Argentina Energy Plan

—OIL AND GAS GUIDELINES—

Secretaría de Gobierno de Energía

Secretaría de Planeamiento Energético
Provide Argentinians with abundant, clean and low cost energy, and transform our country in a World Class Energy Supplier through the massive and responsible development of unconventional resources and through the fast incorporation of renewables, reaching competitive costs for the development of the small and medium-sized enterprises (SMEs), the industries and the transport.
Our six objectives

1. Double oil production in 5 years, reaching 1 million barrels per day and to export 500 thousand daily.

2. Double natural gas production in 5 years, to achieve 260 MMm³ (9.2 Bcf) per day and to export 100 MMm³ (3.5 Bcf) daily.

3. Create 500 thousand new jobs associated with the development of Vaca Muerta.


5. Develop the full potential of renewable energy, reaching by 2025 a 20% share of Argentina’s electricity consumption.

6. Due to this great energy offer reach world class competitive prices to strongly develop SMEs, industries and transport sector.
Argentina energy matrix

Internal energy supply* - 2017

83 MMtoe

Power generation matrix - 2017

136 TWh

*TIES: Total Primary Energy Supply + balance of trade
Private investment in the energy sector - 2018 est.

Power distribution (data for AMBA)
- 519 MMUSD

Renewable generation
- 2,798 MMUSD

Thermal power generation
- 576 MMUSD

Upstream O&G
- 9,521 MMUSD

Transport and distribution of Oil and Gas
- 495 MMUSD

Total private investment
- 13,910 MMUSD
Shale Resource Assessments (EIA 2013) estimates that World has total resources of:

- 7,577 TCF of gas
- 419 Bn. bbl of oil

11% of gas and 7% of oil World unconventional resources are in 3 different basins in Argentina

Most of it is located in the Vaca Muerta formation at Neuquen and Mendoza Province
How huge is Vaca Muerta?

One of the best resources in the world

Unconventional Gas Resources

- China
- Argentina
- Algeria
- EE.UU.

Unconventional Oil Resources

- Russia
- EE.UU.
- China
- Argentina

Source: EIA 2013.

Generated volume 5,000 Bboe

- 2,460 Bboe (98%) Trapped in unconventional reservoirs
  - How much is technically recoverable? According to DOE: 7% - 169 Bboe

- 40 Bboe (2%) Trapped in conventional reservoirs
  - Already Produced: 8.5
  - Recoverable: 9.7
Argentina Reserves and Resources

Oil Reserves and Resources (Bbbl)

- P1 conv, 2.1
- P2 conv, 0.7
- P3 conv, 0.5
- R conv, 1.0

Unconventional Resources, 27.0

Natural Gas Reserves and Resources (Tcf)

- P1 Conv, 11.9
- P2 Conv, 5.2
- P3 Conv, 4.8
- R Conv, 8.3

Unconventional Resources, 802.0

Source: EIA (USA) and Secretariat of Energy (Argentina)
Sweet spots of Vaca Muerta - Sustainability of the Plateau

**Oil**

Neuquén Window: 22,000 km²

- EUR / Well: 631 kbbl/well
- Landing points/area: 2.5/km² (2.5/247 acres)
- MMbbl/Area: 1.6 MMbbl/km² (6.5 kbbl/acre)
- Unconventional Production Plateau 2030: 1,143 kbbl/day
- Reservoir to exploit in 25 years: 10,434 MMbbl
- Exploited Area: 6,614 km² / 1.6 MM acres (30%)

**Gas**

Neuquén Window: 13,000 km²

- EUR / Well: 12.9 BCF/well
- Landing points/area: 2.5/km² (2.5/247 acres)
- BCF/area: 32.25 BCF/km² (0.13 BCF/acre)
- Unconventional Production Plateau 2030: 14.1 BCF/day
- Reservoir to exploit in 25 years: 128.6 TCF
- Exploited Area: 3,990 km² / 987,643 acres (31%)
Current players in Vaca Muerta (Wood Mackenzie)

- More than 30 big, independent and local companies are active in Vaca Muerta

Acreage in Vaca Muerta per company

Source: Wood Mackenzie
<table>
<thead>
<tr>
<th>Area</th>
<th>Operator</th>
<th>Black Oil</th>
<th>Light Oil</th>
<th>Wet Gas</th>
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Sources: WoodMackenzie, Ministerio de Energía y Recursos Naturales de Neuquén y Ministerio de Energía de la Nación
Fractures stages by month are improving

From 180 to 612 fractures/month stages in almost 3 years (58% CAGR), 20% m/m last period. Keeping pace is essential to unlock Argentina Shale Potential

Fortín de Piedra Tecpetrol - 100%

Operative efficiency record:

- 20 fracture stages in less than 24hs:
  - FP-1101 (SLB): 8 stages
  - FP-1051 (SLB): 6 stages
  - FP-1021 (BHGE): 6 stages
From 0 to 635 MMscf/day in 2 years

Fortin de Piedra (Tecpetrol), Neuquen, Argentina

Source: Neuquen Informa
First unconventional oil field of Argentina

Loma Campana (YPF, Chevron)

Añelo City, Neuquen, Argentina

Source: Google
What would Vaca Muerta look like at full development?

Current
Vaca Muerta shale wells
884 wells

Vaca Muerta shale wells
@ Loma Campana’s density
Approx. 35,000 wells

Vaca Muerta shale wells
@ 2,5 landing points/km²
Approx. 85,000 wells
## Vaca Muerta: competitive formation indicators

<table>
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<tr>
<th>Play</th>
<th>TOC [%]</th>
<th>Thickness [m]</th>
<th>Reservoir pressure [psi]</th>
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<tr>
<td>Vaca Muerta</td>
<td>3–10</td>
<td>30–450</td>
<td>4,500–9,500</td>
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<tr>
<td>Barnett</td>
<td>4–5</td>
<td>60–90</td>
<td>3,000–4,000</td>
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<td>Haynesville</td>
<td>0,5–4</td>
<td>60–90</td>
<td>7,000–12,000</td>
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<td>Marcellus</td>
<td>2–12</td>
<td>10–60</td>
<td>2,000–5,500</td>
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<td>Eagle Ford</td>
<td>3–5</td>
<td>30–100</td>
<td>4,500–8,500</td>
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<td>Wolfcamp (Permian)</td>
<td>3</td>
<td>200–300</td>
<td>4,600</td>
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</tbody>
</table>

Sources: Energy Information Administration (EEUU), 2013 & YPF, 2014
Relentless progress through the years but still below potential

Vaca Muerta potential well for a 2,000 m lateral (solid dark line):

- Targeted landing zone
- Tighter cluster spacing
- More clusters per stage

Source: WDVG Petroleum Engineering Laboratories
## Accumulated production by type of wells (Wood Mackenzie)

<table>
<thead>
<tr>
<th></th>
<th>IP30 (boe/d)</th>
<th>EUR (mmboe)</th>
<th>Cum 180 (kboe)</th>
<th>Cum 365 (kboe)</th>
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<tr>
<td></td>
<td>2017</td>
<td>2018</td>
<td>% change</td>
<td>2017</td>
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<tr>
<td>Black Oil</td>
<td>901</td>
<td>531</td>
<td>-41%</td>
<td>0.82</td>
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<tr>
<td>Light Oil</td>
<td>901</td>
<td>945</td>
<td>5%</td>
<td>0.82</td>
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<tr>
<td>Wet Gas</td>
<td>911</td>
<td>1,076</td>
<td>18%</td>
<td>0.83</td>
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<tr>
<td>Dry Gas</td>
<td>2,440</td>
<td>1,993</td>
<td>-18%</td>
<td>2.37</td>
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</tbody>
</table>

### Diagrams

- **Black Oil**: 89.9% Oil, 77.4% Oil
- **Light Oil**: 54.7% Oil, 53.3% Oil
- **Wet Gas/Condensate**: 34.0% Oil, 53.3% Oil
- **Dry Gas**: 2.4% Oil, 0% Oil

*Source: Wood Mackenzie*
Economic values of horizontal wells (Wood Mackenzie)

Black Oil window type well

- NPV15 post-tax, millions
- IRR post-tax

Light Oil window type well

- NPV15 post-tax, millions
- IRR post-tax

Wet Gas/Condensate window type well

- NPV15 post-tax, millions
- IRR post-tax

Dry Gas window type well

- NPV15 post-tax, millions
- IRR post-tax

Source: Wood Mackenzie
Argentina has an Attractive Fiscal Regime

Cash Flow Breakdown
Figures for a type oil development

- Brent
- Export Retentions
- Turnover Tax (1 - 3%)
- Royalties (12%)
- OPEX
- CAPEX
- Income Tax*
- Free Cash Flow

Take per Player
Figures for a type oil development

- Government Take 39%
- Contractor Take 32%
- Company Take 29%

- Unconventional Exploitation Provincial Concession (“CENCH”)
  - Contract life of 35 years with 12% royalties
  - Option to extend contract for 10 years more
- Competitive Royalties and Income Tax compared with other countries

* 35% Income Tax used in this chart. If income is reinvested, Income Tax would be 25% from 2021-on
Argentine’s concession terms are competitive, much more when including the Vaca Muerta cost of entry (Wood Mackenzie).

Remaining NPV post-tax (US$/boe) at 15%

Notes: *Permian including original entry cost at US$15,000/acre | * Vaca Muerta entry costs based on recent YPF and GyP transactions

Source: Wood Mackenzie
New players can enter by participating in:

1. M&A process with acreage holders companies in Vaca Muerta.

2. Area bidding process lead by the Neuquen Province (GyP) every quarter.

3. IEASA (Ex-ENARSA) Farm-Out in Aguada del Chañar.

4. Executing Technical Evaluation Agreement on free areas with Mendoza Province.

There is plenty of room in Vaca Muerta.
1) YPF farm-ins case: averaged US$8,000/acre, less than half L48 costs of US$20,000-30,000 per acre (Wood Mackenzie)

Source: Wood Mackenzie M&A tool

Cost per acre, YPF farm-ins

Midland Permian average 2016-2018

Eagle Ford, Contango Oil & Gas

Loma Campana, Chevron

El Oreyano, Dow

La Amarga Chica, Petronas

Bajada de Añelo, Shell

Bandurria Sur, Schlumberger

Bajo del Toro, Statoil

GyP average

Source: Wood Mackenzie M&A tool
By the end of October, Neuquen Province has granted 32 Unconventional Exploitation Concessions (CENCH) to produce from shale and tight reservoirs.

Only less than 20% of the blocks (10% of Neuquen blocks surface) have been assigned with a CENCH.

Mendoza Province is going to grant its first Unconventional Exploitation Concession, with place for more opportunities.
2) M&A Transactions with GyP are very competitive based on the latest deals in Vaca Muerta

- Gas y Petróleo de Neuquén (“GyP”) license round entry costs (signature bonus and work commitments) have averaged US$3,000/acre.
- 43 areas available for association under the “Plan Exploratorio Neuquen”.
- Blocks located under the 3 Vaca Muerta windows: Dry Gas, Wet Gas and Oil.
- Almost all blocks have available seismic (2D or 3D) and/or well information.
- GyP offers bidding round Quarterly. Next bid date on November 29th, 2018. Bids will be received between 8:30hs and 14:30hs Argentina Time. Opening will be same day at 15:00hs.

Source: Wood Mackenzie M&A tool, GyP
Neuquen: abundant energy and landscape to enjoy

Neuquen City

Villa La Angostura

Lago Mari Menuco
3) IEASA Farm-Out: Aguada del Chañar ready to drill and restart production thru interventions on a prolific Vaca Muerta region

**Aguada del Chañar: Farm Out Opportunity**
- 100% IEASA owned Concession.
- Total area of 14,085 acres
- Cumulated conventional production: 80 kbbl and 3.5 BCF.
- Unconventional Exploitation Concession (CENCH) granted on October 5th, 2018 for 35 years with 12% fixed royalties
- USD 10 MM commitment within next 2 years (2D and deepening an existing well).
- Tight Gas opportunities in Punta Rosada and Lajas Fm.
- GYP.Nq.BCh-3 PROVED VACA MUERTA with cumulated 35 kbbl production (without fracturing)
- The area counts with a Gas Treatment Plant with connection to YPF Loma Campana facilities to dispatch production in an area surrounded by massive projects.
- Existing Oil battery with 3 stocking tanks of 160 m3 each.
- Bidding process to be launched on early December.

**La Amarga Chica:**
YPF 50%op, Petronas 50%
Pilot of USD 550 MM and Development plan of +900 wells to achieve 65 kbbl/day

**Aguada Federal**
Wintershall: 90%op
Gyp: 10%
Up to USD 3,000 MM development planned

**Bajada del Palo**
Vista O&G: 100%op
Expected to triPLICATE production to 65 kbbl/day with a USD 2,000 MM work plan in 5 years
Type Well Cum: 983 kboe (90% oil)

Source: IEASA, Vista O&G, Public information
4) Mendoza Province is also offering competitive TEA conditions to explore Vaca Muerta at the north of Neuquen Basin

- **53 blocks** with Vaca Muerta unconventional potential at the south of the province
- High quantity, quality and availability of **exploratory data** in this area.
- **Information survey** as cores analysis, TOC, vitrinite refractance, etc. also **available**.
- Mendoza Province is encouraging companies to start with **Technical Evaluation Agreements (“TEA”)** that could lead into a Exploratory Permit and after to a Exploitation Concession.
- **Companies can propose** their Area of Interest, Work Program and Time in which evaluation will be carried on.

Source: Wood Mackenzie M&A tool, Mendoza Province
Mendoza: focused on all natural resources development

Las Leñas Sky Center

Mendoza City

Llancanelo Oil Field

La Ruta del Vino
Mendoza

Wine Route
Other Unconventional Formations

1. Neuquena Basin
2. San Jorge Basin
3. Austral Basin

Source: EIA (2013)
San Jorge Basin (Chubut and Santa Cruz North) and Austral Basin (Tierra del Fuego and Santa Cruz South)

Perito Moreno, Santa Cruz

Comodoro Rivadavia, Chubut

Calafate, Santa Cruz

Ushuaia, Tierra del Fuego

1907: Argentina’s 1st Oil Well, Chubut
Argentina is one of the four countries in the world which is commercially developing unconventional resources.
OIL

Production increased

+3% VS SEPTEMBER 2017

485 kbbl/day VS SEPTEMBER 2017

499 kbbl/day

SHALE OIL

+68% vs September 2017

+7% vs last month

UNCONVENTIONAL OIL

Represents 15% of total production

Shale + Tight

Conventional

Shale oil

Tight Oil

65 kbbl/day

2013 2015 2018
NATURAL GAS

Production increased +7% vs September 2017

123 MMm³/day

132 MMm³/day

-1.5% vs last month

SEPTMBER 2018

SHALE GAS

+256% +10% vs September 2017 vs last month

22 MMm³/day

UNCONVENTIONAL GAS

Represents 37% of total production

Conventional
Shale gas
Tight gas
US’ Oil Prices vs Medanito’s export parity price (09/13/2018)

Source: oilprice.com and Secretariat of Energy (Argentina)
Cost decline as performance increases, YPF case

Shale oil costs - Loma Campana [USD/boe]
- Development cost
- Lifting cost

2015: 26.9, Development; 16.4, Lifting
2016: 16.1, Development; 12, Lifting
2017: 13.1, Development; 9.1, Lifting
H1 2018: 11.9, Development; 6.9, Lifting

Source: MINEM Q3 2018

Loma Campana Horizontal well costs [kUSD/lat.ft.]
- Horizontal well cost

2015: 3.05
2016: 2.27
2017: 1.63
Q1 2018: 1.39

Shale gas costs - El Orejano [USD/MMBTU]
- Development cost
- Lifting cost

2016: 2.3, Development; 2.1, Lifting
2017: 1.2, Development; 1.1, Lifting
Q1 2018: 0.9, Development; 0.8, Lifting

Source: MINEM Q3 2018

Loma Campana horizontal well performance
- Avg. Lateral length [km]
- Avg. Frac stages

2015: 16, Avg. Lateral; 1.4, Avg. Frac Stages
2016: 17, Avg. Lateral; 1.4, Avg. Frac Stages
2017: 20, Avg. Lateral; 1.7, Avg. Frac Stages
Q1 2018: 21, Avg. Lateral; 1.9, Avg. Frac Stages

Source: YPF and Ministerio de Energía
Competitive Liquid break-even prices in Vaca Muerta compared with USA plays

Sources: Wood Mackenzie | *Current estimate own elaboration
Also Gas break-even prices in Vaca Muerta are competitive compared USA plays

Vaca Muerta dry gas
Current estimate*

Vaca Muerta dry gas
Woodmac May 18 Estimate

Sources: Wood Mackenzie | *Current estimate own elaboration
Oil Production Forecast

- NGLs
- Unconventional
- P1ND + P2 + P3
- P1 Developed

Double oil production in 5 years

Midstream requirements

Current pipeline capacity

3.3 Bbbl

0.6 Bbbl

1 Bbbl


kbbl/day

1.000 1.100 1.200 1.300 1.400 1.500 1.600

10 20 30 40 50 60 70 80 90 100

Thousand m³/day

100 150 200 250

0.2 Bbbl

0.6 Bbbl

3.3 Bbbl
Natural Gas Production Forecast

Exports (MMm$^3$/d):
- Chile: 10 (2019); 30 (2022).
- Brasil: 3 (2019); 9 (2022); 30 (2025).
- Mundo (GNL): 40 (2023); 80 (2024); 120 (2025).

- Associated gas (shale)
- Unconventional
- P1ND + P2 + P3
- P1 Developed

Midstream requirements

Neuquén-Rosario Pipeline 35 MMm$^3$/d

32 Tcf

5.9 Tcf

3.6 Tcf

5.6 Tcf

Chile: 10 (2019); 30 (2022).
Brasil: 3 (2019); 9 (2022); 30 (2025).
Mundo (GNL): 40 (2023); 80 (2024); 120 (2025).
Key ongoing projects - Oil

NGLs, 68

San Roque (25% Wintershall - 34% YPF - 16% PAE - 25% Total)

La escalonada (45% Total - 23% Shell - 23% O&G Developments - 10% GyP Neuquén)

Bandurria Centro (100% PAE)

La Ribera I (100% YPF)

La Ribera II (100% YPF)

Bandurria Norte (90% Wintershall - 10% PyG Neuquén)

Aguada Federal (90% Wintershall - 10% PyG Neuquén)

Bajo del Toro (50% YPF - 50% Statoil)

Bajo del Choique - La Invernada (90% Exxon Mobil - 10% GyP Neuquén); 50

Bajada de Palo (100% Vista Oil&Gas); 70

Cruz de Lorena - S. Blancas (50% Shell - 40% O&G Developments - 10% GyP Neuquén); 100

La Amarga Chica (50% YPF-50% Petronas); 65

Bandurria Sur (100% YPF); 65

Loma La Isla (100% YPF); 33

Loma Campana (50% YPF-50% Chevron); 90

Conventional, 289
Key ongoing projects - Natural gas

### Associated Gas; 55
- Salinas del Huitrin (100% YPF)
- Los Toldos I Sur (100% ExxonMobil)
- La Escalona (45% Total - 22.5% Shell - 22.5% P&G Developments - 10% YPF Neuquén)
- Estación Fernández Oro (100% YPF)
- Bajo del Choique - La Invernada (90% ExxonMobil - 10% YPF Neuquén)
- La Ribera I (100% YPF)
- Pampa de las Yeguas I (50% Exxon Mobil - 50% YPF)
- Rincon de Ceniza (45% Total - 22.5% Shell - 22.5% P&G Developments - 10% YPF Neuquén)
- Cerro Arena (50% YPF - 50%)

### Non-Associated Gas; 67
- Aguada de la Arena (100% YPF); 15
- Aguada de la Arena 2 (45% YPF - 55% P&G Developments);
- Las Caleras (50% YPF - 50% P&G Developments); 8
- La Calera (50% YPF - 50% P&G Developments); 9
- Cerro las Minas (50% YPF - 50% Total); 13
- Ag. Pichana Oeste (45% PAE - 50% YPF - 25% Total)
- Ag. de Oeste (50% YPF - 50% Total); 16
- Ag. Pichana Este (40% Total - 22.5% Wintershall - 22.5% YPF - 15% PAE); 29
- Fortín de Piedra (100% Tecpetrol); 20
- El Gorrión (50% YPF - 50% DOW); 8

### Conventional; 45
Drilling as driver of a Strong Investment Plan

Completed wells

Investments - BUSD

Conventional Oil
Conventional Natural Gas
Unconventional Oil
Unconventional Natural Gas
Associates
Drilling rigs

Completion sets
25 year project to develop:

50 TCF

approximately 3,900 gas wells

(production: 5.5 BCF/day = 2 TCF year)

38 TCF (77%) export
(production: 4.2 BCF/day)

12 TCF (23%) local market
(production: 1.3 BCF/day)

LNG Patagonia 6 trains

(0.7 BCF/day each)

2023 = 1.4 BCF/day
2024 = 2.8 BCF/day
2025 = 4.2 BCF/day

Estimated ranking:
Installed liquefaction capacity in 2026

<table>
<thead>
<tr>
<th>#</th>
<th>Country</th>
<th>BCF/day</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>USA</td>
<td>27.3</td>
<td>32%</td>
</tr>
<tr>
<td>2</td>
<td>Qatar</td>
<td>13.3</td>
<td>15%</td>
</tr>
<tr>
<td>3</td>
<td>Australia</td>
<td>10.8</td>
<td>13%</td>
</tr>
<tr>
<td>4</td>
<td>Russia</td>
<td>5.4</td>
<td>6%</td>
</tr>
<tr>
<td>5</td>
<td>Argentina</td>
<td>4.2</td>
<td>5%</td>
</tr>
</tbody>
</table>

1.550 km² => 12% acreage Vaca Muerta (gas window)
New employment estimation

Direct, indirect and induced Jobs at the oil and gas in Argentina

Bottom up estimation:

- Overall Jobs 2017 (direct, indirect, induced): 454 thousand jobs
- 500 direct Jobs per rig, 600 Jobs per LNG Train and 20% refinement increase
- Indirect jobs: 3.25 per each direct job in the extraction sector of oil and gas and 9.66 per each job in midstream and downstream (IOT 1997).
- Induced Jobs: +40% (1.7 upstream / 3.9 downstream) per each direct job in Oil and Gas (source: MINEM + MINPROD).
On track to recover the energy trade surplus

Physical Oil international exchange

- Imports
- Exports
- Balance

Physical Natural Gas international exchange

- Bolivia Imports
- LNG Imports
- Exports
- Balance
O&G’s net exports can surpass current agribusiness exports

Trade Balance of O&G

- LNG: 6 USD/MMBTU
  - Bol: 5 USD/MMBTU
  - Oil: 50 USD/BBL
- LNG: 8 USD/MMBTU
  - Bol: 7 USD/MMBTU
  - Oil: 75 USD/BBL
- LNG: 10 USD/MMBTU
  - Bol: 10 USD/MMBTU
  - Oil: 100 USD/BBL

28 BUSD

Soybean Complex
Corn
Wheat
Meat, milk, leather
Other

25 BUSD

Natural Gas
Crude Oil

34 BUSD

O&G Potential 2023
O&G Potential 2027

Agri 2017
We have the capabilities
We have the knowledge
We have the technology
We took the decision
and we have the people
to develop Vaca Muerta
Norpatagonico Train — PPP project to be bidden soon

- Estimated investments: 1,285 M USD
- 48 months of construction
- 850km recovery, Capacity > 6Mt
- 582 M USD, 193 km
- 330 M USD, 176 km

Standard of the Railway:
- 25 tons/ railway’s axis upgraded
- Maximum speed of 70 km/h
- Crossings’ Deviation for 100 wagons
Gas Transport pipelines

**Investments in Gas Transport**

The investments of TGS and Neuquén-Rosario Pipeline correspond to private investments. GNEA, Regional-Centro II Pipeline, De la Costa Pipeline and Cordillerano Pipeline are carried out by public works regime.

- **GNEA (Argentine Northeast Gas Pipeline)**
  - 11 Mm³/day
  - Finished

- **New Pipeline Neuquén-Rosario**
  - Up to 35 Mm³/day
  - Under construction

- **LNG liquefaction plants**
  - 120 Mm³/day
  - TGS S.A.

- **New Pipeline**
  - TGN S.A.
  - To Chile

The investments of TGS and Neuquén-Rosario Pipeline correspond to private investments. GNEA, Regional-Centro II Pipeline, De la Costa Pipeline and Cordillerano Pipeline are carried out by public works regime.

- Nuevo gasoducto TGS Neuquén
- Gasoducto regional centro / De la Costa / Cordillerano
- Gasoducto Neuquén-Rosario
- Gasoducto Noroeste Argentino
- TGS S.A.
- TGN S.A.

**Investment Amounts (MMUSD)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Investment (MMUSD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>74</td>
</tr>
<tr>
<td>2018</td>
<td>97</td>
</tr>
<tr>
<td>2019</td>
<td>89</td>
</tr>
<tr>
<td>2020</td>
<td>85</td>
</tr>
<tr>
<td>2021</td>
<td>51</td>
</tr>
<tr>
<td>2022</td>
<td>150</td>
</tr>
</tbody>
</table>

Note: Tariff Review values expressed in dollars using 16 ARS/USD exchange rate

TGN y TGS: Infrastructure developed by Tariff Review corresponds to maintenance and improvement of gas pipelines and compressor plants. TGS: includes 125 km gas pipeline.
According to the demand forecast, an additional investment of 50MMUSD is estimated in 2026 for the construction of a new section Lago Pellegrini-Medanito.
Vaca Muerta Roundtable

<table>
<thead>
<tr>
<th>Meeting</th>
<th>Timetable</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>08.30h</td>
<td>Entrance and Registration for Meeting (for the rest of meetings, participants should register 30 min before)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>9.00 —10.15 hs</td>
<td>Upstream and Midstream (transport of hydrocarbons and LNG)</td>
</tr>
<tr>
<td>2</td>
<td>10.30 —11.45 hs</td>
<td>Infraestructure (road / railway / logistics)</td>
</tr>
<tr>
<td>3</td>
<td>12.00 —13.15 hs</td>
<td>Value chain / provider development / technology / import management</td>
</tr>
<tr>
<td>13.15 —13.45 hs</td>
<td>Lunch</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>13.45 —15.00 hs</td>
<td>Intensive use of gas to develop the economy: transport, industry, petrochemistry and others, LNG</td>
</tr>
<tr>
<td>5</td>
<td>15.15 —16.30 hs</td>
<td>Productivity, safety, training, housing, health and other labor aspects</td>
</tr>
<tr>
<td>6</td>
<td>16.45 —18.00 hs</td>
<td>Social and environmental aspects</td>
</tr>
</tbody>
</table>

Meetings frequency: Every 3 weeks *(1 in Buenos Aires and 1 in Neuquén)*
Please confirm your participation via mail to: privadaplaneamiento@minem.gob.ar  - +54 11 4349-7581/8624
Please attend exclusively to the corresponding meeting, one person from each organization per meeting
Argentina Bid Round 1 to explore vast Offshore, one of the last areas underexplored in the world with high potential.
Argentina Offshore Round 1

- November 6 of 2018: Bidround was launched.
- High interest demonstrated by International and Local players: 12 companies Nominated blocks and 25 are already working.
- Round includes from medium to high risk exploration blocks.
- 2D/3D seismic and well data available in SEN
- 38 Blocks to be included in Round 1:
  - Austral Basin: 6 Shallow water blocks (WD < 100 m) from 2,000 to 2,700 Km²
  - Malvinas Basin: 18 Deepwater blocks from (WD 100 to 700 m) from 3,600 to 6,300 Km² (Discarded 10 blocks from Nomination process).
  - Argentina Basin: 7 Deepwater blocks (WD 200 to 1,300 m) from 6,000 to 9,000 Km² & 7 UltraDeepwater blocks (WD 1,200 m to 4,000 m) from 3,000 to 9,000 km².

14th March of 2019: Offers to be submitted.

Website: www.costaafuera.energia.gob.ar
Bidding Terms

**Bids:** On Committed Working Units (WUC) for the 1st Exploration Period. Each block will have (i) Minimum Working Units (equivalent to a 3 x 3 km of 2D in 100% of the Block) and (ii) Basic Working Units (equivalent to 20% to 40% of 3D of the surface of the block).

Formula to be used:

\[
\text{Bid (usd)} = \text{WUC} \times 5000 \ (\text{usd/WU}) + \text{Bonus}^* \ (\text{usd})
\]

- **WUC:** Committed Working Units offered for 1st Exploration Period. Must be higher than or equal to Minimum Working Units.
- **Bonus** is accepted only if WU > Basic WU; to be paid 50% upfront + 50% end of 3rd year exchangeable for WU done in the first 3 years in addition to Offered WUs.

Working units in excess of the amount committed in one period may be carried forward to the following period in line with Art. 20 of the Law.

Committed Working Units not fulfilled in one given period shall be paid in cash or Energy Secretariat will execute the guarantee.

Contract Terms

**Long Duration Exploration Permit:** Three periods of 4 + 4 + 5 years for all blocks except – Shallow waters (Austral Basin): 4 + 3 + 4. Relinquishment of 50% at the end of 2nd Period. Obligation to drill one well in 2nd Period and on Extension Period.

- Enough time for Production Concession: 30 years + 10 of extension (successive extensions possible)
- Ability to keep Non Commercial Discoveries: Possibility to keep discoveries for 5 + 5 years after Exploration Permit if discovery appraised and non commercial
- Reduced Royalties linked to success: Starting in 5% to 12% based according to:

\[
R \text{ factor} = (\Sigma \text{Sales} - \Sigma \text{Royalties})/(\Sigma \text{E&A} + \Sigma \text{Investments} + \Sigma \text{OPEX})
\]
Thank you.
VACA MUERTA

Gas y Petróleo del Neuquén S.A.

INVESTMENT OPPORTUNITIES IN THE OIL & GAS SECTOR IN NEUQUEN PROVINCE

November 2018
Neuquén

Argentina

GAS

- 52% Neuquén
- Rest of Arg.
- 18,000,000 m³/d

OIL

- 23% Non
- Rest of Argentina
- 8,500 m³/d

50% Un Conventional

Conventional

50% Un Conventional

Conventional

SHALE WELLS DRILLED & COMPLETED

<table>
<thead>
<tr>
<th>YEAR</th>
<th>YPF</th>
<th>OTHERS</th>
<th>TOTAL</th>
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<tbody>
<tr>
<td>2011</td>
<td>20</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td>2012</td>
<td>25</td>
<td>22</td>
<td>47</td>
</tr>
<tr>
<td>2013</td>
<td>104</td>
<td>29</td>
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<tr>
<td>2014</td>
<td>160</td>
<td>23</td>
<td>183</td>
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<tr>
<td>2015</td>
<td>178</td>
<td>22</td>
<td>200</td>
</tr>
<tr>
<td>2016</td>
<td>103</td>
<td>22</td>
<td>120</td>
</tr>
<tr>
<td>2017</td>
<td>64</td>
<td>45</td>
<td>109</td>
</tr>
<tr>
<td>Jan-Aug 18</td>
<td>44</td>
<td>73</td>
<td>117</td>
</tr>
<tr>
<td>TOTAL</td>
<td>698</td>
<td>233</td>
<td>931</td>
</tr>
</tbody>
</table>
WHERE IN VACA MUERTA?
VACA MUERTA ENTRY OPPORTUNITIES

YPF
INTERNATIONAL OIL COMPANIES
DOMESTIC OIL COMPANIES

GYP
“PLAN EXPLORATORIO NEUQUÉN”

Gas
G&C
Oil
VM core
GyP Active Contracts
JV’s With IOC’s or DOC’s

- Exploration Permits: 23
- Exploration & Exploitation Conventional: 1
- Conventional Exploitation Permits: 4
- Unconventional Exploitation Permits: 9
GYP Unconventional Projects

**Aguada Federal**
- 181.8 MU$$ to assess the potential shale resources. The partners have drilled 6 Wells (2 vertical wells and 4 horizontal Wells).
- Total Project Wells: 148. Total Project Investment: U$$ 2.7 Bn U$$

**Sierras Blancas y Cruz de Lorena**
- Gyp y Shell have drilled 12 Wells in Vaca Muerta. The investment has reached US$ 535 millions. 4 Wells to be drilled in 2018.
- Total Project Wells: 577. Total Project Investment: U$$ 8.9 Bn U$$

**Rincón la Ceniza y La Escalonada**
- The partners have drilled 16 Wells. Actual Investment (included 2018): US$ 589 millions.
- Total Project Wells: 590. Total Project Investment: U$$ 12.8 Bn U$$

**Bajo del Choique - La Invernada**
- Total Project Wells: 561. Total Project Investment: U$$ 13.9 Bn U$$

**Los Toldos 1 Sur**
- Exxon has drilled 3 Wells, 5 committed for next 18 months. US$ 252 to be invested (granted 46 resolution)
- Total Project Wells: 304. Total Project Investment: U$$ 7 Bn U$$
Plan Exploratorio Neuquén

- Availables for quarterly offers under “Plan Exploratorio Neuquén” (43)

Licensing rounds are the lowest cost option and a good fit for companies that desire to operate. Work commitments are not under strict timelines, which allows the operator flexibility in developing its own strategy to prove up the acreage. GyP’s blocks, offered on an ongoing basis, are generally more peripheral and higher risk contributing to a lower cost per acre on average.
Mendoza Subannex
MENDOZA
ARGENTINA

Not Only Oil Business Opportunities
Mendoza Cuyana Basin
Main Oil Fields and an East-West Structural Layer View
NC Opportunities on Cacheuta and Potrerillos Fm.
EOR in current mature areas

Tomado y modificado de Silvia Zencich1, Héctor J. Villar2 y Daniel Boggetti3, IAPG 2014

Tomado y modificado de Silvia Zencich1, Héctor J. Villar2 y Daniel Boggetti3, IAPG 2014
Estructural Levels, Areas and Current Operation Companies on Cuyana Basin
Mendoza Neuquina Basin
(Vaca Muerta – Agrio - Heavy Oil)

✓ **Vaca Muerta Studies indicate:**
  ✓ 2500 Km2 VM & Agrio Productive Area
  ✓ 300-400 m average thickness
  ✓ 2 to 6% TOC
  ✓ 0.9 yo 1.1 Ro
  ✓ 37 to 55 billion bbl Oil in Place
  ✓ 5 to 10% estimated oil Recovery opportunity
  ✓ From 1.9 to 5.5 Bbbl Estimated Production

✓ **Heavy Oil Opportunities:**
  ✓ 5000 Km2 Basin Edge Heavy Oil Opportunities
  ✓ 1.5 to 3.4 Mbbl Estimated Production
Oil Business Opportunities at Mendoza

- Develop of Vaca Muerta Exploitation (1.9 to 5.5 Bbbl)
- NC Exploitation on Cacheuta & Potrerillos, in Cuyana Basin (1.3 to 2.6 Bbbl)
- Develop of Heavy Oil Exploitation at Neuquina Basin (1.5 to 3.4 Bbbl)
- EOR / CEOR in both Basins
- Royalties Reduction to Exploit this Opportunities (up to 5% Red.)
- Predictable Government and Unions
- Environmental Approvals Improvements
Main Laws

- 1967: Law 17,319 creates the legal framework for the Oil & Gas Industry
- 2007: Law 26,197 transfers H/C ownership to Provinces for Onshore & Offshore 12 miles
- 2014: Law 27,007 establishes framework mainly for Unconventionals

Legal Framework

- Concession Regime (Royalties + Income tax)
- Subsurface resources are Province / Federal Government property (Offshore >12 miles)
- Exploration Permits & Exploitation Concessions granted on income tax (30%-25% Income Tax) + royalty regime (5 to 12 %)
- Access to acreage through bid rounds or farm-in agreements with existing rightsholders
- Federal Government sets H/C policies, controls marketing activities and inter-province transport
- Provinces in charge of onshore supervision and control
- Minimum environmental regulations set by Federal Government and specific legislation set by Provinces
Argentina Offshore Round 1 - Context

Argentina Offshore Context:

- Offshore Cuenca Austral produces 800 MMscfd - 20% of the gas of Argentina
- Very large under explored area (200000 Km2 in Round 1 only)
- Very limited exploration activity in last 20 years (6000 Km2 of 3D outside Concessions and no wells on >500 m. WD, last well in 2011)
- Medium to high risk (Size of Structures in Malvinas and Austral / Source Rock in Argentina)
- Limited infrastructure & long distances
- Large distances to developed areas
- Developed local oil & gas industry (increasing with Vaca Muerta)
- Competitive legal framework

Main Goal of the Round:
Increase awareness of Argentine Offshore through real investments in Exploration, carried out by companies with the technical and financial capability to fulfil the objectives.
Argentina Offshore – General Review

OFFSHORE E&P HIGHLIGHTS
- Last exploration well drilled: Malvinas-1 2011 YPF
- Northern Margin Wells: 22 Last one 1997- all <110m wd
- Wells with WD > 100 m: 3 All in the Malvinas Basin
- 3D Seismic: only 15000 Km² (10000 km² in Austral)
- Current Exploration Permits: 1 + 1 under renegotiation

Qg = 0.8 Bcf/d
20% of Arg. Gas production

Original Reserves
OIL ≈ 327 Mbbls
GAS ≈ 8.5 Tcf

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- Current Exploration Permits: 1 + 1 under renegotiation

Qg = 0.8 Bcf/d
20% of Arg. Gas production
Launched November 6th 2018.
- Site of the Round – https://costaafuera.energia.gob.ar
- Decree 872/2018. Defines blocks, royalties and arbitration clause.
- Resolution 65/2018 SEN. Includes Terms & Conditions of Round 1.

Offers to be submitted by March 14th 2019.

Around 25 companies already working in the Round.
- 6 Workshops from January to July 2018 – Open discussion on general conditions of the Round.
- Processed 2D and 3D Seismic and wells data available in SEN Databank.
- Acquisition of Multiclient 2D seismic shot by Spectrum (around 35000 Km in Argentina Basin and 15000 Km in Malvinas Basin) - Several studies performed by various companies through reprocessing and interpretation of existing data in the Data Bank.
Main processed seismic available in the MINEM Data Bank
2D Multiclient Seismic acquired by Spectrum 2017/18 (around 50000 Km)
Argentina Offshore Round 1 – Blocks

Argentina North Basin
100000 Km²

- 7 Deepwater blocks (WD 200 to 1300 m.)
  Blocks surface from 6000 to 9000 Km²

- 7 UltraDeepwater blocks (WD 1200 m. to 4000 m.)
  Blocks surface from 3000 to 9000 km²
Malvinas West Basin
86000 Km²

18 Deepwater blocks (WD 100 to 600 m.)
Blocks Surface from 3600 to 6300 Km²

Austral Basin
14000 Km²

6 Shallow water blocks (WD < 100 m.)
Blocks Surface from 2000 to 2700 Km²
Exploration Permit: Periods and Surface relinquishment:
- Three periods of 4 + 4 + 5 years for all blocks except Shallow waters (Austral Basin): 4 + 3 + 4.
- No relinquishment after 1st period and only 50% relinquishment after 2nd period.
- Relinquishment available at any time provided commitments have been fulfilled.
- Obligation to drill one well in 2nd Period and on Extension Period.

Production Concession: 30 years + 10 of extension (successive extensions possible).

Non Commercial Discoveries: Possibility to keep discoveries for 5 + 5 years after Exploration Permit if discovery appraised (at least 2 wells in the structure) and need to demonstrate non-commerciality.

Offers: On Committed Working Units (WUC) for the 1st Exploration Period.

Offer = WUC x 5000 usd/WU + Bonus*
- Minimum WU (equivalent to 2D of 3 x 3 Km in 100% of the block) If WUC < Minimum WU offer discarded.
- Basic WU (equivalent to 3D in 20 to 40% of the block): *If WUC < Basic WU no Bonus accepted.
- *Bonus: 50% when obtaining the Permit + 50% at the end of 3rd year (can be compensated with additional WU to WUC).
 Royalties: Law 17.319 => 12% may be reduced to 5% for Offshore.

\[
R \text{ Factor } = \frac{Cum(Sales-Royalties)}{Cum(E&A+CAPEX+OPEX)}
\]

- \( R \leq 1.1 \) => Royalties = 5%
- \( R > 1.1 \) and \( < 1.8 \) => Royalties = \((R \times 10)\% - 6\%
- \( R \geq 1.8 \) => Royalties = 12%
  - “E&A” will include all historical Exploration activities in the Permit + all wells delineating discovery
  - R factor calculation will be done by Production Concession

Surface fee: In line with the Hydrocarbons Law.

- 1st Period = AR$ 250 /km2/y & 2nd Period = AR$ 1000 /km2/y
- Extension (3rd Period) = AR$ 17500 /km2/y increasing 25% each year.
- For the 2nd and 3rd Periods the Surface fee may be exchanged (maximum deduction of 90% of the Surface Fee) for new investments above those already committed.
- Production Concession Fee = AR$ 4500 /km2/y
Registration for the Round - Bidders qualification: Technical & Financial. Individual Registration by company is opened until 30 days before the Bidding date. Payment of 50 Kusd to start Registration and get a HD with the information prepared by Schlumberger.

Operator types:
- Operator/Non Operator = A / for all blocks (In TEIT 50 & 100 ranking)
- Operator/Non Operator = B / for Deep y Shallow (< 100 m.)
- Operator/Non Operator = C / only Shallow

Automatic qualification as Operator/Non Operator A for companies demonstrating they are included in “The Energy Intelligence Top 50 of 100: Ranking the World’s Top Oil Companies”.

Financial requirements: (i) Avg. Capital Investments 2015/16/17 or (ii) Last Balance Net equity

<table>
<thead>
<tr>
<th>Operator</th>
<th>Investments Avg 2015/16/17 MMusd</th>
<th>Net Equity MMusd last Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>750</td>
<td>250</td>
</tr>
<tr>
<td>B</td>
<td>300</td>
<td>100</td>
</tr>
<tr>
<td>C</td>
<td>100</td>
<td>30</td>
</tr>
</tbody>
</table>

Non Operators 50% of requirements of Operators
Argentina Offshore Round 1 - Bidders Qualification & Registration Process

- **Operator – Technical requirements:**
  - **Requirements Operator A:**
    - Production > 20000 boe/d average 2015/16/17. This requirement may be also achieved demonstrating the operation of at least 3 exploration wells in water depth of more than 1000 m. in the last 10 years
    - Operated at least in one block in the last 15 years in waters deeper than 500 m. depth (Exploration or Exploitation)
  - **Requirements Operator B:**
    - Production > 10000 boe/d average 2015/16/17. This requirement may be also achieved demonstrating the operation of at least 3 exploration wells in water depth of more than 100 m. in the last 10 years
    - Operated at least in one block in the last 15 years in waters deeper than 100 m. depth (Exploration or Exploitation)
  - **Requirements Operator C:**
    - Production > 5000 boe/d average 2015/16/17. This requirement may be also achieved demonstrating the operation of at least 3 offshore exploration wells in the last 10 years.
    - Operated at least in one block in the last 15 years in offshore (Exploration or Exploitation)

- **% Minimum Working Interest:** Operator 30% / Partner 5%
- **Unitization**: obligation to reach a unitization agreement between the parties, scheme to be included

- **External Guarantee**: Covering pending Working Units commitments. Calculated on a yearly basis. Given by the Operator but partners solidary responsible. Letter of Credit, Bank Guarantee or a Surety Bond will be accepted.
  - 1st Period: 100% of Minimum WU + 25% of WUC Additional to minimum WU + 50% of Bonus.
  - 2nd Period and Extension Period: 10 MMusd (Shallow Blocks) / 17 MMusd (Deep) / 22 MMusd (Ultra Deep) until obligation to drill the well is fulfilled

- **Bidding**: Bid Guarantee of US$ 100K for 120 days
  - Foreign companies will be able to bid, with the commitment to open a Local vehicle if one of the blocks is Pre Awarded to them (they will have 30 days to show they have started the process)
  - **Working Program Flexibility**: The winner of a block will have to pursue the Working program proposed in the bid and fulfill 100% of the number of WU proposed. Changes to the program can be done with the approval by the SEN, changes to the program without SEN approval of up to 40% of the WU committed, only in the case that 40% is fulfilled either with 2D seismic, 3D seismic, or drilling of a well (including casing, coring, testing).
  - **Multiclient WU (Acquisition date before bidding)**: 100% of Multiclient Working Units can be applied for the Bid if work was acquired in the last 3 years before the Bidding date, and it is bought by the Bidder up to 18 months after the Permit is awarded. Multiclient WU cannot be considered for the fulfillment of the Minimum Working Units.
Arbitration Clause:

- Any lawsuit of ≤ 20 MMusd => Local justice for > 20 MMusd then Arbitration Clause
- 3 Arbitrators defined one by each Party, and the 3rd one in Agreement between two Parties from the Permanent Court of Arbitration of La Haye (PCA), if no Agreement then the 3rd Arbitrator will be chosen by the President of the Supreme Court (Hydrocarbon Law Art. 86) from the same PCA panel within 60 days. If the President of the Supreme Court does not appoint the third arbitrator then the parties may request the PCA Secretary-General to carry out such appointment of the third arbitrator (under consideration)
- Arbitration by agreed rules or otherwise UNCITRAL rules
- Foreign Shareholder of a Party and the Party should choose between claiming through this Arbitration Clause or by using any Bilateral Investment Treaty
- Place of Arbitration: Buenos Aires for local companies or otherwise to be agreed by the two Parties in a city of a country having signed the Convention on the Recognition and Enforcement of Foreign Arbitral Awards (New York, 1958) (the "New York Convention") if no agreement, then the Arbitrators should agree on a place in line with Arbitration rules, excluding any of the countries of the Parties
- Each company in a UTE has the possibility to demand individually
- **Local content**: No local content commitment on investments resulting from the bidding documents.

  - The only commitment will be that included in Laws of general application ("Compre Nacional"; "Contrate Nacional") whereby local providers may enjoy certain price preferences.

  - The Hydrocarbon Law requires a minimum of 75% of local employees but states that *this minimum shall be reached within the timeframe set by the regulations or tenders*.

  - Round 1: In Production Phase: 1st year of production 50% of local employees, increasing 5% every year until reaching 75% in the 6th year.
Argentina Offshore Round 1 offers a great opportunity for both industry and country

- Vast underexplored area (200,000 km2).
- Little done in the last 20 years, nearly nothing in Deep and Ultra Deep waters while it was one of the main drivers of the industry worldwide.
- Increasing new technologies show good potential and there are still many others to be applied.
- High oil prices increase appetite from industry for Offshore plays and Risked Exploration.
- High awareness of the government on the need to set Competitive conditions.
- 20 to 25 big offshore players are working on the Round since 1st half of 2018

Argentina Offshore Round 1

www.costaafuera.energia.gob.ar
Argentina Offshore Round 1

Houston - November 2018
Value of the WU = 5000 USD

<table>
<thead>
<tr>
<th>Activity</th>
<th>Units</th>
<th>usd/unit</th>
<th>UT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition 3D Seismic</td>
<td>km²</td>
<td>11000</td>
<td>2,2</td>
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<tr>
<td>Acquisition 2D Seismic</td>
<td>km</td>
<td>1200</td>
<td>0,24</td>
</tr>
<tr>
<td>Reprocessing 2D TIME Domain</td>
<td>km</td>
<td>200</td>
<td>0,04</td>
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<tr>
<td>Reprocessing 2D DEPTH Domain</td>
<td>km</td>
<td>100</td>
<td>0,02</td>
</tr>
<tr>
<td>Reprocessing 3D TIME Domain</td>
<td>km²</td>
<td>1000</td>
<td>0,2</td>
</tr>
<tr>
<td>Reprocessing 3D DEPTH Domain</td>
<td>km²</td>
<td>500</td>
<td>0,1</td>
</tr>
<tr>
<td>Acquisition Potential Methods - Ship (grav/mag)</td>
<td>km</td>
<td>500</td>
<td>0,1</td>
</tr>
<tr>
<td>Acquisition Potential Methods - Air (grav/mag)</td>
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<td>60</td>
<td>0,012</td>
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<tr>
<td>Acquisition CSEM</td>
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<tr>
<td>Acquisition Multibeam</td>
<td>km²</td>
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<tr>
<td>Drop Cores (includes geochemistry)</td>
<td>N°</td>
<td>17000</td>
<td>3,4</td>
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</table>

For methods having Km² as Units, a maximum of 120% of the acquired activity inside the block will be recognized as WU.

All acquisitions includes processing.
<table>
<thead>
<tr>
<th>Total TD BRT (m.)*</th>
<th>Jack up</th>
<th>100 (Floating)</th>
<th>500</th>
<th>1000</th>
<th>1500</th>
<th>2500</th>
<th>3500</th>
<th>4500</th>
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<tbody>
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<tr>
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<td>21,1</td>
<td>16,5</td>
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<td>0,0</td>
<td>0,0</td>
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<tr>
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<td>29,7</td>
<td>25,1</td>
<td>24,0</td>
<td>19,0</td>
<td>0,0</td>
<td>0,0</td>
<td>0,0</td>
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<tr>
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<td>17,9</td>
<td>38,5</td>
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<td>32,8</td>
<td>27,8</td>
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<tr>
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<td>22,0</td>
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<td>9000</td>
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<td>93,6</td>
<td>87,7</td>
<td>81,6</td>
<td>75,2</td>
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</tbody>
</table>

*For all values exceeding this table extrapolation following the line tendencies will be used.

*The final WU of a well should be obtained by linear interpolation of both parameters WD and TD. With the following procedure:

*For WD <100 m., this UT should be used for any well drilled with a Jackup in shallow waters.

Example: a well drilled in 120 m. of WD with a Jackup should use this <100 m. values.

Casing of the well to TD: Increase the above values by 5%
Coring: Increase the above values by 0.5% for every 4.5 m of recovered core.
DST (cased or openhole): Increase the above values by 20%
### Working Units Tables

**Value of the WU = 5000 USD**

<table>
<thead>
<tr>
<th>Total TD BRT (m.)*</th>
<th>Jack up</th>
<th>100 (Floating)</th>
<th>500</th>
<th>1000</th>
<th>1500</th>
<th>2500</th>
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<th>4500</th>
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<td>19780</td>
<td>18720</td>
<td>17540</td>
<td>16320</td>
<td>15040</td>
</tr>
</tbody>
</table>

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**Coring:** Increase the above values by 0,5% for every 4,5 m of recovered core.

**DST (cased or openhole):** Increase the above values by 20%
Methodological Subannex
Historical Production and Reserves of Oil and Natural Gas

### Oil Production

-37% / -3% cagr

### Oil Reserves (2P)

-24% / -2% cagr

-15%

### Natural Gas Production

-18% / -2% cagr

+10%

### Natural Gas Reserves (2P)

-52% / -5% cagr

+7%
Growth in U.S. Energy Supply: Natural Gas vs. Solar and Wind

Source: Data drawn from EIA, Monthly Energy Review, July 2018
On track to recover the energy trade surplus

Trade Balance of Oil

- 50 USD/BBL
- 75 USD/BBL
- 100 USD/BBL

Trade Balance of Natural Gas

- LNG: 6 USD/MMBTU
- Bol: 5 USD/MMBTU
- LNG: 8 USD/MMBTU
- Bol: 7 USD/MMBTU
- LNG: 10 USD/MMBTU
- Bol: 10 USD/MMBTU
O&G’s net exports can surpass current agribusiness exports.
Global energy context - Production, demand and reserves

**Production – MMBBL/d**
- Asia Pacific
- Africa
- E. & Cent. America
- Middle East
- CIS

**Demand – MMBBL/d**
- Asia Pacific
- Africa
- E. & Cent. America
- Middle East
- CIS

**Reserves – %**
- Middle East
- S. & Cent. America
- North America
- CIS
- Africa
- Asia Pacific
- Europe

**OIL**

**GAS**

2017 Total 1.696.6 thousand million barrels

2017 Total 193.5 trillion cubic metres
The exponential growth of non-conventional oil production in Argentina motivates the study of the transportation system to identify possible bottlenecks and guarantee an adequate infrastructure planning.

Demand forecast for the period 2019-2023 shows the need to carry out expansion works on the oil transport system.

Oil Transport System Expansion (OldelVal)

Current situation

- Works needed to supply demand forecast (2019-26)

Next Steps

OldelVal Proposition

- New Contract Carrier regulation to enable firm offer transport contracts.
- Time extension of Oldelval concession to match investment amortization period.

Expected Results

- Financial viability of oil pipeline expansions.
- More flexibility for producers to match transport contracts with upstream projects.
## Main assumptions about profiles

<table>
<thead>
<tr>
<th>Natural Gas</th>
<th>Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conventional assumptions</strong></td>
<td></td>
</tr>
<tr>
<td>EUR (y15)</td>
<td>1.5 BCF</td>
</tr>
<tr>
<td>Declination</td>
<td>-15%</td>
</tr>
<tr>
<td>Risked P1/P2/P3</td>
<td>100% / 50% / 10%</td>
</tr>
<tr>
<td>Incorporation of reserves in the first year</td>
<td>5%</td>
</tr>
<tr>
<td>Incremental incorporation reserves</td>
<td>+0.3% per year</td>
</tr>
<tr>
<td>Production in the first year of the reserves incorporated</td>
<td>16.4%</td>
</tr>
<tr>
<td>Capex</td>
<td>2.5 MM USD</td>
</tr>
<tr>
<td>Total reserves incorporated</td>
<td>6 TCF</td>
</tr>
<tr>
<td><strong>Unconventional assumptions</strong></td>
<td></td>
</tr>
<tr>
<td>EUR (y30)</td>
<td>12.9 BCF</td>
</tr>
<tr>
<td>EUR total (y30)</td>
<td>2,388 kboe</td>
</tr>
<tr>
<td>Condensed</td>
<td>1 m³ oil per 28,000 m³ gas</td>
</tr>
<tr>
<td>GOR</td>
<td>-</td>
</tr>
<tr>
<td>Capex</td>
<td>12.2 MM USD + 15% facilities</td>
</tr>
<tr>
<td>Opex</td>
<td>5.9 USD/BOE (1 USD/MMBTU)</td>
</tr>
<tr>
<td>Fractures</td>
<td>33</td>
</tr>
<tr>
<td>Total reserves incorporated</td>
<td>55 TCF</td>
</tr>
<tr>
<td>EIA 2013</td>
<td>7%</td>
</tr>
<tr>
<td>Breakeven</td>
<td>4 USD/MMBTU</td>
</tr>
</tbody>
</table>

### Diagrams

**Overall unconventional oil production profile.**

**Overall unconventional gas production profile.**
Conventional production:
- PID (72%): declines @ 15%
- PIND (100%) + P2 (50%) + P3 (10%):
  - Total incorporated reserves: 172 Billion m³ (6 TCF).
  - Incorporation of reserves in the first year: +5%
  - Incremental incorporation reserves: +0.3%
  - The production in the first year is 16.4% of the incorporated reserves, then decline equal to developed reserves (-15%).
  - Accumulated production per well: 42 Million m³ (1.5 BCF)
  - Cost per well: 2.5 MM USD

Overall unconventional production profile
- EUR$_{30}$ = 366 Million m³ gas (12.9 BCF).
- Total EUR = 2,388 kboe
- Capex = 12.2 MM USD + 15% of facilities.
- Opex = 5.9 USD/boe (1 USD/MMBTU)
- IP 30: 0.33 MM m³/day gas
- Condensed: 1 m³ de oil per 28,000 m³ of gas
- Horizontal well with 33 fracture stages, 250 tons of sand per fracture
- 40 perforation´s days

Break-even: 4 USD/MMBTU
Main assumptions about Oil production

Conventional Production:

- P1D (72%): declines @ 9%
- P1ND (100%) + P2 (50%) + P3 (10%):
  - Total incorporated reserves: 157 Million m³ (25 MM bbl).
  - Incorporation of reserves in the first year: +5%
  - Annual incremental incorporation reserves: +0.3%
  - Total production in the first year is 11.9% of the incorporated reserves, then decline equal to developed reserves (-9%).
  - Accumulated production per well: 28.6 thousand m³ (180 kbbi)
  - Cost per well: 2.5 MM USD.

Overall unconventional production profile

- EUR₃₀ = 100.3 mil m³ oil (631 kbbi).
- EUR Total = 820 kboe.
- Capex = 10.2 MM USD + 15% de facilities.
- Opex = 7 USD/boe
- IP 30: 92 m³/d oil (579 bbl/day)
- GOR = 300 m³ gas/m³ oil
- Horizontal well with 33 fracture stages, 250 tons of sand per fracture
- 40 perforation´s days

Break-even: 46.7 USD/BBL
Activity is increasingly driven by new players (IHS – Markit)
Natural gas liquefaction plant analysis

- Gradual incorporation: 40 MMm³/day in 2023, 80 MMm³/day in 2024 and 120 MMm³/day in 2025.
- The cost of liquefaction ranges between USD 2.5 / MMBTU and USD 3.6 / MMBTU, depending on the price of gas in PIST (for each USD that increases local gas, the cost of liquefaction increases 0.1 USD).

Plant assumptions:
- Capacity per train: 5 MMmtpa (20 MMm³/day)
- Number of trains: 6
- Total capacity: 30 MMmtpa (120 MMm³/day)
- CAPEX: 600 USD/tpa installed
- Total investment: 18 thousand MMUSD
- Discount rate: 9% in USD
- Amortization period and useful life: 25 years
- Natural gas own consumption: 9%
- OPEX: 0.65 USD / MMBTU

Transportation assumptions:
- Local Transportation – new gas pipeline: 0.75 USD/MMBTU
- GNL shipping:
  - USA – Argentina: 1.0 USD/MMBTU
  - USA – Asia: 1.8 USD/MMBTU
  - Argentina – Asia: 1.6 USD/MMBTU
World context and Argentina: Crude oil prices

- WTI
- Escalante Official dolar
- Escalante Real Dolar
- Medanito Oficial Dolar
- Medanito Real Dolar
World context and Argentina: Natural gas prices

USD/MMBTU

- Henry Hub
- LNG Price
- Bolivian Natural Gas Price
- Internal market official dolar price (avg.)
- Internal market real dolar price (avg.)
WTI and Brent vs Medanito

Note: Medanito Export Parity was estimated using Brent -4 USD/bbl (transport) -10% (export tax).
Medanito vs. Brent

Sources: Energy Information Administration (EIA) y Ministerio de Energía de la Nación
Anadarko’s Delaware Wolfcamp Northeast Extension position used as base asset to benchmark across regions (Wood Mackenzie)

- Anadarko holds approximately 240,000 net acres in the Delaware Wolfcamp NE Extension.
- Remaining PV post-tax of this acreage is US$ 4,286 million.
- 2017 and 2018 M&A deals in the same sub-play closed between US$ 25,000 and 40,000 per acre.
- Assuming US$25,000/acre for a potential new entry in 2019, the cost of acquiring this position would be US$ 6,000 million.
- A US$15,000/acre price, reflective of earlier entries, equals to a US$ 3,600 million acquisition cost (used in the benchmarking exercise).

2017/2018 M&A transaction prices in Wolfcamp A NE Extension

![Graph showing average consideration per acreage (US$/acre) for different companies over the years: Callon Petroleum, Centennial Resource Dev., Lilis Energy, and Oasis Petroleum. The graph displays data points for each company in 2017 and 2018.]
Argentina fiscal terms and oil pricing assumptions

Royalty: 12%
Sales Tax: 2%
Income Tax
2018 35%
2019 30%
2020 25%

Oil price
Brent - 10% export retention (assumes ARS4/USD exported)

Anadarko Delaware Wolfcamp Northeast Extension asset assumptions

**Lease Information**

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<tr>
<th>Basin</th>
<th>Gross Acres ('000 acres)</th>
<th>Net Acres ('000 acres)</th>
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**Type Well Assumptions**

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<th>EUR (mmboe)</th>
<th>Initial Production Gas (mmcf/d)</th>
<th>Initial Production Oil (b/d)</th>
<th>Initial Production NGLs (b/d)</th>
<th>Royalty Rate (%)</th>
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**Remaining Recoverable Reserves (at 01/01/2018)**

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<th>Liquids (mmbbl)</th>
<th>Gas (bcf)</th>
<th>Total (mmboe)</th>
<th>Proved Developed</th>
<th>Proved + Probable (2P)</th>
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<td>75.56</td>
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**Net Development Drilling in the play**

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<td>62</td>
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**Applicable Tax Rates by State**

<table>
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<tr>
<th>State</th>
<th>Oil Severance</th>
<th>Gas Severance</th>
<th>Oil Ad Valorem</th>
<th>Gas Ad Valorem</th>
<th>Income</th>
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<tr>
<td>New Mexico</td>
<td>8.24%</td>
<td>9.09%</td>
<td>2.50%</td>
<td>7.60%</td>
<td>7.60%</td>
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<tr>
<td>Texas</td>
<td>4.60%</td>
<td>7.50%</td>
<td>4.00%</td>
<td>n/a</td>
<td>7.60%</td>
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