Argentina Energy Plan
—Guidelines—
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 natural gas production in 5 years, to achieve 260 MMm³ (9.2 Bcf) per day and to export 100 MMm³ (3.5 Bcf) daily.

2. Double oil production in 5 years, reaching 1 million barrels per day and to export 500 thousand 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.
Argentine energy matrix

Internal energy supply* - 2017

- Natural Gas: 57%
- Oil and derivatives: 30%
- Mineral Coal: 1%
- Nuclear: 2%
- Hydropower: 4%
- Other: 2%
- Biomass and biofuel: 4%

Total: 83 MMtoe

Power generation matrix - 2017

- Thermal: 65%
- Hydraulic >50 MW: 29%
- Nuclear: 4%
- Other Renewables: 2%

Total: 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
Public investment in the energy sector – 2018 est. 

Power transmission and distribution
- 201 MMUSD
- Renewable energy
- 265 MMUSD
- Thermal power generation
- 24 MMUSD
- Total public
- 1,152 MMUSD

Other O&G
- 20 MMUSD

Transport and distribution of natural gas
- 184 MMUSD

Nuclear
- 458 MMUSD
### 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
Fractures stages by month - SHALE
<table>
<thead>
<tr>
<th>Area</th>
<th>Operator</th>
<th>Black Oil</th>
<th>Light Oil</th>
<th>Wet Gas</th>
<th>Dry Gas</th>
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<td>31 Puesto Rojas</td>
<td>Phoenix</td>
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</table>
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
Conventional and Unconventional 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)
Vaca Muerta in numbers

One of the best resources in the world

Unconventional Gas Resources
- China
- Argentina
- Argelia
- EE.UU.

Unconventional Oil Resources
- Rusia
- 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
## Vaca Muerta vs. US plays

<table>
<thead>
<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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<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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<tr>
<td>Marcellus</td>
<td>2–12</td>
<td>10–60</td>
<td>2,000–5,500</td>
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<tr>
<td>Eagle Ford</td>
<td>3–5</td>
<td>30–100</td>
<td>4,500–8,500</td>
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<tr>
<td>Wolfcamp (Permian)</td>
<td>3</td>
<td>200–300</td>
<td>4,600</td>
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</tbody>
</table>

### Acreage
- Vaca Muerta: ~8.65 MM acres, 35,000 km²
- Eagle Ford: ~9.4 MM acres, 38,000 km²

### Max Thickness
- Vaca Muerta: ~1,480 feet
- Eagle Ford: ~330 feet

Sources: Energy Information Administration (EEUU), 2013 & YPF, 2014
There is plenty of room in Vaca Muerta for new players.
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
WDVG Production Analysis:

- Methodology: the plot shows the Original Oil in Place per Section vs the EUR normalized to effective lateral length for various areas of the different plays.

Source: WDVG Petroleum Engineering Laboratories
Argentina’s concession terms are competitive against its peer group, even when including the Vaca Muerta cost of entry (Wood Mackenzie).

Remaining NPV post-tax (US$/boe) at 15%
YPF farm-ins have averaged US$8,000/acre, less than half L48 costs of US$20,000-30,000 per acre (Wood Mackenzie).

GyP Neuquen license round entry costs (signature bonus and work commitments) have equated to US$3000/acre.

Neuquen basin ownership

Cost per acre, YPF farm-ins

Source: Wood Mackenzie M&A tool
Production and reserves of oil and natural gas

Oil Production

-37% / -3% cagr
-9%

Oil Reserves (2P)

-24% / -2% cagr
-15%

Natural Gas Production

-18% / -2% cagr
+10%

Natural Gas Reserves (2P)

-52% / -5% cagr
+7%
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.)
Where we are heading in energy markets

**Natural Gas**: a unique, transparent and competitive market

- MEGSA: electronic platform for spot transactions and contracts.
- Complete and real time information.
- Business opportunities: liquefaction and storage.

**Power markets**: an efficient and competitive system

- More natural gas availability for power generation at lower prices.
- Lower generation costs due to fuel optimization.
- 5,000+ MW of renewable energy.
- Operation efficiency: PPP for power transmission.

**Transport**: more supply options

- Gasoline and Diesel oil.
- vs. LNG, GNC.
- vs. biodiesel, bioethanol.
- vs. electric vehicles.
**OIL**

Production increased

- **485 kbbl/day**
- **+3%**

**SALE OIL**

- **499 kbbl/day**
- **+1.5%** vs September 2017
- **+68%** vs September 2017
- **+7%** vs last month

**UNCONVENTIONAL OIL**

- **Represents 15% of total production**

- Conventional
- Shale oil
- Tight Oil
NATURAL GAS

Production increased

+7% VS SEPTEMBER 2017

123 MMMm³/day

132 MMMm³/day

-1.5% VS LAST MONTH

SEPTEMBER 2018 VS SEPTEMBER 2017

SHALE GAS

+256% +10% VS LAST MONTH

22 MMMm³/day

UNCONVENTIONAL GAS

SHALE + TIGHT

REPRESENTS 37% OF TOTAL PRODUCTION

Conventional
Shale gas
Tight gas
Argentina is one of the four countries in the world which are commercially developing unconventional resources.
Cost decline as performance increases (source YPF)

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

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

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

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

Source: YPF and Ministerio de Energía
WTI and Brent vs Medanito

Note: Medanito Export Parity was estimated using Brent -4 USD/bbl (transport) -10% (export tax).
US’ Oil Prices vs Medanito’s export parity price (09/13/2018)

<table>
<thead>
<tr>
<th></th>
<th>USD/bbl</th>
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<tbody>
<tr>
<td>Eagle Ford (Texas)</td>
<td>66.5</td>
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<tr>
<td>Williston Sweet (North Dakota)</td>
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<tr>
<td>&quot;Permian&quot; W.Tx./N.Mex.Inter.</td>
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<tr>
<td>WTI</td>
<td>68.8</td>
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<tr>
<td>Medanito EPP</td>
<td>66.9</td>
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</table>

Source: oilprice.com and Secretariat of Energy (Argentina)
Liquid break-even prices in Vaca Muerta vs. USA plays

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

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

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

Double oil production in 5 years

Current pipeline capacity

Midstream requirements

1 Bbbl

0.6 Bbbl

3.3 Bbbl

0.2 Bbbl
Key ongoing projects - Oil

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 lata (100% YPF); 33
Loma Campana (50% YPF-50% Chevron); 90

Conventional; 289
Key ongoing projects - Natural gas

- Salinas del Huílirín (100% YPF)
- Los Toldos Sur (100% ExxonMobil)
- La Escalonada (45% Total - 22.5% Shell - 22.5% F&G Developments - 10% GYP Neuquén)
- Estación Fernández Oro (100% YPF)
- Bajo del Choique - La Invernada (90% ExxonMobil - 10% GYP Neuquén)
- La Ribera I (100% YPF)
- Pampa de las Yeguas I (50% ExxonMobil - 50% YPF)
- Rincon la Ceniza (45% Total - 22.5% Shell - 22.5% F&G Developments - 10% GYP Neuquén)
- Cerro Arena (50% YPF - 50%)

- Aguada de la Arena (100% YPF); 15
- Aguada de las Minas (50% YPF - 50% YPF) 5
- La Goberña; 100% Pluspetrol; 50% YPF) 8
- Las Facanias (50% YPF - 50% Pluspetrol); 9
- Cerro las Minas (50% YPF - 50% Total); 13
- Ag. Pichana Oeste (45% PAE - 50% YPF - 15% Total)
- Ag. de Circeo (50% YPF - 50% Total); 18
- Ag. Pichana Este (40% Total - 22.5% Wintershall - 22.5% YPF - 15% PAE); 29
- Fortín de Piedra (100% Tecpetróil); 20
- El Driego (50% YPF - 50% DOW); 8

Conventional; 45
Production Wells and associated investments

Completed wells

Investments - BUSD
Equipment requirements to develop resources

Drilling rigs

Completion sets
Patagonia LNG: Energy for the world

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)

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

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

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<tr>
<th>#</th>
<th>Country</th>
<th>BCF/day</th>
<th>%</th>
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<tbody>
<tr>
<td>1</td>
<td>USA</td>
<td>27.3</td>
<td>32%</td>
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<td>2</td>
<td>Qatar</td>
<td>13.3</td>
<td>15%</td>
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<tr>
<td>3</td>
<td>Australia</td>
<td>10.8</td>
<td>13%</td>
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<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>
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

**Trade Balance of Oil**

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

**Trade Balance of Natural Gas**

- LNG: 6 USD/MMBTU
- LNG: 8 USD/MMBTU
- LNG: 10 USD/MMBTU

Bol: 5 USD/MMBTU
Bol: 7 USD/MMBTU
Bol: 10 USD/MMBTU
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

15 BUSD

Natural Gas

34 BUSD

Natural Gas

Crude Oil

Crude Oil
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

- Soybean Complex
- Corn
- Wheat
- Meat, milk, leather
- Other

- Agri 2017
- O&G Potential 2023
- O&G Potential 2027

Natural Gas
- 28 BUSD

Crude Oil
- 15 BUSD
- 34 BUSD
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 bidded soon

- Estimated investments: 1,285 M USD
- 48 months of construction
- 850km recovery
  - Capacity > 6Mt
- Standard of the Railway
  - 25 tons/ railway’s axis upgraded
  - Maximum speed of 70 km/h
  - Crossings’ Deviation for 100 wagons

Map:
- 200km recovery
- 250km new railway
- 391km upgraded
- Añelo
- Vaca Muerta
- C. Cordero
- Cipolletti
- Chichinales
- Nuevo acceso Cangrejal
- Bahía Blanca
- Gral. Cerri
- Ing. White

Key Locations:
- Neuquén
- La Pampa
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.

**Investments in Gas Transport**

![Map of Gas Transport Pipelines]

- **GNEA (Argentine Northeast Gas Pipeline)**: 11 Mm³/day
- **New Pipeline Neuquén-Rosario**: Up to 35 Mm³/day
- **LNG liquefaction plants**: 120 Mm³/day

**Investment Amounts (MMUSD)**

<table>
<thead>
<tr>
<th>Year</th>
<th>GNEA</th>
<th>New Pipeline Neuquén-Rosario</th>
<th>LNG liquefaction plants</th>
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<td>2017</td>
<td>35</td>
<td>74</td>
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<tr>
<td>2018</td>
<td>212</td>
<td>97</td>
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</tr>
<tr>
<td>2019</td>
<td>500</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>2020</td>
<td>500</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>2021</td>
<td>350</td>
<td>82</td>
<td>82</td>
</tr>
<tr>
<td>2022</td>
<td>300</td>
<td>300</td>
<td>300</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.
Cities and Interconnections - Resources from Res. 46/2017

- Malargüe
- Ranquil del Norte
- Chos Malal
- Rincón de los Sauces
- Catriel
- Añelo
- Zapala
- Cutral CO
- Neuquén

A Bahía Blanca
<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 #1 (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>

Place: Espacio Duam – San Martín 5901 – Acceso Aeropuerto - Ciudad de Neuquén
Meetings frequency: Every 3 weeks (1 in Buenos Aires and 1 in Neuquén)
Please confirm your participation via mail to: privadaplaneamiento@minem.gob.ar - 011-4349-7581/8624
Please attend exclusively to the corresponding meeting, one person from each organization per meeting
12 companies Nominated blocks. Blocks to be included in Round 1 are the following:

- Malvinas Basin: 18 Deepwater blocks from (WD 100 to 700 m) from 3,600 to 6,300 Km² (Discarded 10 blocks from Nomination process).
- Austral Basin: 6 Shallow water blocks (WD < 100 m) from 2,000 to 2,700 Km²
- 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.

7th June of 2018: Nomination Process ended.

31th October of 2018: Presidential decree 827/2018 allowed to call to International Public Contest.

28th February of 2019: Opening of offers.
Bidding Terms

**Bids:** On committed Working Units for the 1st Exploration Period. Each block will have (i) Minimum Working Units (equivalent to a 4 x 4 or 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:

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

**WU:** 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: 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:

\[
\text{R factor} = \frac{\sum \text{Sales} - \sum \text{Royalties}}{\sum \text{E&A} + \sum \text{Investments} + \sum \text{OPEX}}
\]
<table>
<thead>
<tr>
<th>Year</th>
<th>Project</th>
<th>Grupo Operante</th>
<th>MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>Aña Cuá</td>
<td>GEN MEDITERRÁNEA S.A</td>
<td>276</td>
</tr>
<tr>
<td></td>
<td>La Barrancosa</td>
<td>GEN MEDITERRÁNEA S.A</td>
<td>360</td>
</tr>
<tr>
<td></td>
<td>Cónor Cliff</td>
<td>GEN MEDITERRÁNEA S.A</td>
<td>950</td>
</tr>
<tr>
<td></td>
<td>El Tambolar</td>
<td>GEN MEDITERRÁNEA S.A</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Portezuelo del Viento</td>
<td>GEN MEDITERRÁNEA S.A</td>
<td>210</td>
</tr>
<tr>
<td>2019</td>
<td>Carem</td>
<td>ZYEN S.A.</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Ensenada de Barragán</td>
<td>GEN MEDITERRÁNEA S.A</td>
<td>280</td>
</tr>
<tr>
<td>2020</td>
<td>Brigadier López</td>
<td>GEN MEDITERRÁNEA S.A</td>
<td>140</td>
</tr>
</tbody>
</table>

**Central Embratel**
- +35 MW

**Resolución 287**
- 1,810 MW
Results of the RenovAr program

Diversity of technologies and federal distribution

- **Wind**: 34 projects, 2,466 MW, 9.778 GWh/year
- **Solar PV**: 41 projects, 1,732 MW, 4,290 GWh/year
- **Biomass**: 58 projects, 236 MW, 1,665 GWh/year
- **Mini Hydro**: 14 projects, 32 MW, 103 GWh/year

147 awarded projects, 4,466.5 MW, 15,835 GWh
Renewables installed power capacity

New renewable capacity

Renovar 1, 1.5, 2
MATER
Res. 202

<table>
<thead>
<tr>
<th>Year</th>
<th>Acumulate Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>826</td>
</tr>
<tr>
<td>2019</td>
<td>2,299</td>
</tr>
<tr>
<td>2020</td>
<td>2,393</td>
</tr>
<tr>
<td>2021</td>
<td>1,089</td>
</tr>
<tr>
<td>2022</td>
<td>604</td>
</tr>
<tr>
<td>2023</td>
<td>604</td>
</tr>
<tr>
<td>2024</td>
<td>610</td>
</tr>
<tr>
<td>2025</td>
<td>632</td>
</tr>
<tr>
<td>2026</td>
<td>656</td>
</tr>
<tr>
<td>2027</td>
<td>682</td>
</tr>
<tr>
<td>2028</td>
<td>709</td>
</tr>
<tr>
<td>2029</td>
<td>737</td>
</tr>
<tr>
<td>2030</td>
<td>769</td>
</tr>
</tbody>
</table>

- Minihydro
- Biogas
- Biomass
- Rooftop Solar PV
- Solar
- Wind

- Accumulate Capacity
Investments in Power Transport

- **Transcomahué**
  - EPEN: 765 km, 340 MVA; 11 Substation
  - TRANSCO: 602 km, 285 MVA; 11 Substation

- **Transnea**
  - 1867 km, 1350 MVA; 22 Substation

- **Transener**
  - 7645 km, 15300 MVA; 37 Substation

- **Transpa**
  - 2312 km, 1702 MVA; 21 Substation

- **Distrocuyo**
  - 1259 km, 1596 MVA; 11 Substation

**Amounts in ARS at May 2018 using 23 ARS/USD exchange rate**

- 2017: 43
- 2018: 42
- 2019: 40
- 2020: 42
- 2021: 38

- 2017: 8
- 2018: 7
- 2019: 6
- 2020: 4
- 2021: 4

- 2017: 20
- 2018: 22
- 2019: 20
- 2020: 16
- 2021: 15

- 2017: 4
- 2018: 4
- 2019: 4
- 2020: 4
- 2021: 4
Power Transport - 500 kV lines and transmission substation

Projects in progress

- 500 kV Interconnection in Bahía Blanca - Mar del Plata and connection in 132 kV to Villa Gesell, North Section
- 500 kV Interconnection in Bahía Blanca - Mar del Plata and connection in 132 kV to Villa Gesell, South Section
- 500 kV Interconnection ET La Rioja Sur 500/132 kV and Supplementary Project II
- Electrical Interconnection ET Rincón Santa María - ET Resistencia - Line II

PPP Investments - 2019 onwards

- 500 kV Interconnection ET Río Diamante - ET Coronel Charlene and Supplementary Project in 132kV
- 500 kV Transmission Line ET New San Juan - ET Rodeo - Iglesias
- 500 kV Interconnection ET Atucha II - ET Nueva Belgrano - ET Oscar Smith
- 500 kV Interconnection ET Coronel Charlene - ET Plomer - ET Ezeiza
- 500 kV Interconnection ET Plomer - ET Vivoratá ET Plomer - ET Atucha II, ET Plomer - ET Manuel Belgrano
- 500 kV Interconnection ET New San Juan - ET Rodeo - ET La Rioja
- 500 kV Interconnection ET Choel Choel - ET Puerto Madryn (2nd line)
- Transmission Substation 500/132 kV - 450 MVA Comodoro Rivadavia

Now being bid

300 MM USD

2,300 MM USD
## Schedule and PPP Investments

<table>
<thead>
<tr>
<th>STAGE</th>
<th>WORK</th>
<th>PROJECTS</th>
<th>MAP</th>
<th>INVESTMENT</th>
</tr>
</thead>
</table>
| 1     | - 480 km – 500 kV  
     | - 420 km – 132 kV  
     | - 2 new substation | ![Map](image1.png) | **USD 630 MM** |
| 2     | - 1300 km – 500 kV  
     | - 1 new substation | ![Map](image2.png) | **USD 990 MM** |
| 3     | - 400 km – 500 kV  
     | - 3 new substation | ![Map](image3.png) | **USD 660 MM** |
**STAGE 1**

**OCT 2018**
PLIEGOS
16/10 - HOME TRANSPARENT
CONSULTATION PERIOD
26/10 - FINISH TCP
31/10 - CALL TO TENDER

**SEP 2018**
CONSULTATION ABOUT RFQ
PRESENTATION

**DEC 2019**
PUBLIC AUDIENCE

**FEB 2019**
ADJ.

**STAGE 2**

**NOV 2018**
CONSULTATION ABOUT
RFQ PRESENTATION

**DEC 2018**
T & C

**FEB 2019**
PRESENTATION OF OFFERS

**APR 2019**
ADJ.

**STAGE 3**

**JAN 2019**
CONSULTATION ABOUT
RFQ PRESENTATION

**FEB 2019**
T & C

**APR 2019**
PRESENTATION OF OFFERS

**JUN 2019**
ADJ.
Works to be bidded by PPP – Stage 1

**STAGE 1**

**LEAT 500 kV T. S. Río Diamante - new T. S. Coronel Charlone, Transforming substation and complementary works**

<table>
<thead>
<tr>
<th>TOTAL LENGTH HVAC TL 500 kV</th>
<th>487 Km</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEAT 500 kV E.T. Río Diamante - Nueva E.T. Coronel Charlone</td>
<td>487 Km</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TOTAL LENGTH 132 kV SINGLE AND DOUBLE CIRCUIT TL</th>
<th>422 Km</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAT 132 kV single circuit Coronel Charlone - Laboulaye</td>
<td>71 Km</td>
</tr>
<tr>
<td>LAT 132 kV double circuit Coronel Charlone - Rufino</td>
<td>78 Km</td>
</tr>
<tr>
<td>LAT 132 kV single circuit Coronel Charlone - General Villegas</td>
<td>50 Km</td>
</tr>
<tr>
<td>LAT 132 kV single circuit Coronel Charlone - General Pico Sur</td>
<td>127 Km</td>
</tr>
<tr>
<td>LAT 132 kV single circuit Coronel Charlone - Realicó</td>
<td>96 Km</td>
</tr>
</tbody>
</table>

**TRANSFORMER SUBSTATION**

- New T.S. Coronel Charlone 500/132 kV
- Extension of T.S. Río Diamante 500/220 kV
PPP Scheme

CONVENCING AUTHORITY

Secretaría de Gobierno de Energía

Reserve Found (1 year) + Contingent Contribution

FINANCING ENTITY

Sale of TPI

Cash

CONTRACTING ENTITY

ieasa

Instruction issuance of TIP

TRUST PPP FOR ELECTRIC TRANSMISSION BICE

Issuance/Payment of TPI

Residual Canon Payment

PPP CONTRACTOR

SCHEDULE 3 years: Construction 12 years: O & M

ELECTRICITY DEMAND

Charge Contribution (Canon)

Charge Contribution (Canon) 500 kV: all 132 kV: area

CAMIMESA
Thank you.
Methodological Subannex
World Energy Matrix - Primary Energy Offer (MMTOE)

GLOBAL

BY REGION

Coal
Renewables
Hydroelectricity
Nuclear energy
Natural gas
Oil
Global energy context - Production, demand and reserves

**Production – MMBBL/d**

- Asia Pacific
- Africa
- S. & Cent. America
- Middle East
- CIS

**Demand – MMBBL/d**

**Reserves – %**

- Middle East
- S. & Cent. America
- North America
- CIS
- Africa
- Asia Pacific
- Europe

2017 Total 1696.6 thousand million barrels

2017 Total 193.5 trillion cubic metres
Current situation

- 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 System:
- 887 Km.
- 1,706 Km pipeline.
- 8 Pump Stations
- 8 Expansion spots

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></th>
<th>Natural Gas</th>
<th>Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conventional assumptions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EUR (y15)</td>
<td>1.5 BCF</td>
<td>180 kbbl</td>
</tr>
<tr>
<td>Declination</td>
<td>-15%</td>
<td>-9%</td>
</tr>
<tr>
<td>Risked P1ND/P2/P3</td>
<td>100% / 50% / 10%</td>
<td>100% / 50% / 10%</td>
</tr>
<tr>
<td>Incorporation of reserves in the first year</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Incremental incorporation reserves</td>
<td>+0.3% per year</td>
<td>+0.3% per year</td>
</tr>
<tr>
<td>Production in the first year of the reserves incorporated</td>
<td>16.4%</td>
<td>11.9%</td>
</tr>
<tr>
<td>Capex</td>
<td>2.5 MM USD</td>
<td>2.5 MM USD</td>
</tr>
<tr>
<td>Total reserves incorporated</td>
<td>6 TCF</td>
<td>25 MM BBL</td>
</tr>
</tbody>
</table>

| **Unconventional assumptions** | | |
| EUR (y30)                  | 12.9 BCF    | 631 kbbl  |
| EUR total (y30)            | 2,388 kboe  | 820 kboe  |
| Condensed                 | 1 m³ oil per  | -         |
| 28,000 m³ gas             | 300 m³ gas per m³ oil |
| GOR                      | -           |          |
| Capex                    | 12.2 MM USD + 15% facilities | 10.2 MM USD + 15% facilities |
| Opex                     | 5.9 USD/BOE (1 USD/MMBTU) | 7 USD/BOE |
| Fractures                | 33          | 33        |
| Total reserves incorporated | 55 TCF       | 5.5 Bbbl  |
| EIA 2013                 | 7%          | 21%       |
| Breakeven                | 4 USD/MMBTU | 46.7 USD/BBL |

---

**Overall unconventional oil production profile.**

- Production (bbl/day)
- Accumulated Production (kbbl)

**Overall unconventional gas production profile.**

- Production (MM m³/day)
- Accumulated production (MM m³)
Main assumptions about Natural Gas production

Conventional production:
- P1D (72%): declines @ 15%
- PIND (100%) + P2 (50%) + P3 (10%):
  - Total incorporated reserves: 172 Billion m$^3$ (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 m$^3$ (1.5 BCF)
  - Cost per well: 2.5 MM USD

Overall unconventional production profile
- EUR$_{30}$ = 366 Million m$^3$ 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 m$^3$/day gas
- Condensed: 1 m$^3$ de oil per 28,000 m$^3$ 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%
  - The 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 kbbl)
  - Cost per well: 2.5 MM USD.

Overall unconventional production profile

- EUR₄₀₀ = 100.3 mil m³ oil (631 kbbl).
- 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
# 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>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2017</td>
<td>2018</td>
<td>% change</td>
<td>2017</td>
</tr>
<tr>
<td>Black Oil</td>
<td>901</td>
<td>531</td>
<td>-41%</td>
<td>0.82</td>
</tr>
<tr>
<td>Light Oil</td>
<td>901</td>
<td>945</td>
<td>5%</td>
<td>0.82</td>
</tr>
<tr>
<td>Wet Gas</td>
<td>911</td>
<td>1,076</td>
<td>18%</td>
<td>0.83</td>
</tr>
<tr>
<td>Dry Gas</td>
<td>2,440</td>
<td>1,993</td>
<td>-18%</td>
<td>2.37</td>
</tr>
</tbody>
</table>

**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
Activity is increasingly driven by new players (IHS - Markit)
Natural gas liquefaction plant analysis

- Gradual incorporation: 40 MMm$^3$/day in 2023, 80 MMm$^3$/day in 2024 and 120 MMm$^3$/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 MMtpa (20 MMm$^3$/day)
- Number of trains: 6
- Total capacity: 30 Mmtpa (120 MMm$^3$/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
Assumptions for vehicle fleet

**Trucks assumptions:**
- 20% replacement in LNG trucks by 2030
- Annual gasoil consumption per truck: 10.2 m³
- Annual LNG consumption per truck: 8 tn
- Fleet growth in trucks fleet: 2% (a.a.)
- Initial fleet 2017 (ADEFA): 680 thousand.
- Effective cutting biodiesel 2030: 16%

**AMBA buses assumptions:**
- 80% of buses from AMBA to CNG in 2030
- Annual gasoil consumption per bus: 33 m³
- Annual CNG consumption per bus: 34 thousand m³
- Fleet growth in buses fleet: 2% (a.a.)
- Initial fleet 2017 (MINTRAN): 20 thousand.
- Effective biodiesel cutting: 20%

**Cars assumptions¹:**
- 20% replacement to CNG in the fleet in 2030.
- Annual gasoline consumption per car: 1.53 m³
- Annual GNC consumption per car: 1.38 thousand m³
- Fleet growth in vehicle fleet: 3.8% (a.a.)
- Initial fleet 2017 (ADEFA): 9.4 million
- Effective cut bioethanol: 22%

In 2030 the demand for additional CNG amounts to 20 MMm³ / day, given the reconversion of private vehicles, SUVs, trucks and buses to CNG / LNG.

Due to the substitution of liquid fossil fuels, it is possible to save 0.85 million tCO₂e of GHG in 2025 and 0.57 million in the year 2030.

Notes: ¹ Includes private cars, taxis or similar and SUVs.
• Energy represents 52.5% of total emissions in 2014 (368 MMtCO2e - National emissions inventory).

• In the Paris Agreement, Argentina has an aggregate commitment to limit its emissions to 483 MMtCO2e unconditionally, and 369 MMtCO2e in the conditional target to the application of certain policies.

• Our estimations would lead the energy sector to 56% in the case of fulfilling the unconditional commitment and 73% of the conditional commitment.

Notes: Estimation methodology using the IPCC 2006 methodology with the emission factors of the BUR of the Argentine Republic to the UNFCCC.
New Electric Power Generation

Nominal power incorporated per year [MW]

- BG/BM
- Eólico
- Nuclear
- Térmico
- Solar
- Hidro (<50MW)
- Hidro

Investment 2017 - 2018 (MMUSD)
5,000 MMUSD

Estimated value 2017 - 2018

5 BUSD

Estimated value 2019 - 2030
46 BUSD

Investment dates are based on project commissions
Decreasing prices in each competitive bidding.

Weighted average price: 54.72 USD/MWh
Electric Power Distribution

Investments in Electrical Distribution
(Buenos Aires Metropolitan Area)

Amounts in ARS at May 2018 using 23 ARS/USD exchange rate

Only EDENOR and EDESUR expansion and maintenance are considered
EDENOR Investment Plan: Expected results
Requirements in High, Medium and Low Voltage networks
Gas Distribution

Investments (RTI) in Gas Distribution

Investment includes in system expansion and maintenance

RTI values expressed in dollars using 16 ARS/USD exchange rate
Brent vs. WTI

Source: Energy Information Administration (EIA)
Brent vs. WTI

Source: Energy Information Administration (EIA)
WTI vs. Oil prices in USA and Canada

Sources: Energy Information Administration (EIA) y Natural Resources Canada
WTI vs. Oil in Canada

Sources: Energy Information Administration (EIA) y Natural Resources Canada
Oil royalties by province

**Chubut**
- IIBB: 3%
- Regalías: 12.9%

**Neuquén**
- IIBB: 3%
- Regalías: 12.9%

**Santa Cruz**
- IIBB: 3%
- Regalías: 13.7%

**Mendoza**
- IIBB: 3%
- Regalías: 14.0%

**Río Negro**
- IIBB: 3%
- Regalías: 13.1%

**Tierra del Fuego**
- IIBB: 3%
- Regalías: 12.7%

Source: Ministerio de Energía de la Nación.
Note: Provincial sales taxes were estimated using legal tax rates. Royalties rates were estimated using weighted averages by province.
Natural gas royalties by province

**Source:** Ministerio de Energía de la Nación.

**Note:** Provincial sales taxes were estimated using legal tax rates. Royalties rates were estimated using weighted averages by province.
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
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

<table>
<thead>
<tr>
<th>Lease Information</th>
<th>Gross Acres ('000 acres)</th>
<th>Net Acres ('000 acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basin</td>
<td></td>
<td>Delaware</td>
</tr>
<tr>
<td></td>
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<td>590</td>
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<table>
<thead>
<tr>
<th>Type Well Assumptions</th>
<th>EUR (mmboe)</th>
<th>Initial Production</th>
<th>Initial Production</th>
<th>Initial Production</th>
<th>Royalty Rate (%)</th>
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</thead>
<tbody>
<tr>
<td>Oil (b/d)</td>
<td>770</td>
<td>173</td>
<td>18.00</td>
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<tr>
<td>Gas (mmcfd)</td>
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<tr>
<td>NGLs (b/d)</td>
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</tr>
<tr>
<td>Royalty Rate (%)</td>
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<table>
<thead>
<tr>
<th>Remaining Recoverable Reserves (at 01/01/2018)</th>
<th>Proved Developed</th>
<th>Proved + Probable (2P)</th>
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</thead>
<tbody>
<tr>
<td>Liquids (mmbbl)</td>
<td>Gas (bcf)</td>
<td>Total (mmboe)</td>
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<tr>
<td>36.50</td>
<td>75.56</td>
<td>49.80</td>
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<table>
<thead>
<tr>
<th>Applicable Tax Rates by State</th>
<th>Severance</th>
<th>Ad Valorem</th>
<th>Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Mexico</td>
<td>8.24%</td>
<td>2.50%</td>
<td>7.60%</td>
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<tr>
<td>Oil</td>
<td>9.09%</td>
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<tr>
<td>Gas</td>
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<tr>
<td>Texas</td>
<td>4.60%</td>
<td>4.00%</td>
<td>n/a</td>
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<tr>
<td>Oil</td>
<td>7.50%</td>
<td></td>
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</tr>
<tr>
<td>Gas</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>