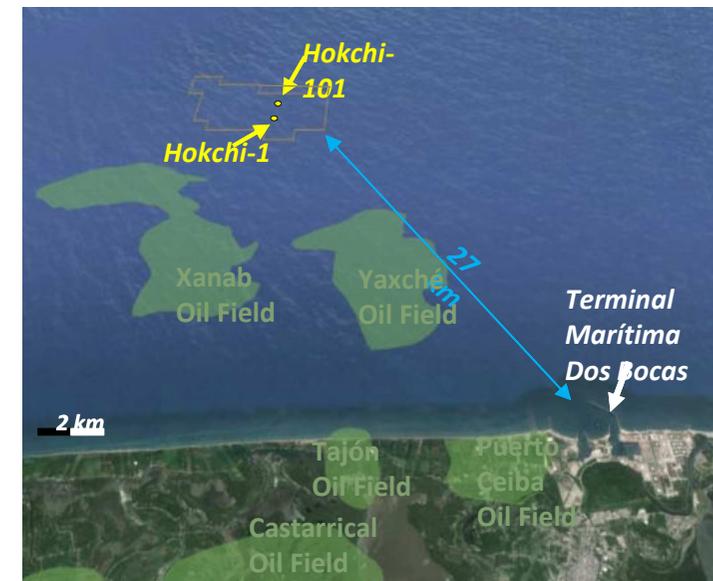
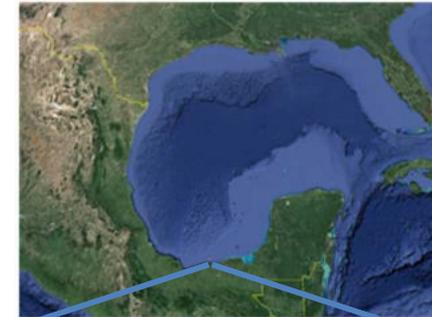
Hokchi

Evaluation period: completed

- Activity:
 - ✓ 3D Seismic Reprocessing
 - ✓ 5 delineation wells
 - ✓ 2 well production tests
 - ✓ G&G Studies
 - ✓ Screening Study and Engineering

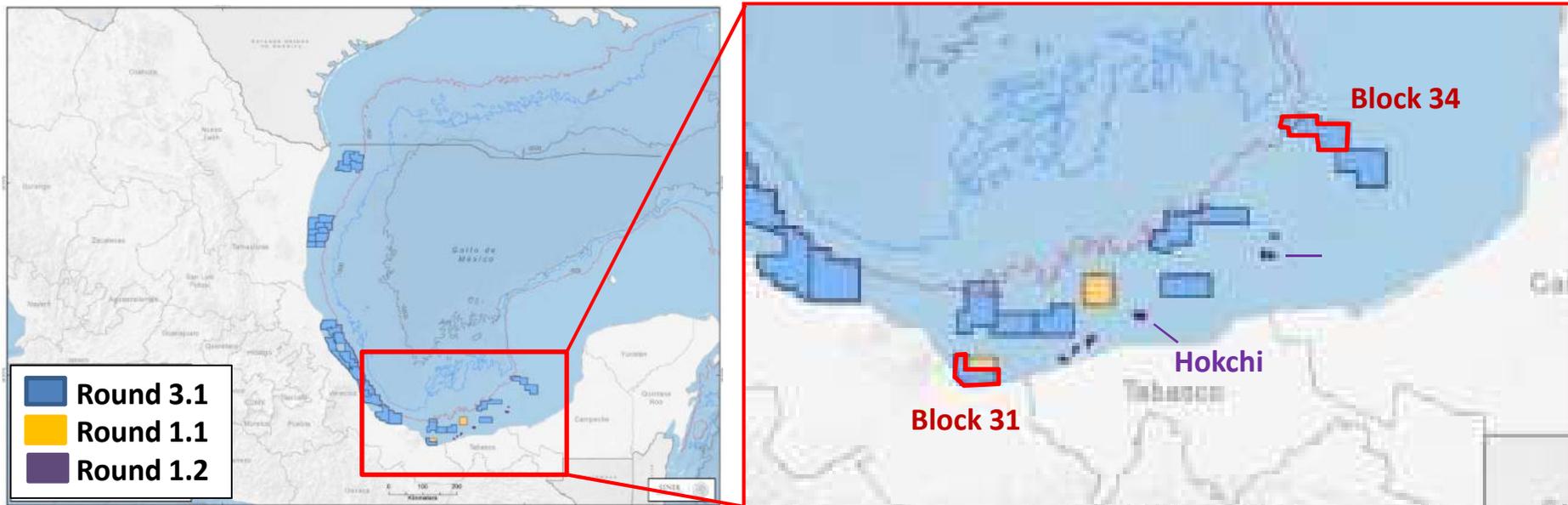
Development Plan

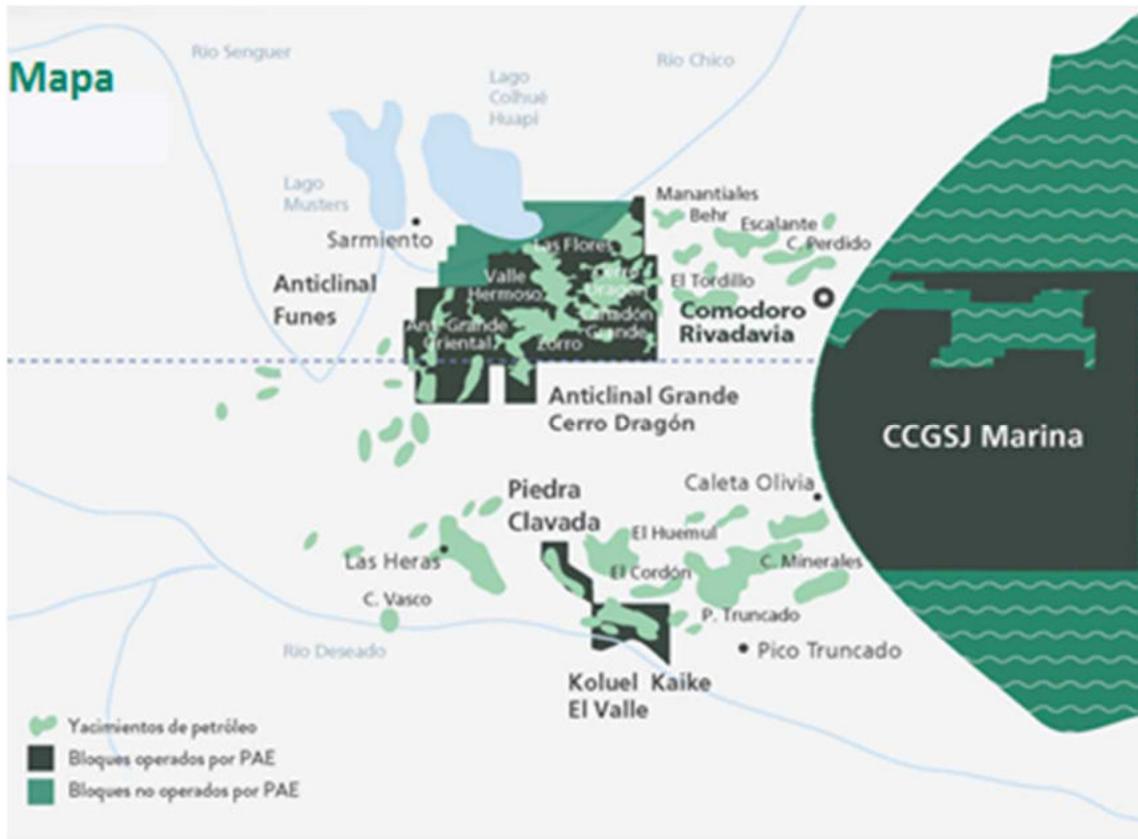
- Facilities construction:
 - ✓ 2 Unmanned Well Head Platforms: Central-16 slots and Satellite-6 slots
 - ✓ On-Shore Facilities: Oil Treatment Plant, Water Treatment/Injection Plant, Gas Compression / Treatment and Power Generation
 - ✓ Pipelines
- First production: May-2020



Mexico – Round 3.1

- **PAE was awarded in Exploration Blocks 31 and 34:**
 - Block 31: PAE 100% WI
 - Block 34: PAE 15% WI JV with BP and TOTAL
- **Commitment for each block :**
 - Seismic reprocessing
 - 1 Exploratory well





 **3.564**
Active Producing Wells

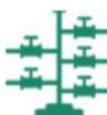
 **763** Injector wells

 **94,5 Mbopd**
Oil production

 **1.336,1 Mbpd**
Fluid

 **299,13 MMcfd**
Gas production

 **176,40 MMcfd**
Gas sales

 **1.241,6 Mbpd**
Water Injection

 **1958 (Amoco)**
Acquisition date

3.480 Km²
Surface area

 **8** Districts

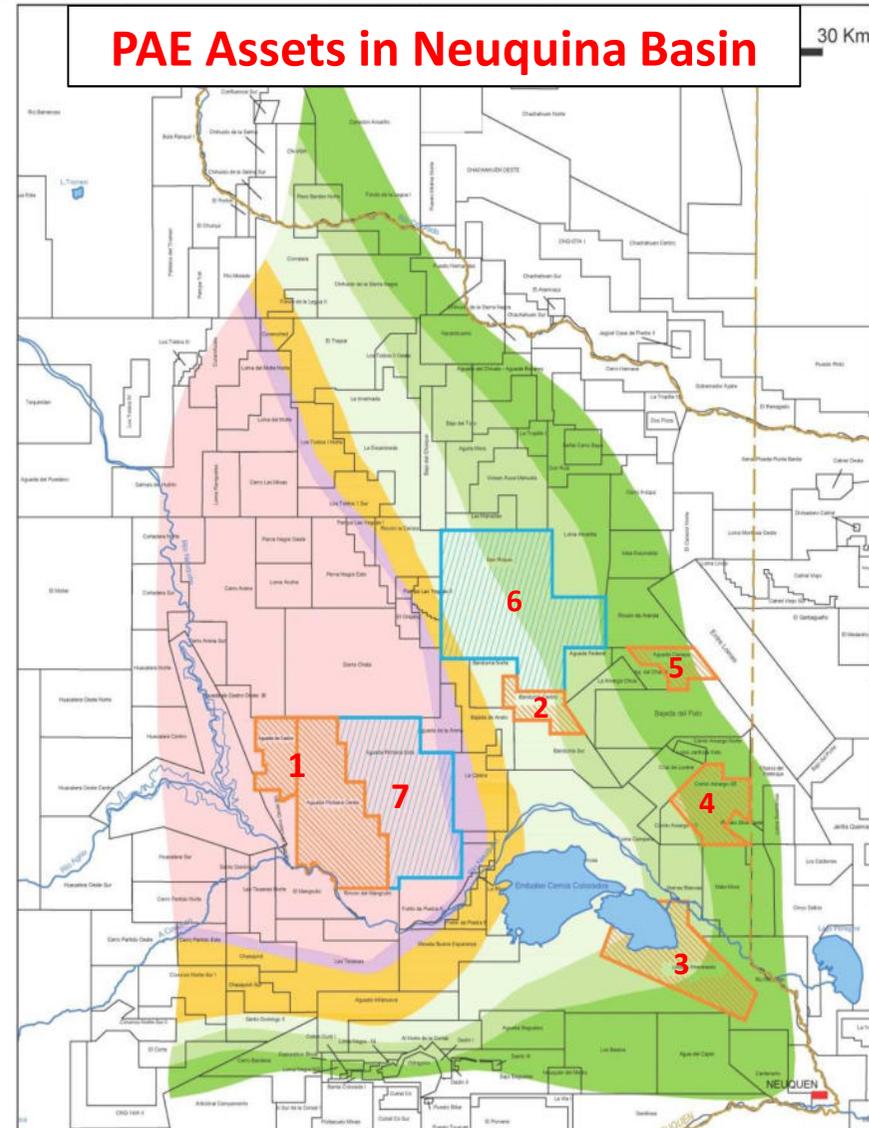
 **7.880**
Employees:
(PAE + Contractors)

 **3.456**
Vehicles

 **86.181.109**
Km traveled:
(Over the past 12 months)

What we are doing – PAE's Unconventional Participation

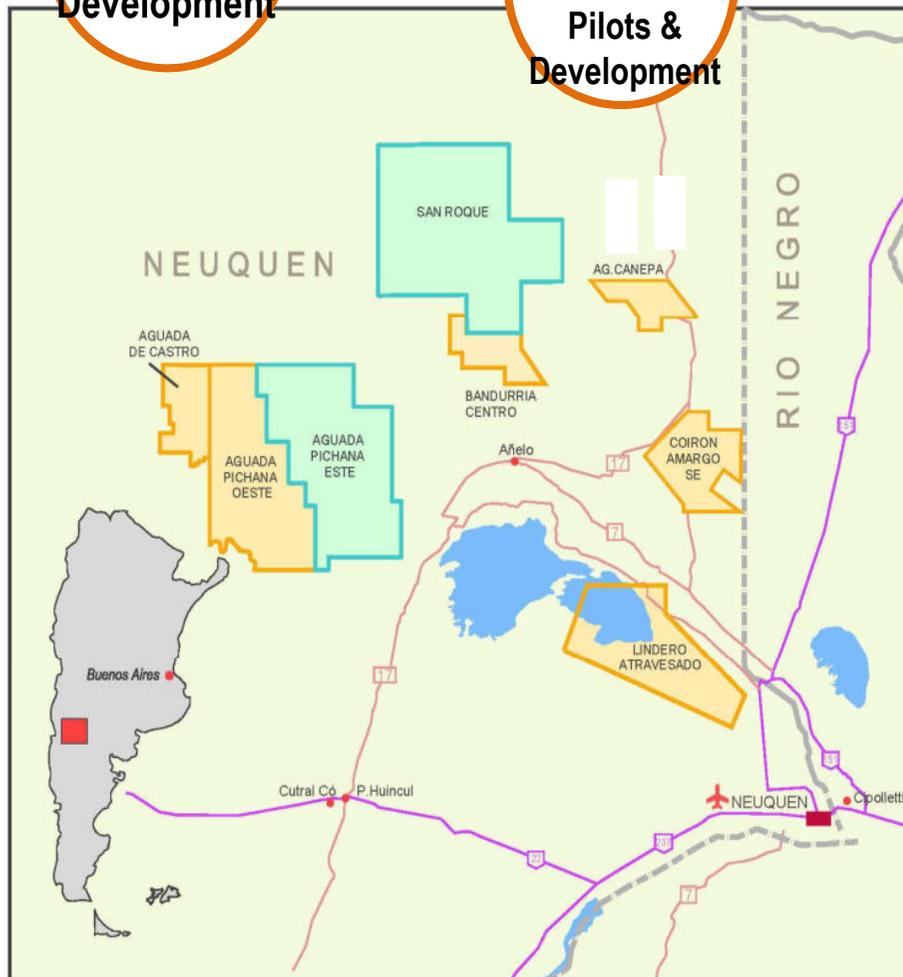
- PAE is currently performing exploration, delineation, pilots & full development of Vaca Muerta (“VM”) Fm. and the Grupo Cuyo within the following blocks:
- PAE as Operator
 1. Aguada Pichana Oeste & Aguada de Castro
 2. Bandurria Centro
 3. Lindero Atravesado
 4. Coirón Amargo Sur Este
 5. Aguada Cánepa
- PAE as Non Operator
 6. San Roque
 7. Aguada Pichana Este
- PAE's Total net Acreage: 327,097



What we are doing - PAE's Activity in Unconventional Plays

Tight Gas Full Development

Shale Oil & Gas Delineation / Pilots & Development



May, 2018



LINDERO ATRAVESADO (op.)

Tight gas Development +100 vertical wells drilled, average depths of 4200m. New facilities built. First horizontal well in VM to be drilled during 2018



BANDURRIA CENTRO (op.)

Shale oil Pilot Project currently on going. EPF under construction. First tight gas well drilled.



COIRÓN AMARGO SE (op.)

Two re-entries in existing well in VM shale oil (1500 m drain) completed and producing.



AGUADA PICHANA OESTE – AGUADA DE CASTRO (op.)

Pilot Project on going – first gas since 27th April 2018



AGUADA CÁNEPA (op.)

Partnership with GyP for shale oil exploration.



AGUADA PICHANA ESTE

Tight Gas & Shale Gas Pilot Projects completed. Phase 1a of Full Development ongoing

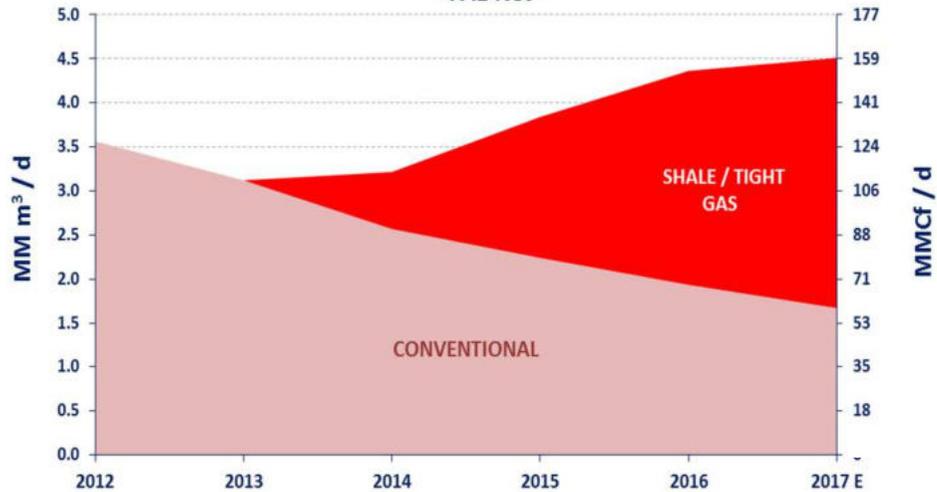


SAN ROQUE

First shale oil PADs drilled

How we are doing it – PAE's Activity Indicators in Unconventional

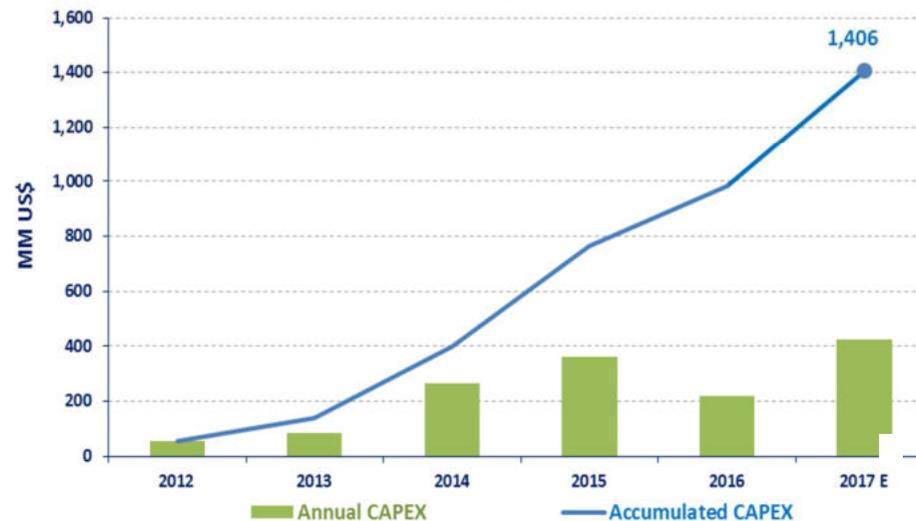
Gas Production
- PAE Net -



Oil Production
- PAE Net -



Exploration and Production CAPEX
- PAE Net -



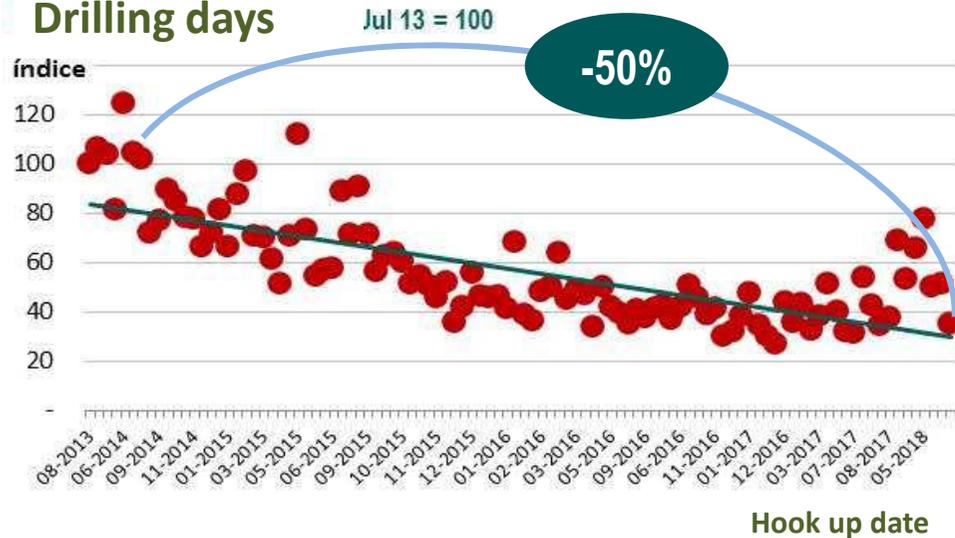
How we are doing it - PAE's Wells Main Parameters

SHALE OIL & GAS Objectives	WELL TYPES	Wells 2017	Measure Depth [Feets]	Sxs/Well	# Stages	Technology	KLbs \Stg	Lbs/Feet	Volume [m3/Well]	Completion Time [Days]
	VM-Hztal-1500	2	14850	108345	60	Anular Frac	199	2413	26100	18
	VM- Hztal-2000	5	16830	144460	80	Anular Frac + 20 Ball Sleeves	199	2413	34800	20
	VM- Hztal-2500	1	18150	180575	100	Anular Frac + 20 Ball Sleeves	199	2413	43500	22

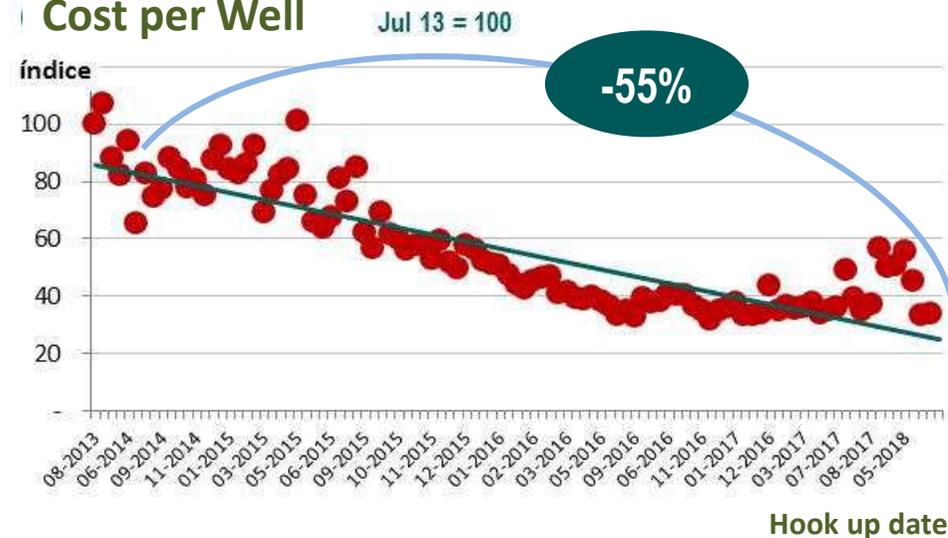
TIGHT GAS Objective	WELL TYPES	Wells 2017	Measure Depth [Feets]	Sxs/Well	# Stages	Technology	KLbs \Stg	Lbs/Feet	Volume [m3/Well]	Completion Time [Days]
	Tight -Vert-Lajas Oriental	10	14520	20351	8	P&P	299	NA	3914	11
	Tight -Vert-Lajas Occidental	8	15180	27490	10	P&P	303	NA	6000	15
	Tight-Hztal-1000	2	18120	34015	11	P&P	357	1136	6400	18
	VM-Hztal-1500	2	16000	108345	60	Anular Frac	199	2413	26100	18

How we are doing it – Unconventional Efficiency Improvement

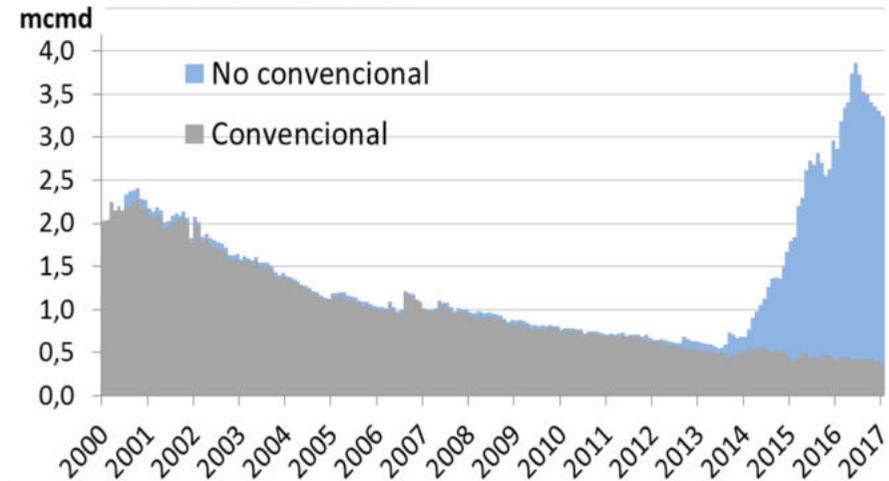
Drilling days



Cost per Well



Producción de gas (Gross)



Main Highlights

Operational Optimization & Technology

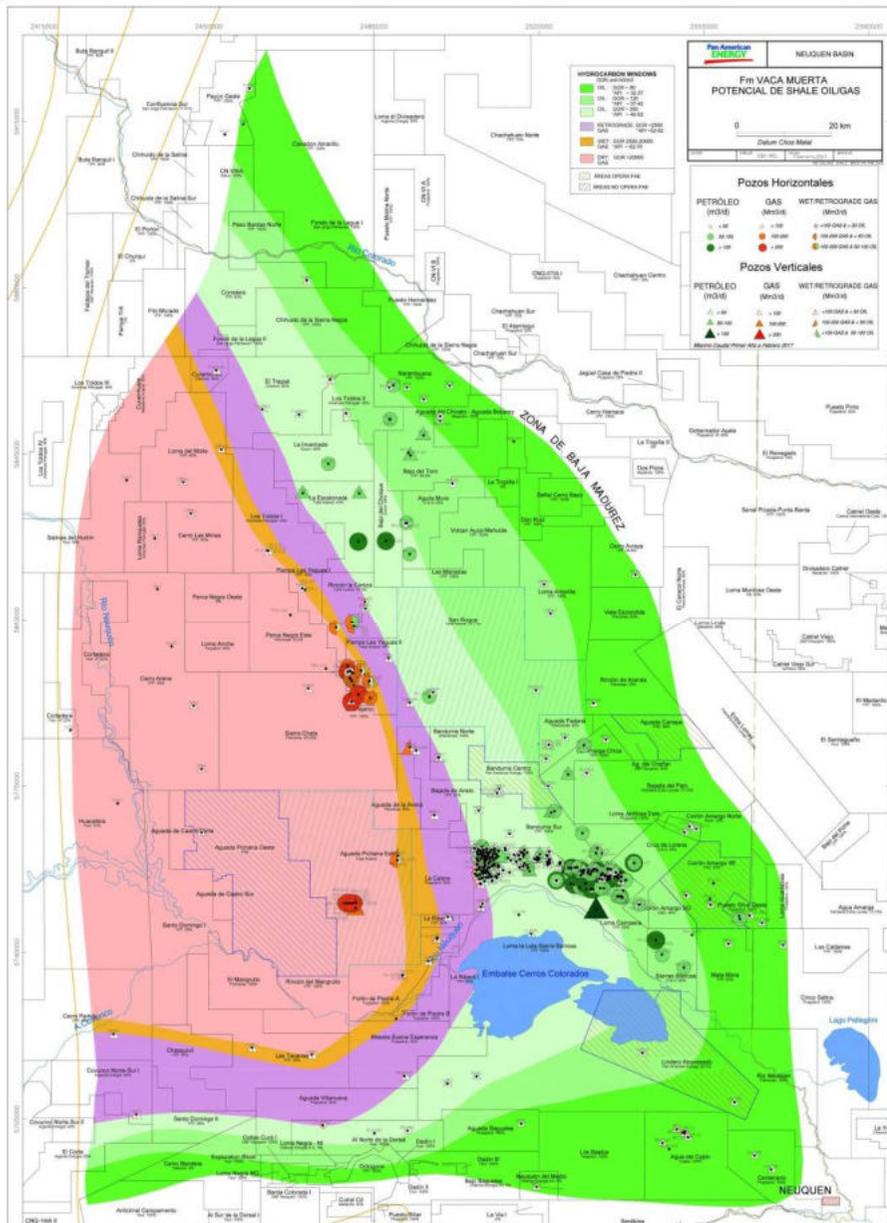
- Incorporation of drilling rig with *walking system*
- Switched from Water-Based-Mud to Oil-Based-Mud in intermediate and productive sections
- Switched to *Factory Model*, drilling multipad wells
- Use of sliding sleeves technology for annular fractures

Logistics

- Direct purchase of massive consumption products (frac sand, mud products, others)

Future Challenges - Unconventional Sizing of Future Activity

Future Activity for Unconventional Resources is estimated in the need of 39.000 new wells



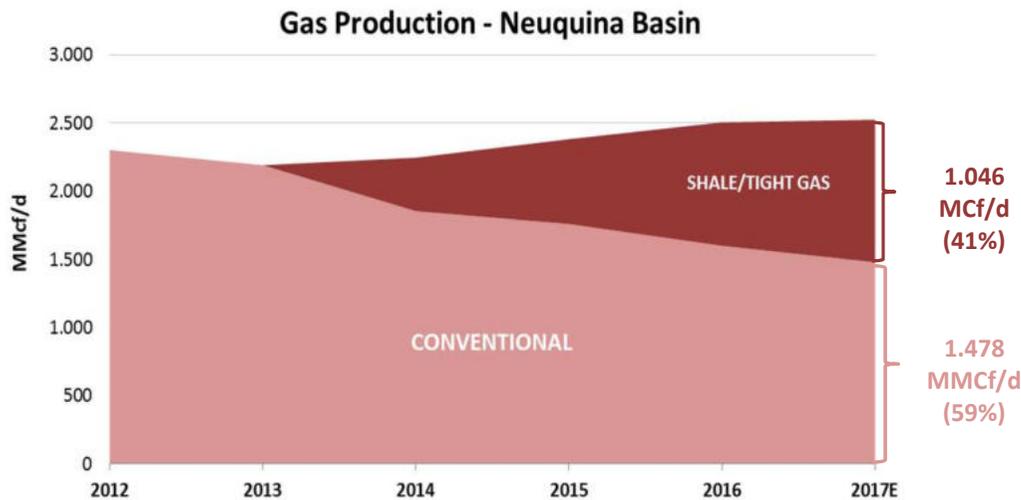
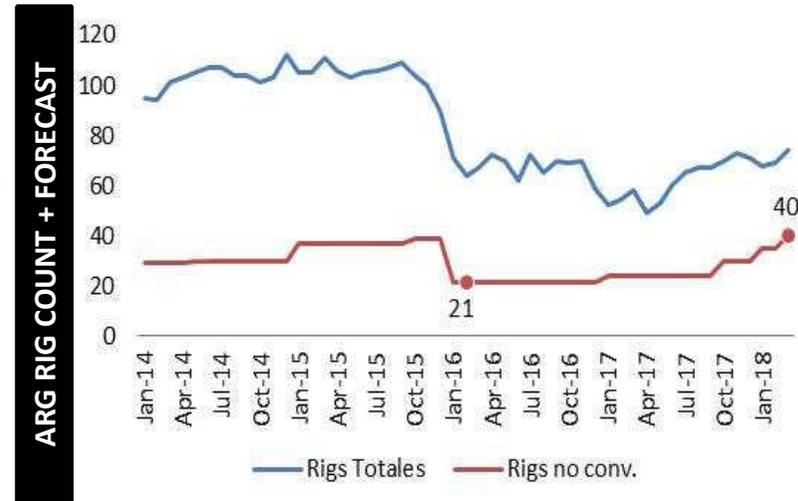
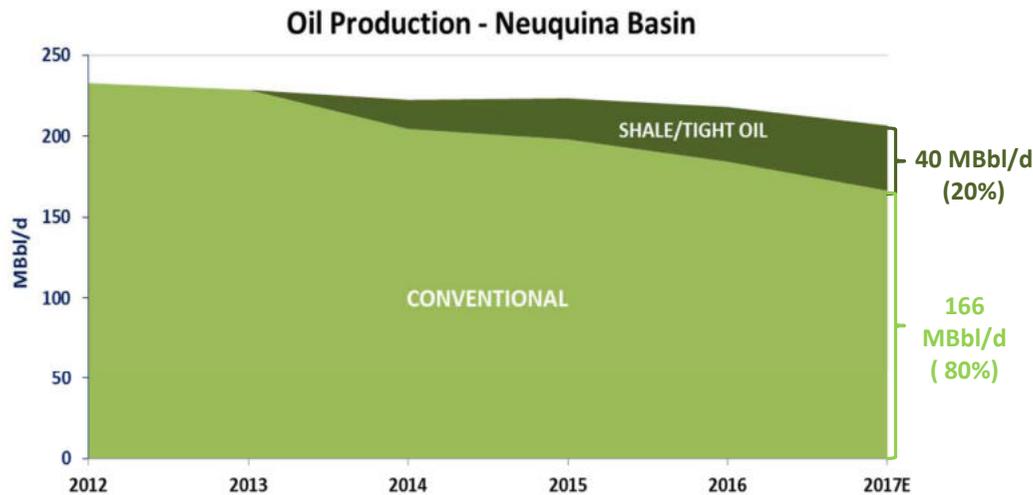
- The Neuquina Basin is considered a World Class Unconventional Play not only for the VM Fm, in terms of both shale oil and shale gas, but also for the tight gas potential in the Grupo Cuyo and Los Molles Fm.
- The VM Fm extends along an area in the range of **30,000 Km2**
- VM depths ranges +/- 3000 mts.

wells by oil and gas windows

	Superficie (km2)		Densidad (Acre/pozo)	Probabilidad de Desarrollo	Cantidad de Pozos
	Total	Perforable			
Grupo Cuyo 1	49	49	40	100%	300
Grupo Cuyo 2	65	65	40	100%	400
TOTAL TIGHT					700
VM DRY GAS	7.564	4.787	140	87%	7.320
VM WET GAS	2.278	1.660	100	100%	4.101
VM OIL 1	4.315	2.815	80	100%	8.690
VM OIL 2	3.783	2.400	80	100%	7.410
VM OIL 3	5.962	4.431	80	50%	6.841
TOTAL VM	23.902	16.094			34.362
LOS MOLLES	2.877	2.877	180	100%	3.948

Future Challenges - Unconventional Sizing of Future Activity

Despite that unconventional developments in Argentina are at its early stage the production and activity has increase during the last four years.



Several tenders for new rigs are currently undergoing increasing the rig count from 35 to 40

Future Challenges - Unconventional Developments

- We are in the right direction in terms of improving efficiency but there is still lots of work to do.
- All players need to look for sensible and realistic solutions in order to allow the full hydrocarbons developments of the unconventional resources.

A joint effort which should involve all industry players: operators, contractors/suppliers, unions, provincial and federal governments.

Hydrocarbon Producers and its Production Chain:

Efficiency improvement, in order to allow more development projects to be carried out. We should work in the contract services focused on efficiency, including variable rates subject to productivity.

Increase amount of Operators and its productive environment. We think that the industry has a long way to go. More competition should be generated. In the meantime the industry should continue working with suppliers looking for efficiency through tasks' standardization and rationalization.

Reach a higher level of technical & geological knowledge required for these type of developments.

All players, specially our contractors, small and medium-sized companies ("Pymes"), suppliers, etc, should understand that this type of developments have a marginal gain and that benefits come with sustainability, and, in the long term, sustentability of the business.

New service companies willing to arrive to Argentina will have the chance to work in an environment with aggressive growing activity

Future Challenges - Unconventional Developments

Unions:

- Are called to take part in this challenge by working in continuous improvement of efficiency and social peace. Without this compromise, it will be very difficult to maintain the activity levels.
- By improving work productivity new genuine jobs will be created.

Provincial & Federal Governments:

- We understand that the role of the State is to create conditions that will provide for a more competitive environment for the industry. This requires a huge rationality and effort in order to align the regulations with the requirements of sustainability that needs VM for the development of the country.
- *Unconventional Development is at a stage of take-off and there is a lot of work to be done.*
- *We are still learning about geology and well productivity. VM sweet spot are yet to be determined and we are still developing and testing the appropriate techniques for such developments.*
- *The industry needs to face the extraordinary challenge of developing these resources in order to meet the energetic growth of the country, to create new jobs and, of course, to increase the wealth of the Province and the country itself.*
- *If compared to the USA, we are still at an early stage of the learning curve when it comes to reaching the technical capacity and the adequate geological knowledge of this type of resources.*
- *We should assume that our competitiveness level still needs a fast and full improvement. The gap in efficiency and costs that separates us from more competitive international producers is still broad.*
- *With focus in the long term, we should work together in order to reach the above mentions standards.*

Thank You

