



Argentina Energy Plan

— 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.

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.**
4. **Enhance Argentina's trade balance, by contributing 15.000 MMUSD of net anual exports in 2023 .**
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.**

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.

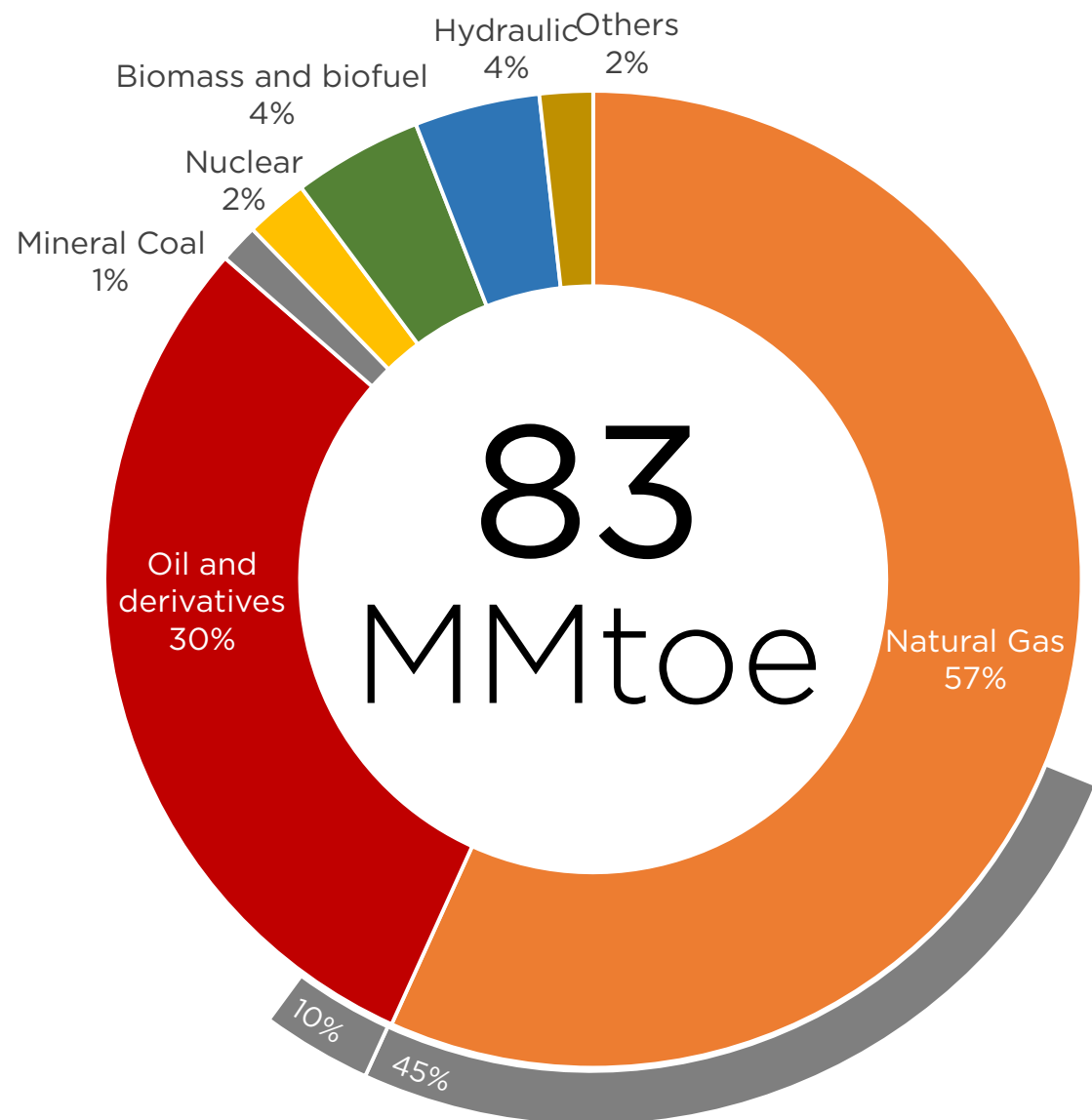
Power markets: an efficient and competitive system

- ✓ More natural gas availability for power generation at lower prices.
- ✓ Low generation costs due to fuel optimization.
- ✓ 5.000+ MW of renewable energy.
- ✓ Operation efficiency: PPP for power transmission.

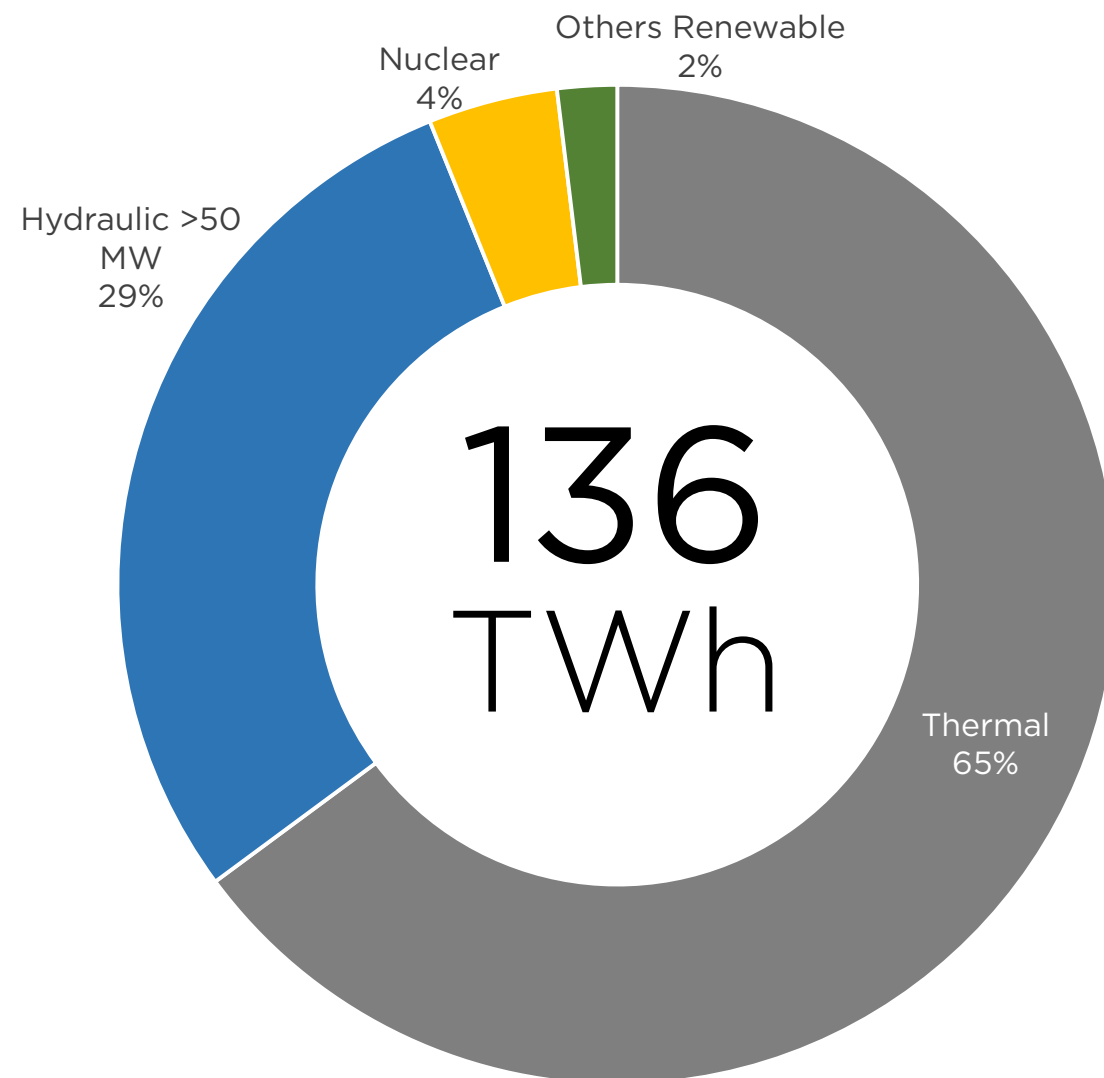
Transport: more supply options

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

Internal energy supply* - 2017



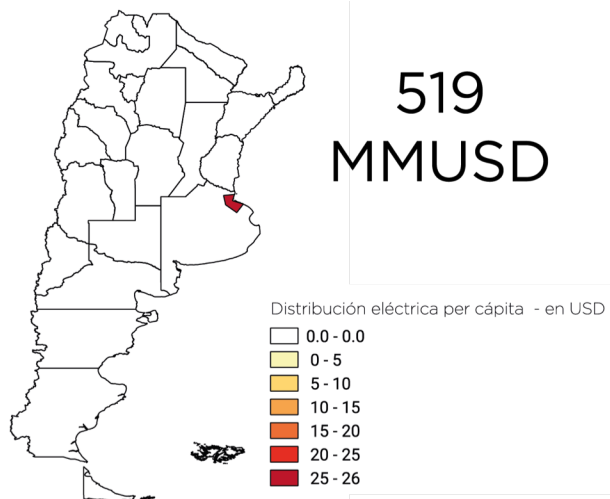
Power generation matrix - 2017



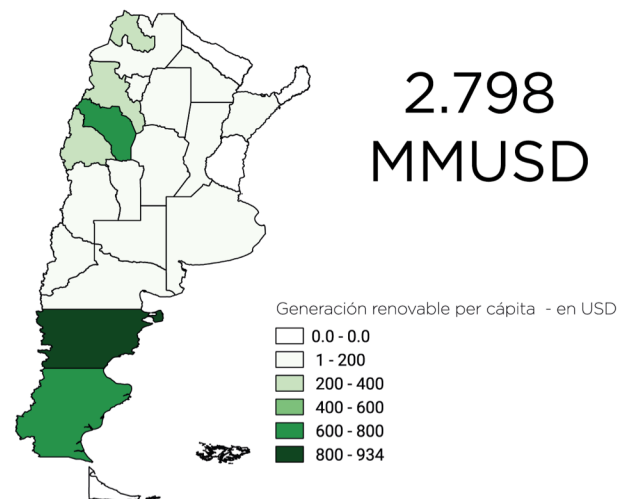
* TIOS: Total Primary Energy Supply + balance of trade

Private investment in the energy sector – 2018 est.

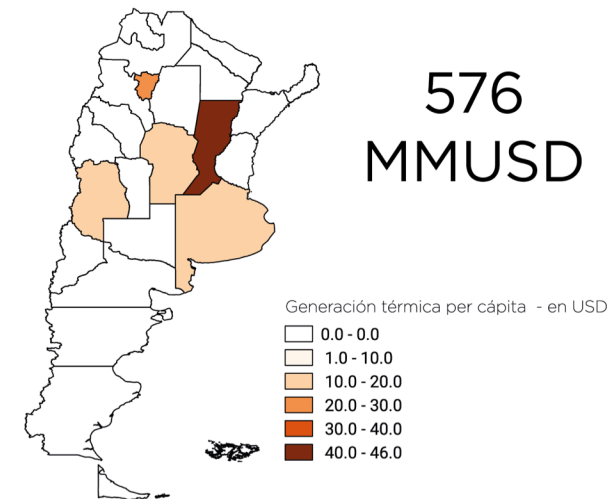
Power distribution (data for AMBA)



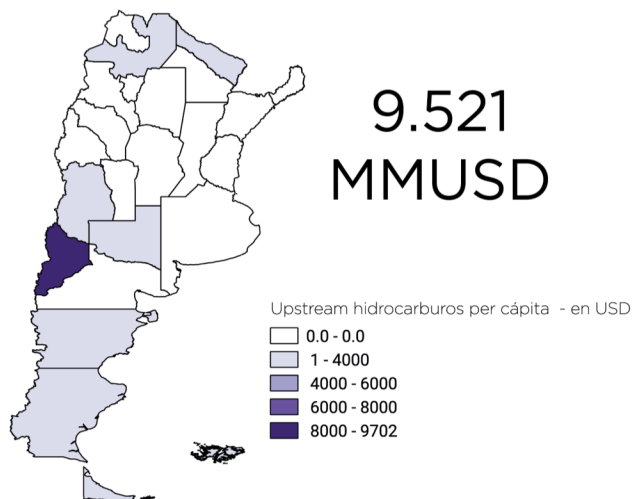
Renewable generation



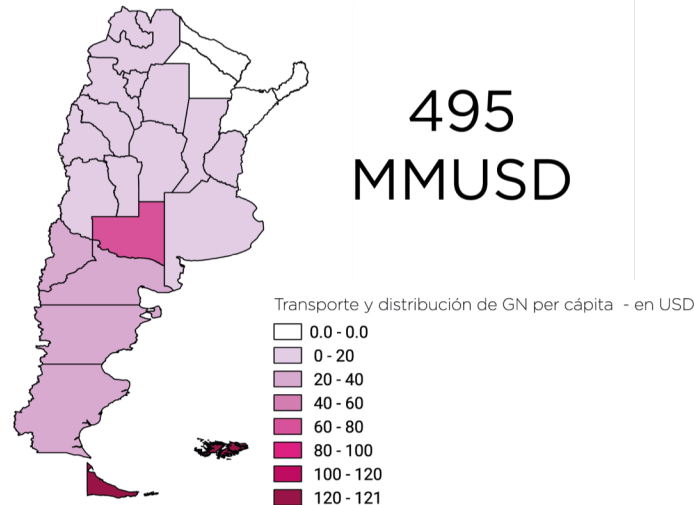
Thermal power generation



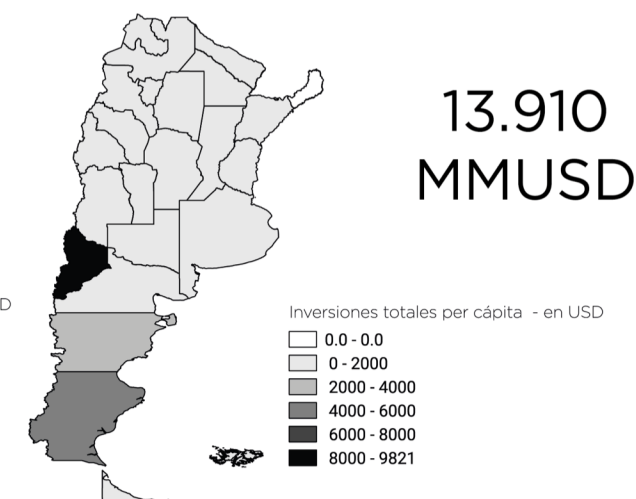
Upstream O&G



Transport and distribution of Oil and Gas

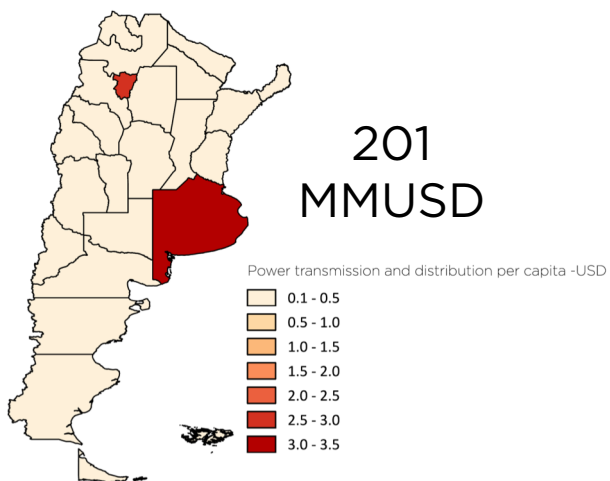


Total private investment

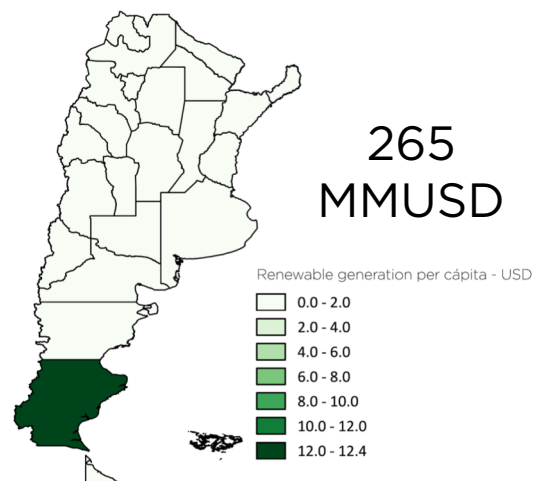


Public investment in the energy sector – 2018 est.

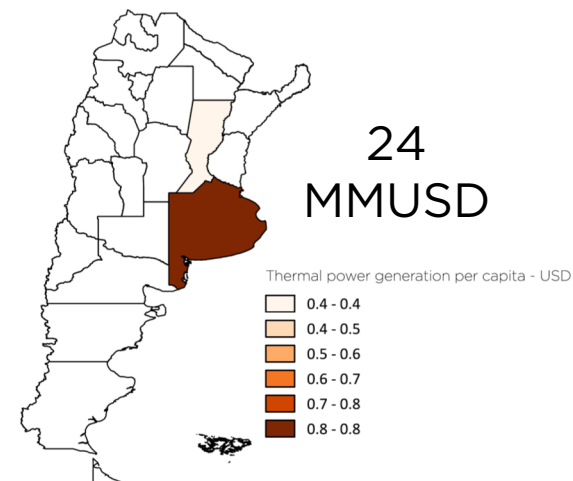
Power transmission and distribution



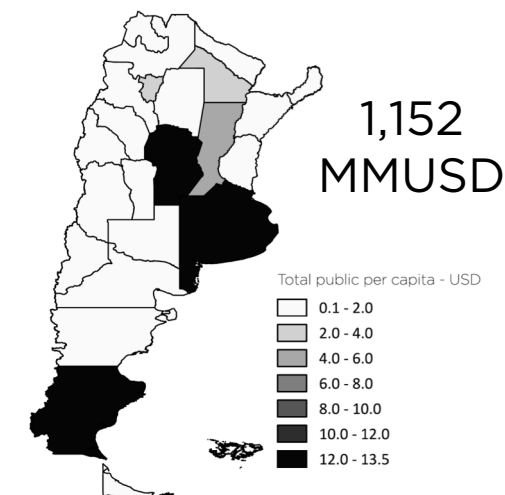
Renewable energy



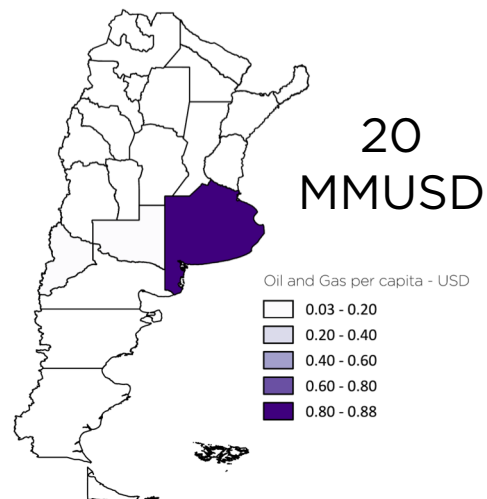
Thermal power generation



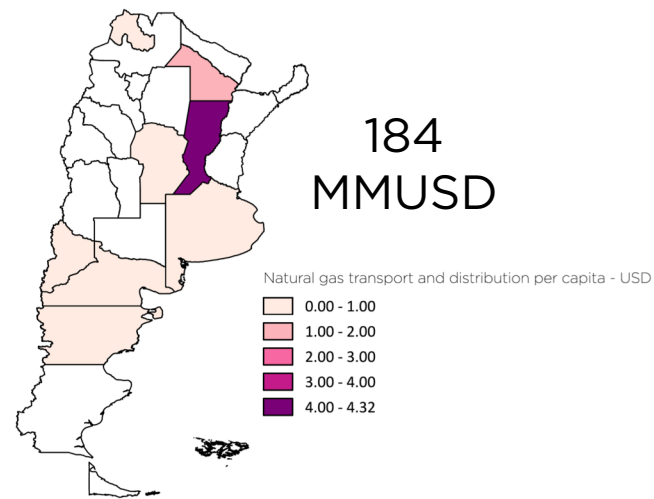
Total public



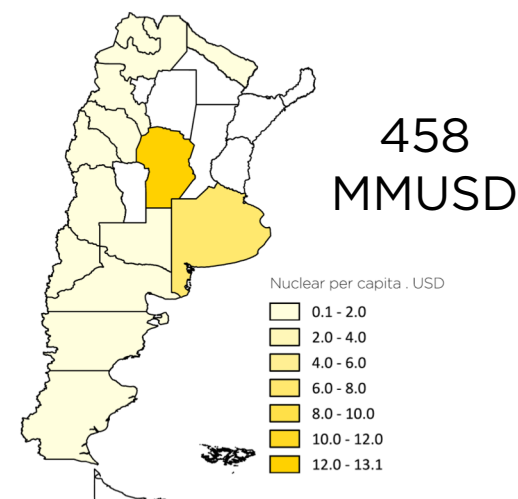
Other O&G

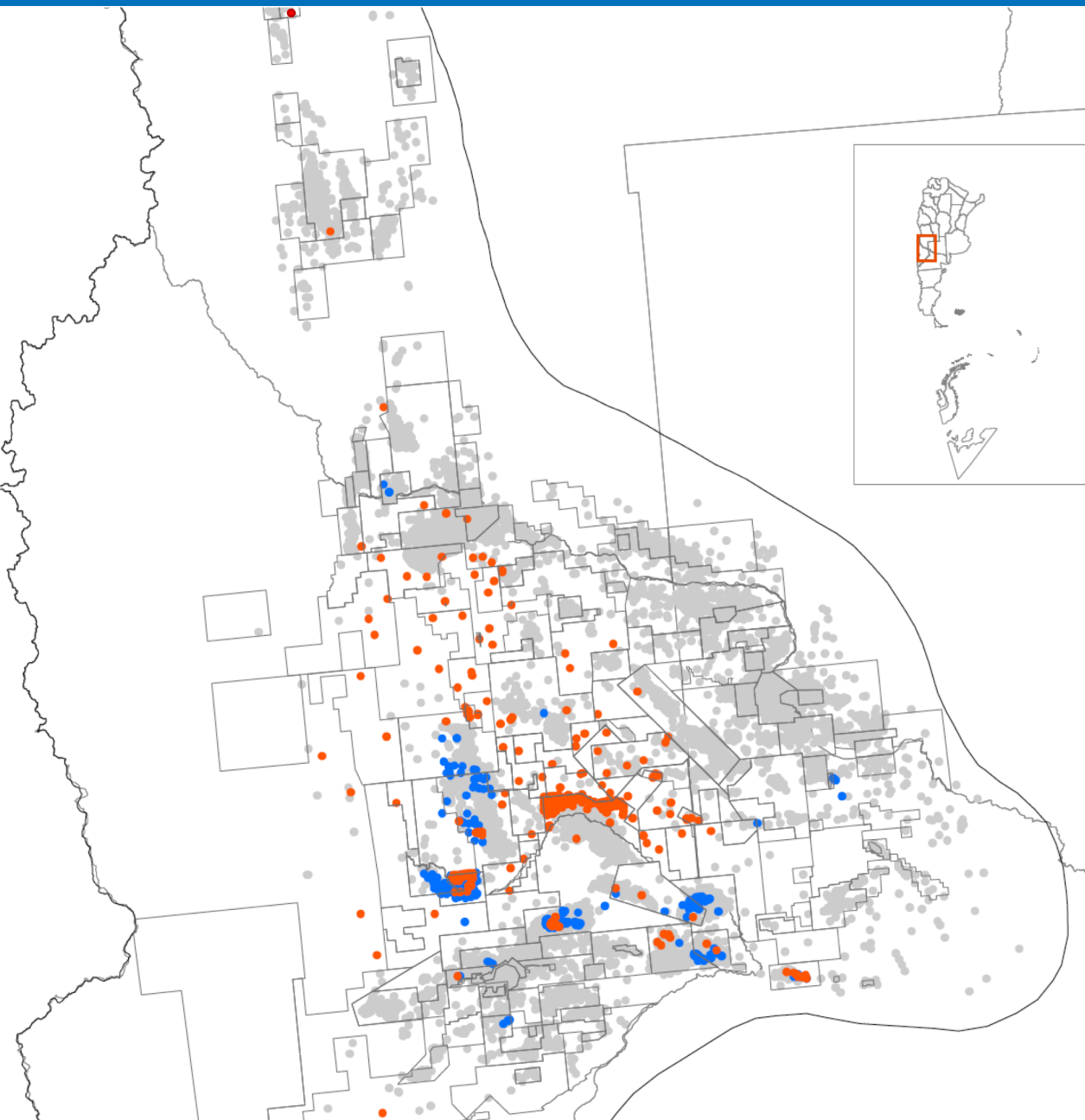


Transport and distribution of natural gas



Nuclear





Oil

Window: 22.000 km²

5,4+ MM Acres

EUR / Well	631 kbbbl/well
Landing points/area	2.5/km ² (2.5/247 acres)
MMbbl/Area	1.6 MMbbl/km ² (6.5 kbbbl/acre)
Unconventional Production Plateau 2030	1,143 kbbbl/day
Reservoir to explote in 25 years	10,434 MMbbl
Exploited Area	6,614 km ² / 1.6 MM acres (30%)

Gas

Window: 13.000 km²

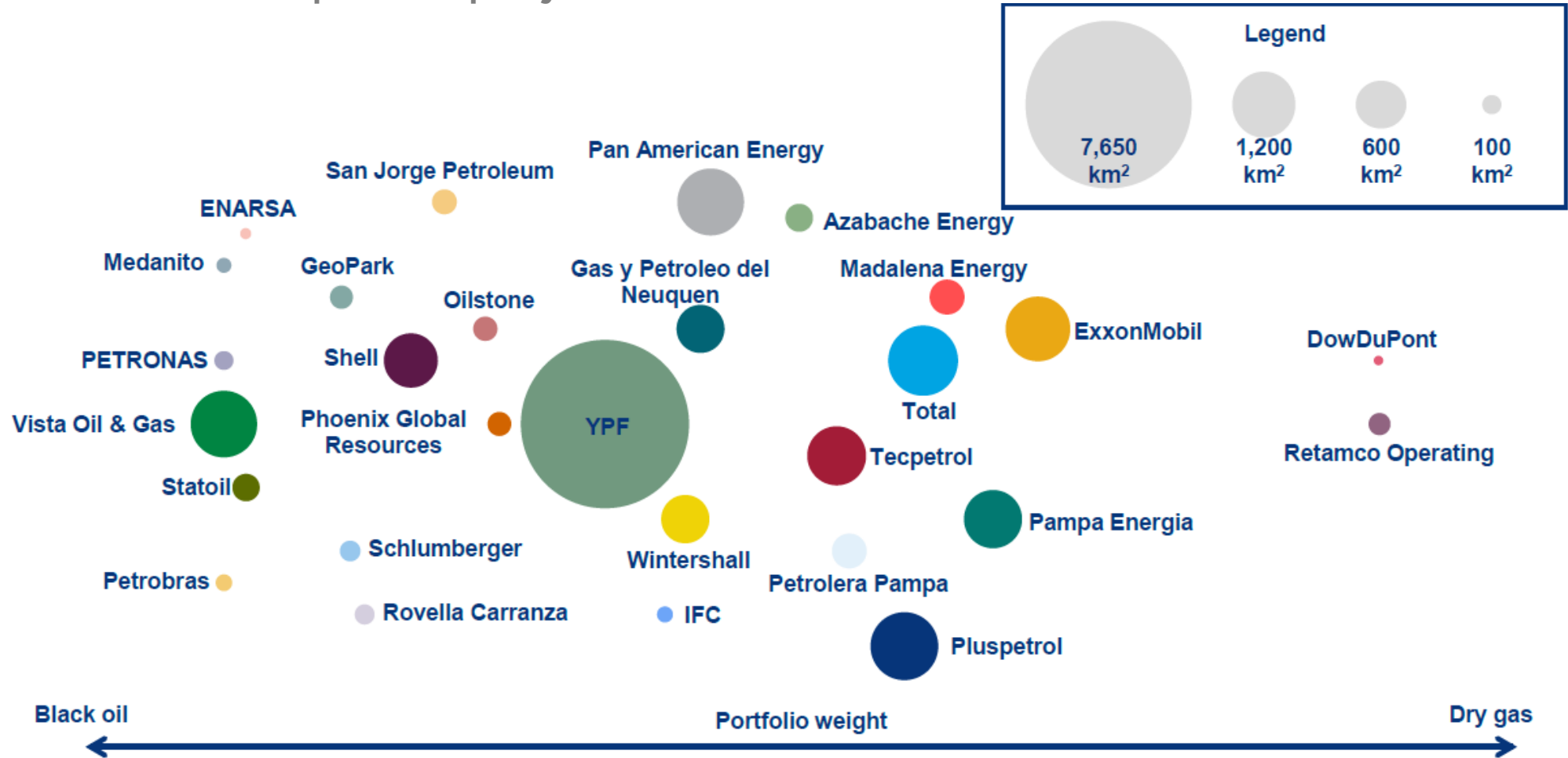
3,2+ MM acres

EUR / Well	12.9 BCF/well
Landing points/area	2.5/km ² (2.5/247 acres)
BCF/area	32.25 BCF/km ² (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 km ² / 987,643 acres (31%)

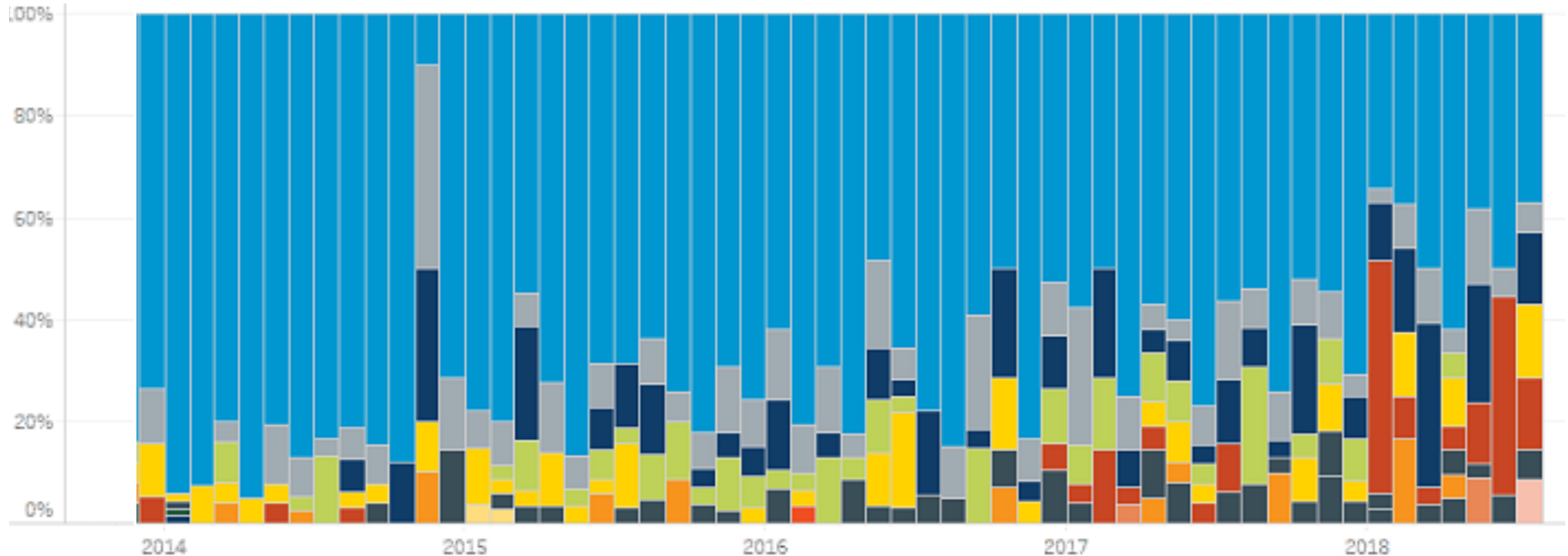
Current players in Vaca Muerta (Wood Mackenzie)

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

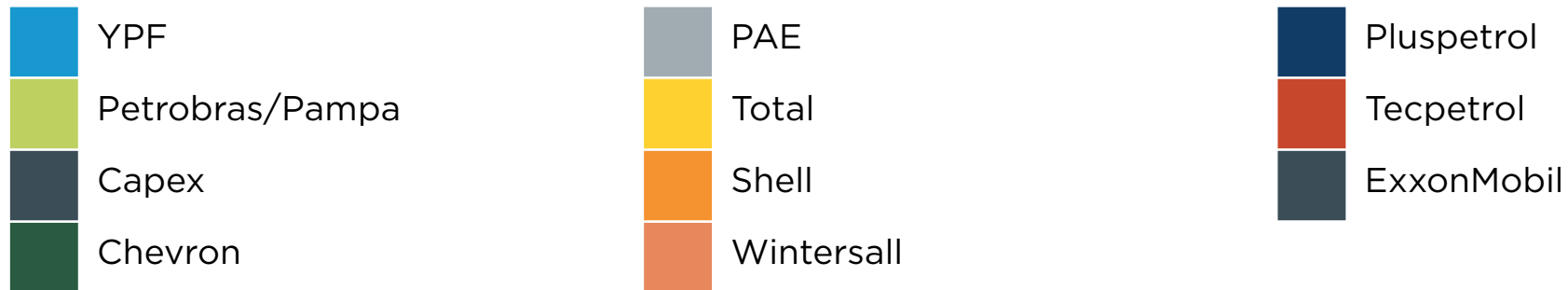
Acreage in Vaca Muerta per company



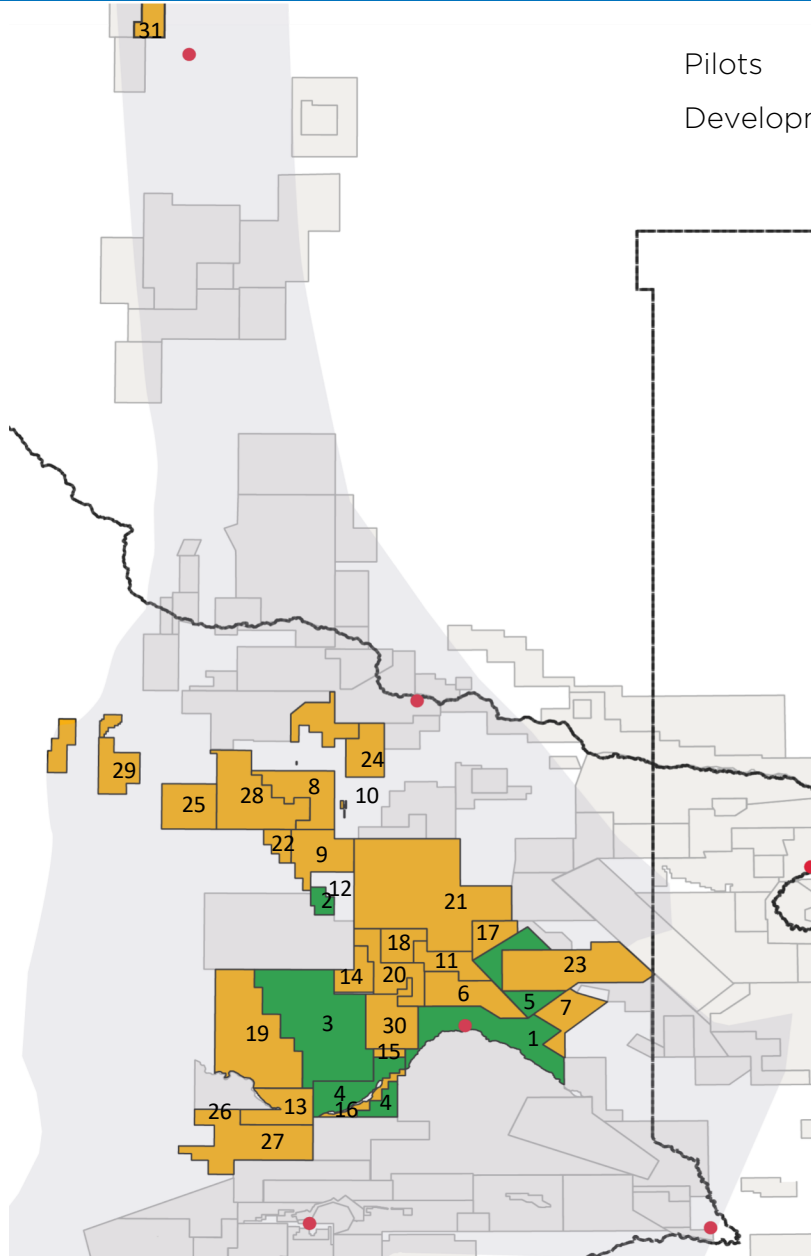
Activity is increasingly driven by new players (IHS - Markit)



Month of Date - First BOE Prod



31 key projects



Pilots
 Development

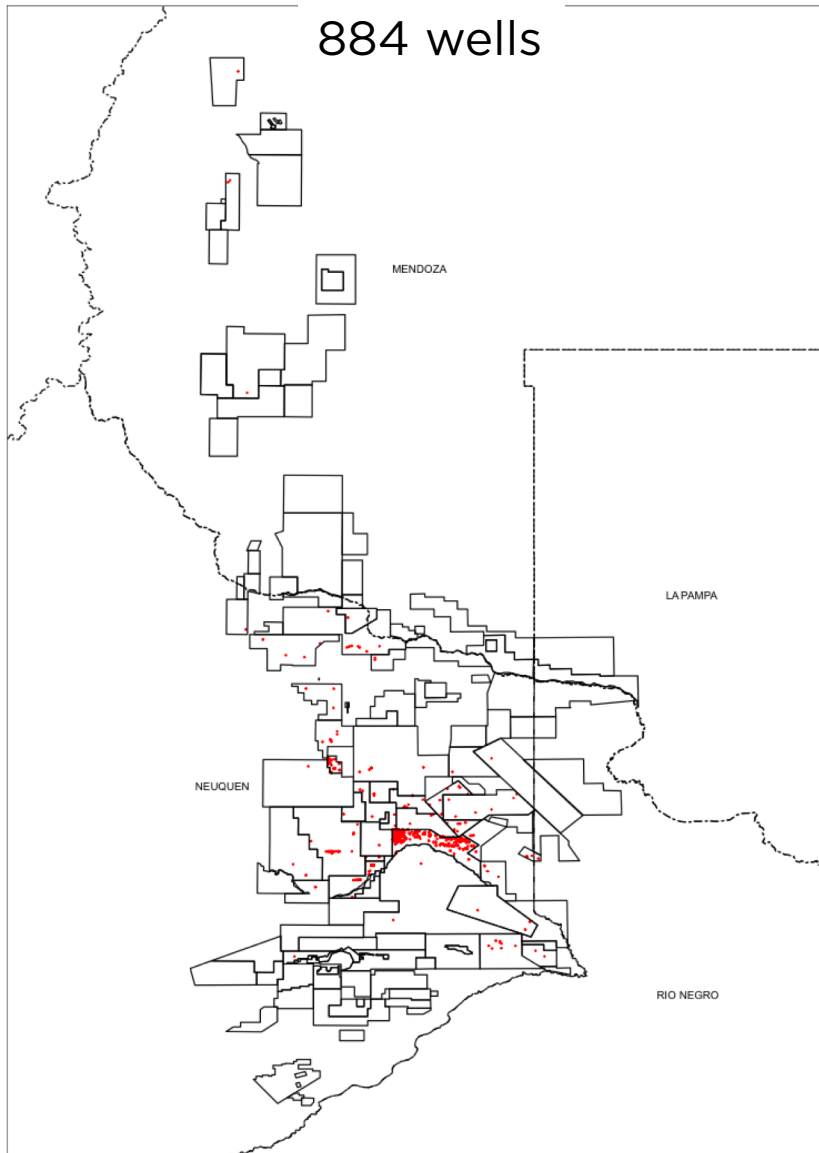


	Area	Operador	Black Oil	Light Oil	Wet Gas	Dry Gas	Cond	2010	11	12	13	14	15	16	17	18
1	Loma Campana	YPF														
2	El Orejano	YPF														
3	Aguada Pichana Este	Total														
4	Fortín de Piedra	Tecpetrol														
5	La Amarga Chica	YPF														
6	Bandurria Sur	YPF														
7	Cruz de Lorena - Sierras Blancas	Shell														
8	La Escalonada	Total														
9	Rincon de la Ceniza	Total														
10	Bajo del Choique - La Invernada	ExxonMobil														
11	Bandurria Centro	PAE														
12	Pampa de las Yeguas I	ExxonMobil														
13	Rincon del Mangrullo	YPF														
14	Aguada de la Arena	YPF														
15	La Ribera I	YPF														
16	La Ribera II	YPF														
17	Aguada Federal	Wintershall														
18	Bandurria Norte	Wintershall														
19	Aguada Pichana Oeste - Aguada de Castro	PAE														
20	Bajada de Anelo	Shell														
21	San Roque	Total														
22	Los Toldos I Sur	ExxonMobil														
23	Bajada de Palo	Vista Oil & Gas														
24	Bajo del Toro	YPF														
25	Cerro Arena	YPF														
26	Las Tacanas	YPF														
27	Las Tacanas Norte	Pampa														
28	Cerro Las Minas	YPF														
29	Salinas del Huitrin	YPF														
30	La Calera	Pluspetrol														
31	Puesto Rojas	Phoenix														

What would Vaca Muerta look like at full development?

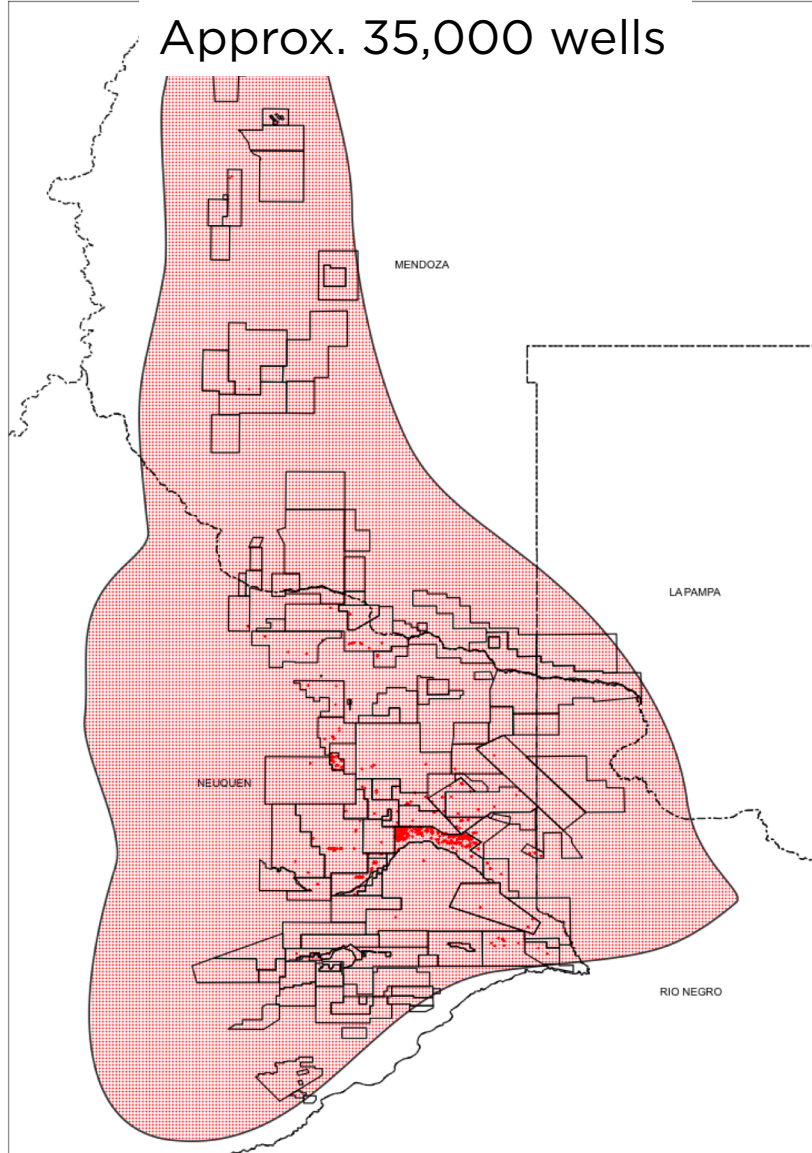
Current Vaca Muerta shale wells •

884 wells



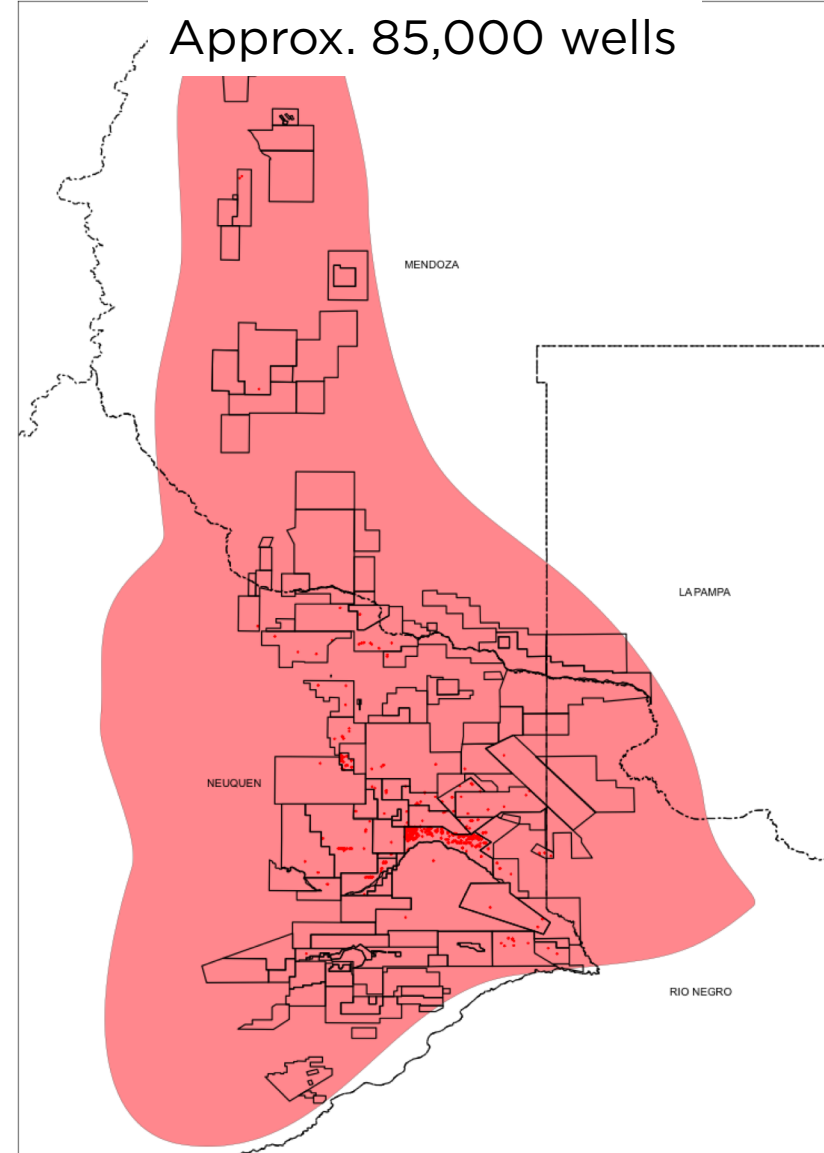
Vaca Muerta shale wells • @ Loma Campana's density

Approx. 35,000 wells

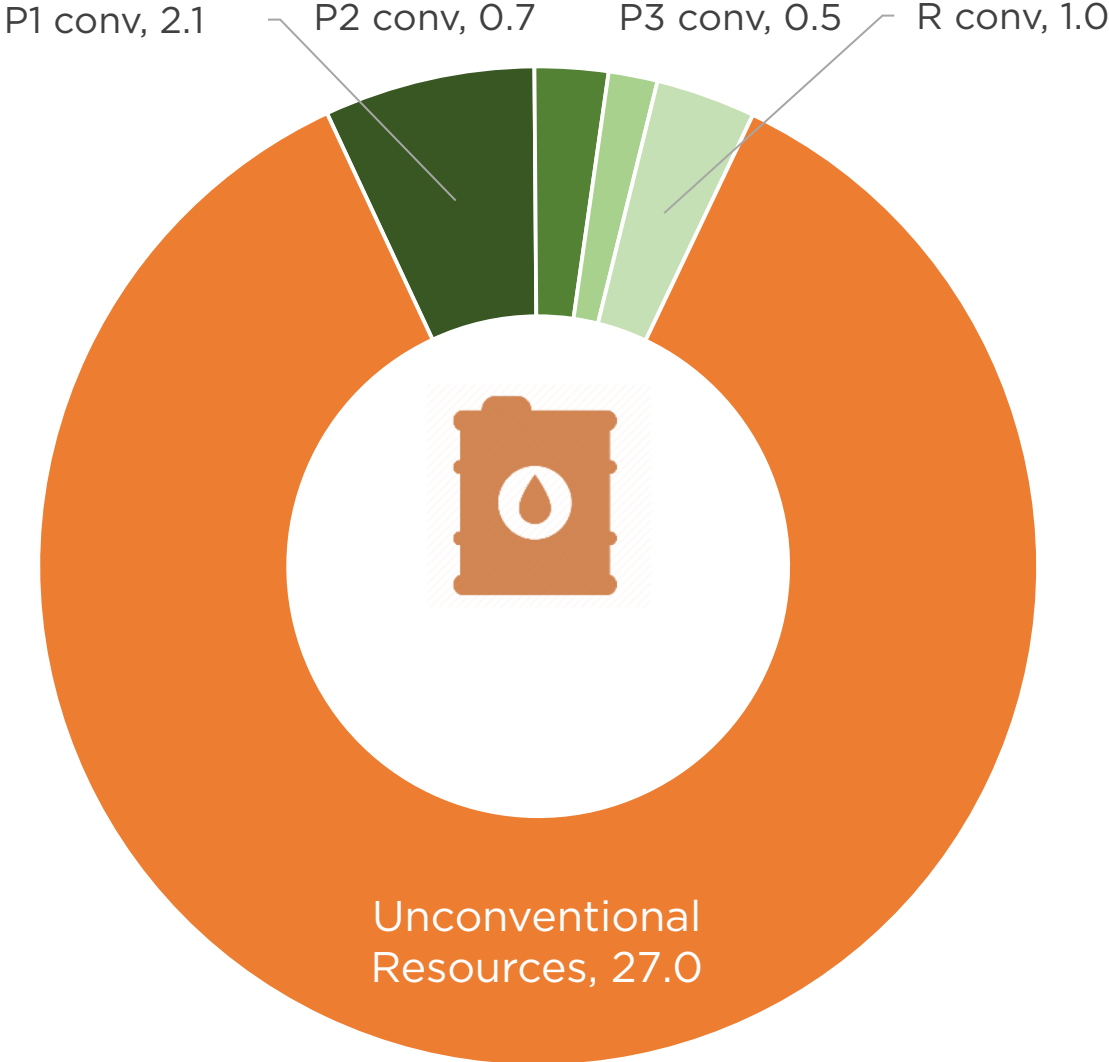


Vaca Muerta shale wells • @ 2,5 landing points/km²

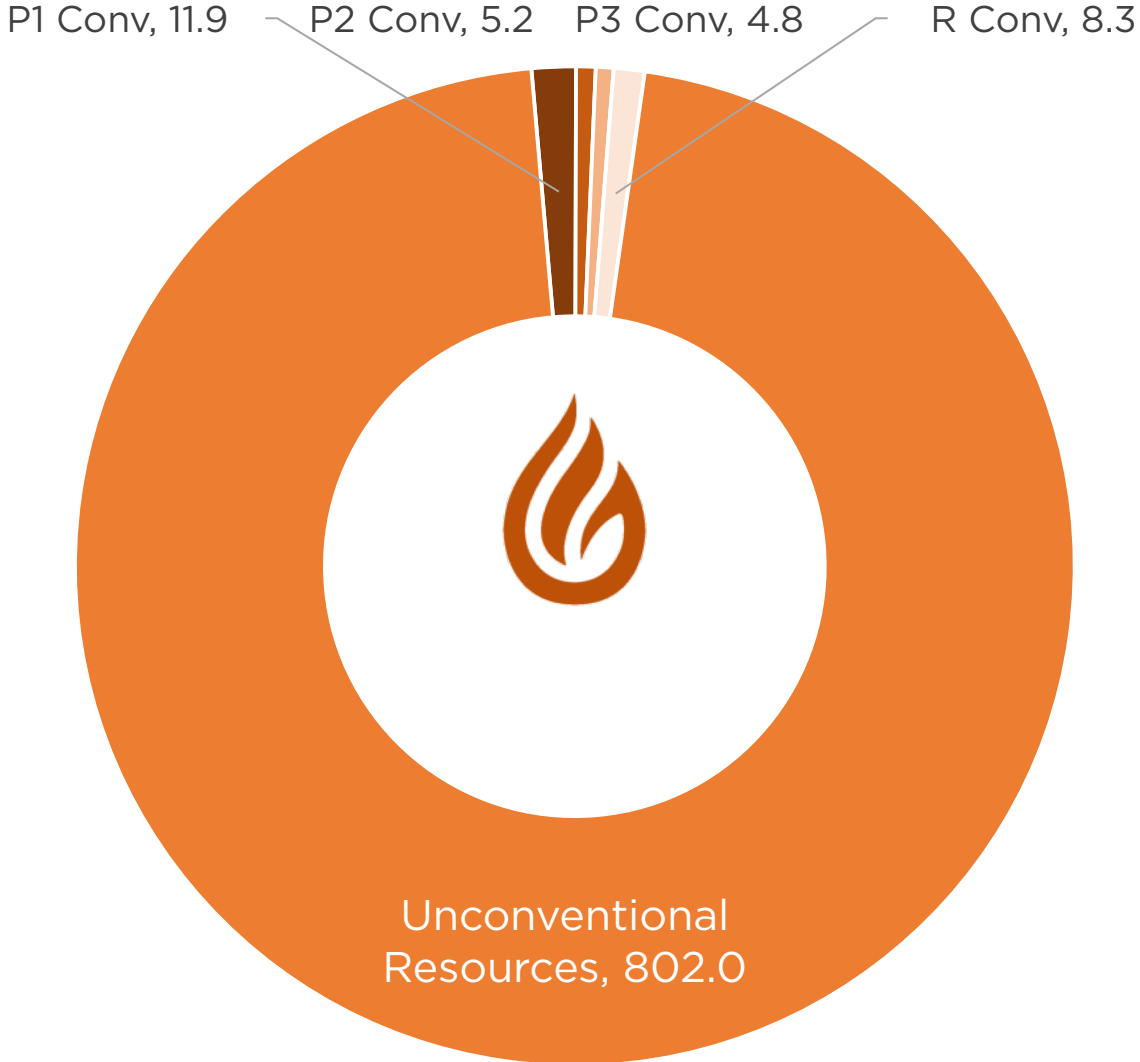
Approx. 85,000 wells



Oil Reserves and Resources (Bbbl)



Natural Gas Reserves and Resources (Tcf)



Source: EIA (USA) and Secretariat of Energy (Argentina)

One of the best resources in the world

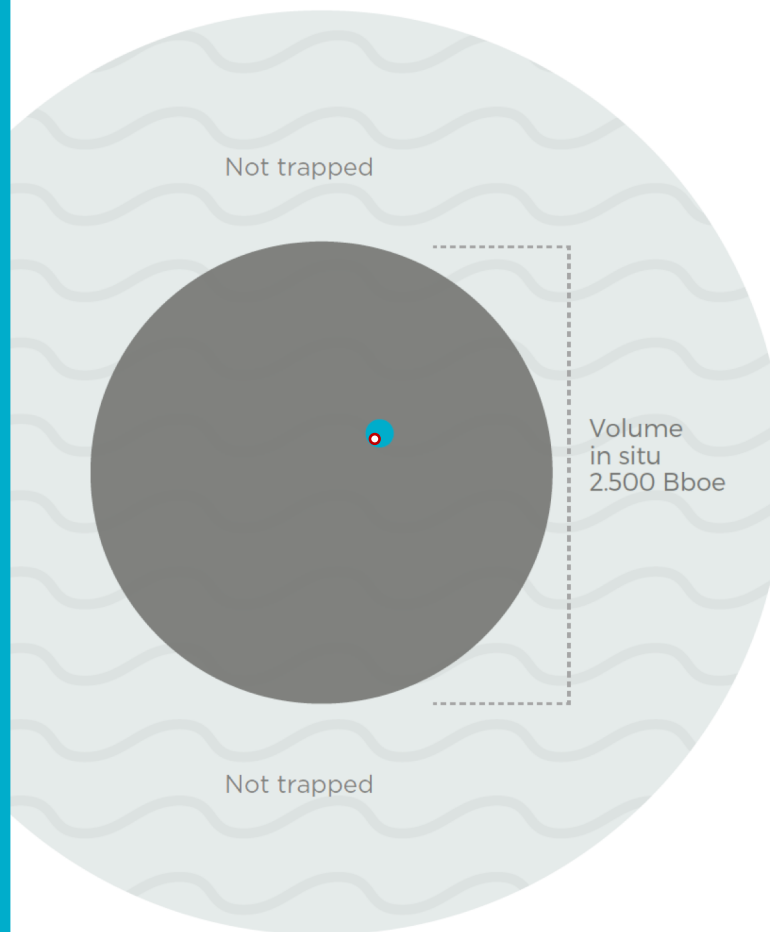


Unconventional Gas Resources



Unconventional Oil Resources

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

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

Acreage
Vaca Muerta
~8.65 MM acres
35.000 km²

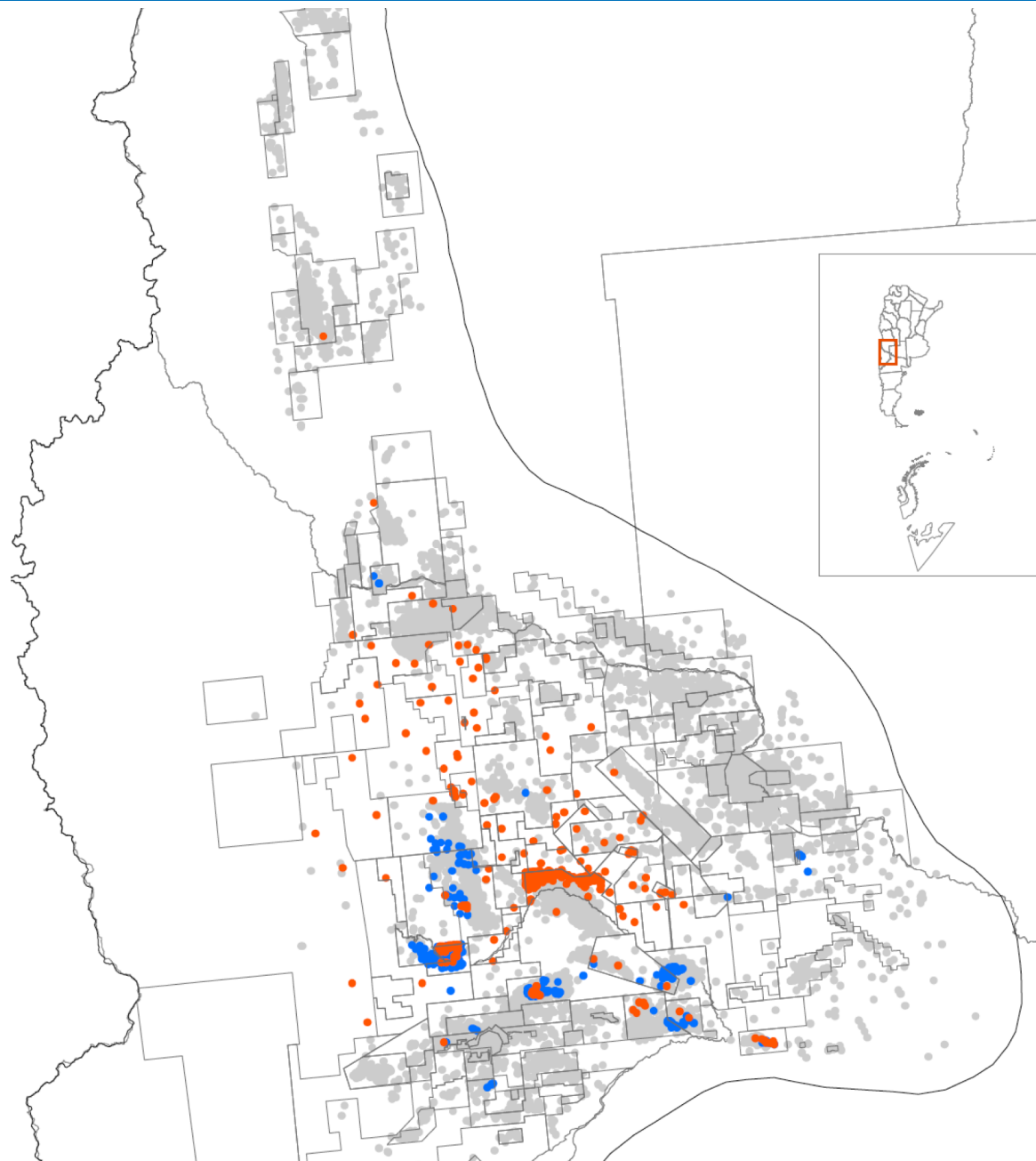
Acreage
Eagle Ford
~9.4 MM acres
38.000 km²

Max Thickness
Vaca Muerta
~1,480 feet

Max Thickness
Eagle Ford
~330 feet

Completed wells in Vaca Muerta by resource type

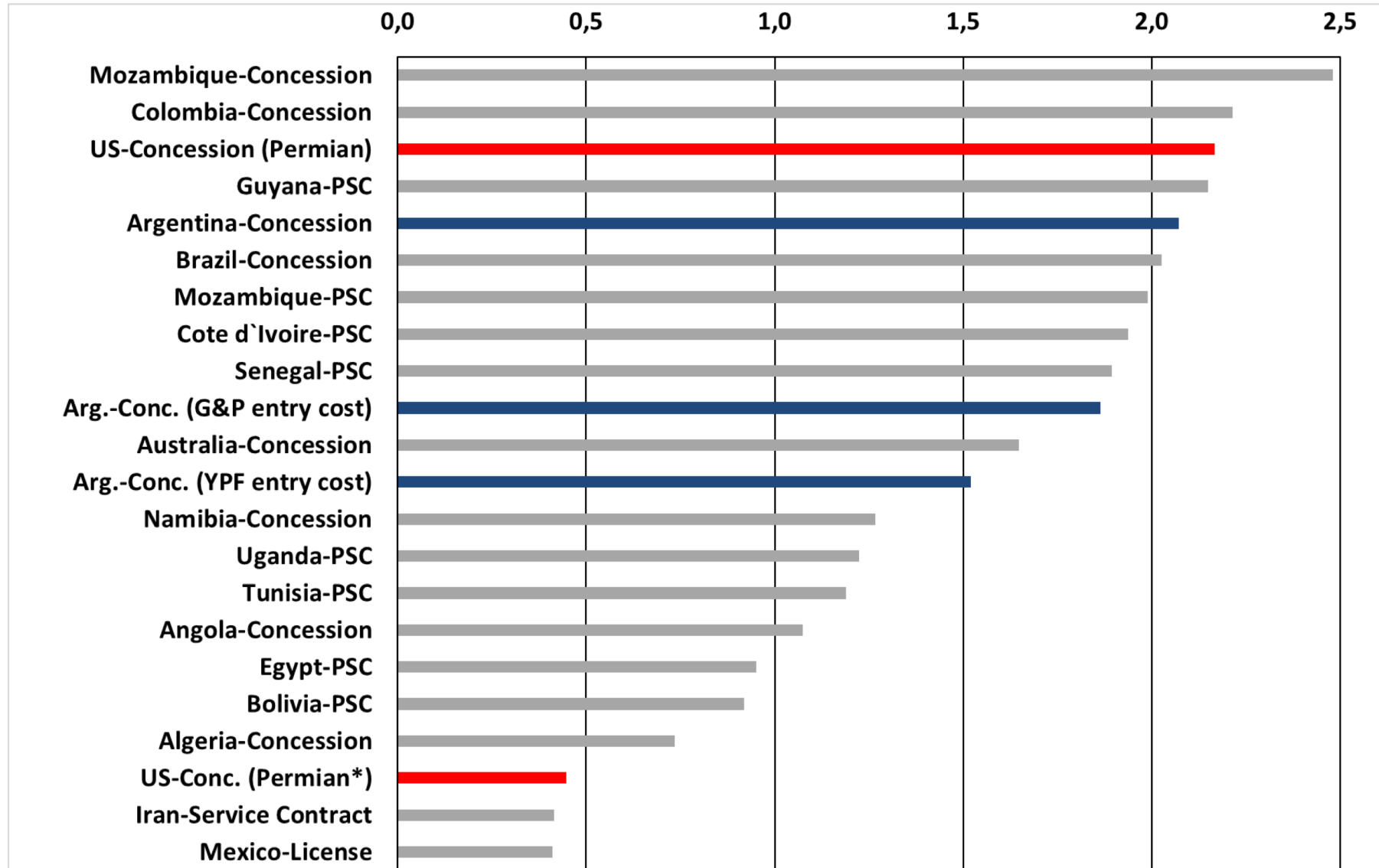
There is plenty of room in Vaca Muerta for new players



- Tight
- Shale
- Conventional

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%

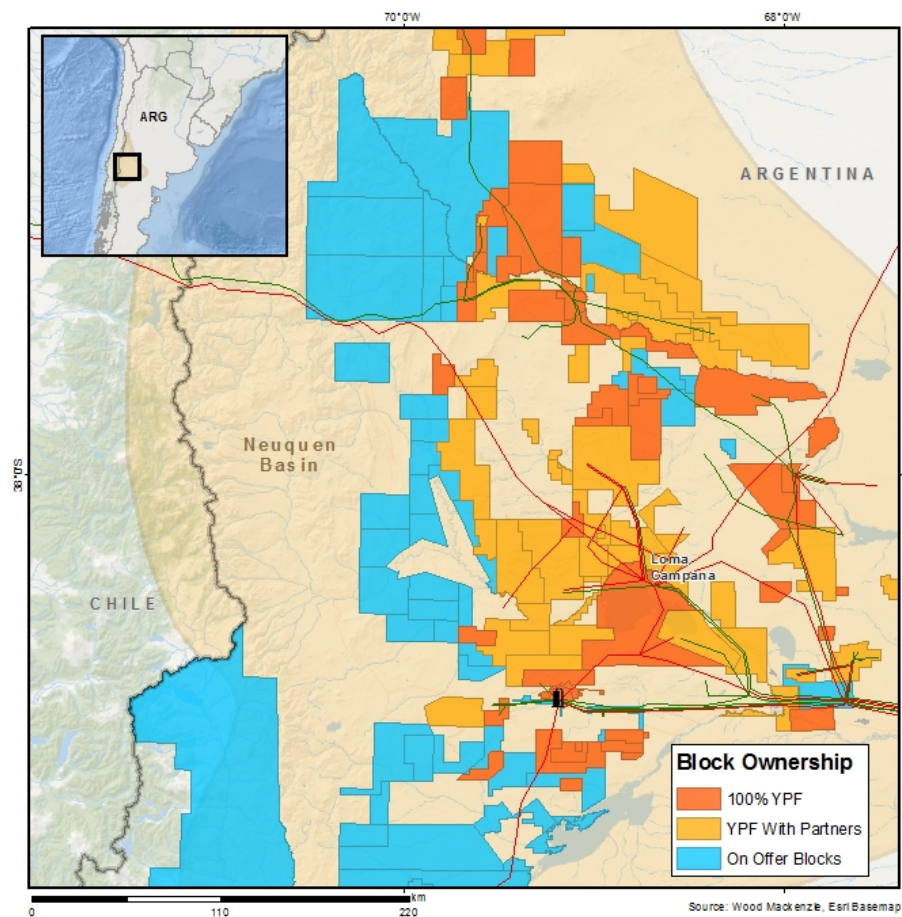


Notes: *Permian including original entry cost at US\$15,000/acre | * Vaca Muerta entry costs based on recent YPF and GyP transactions
 Source: Wood Mackenzie

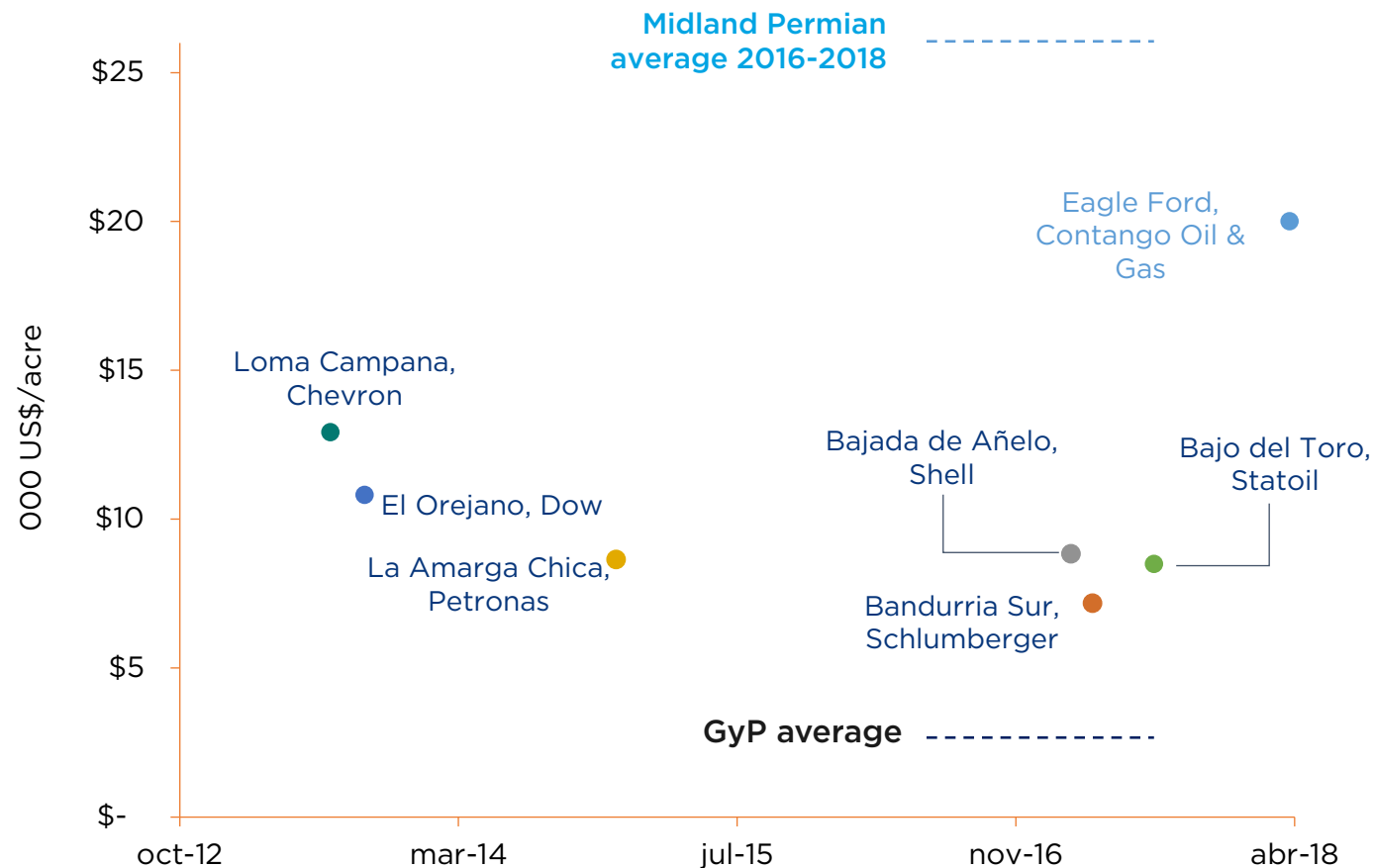
YPF farm-ins have averaged US\$8,000/acre, less than half L48 costs of US\$20,000-30,000 per acre (Wood Mackenzie)

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



Shale oil production - Horizontal wells

Unconventionals represent

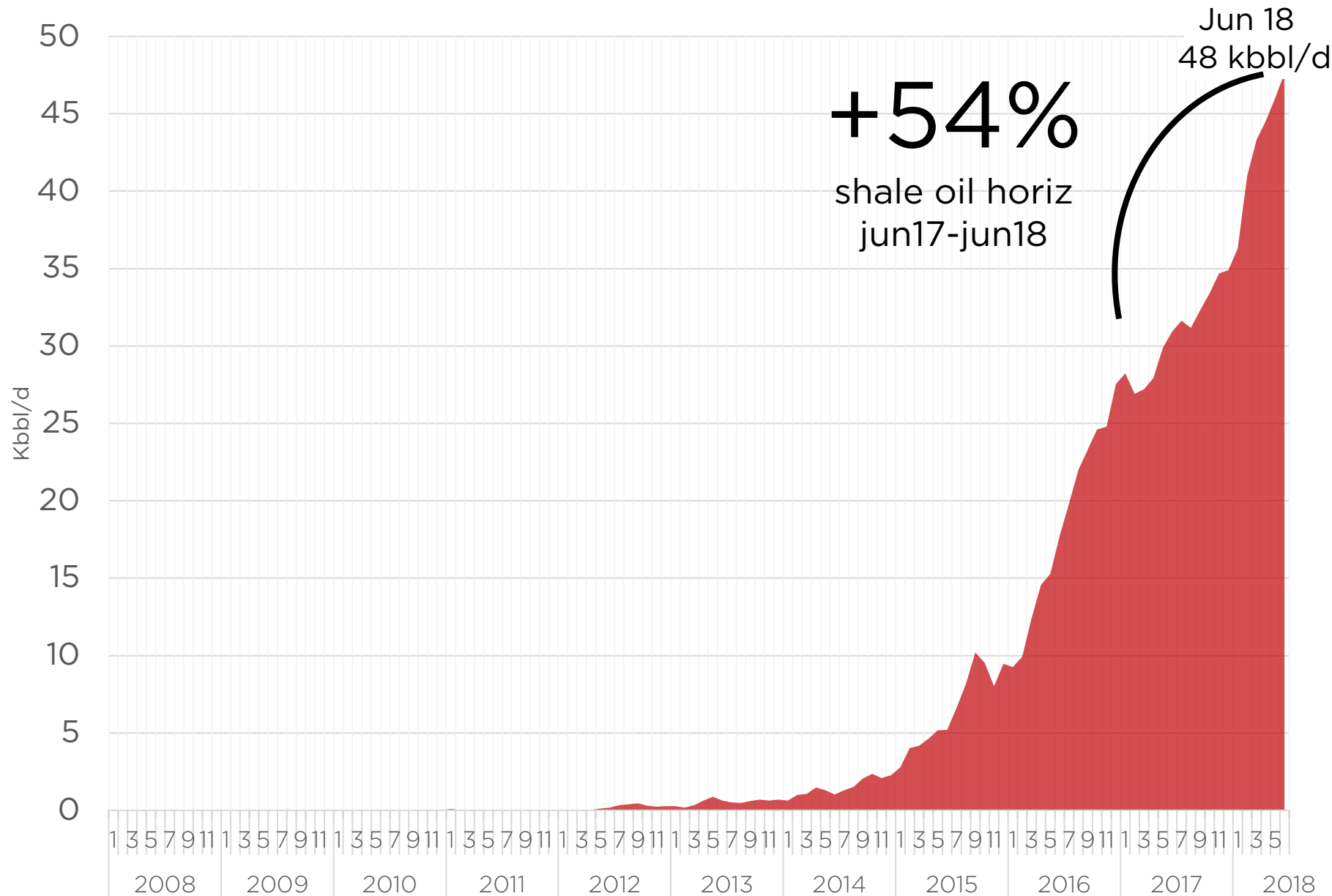
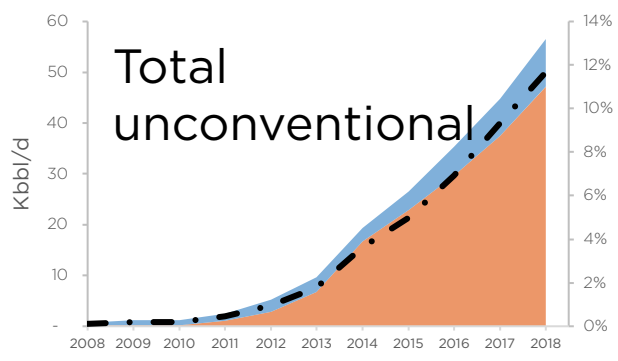
12%

of oil production

Total oil production increased

5.0%

between june 17 and june 18



Shale gas production - Horizontal wells

Unconventional represents

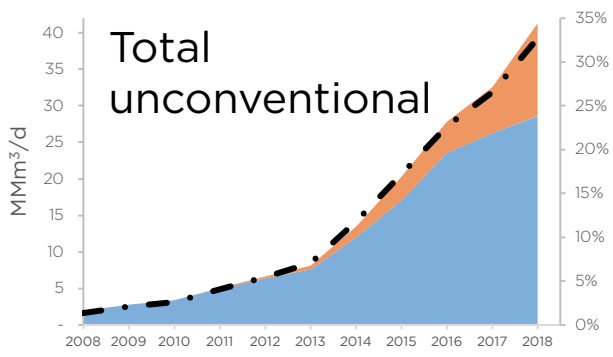
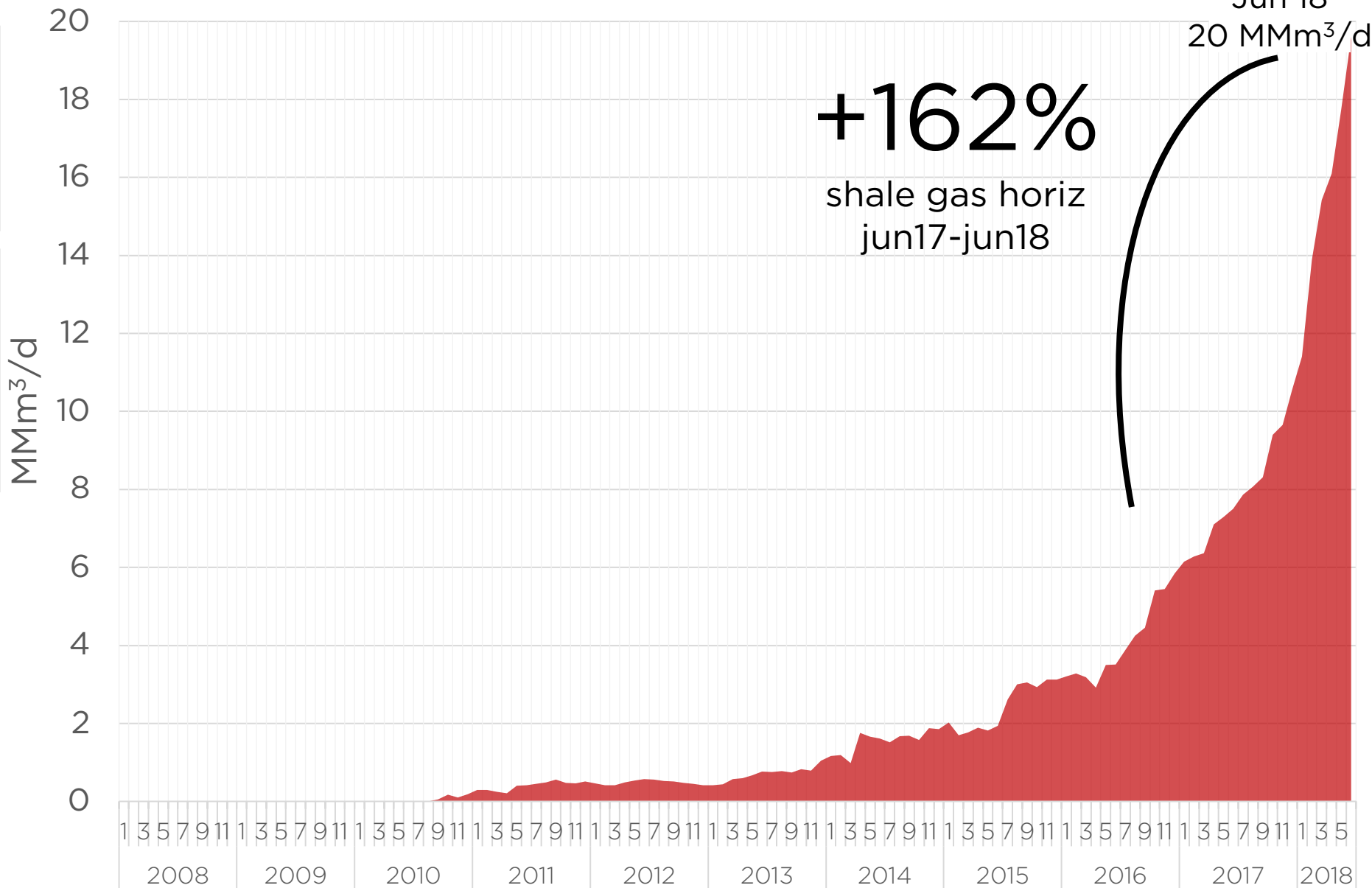
36%

of natural gas production

Total natural gas production increased

8.2%

between June 17 and June 18

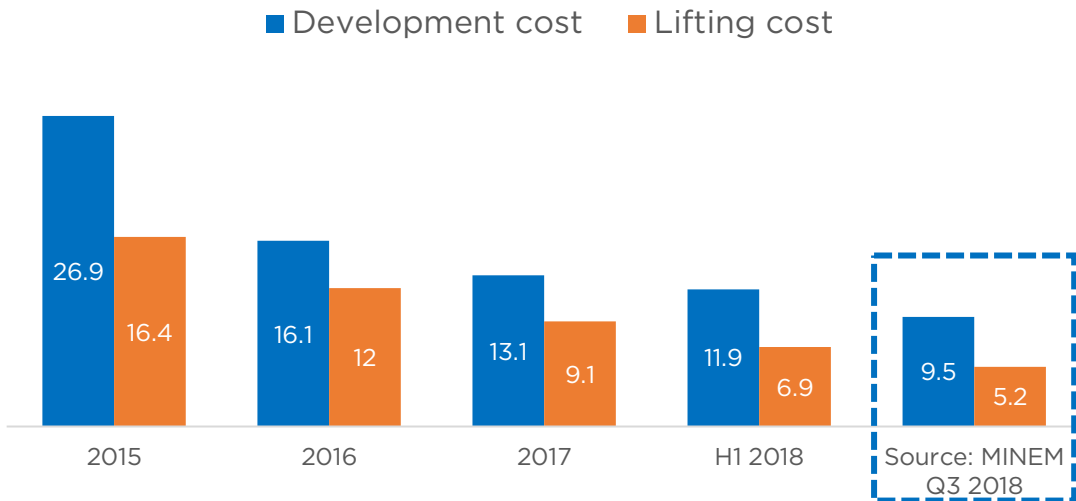




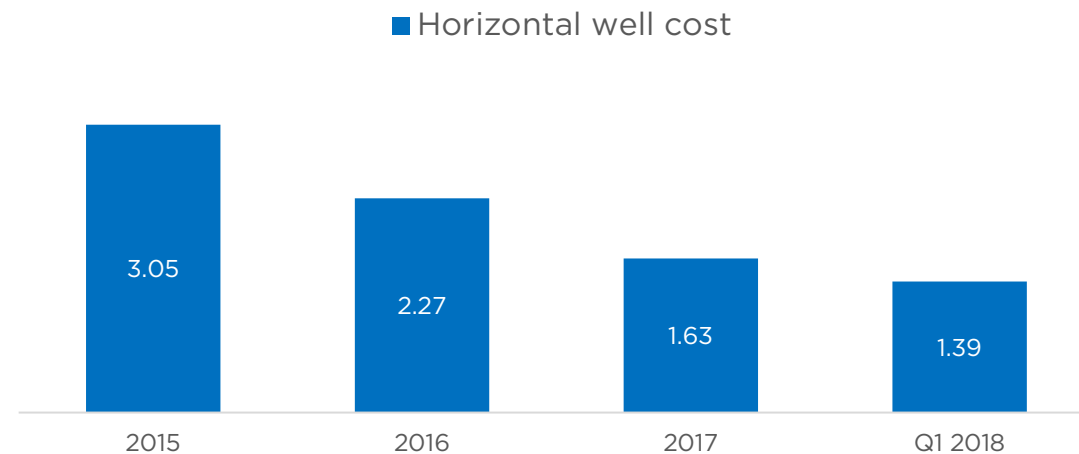
Argentina is one of the four countries in the world which are commercially developing unconventional resources.

Cost decline as performance increases (source YPF)

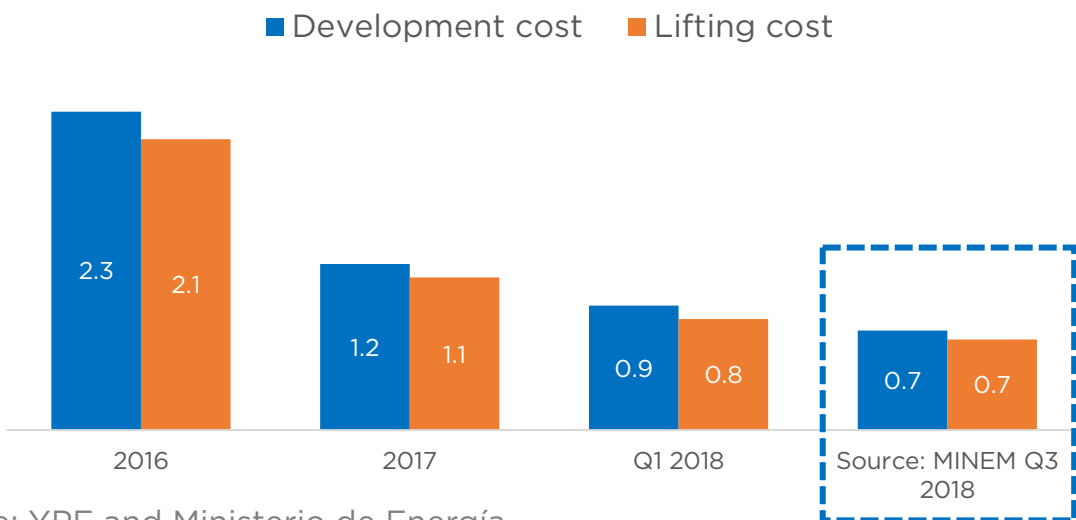
Shale oil costs - Loma Campana [USD/boe]



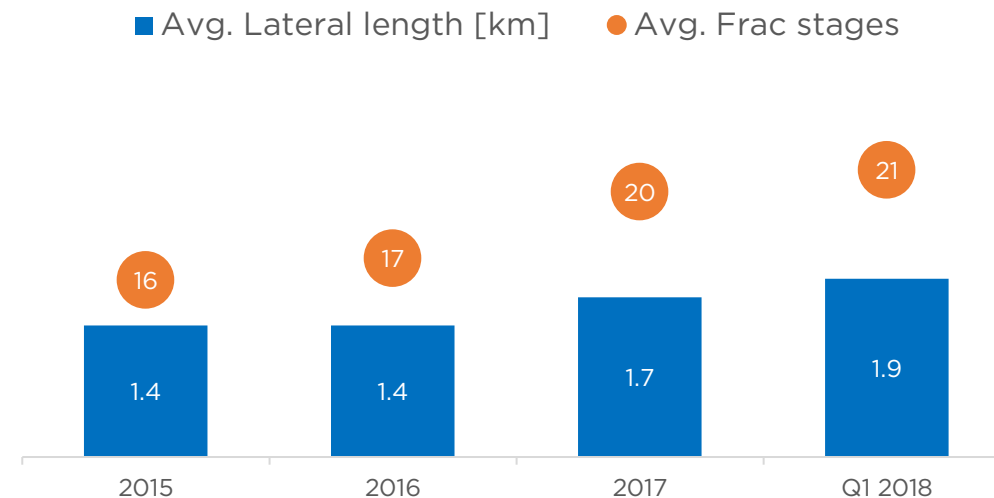
Loma Campana Horizontal well costs [kUSD/lat.ft.]



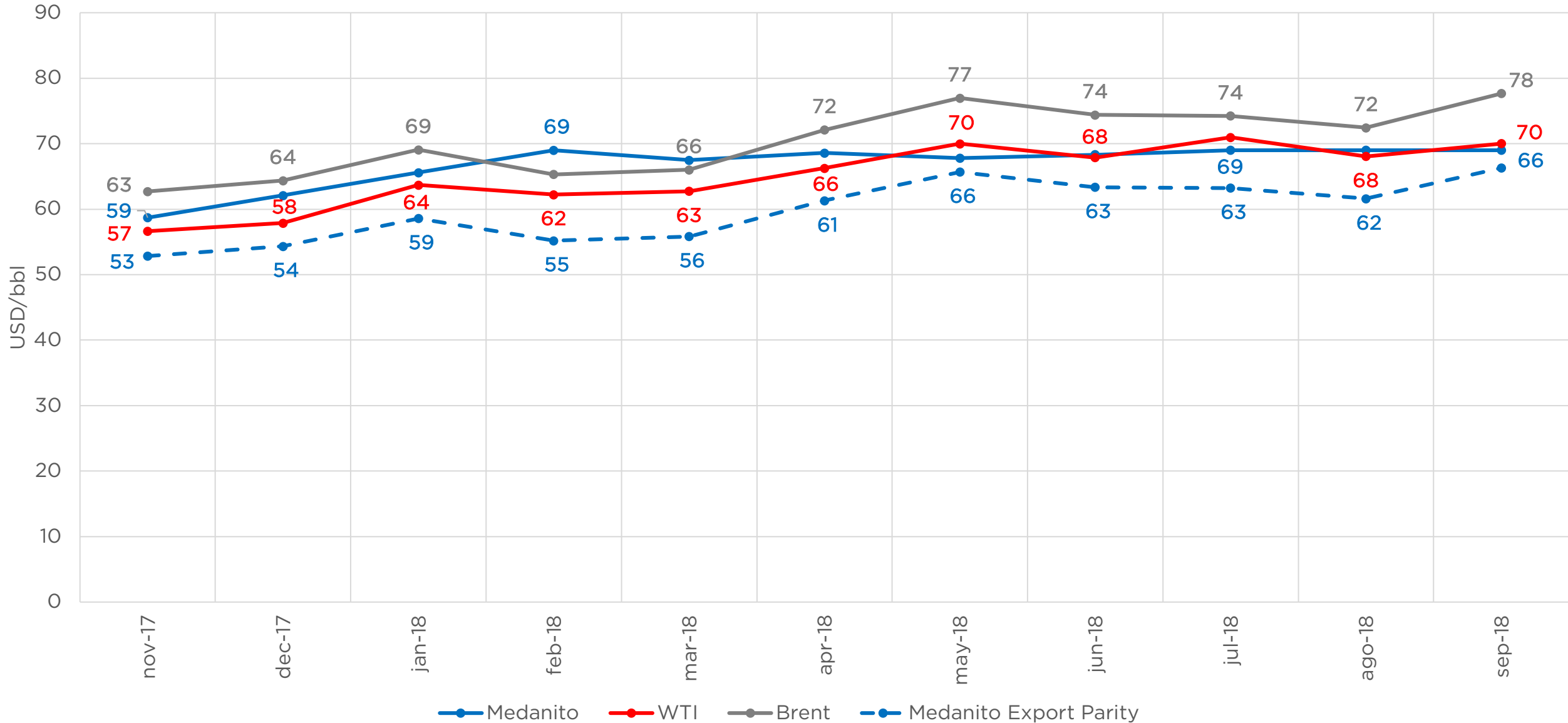
Shale gas costs - El Orejano [USD/MMBTU]



Loma Campana horizontal well performance

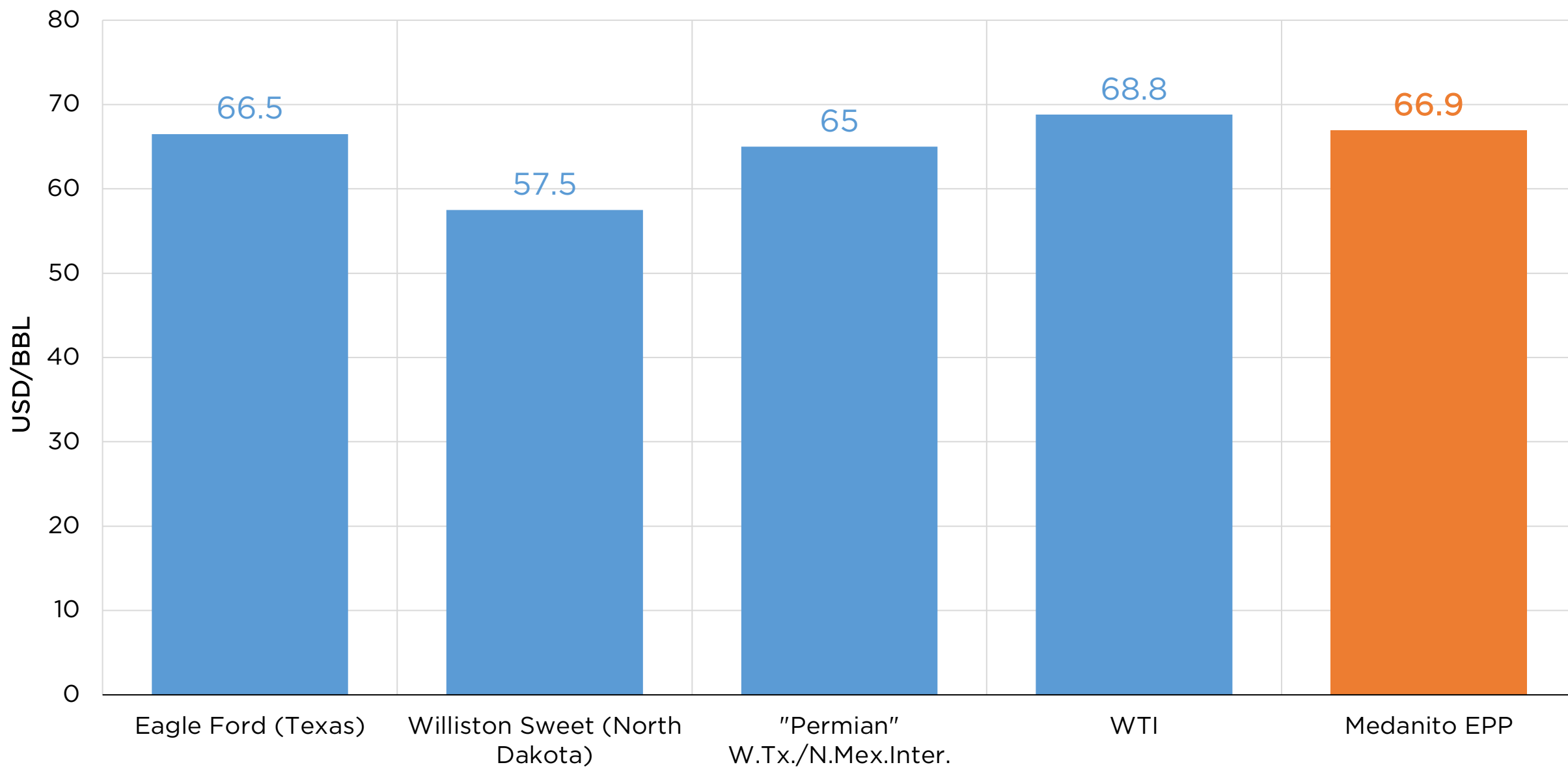


WTI and Brent vs Medanito



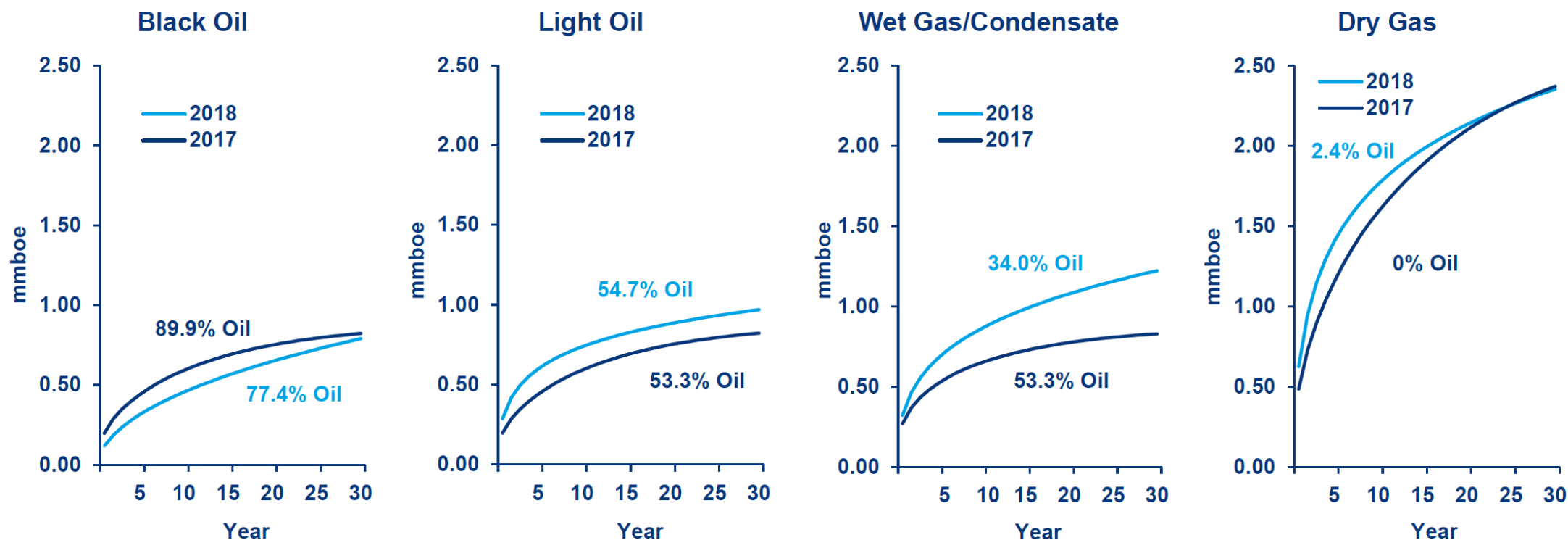
Note: Medanito Export Parity was estimated using Brent -4 USD/bbl (transport) -10% (export tax).

US' Oil Prices vs Medanito's export parity price (09/13/2018)

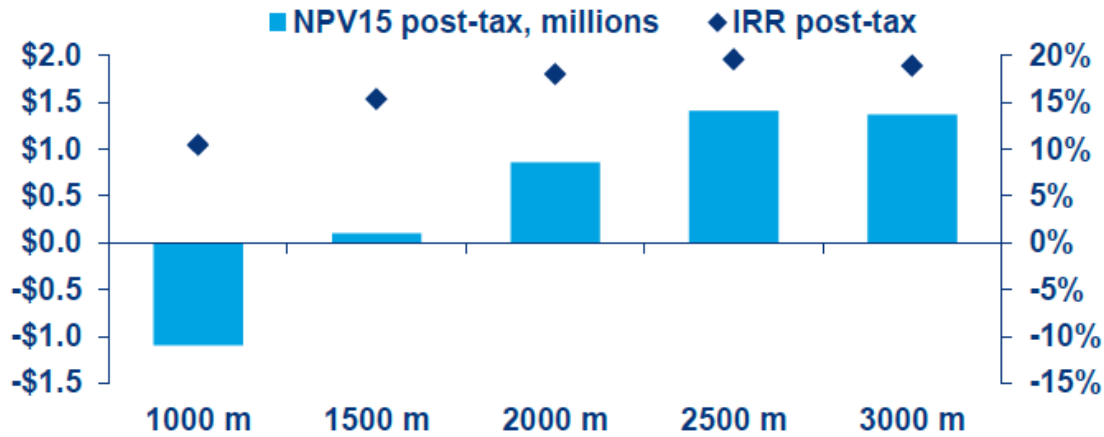


Accumulated production by type of wells (Wood Mackenzie)

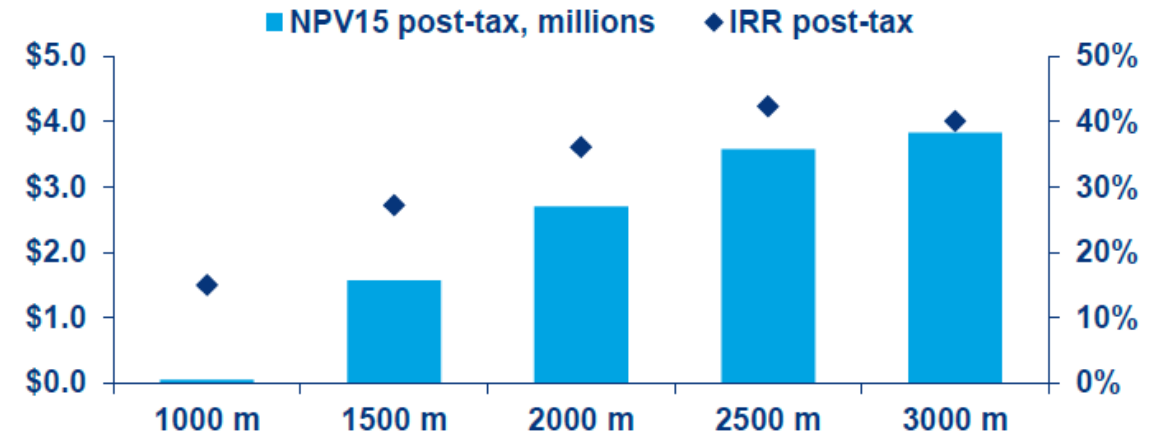
	IP30 (boe/d)			EUR (mmboe)			Cum 180 (kboe)			Cum 365 (kboe)		
	2017	2018	% change	2017	2018	% change	2017	2018	% change	2017	2018	% change
Black Oil	901	531	-41%	0.82	0.79	-4%	111	71	-36%	174	116	-33%
Light Oil	901	945	5%	0.82	0.97	18%	111	155	39%	174	280	61%
Wet Gas	911	1,076	18%	0.83	1.22	47%	103	177	71%	151	313	107%
Dry Gas	2,440	1,993	-18%	2.37	2.35	-1%	306	327	7%	484	604	25%



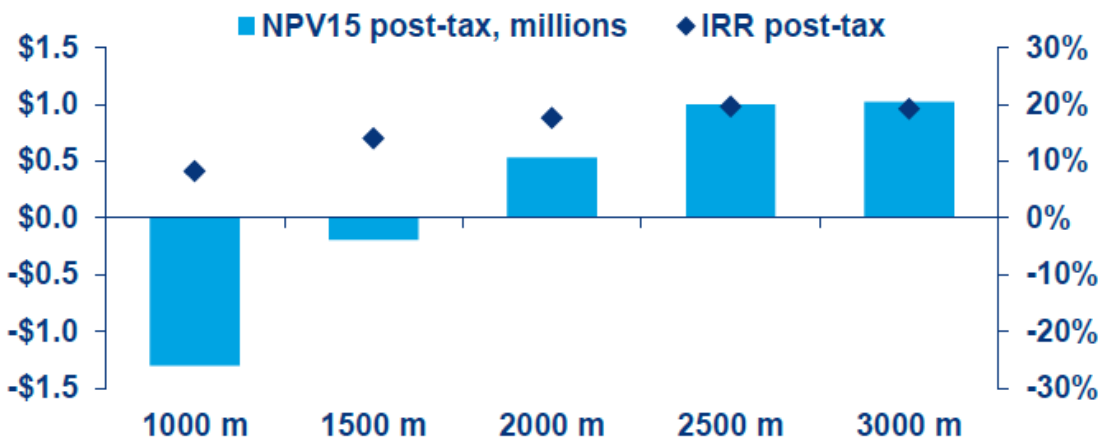
Black Oil window type well



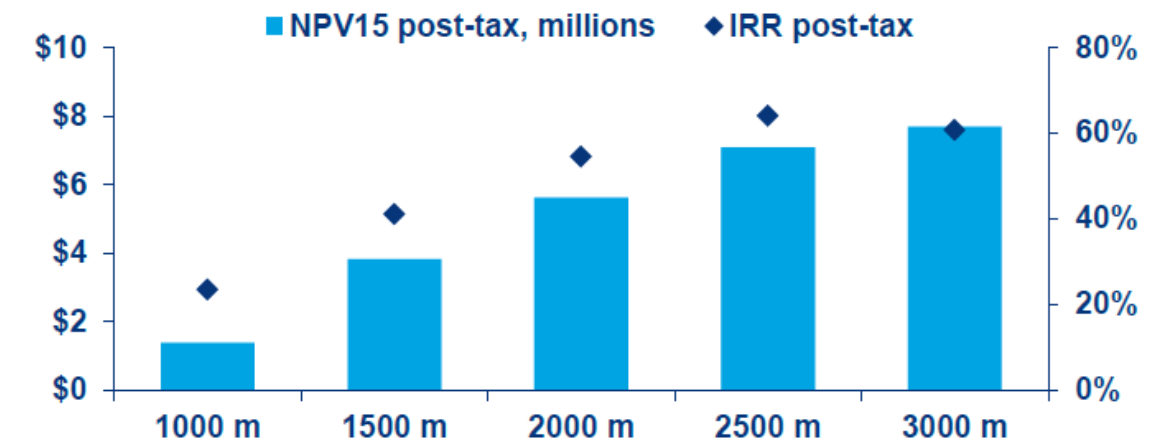
Light Oil window type well



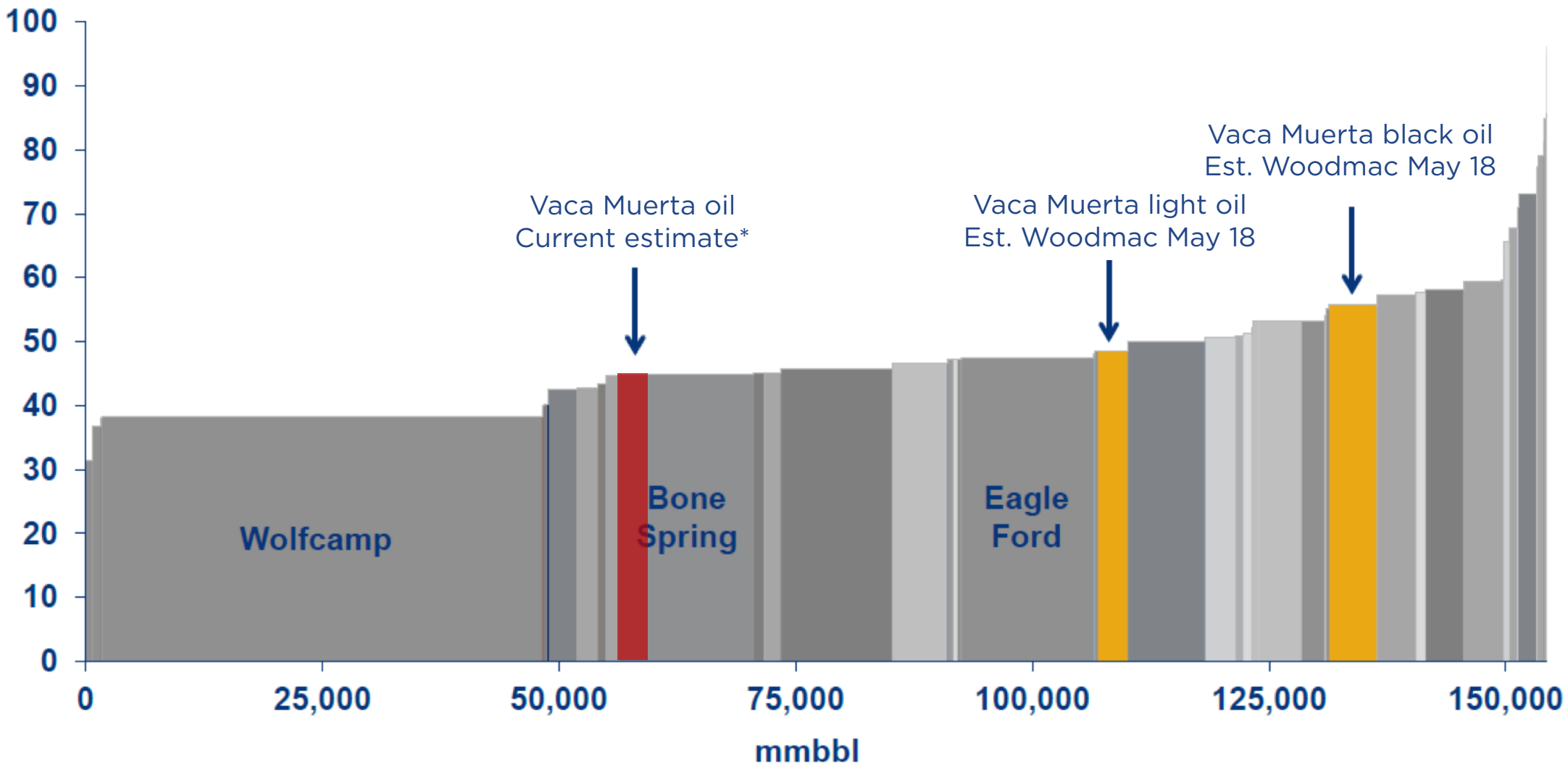
Wet Gas/Condensate window type well



Dry Gas window type well

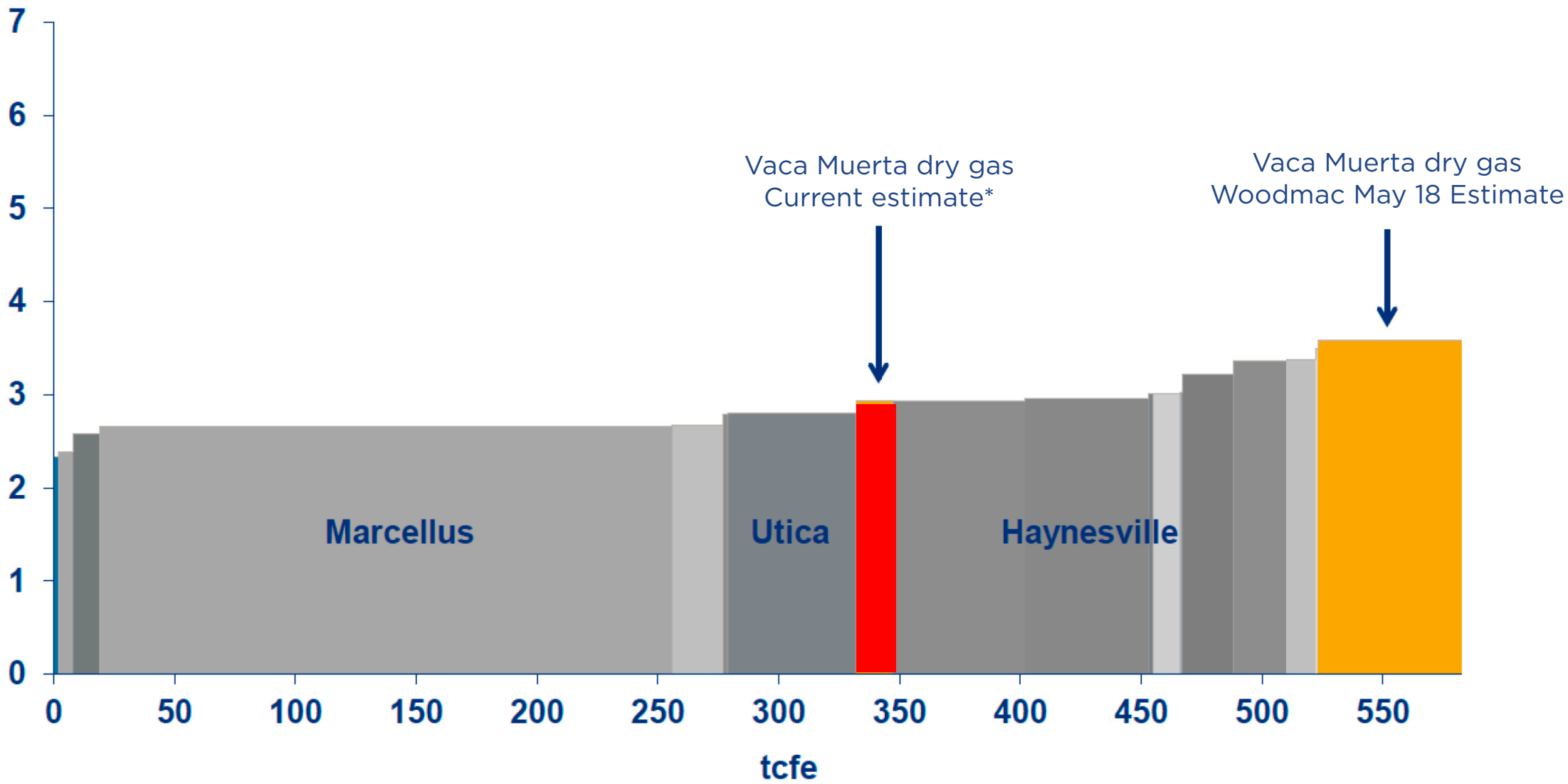


Liquid break-even prices in Vaca Muerta vs. USA plays

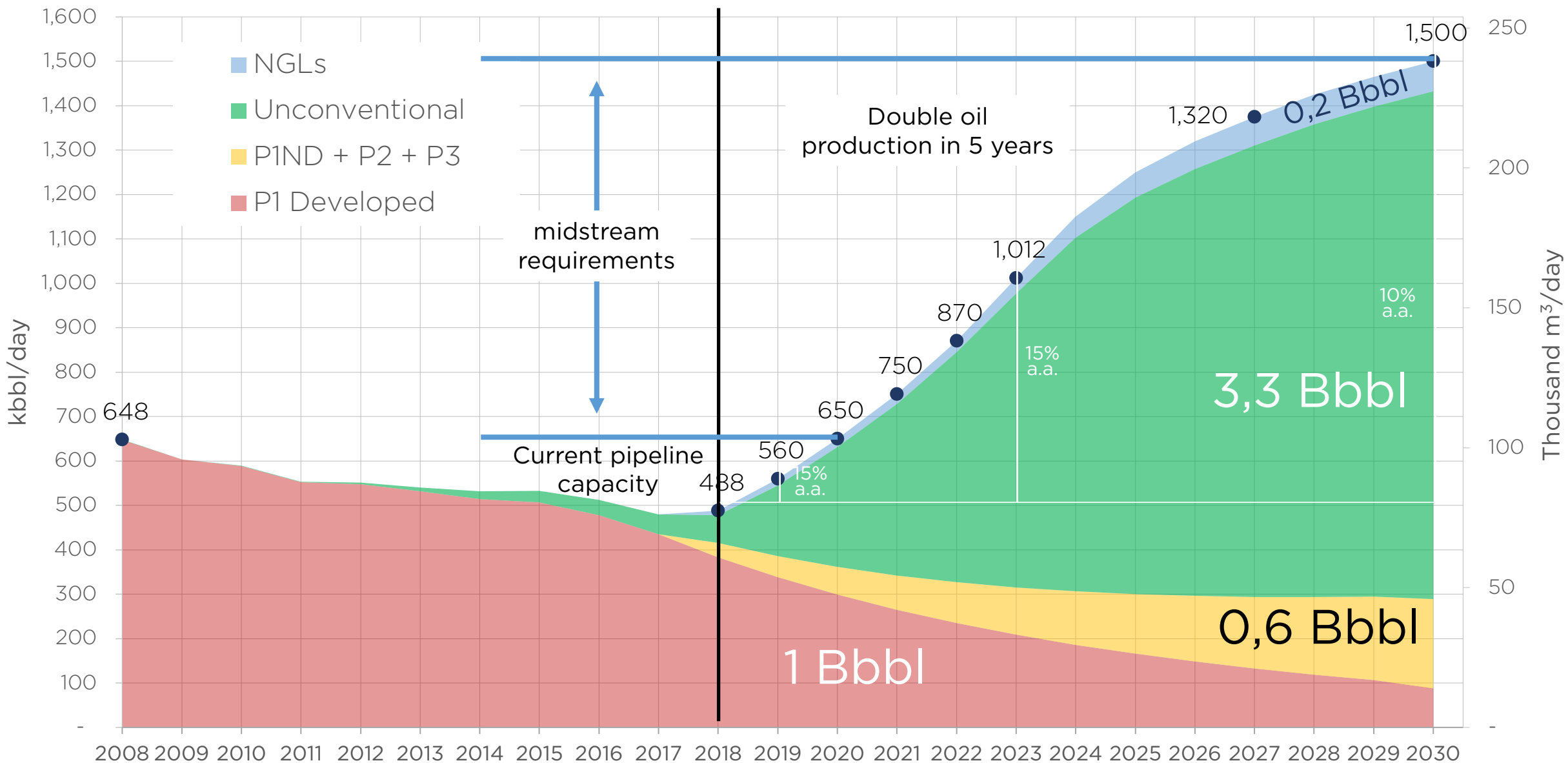


Sources: Wood Mackenzie / **Current estimate own elaboration

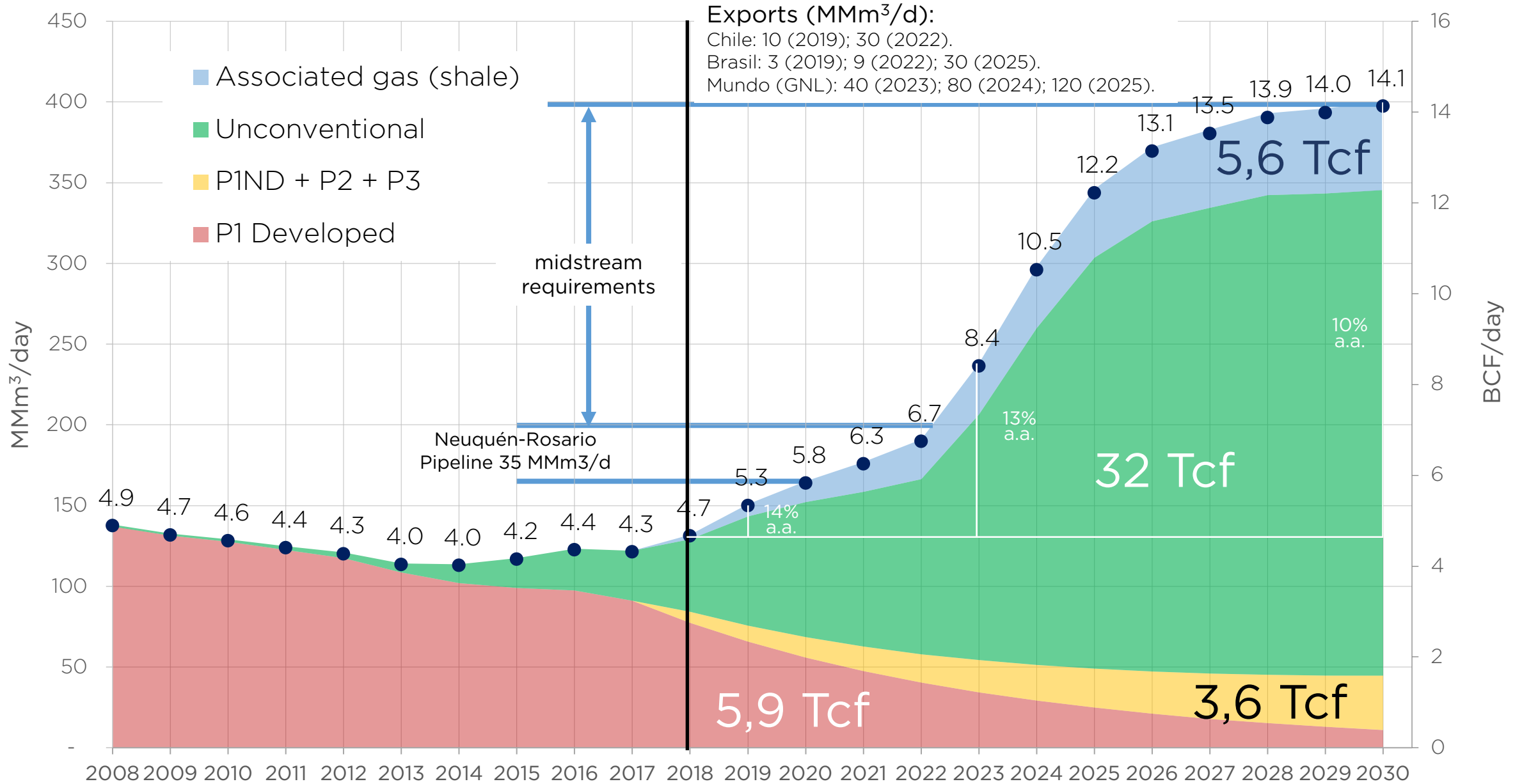
Gas break-even prices in Vaca Muerta vs USA plays



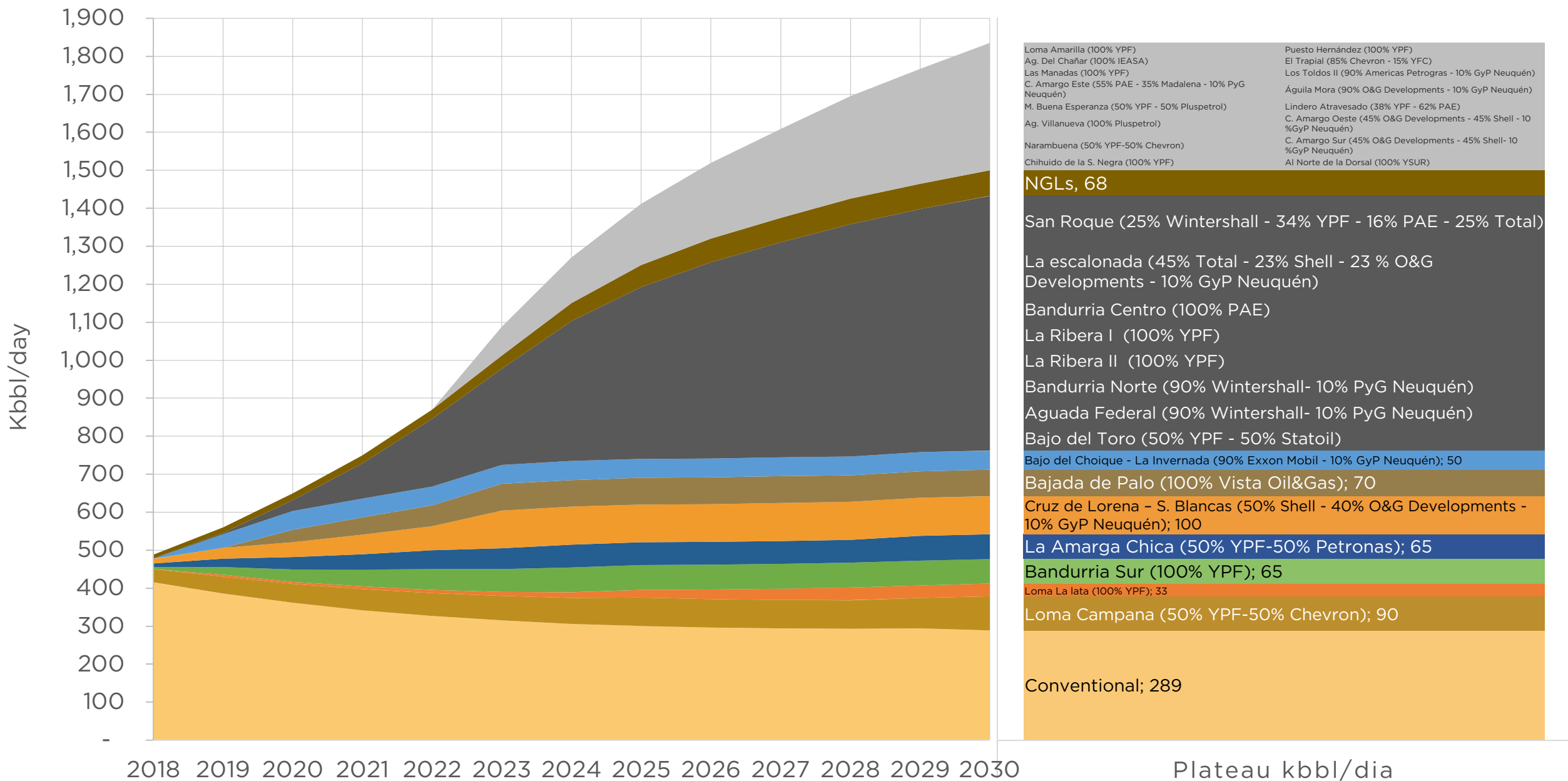
Sources: Wood Mackenzie / **Current estimate own elaboration



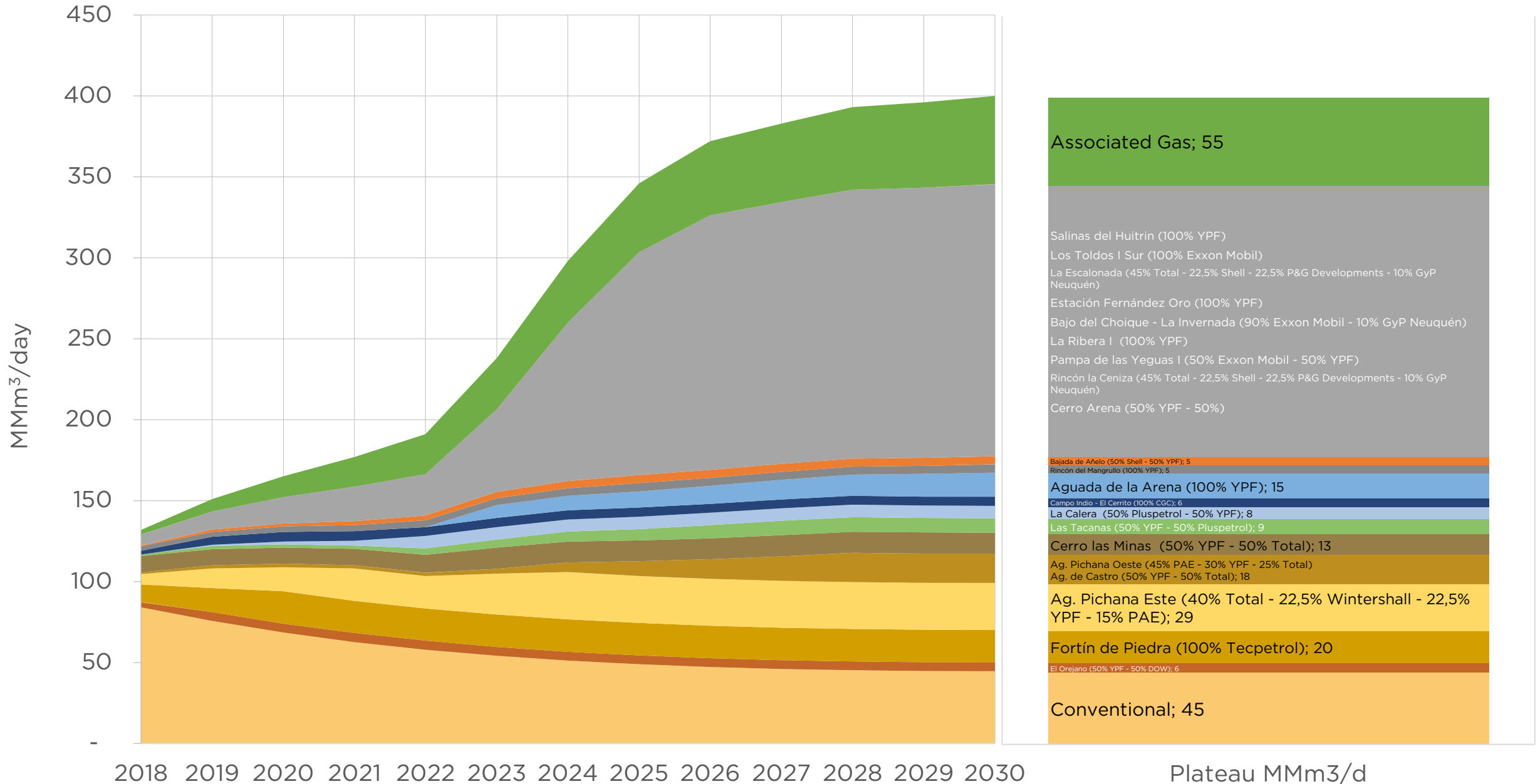
Natural Gas Production



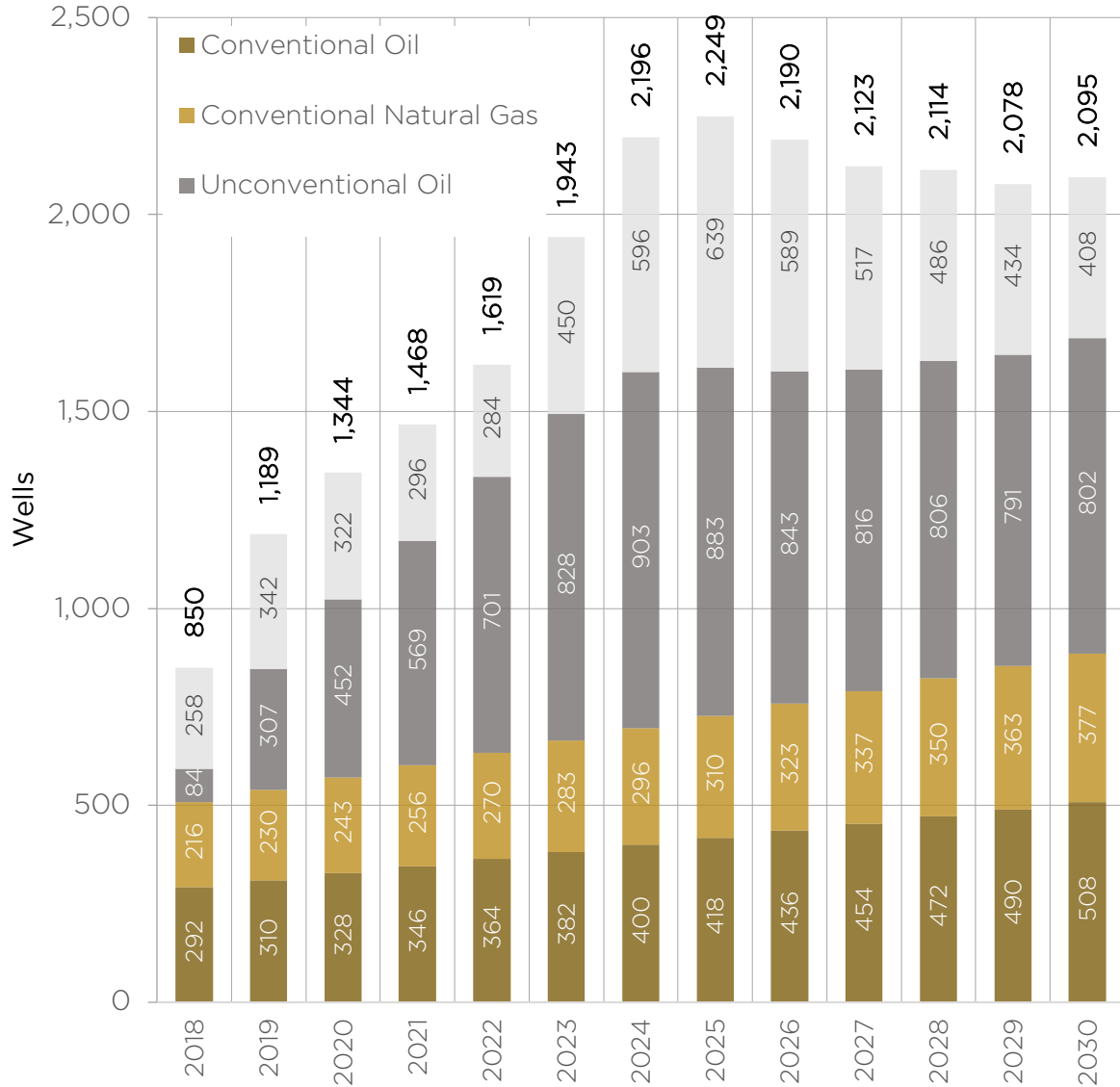
Key ongoing projects - Oil



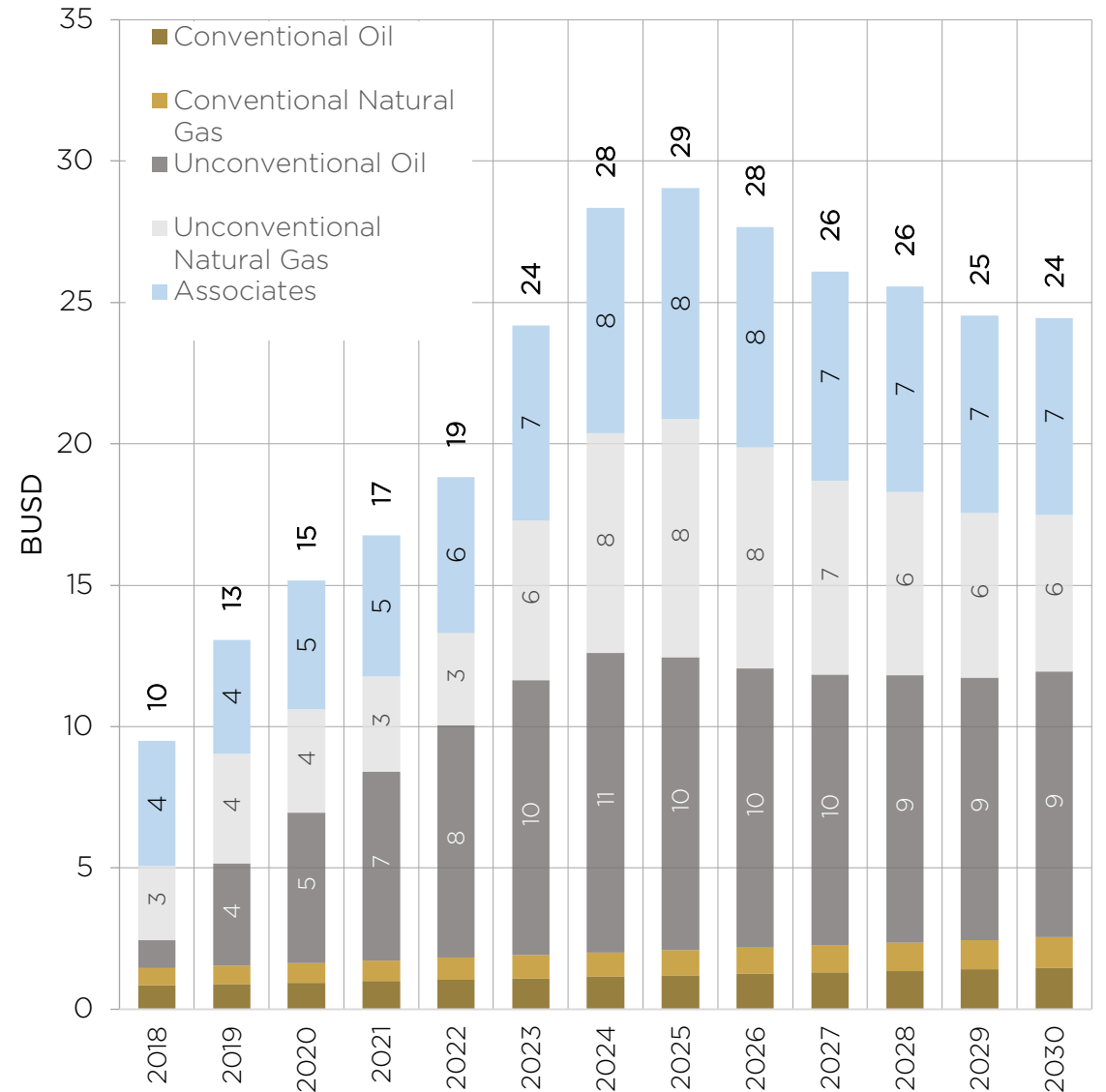
Key ongoing projects - Natural gas



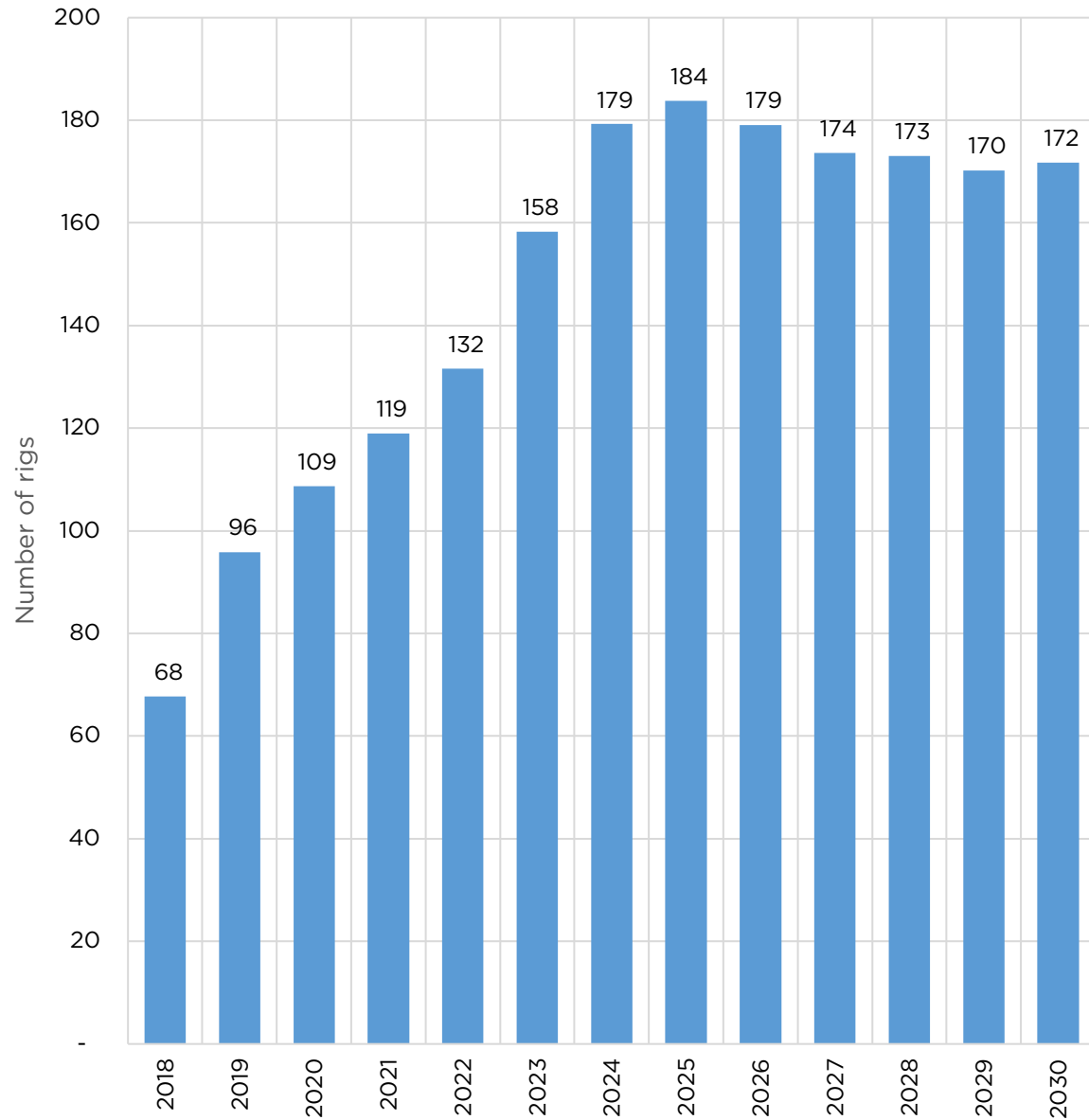
Completed wells



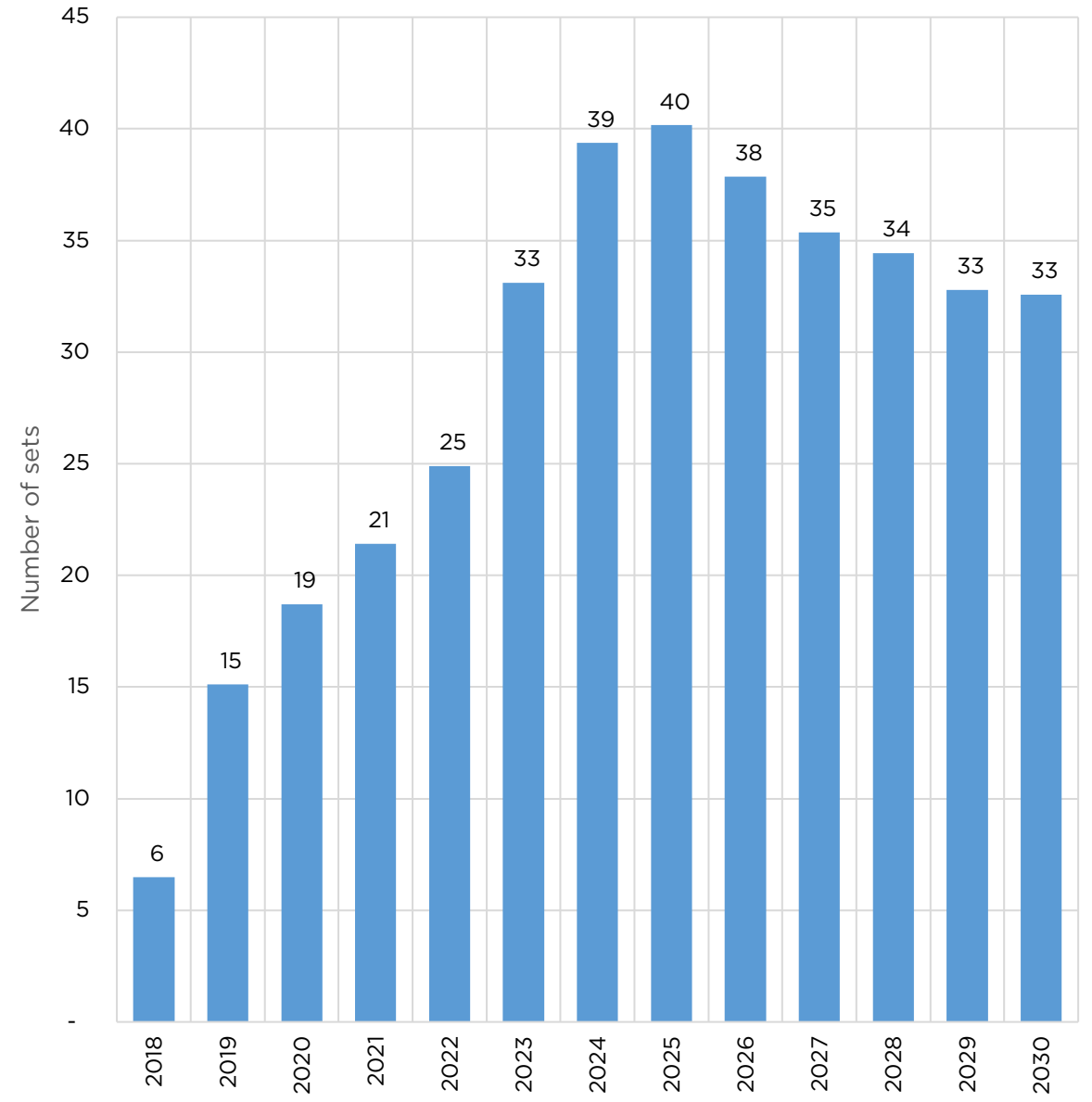
Investments - BUSD



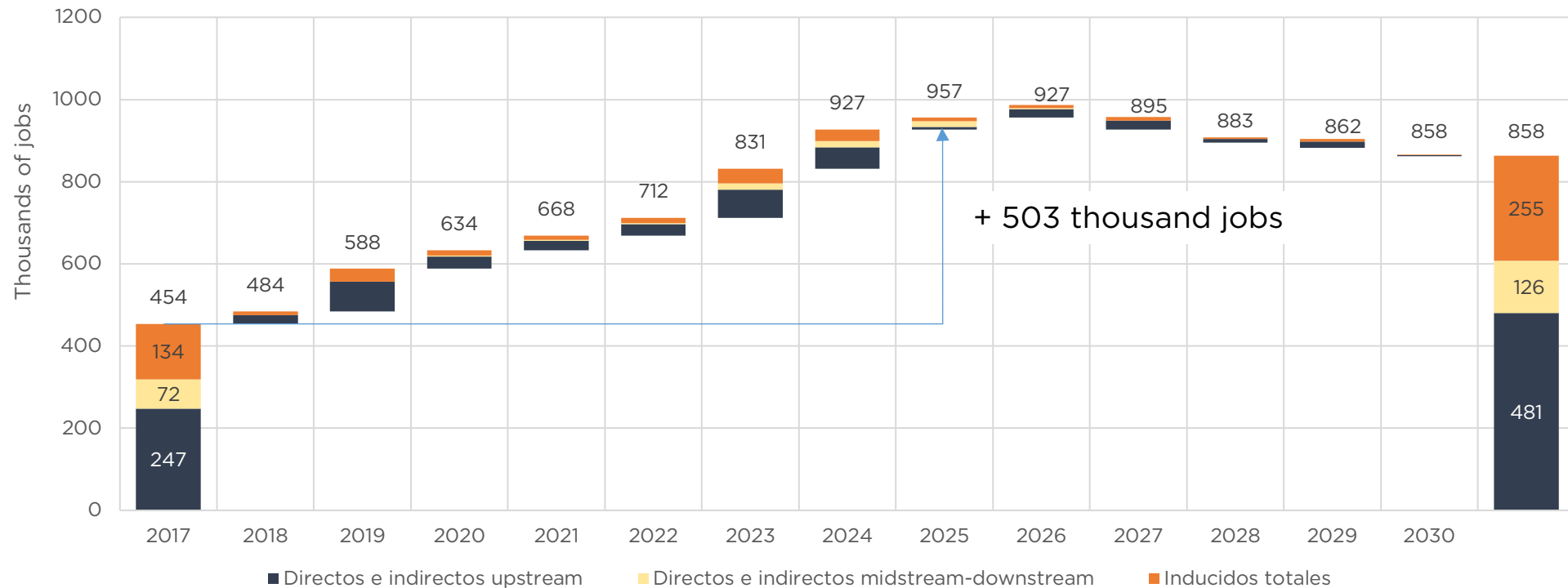
Drilling rigs



Completion sets



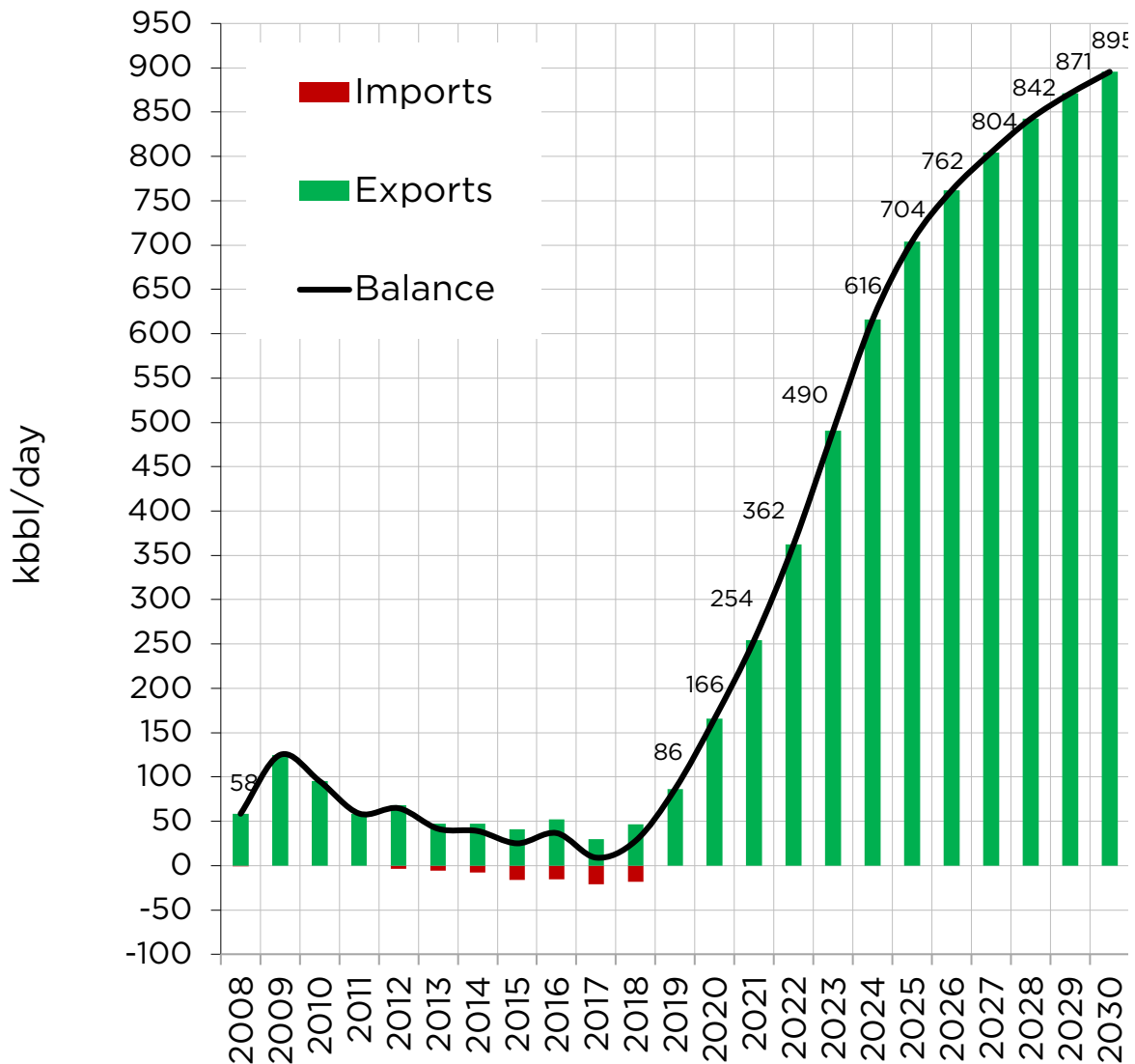
Direct , indirect and induced Jobs at the oil and gas in Argentina



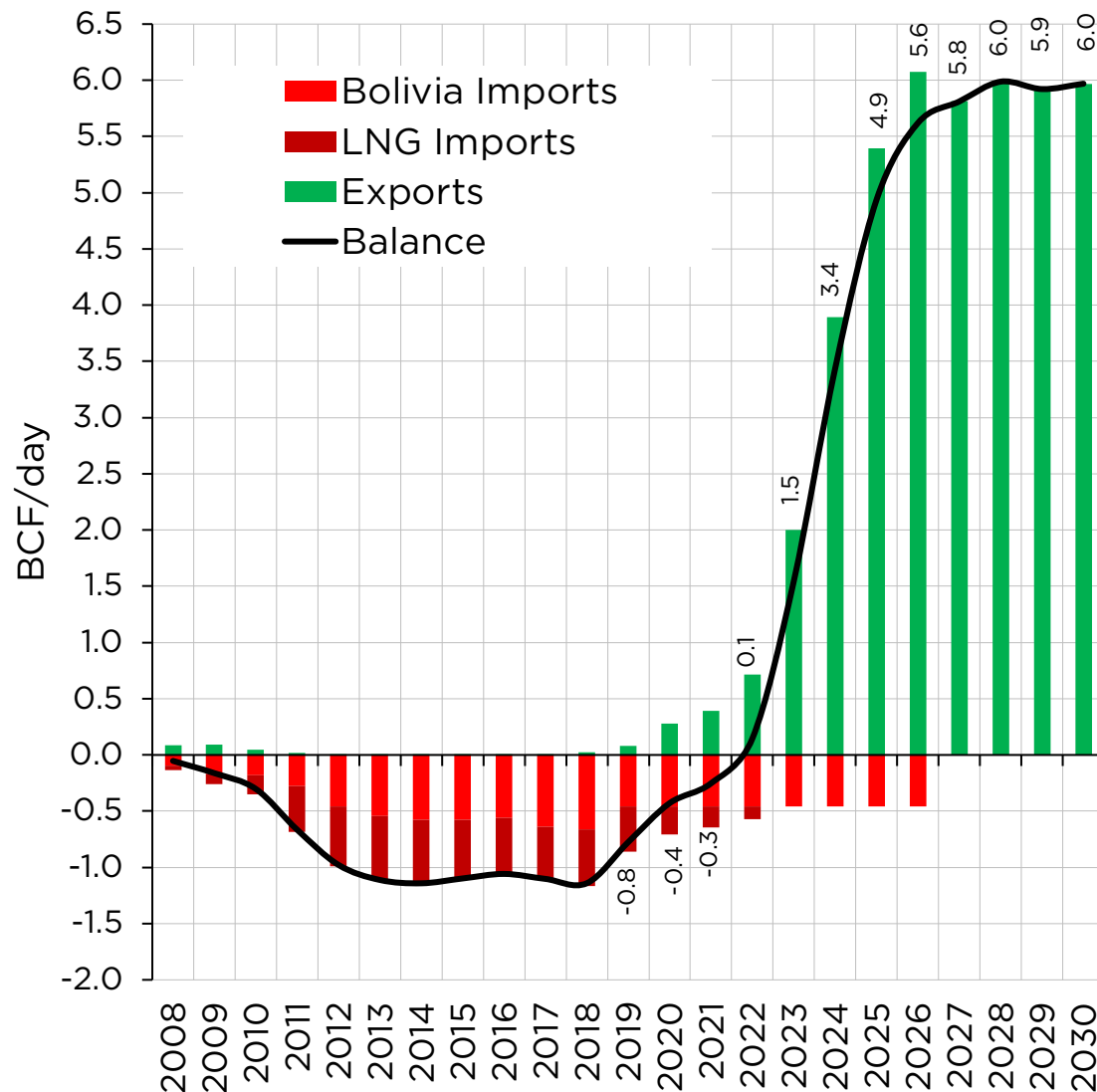
Bottom up estimation:

- 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).

Physical Oil international exchange

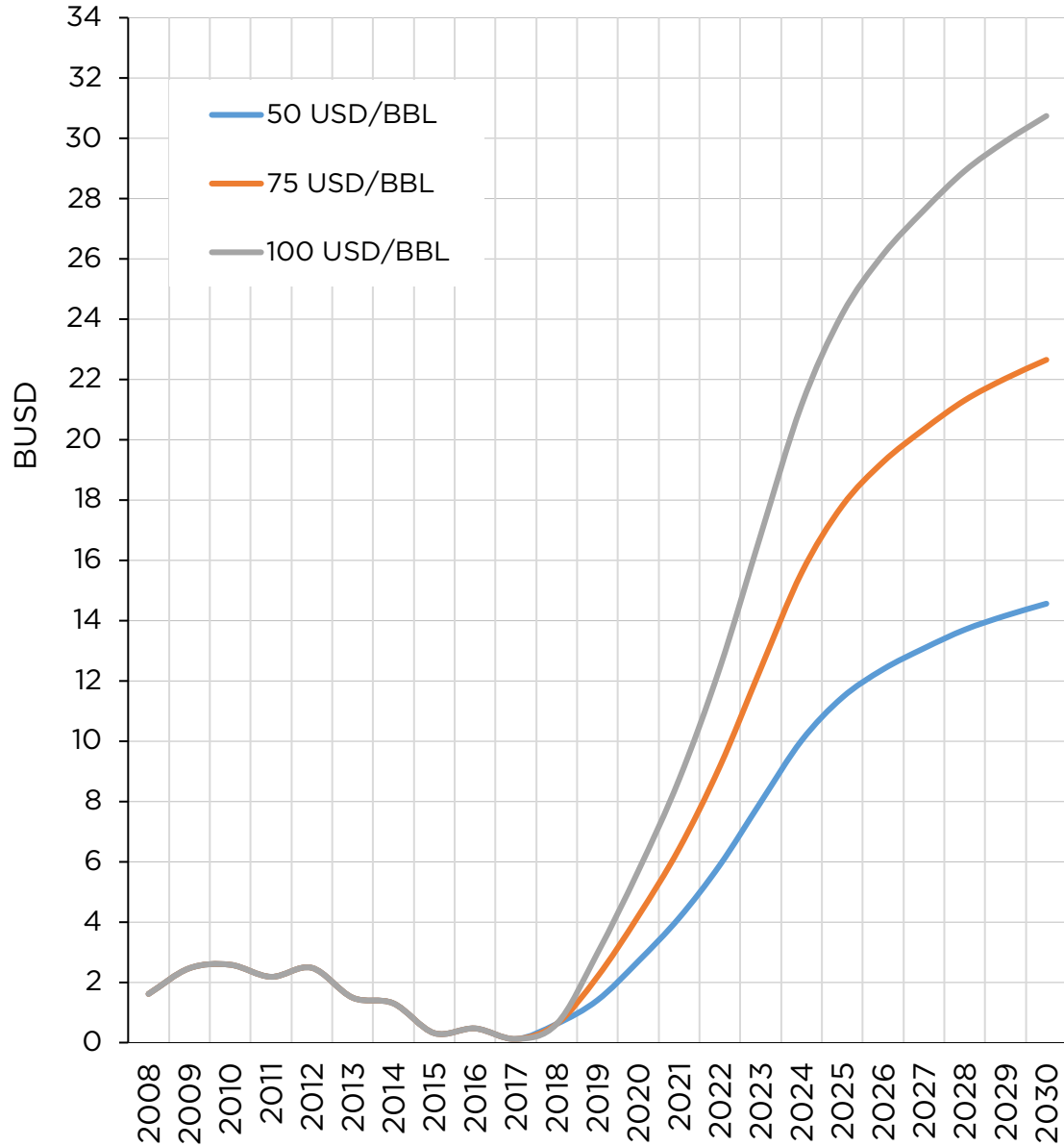


Physical Natural Gas international exchange

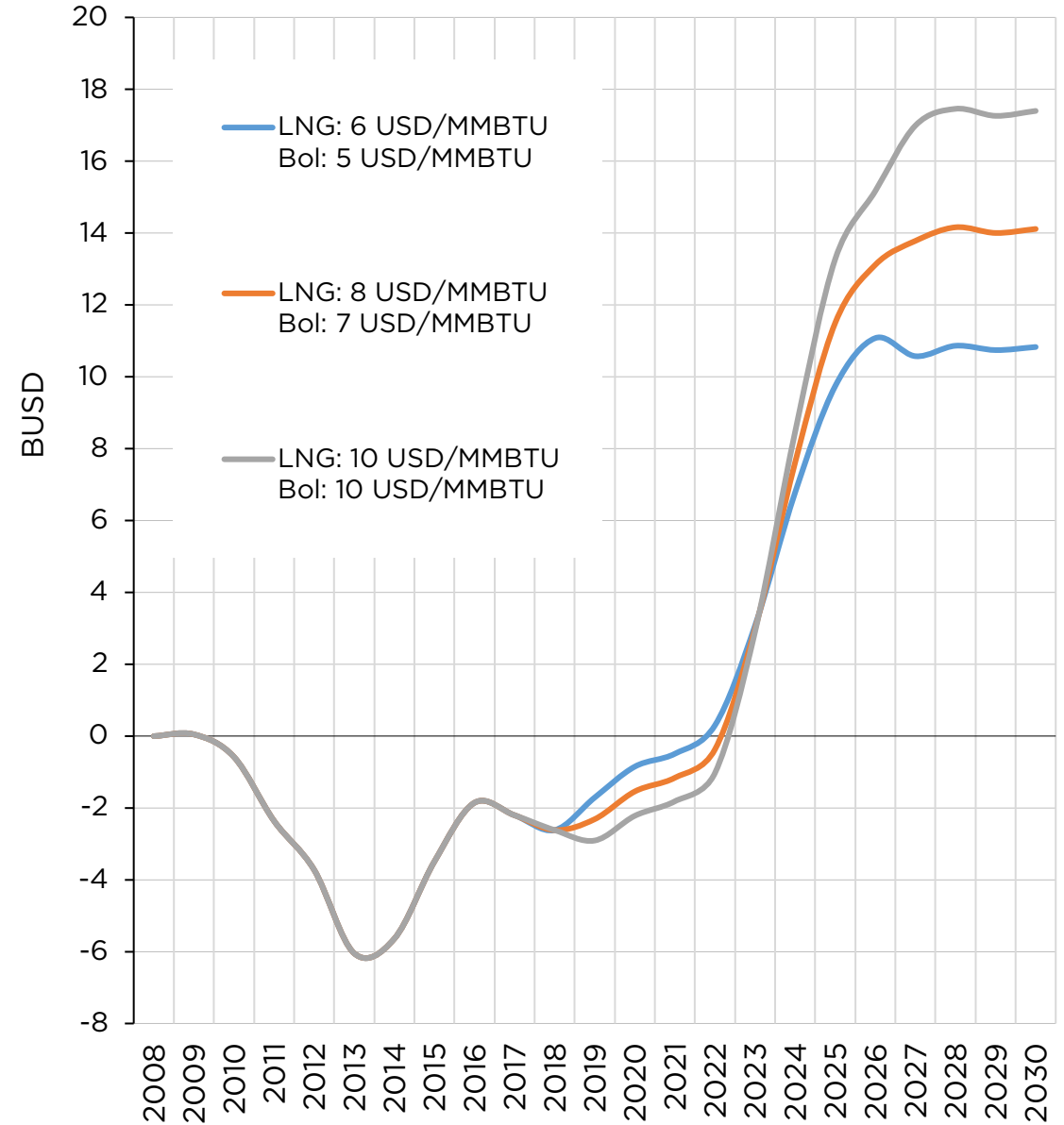


On track to recover the energy trade surplus

Trade Balance of Oil

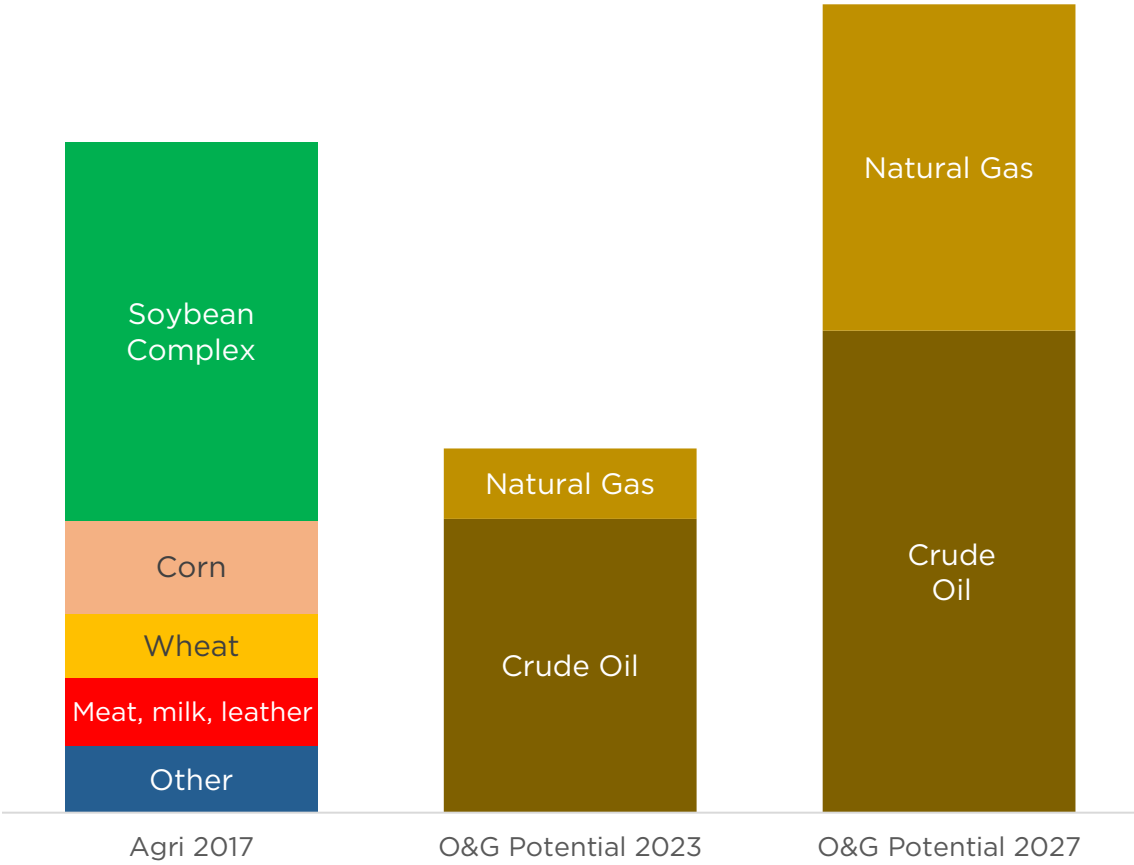
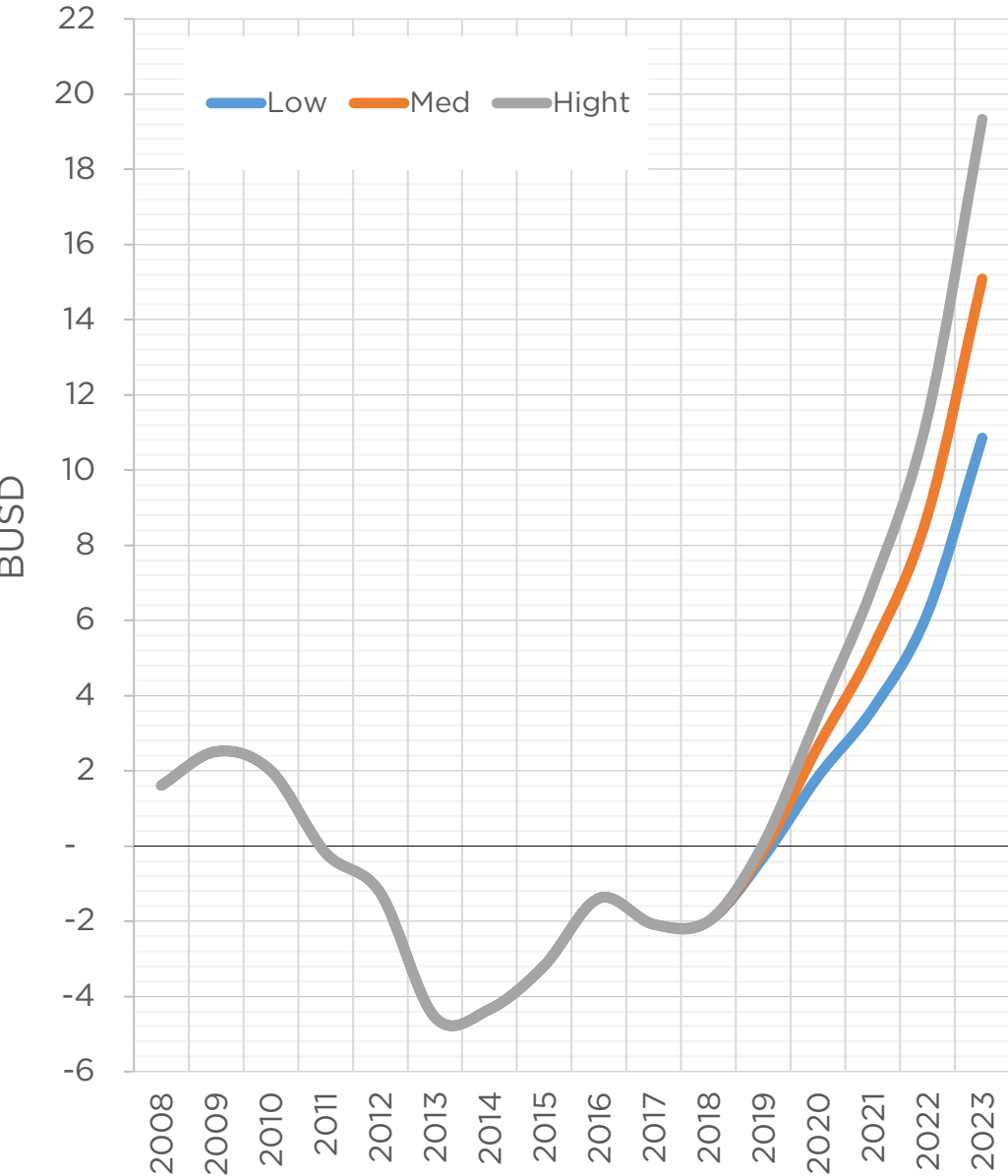


Trade Balance of Natural Gas



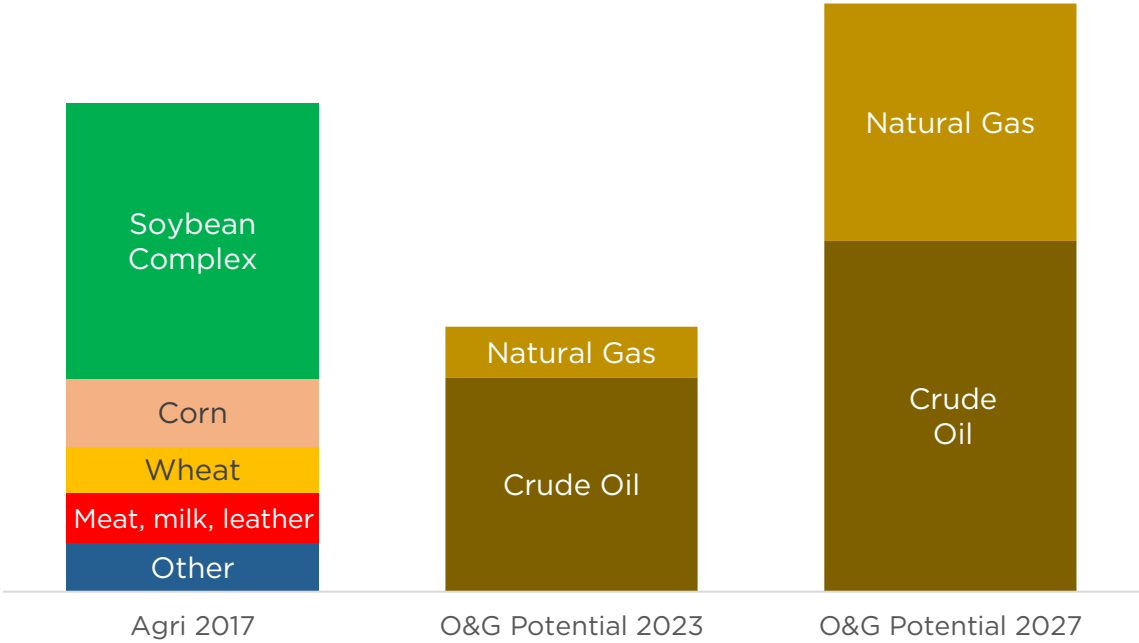
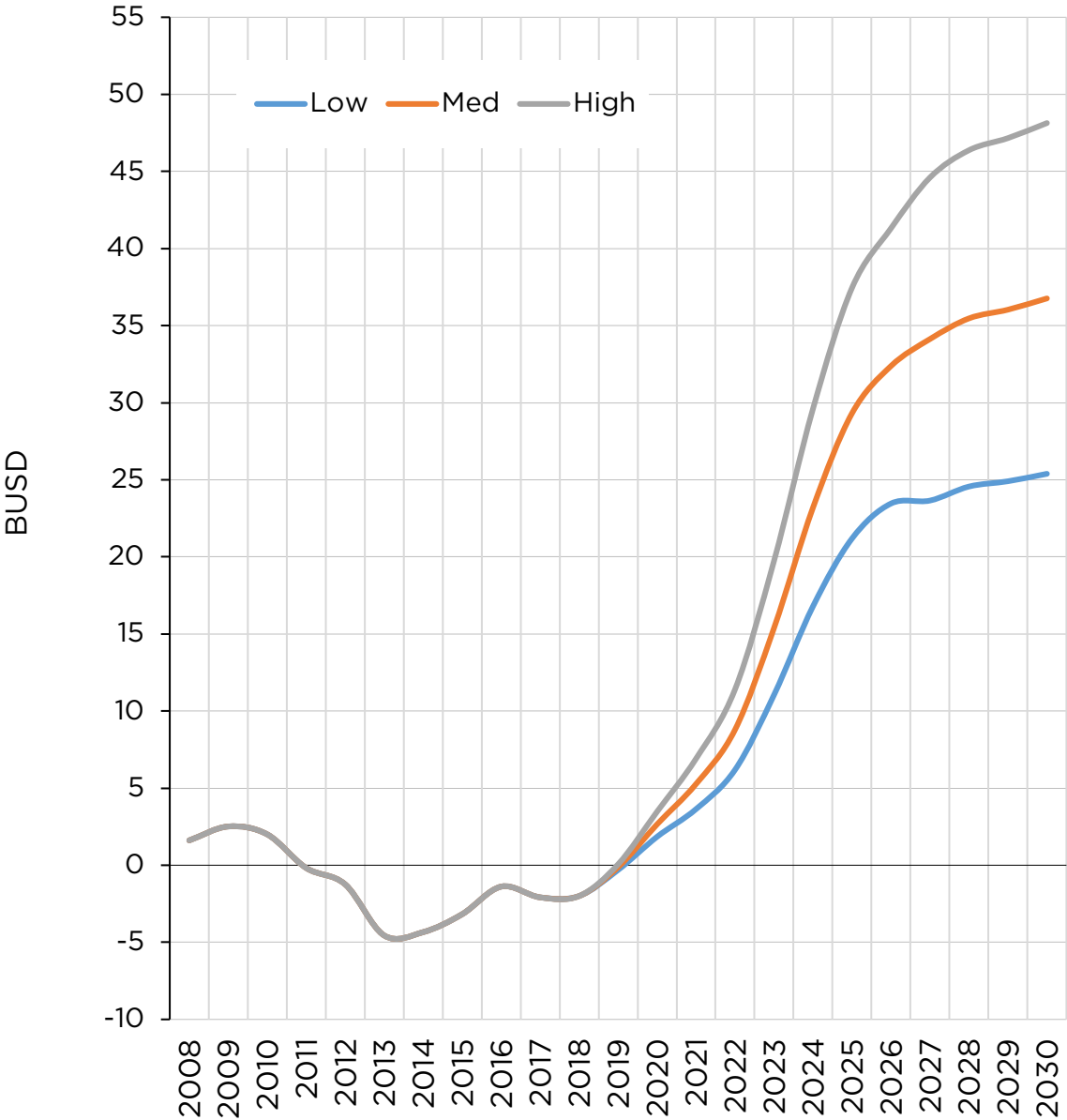
O&G's net exports can surpass current agribusiness exports

Trade Balance of O&G



O&G's net exports can surpass current agribusiness exports

Trade Balance of O&G



Norpatagonico Train — PPP project to be bid soon



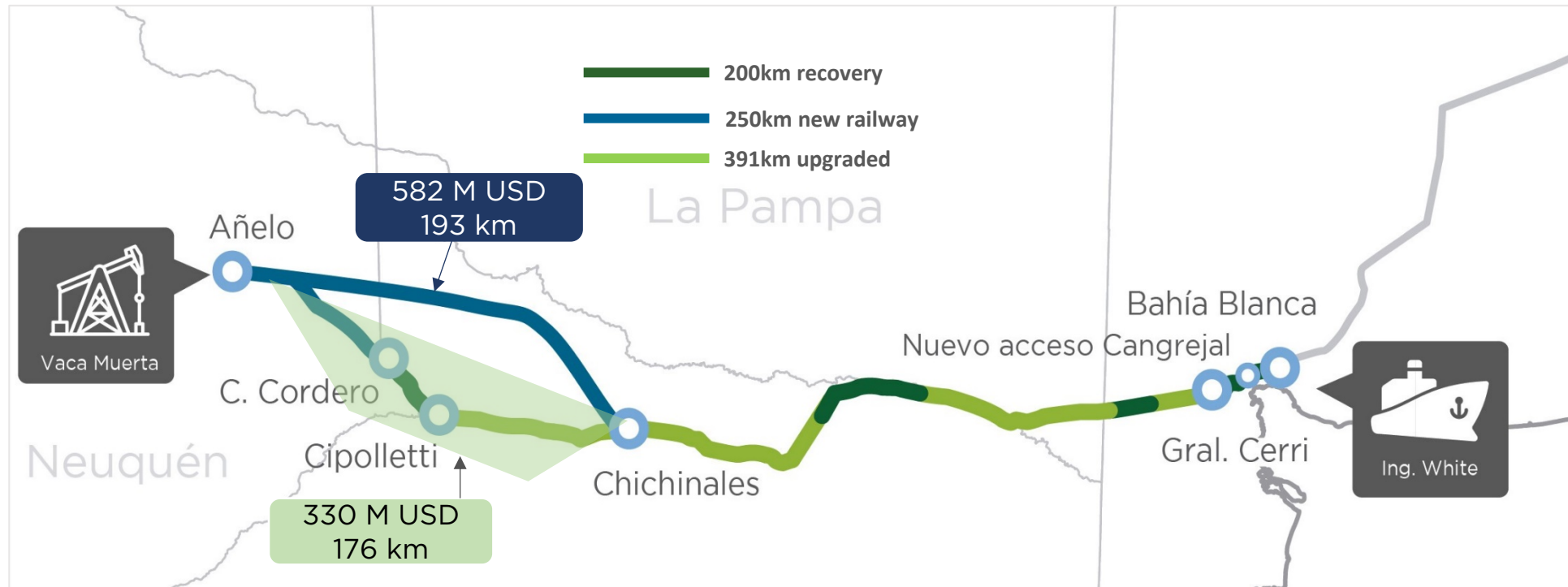
Estimated investments
1,285 M USD

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



UPSTREAM

MIDSTREAM

DOWNSTREAM

Gas pipeline
4.2 BCF per day

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)

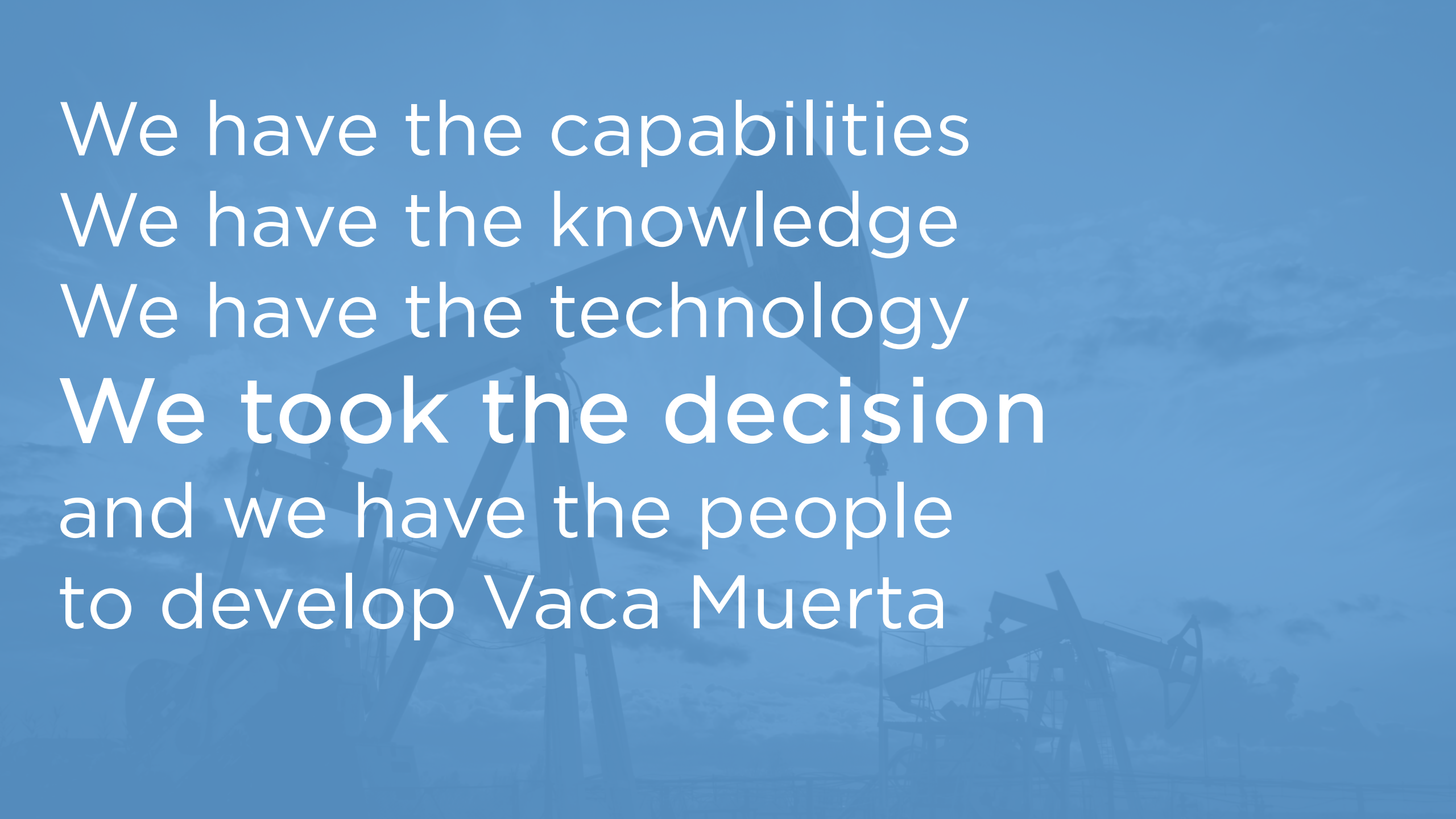
2023 = 1.4 BCF/day

2024 = 2.8 BCF/day

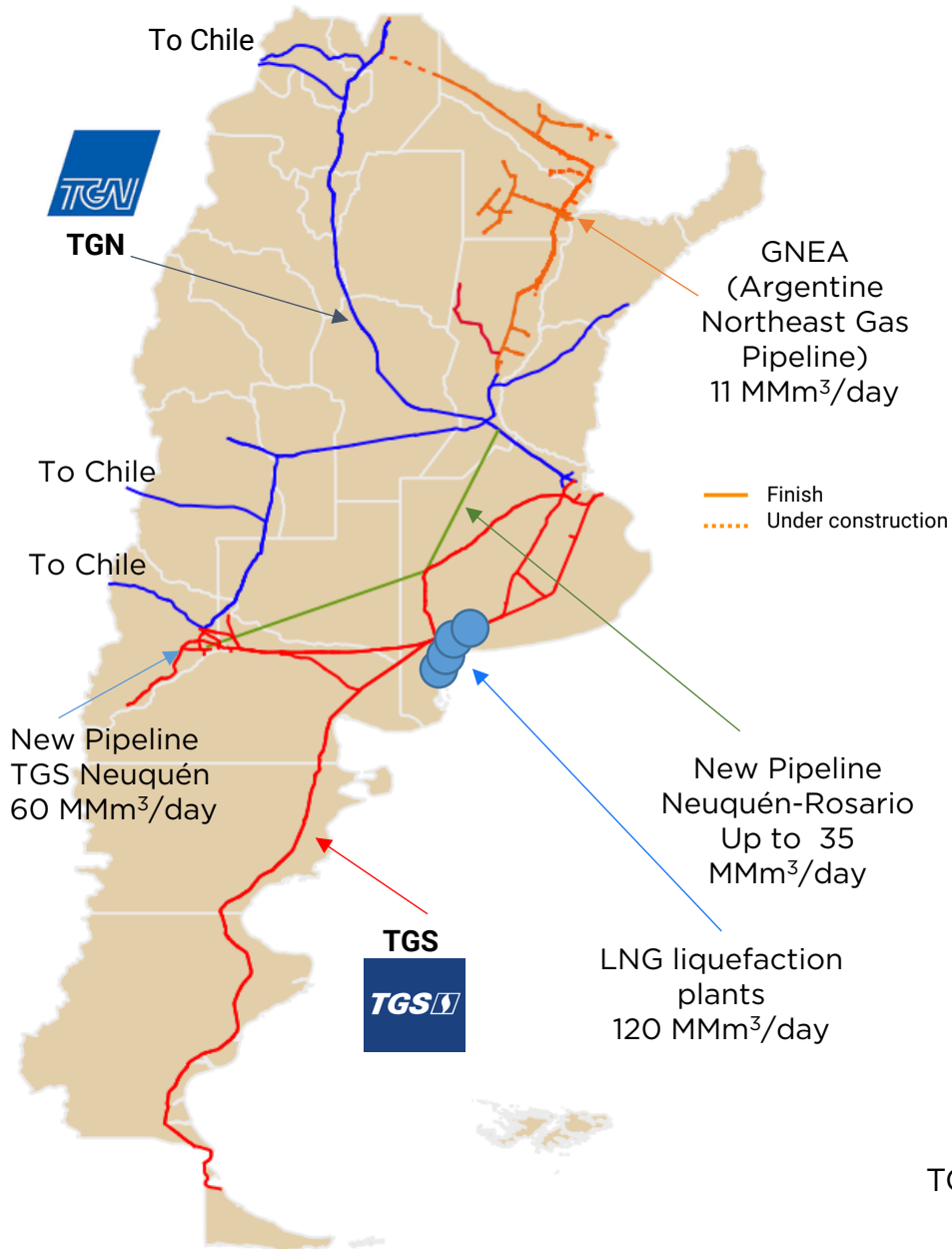
2025 = 4.2 BCF/day

Estimated ranking:
Installed liquefaction capacity in 2026

#	Country	BCF/day	%
1	USA	27.3	32%
2	Qatar	13.3	15%
3	Australia	10.8	13%
4	Russia	5.4	6%
5	Argentina	4.2	5%

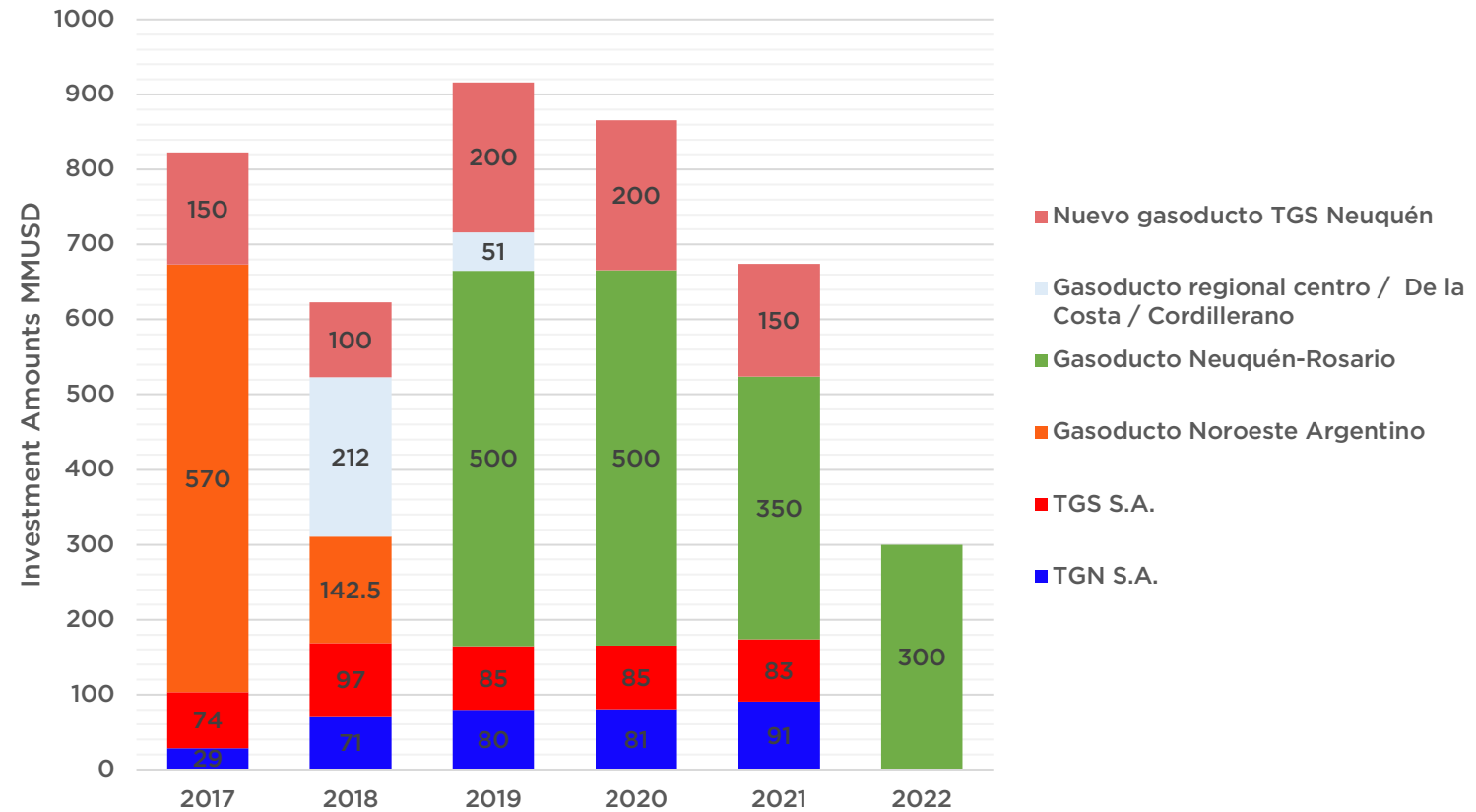


We have the capabilities
We have the knowledge
We have the technology
We took the decision
and we have the people
to develop Vaca Muerta



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



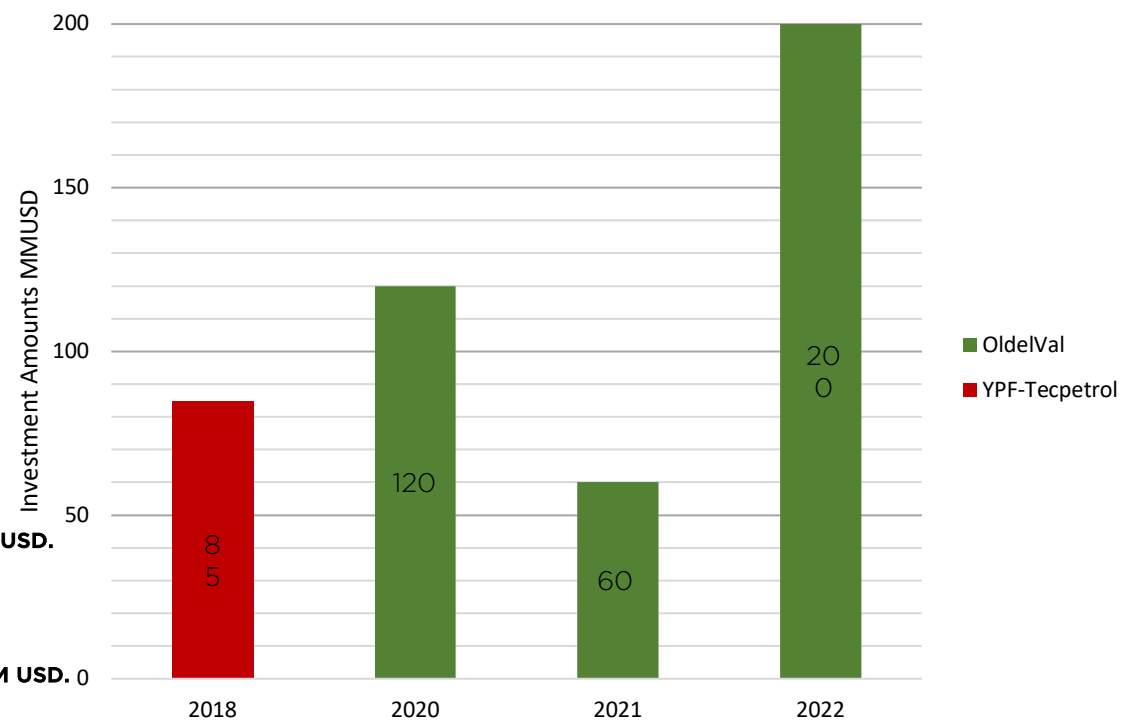
Note: Tariff Review values expressed in dollars using 16 ARS/USD exchange rate

TGN y TGS: Infraestructura desarrollada por Tariff Review corresponde a mantenimiento e mejoramiento de gasoductos y plantas de compresión.
 TGS: incluye 125 km gasoducto.



Investments in Oil Pipelines

The main investments correspond to the expansion of the transport capacity of the oil pipelines operated by Oldelval (private investment).



According to the demand forecast, an additional investment of 50MMUSD is estimated in 2026 for the construction of a new section Lago Pellegrini-Medanito.

Argentina Offshore Round 1

Austral / West Malvinas and Northern portion of the Argentina Basin

General goal of the Round:

Increase awareness of Argentine Offshore through real investments in Exploration, carried out by companies with the technical and financial capacity to fulfill the objectives of the Round.

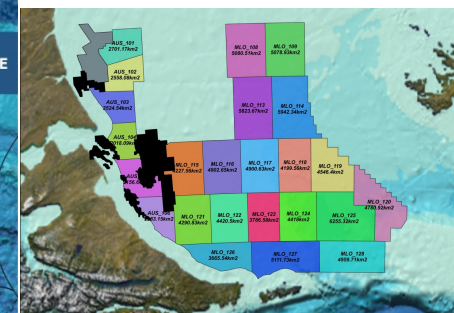
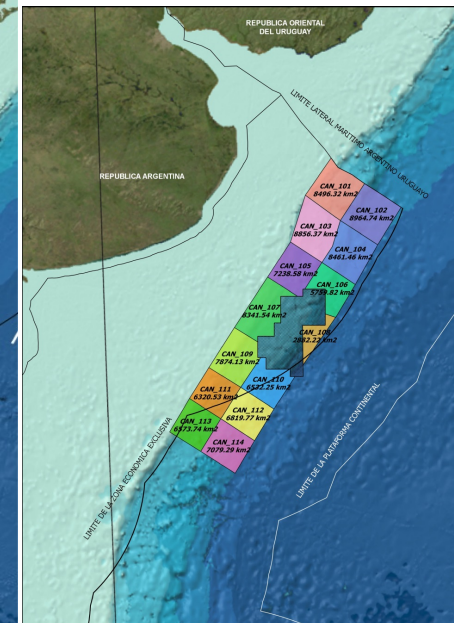
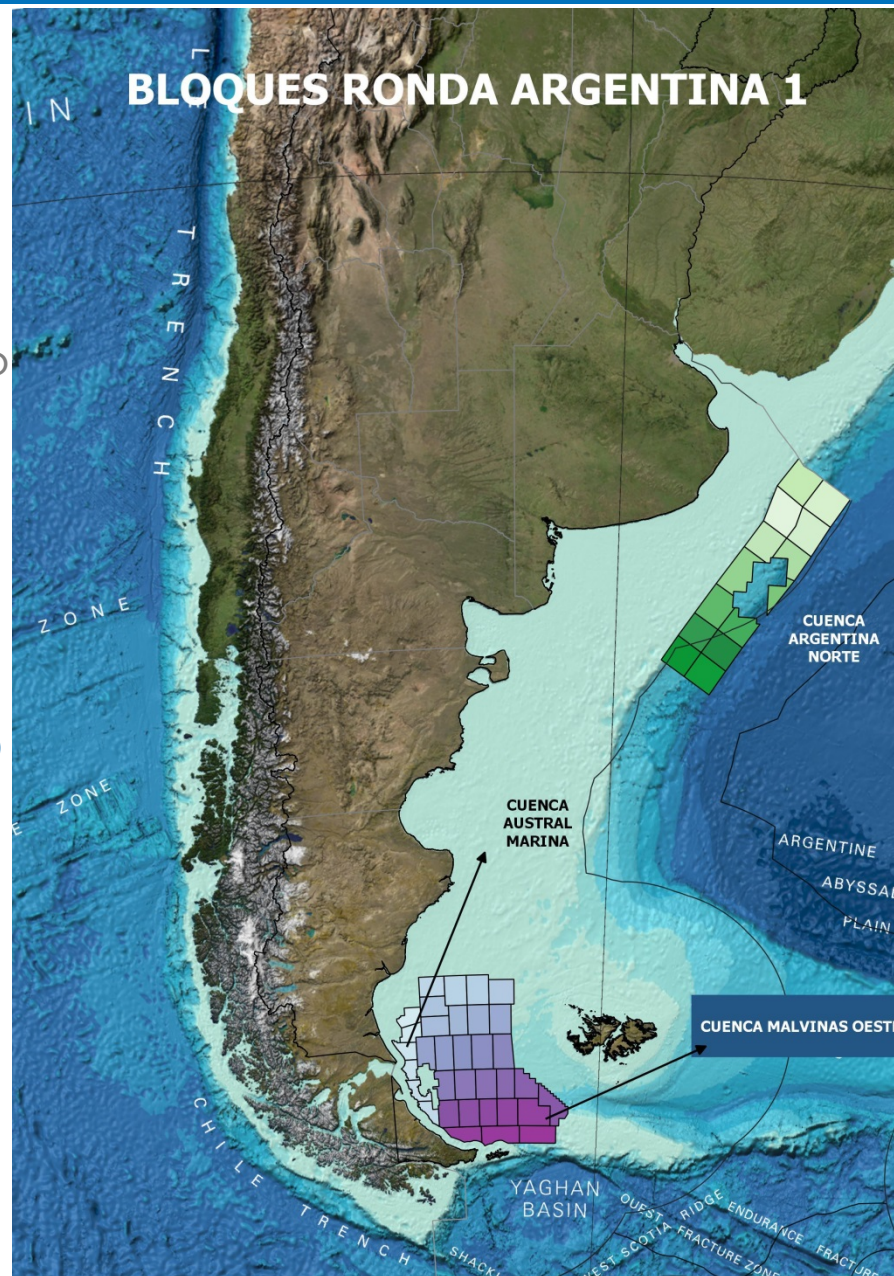
Status:

- Nomination Process ended the 7th of June

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.



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 $WU > \text{Basic WU}$; 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:

$$\text{R factor} = (\Sigma \text{Sales} - \Sigma \text{Royalties}) / (\Sigma \text{E\&A} + \Sigma \text{Investments} + \Sigma \text{OPEX})$$

Round to be launched **October 2018.**

Offers to be submitted by the end of **February 2019.**

Roadshows to be held in Buenos Aires, Houston and Europe (London or Paris) planned for October.

Those interested in receiving information about the Round (e.g. new Data in the Database, dates of workshops, new legal instruments, any other news about the Round) please send an email to rgarciaberro@minem.gob.ar



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



300 MMUSD

PPP Investments - 2019 onwards █

• 500 kV Interconnection ET Río Diamante - ET Coronel Charlone and Supplementary Project in 132kV

} Now being bidded

- 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 Charlone - 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 Choele Choel - ET Puerto Madryn (2nd line)
- Transmission Substation 500/132 kV - 450 MVA Comodoro Rivadavia



2,300 MMUSD

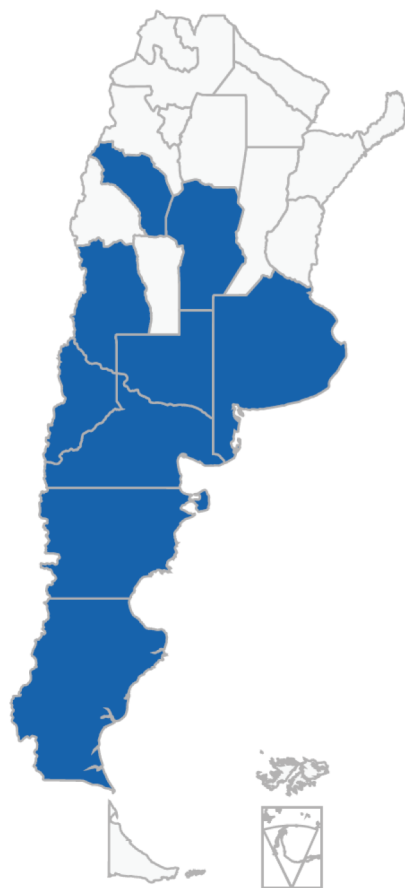
Results of the RenovAr program

Diversity of technologies and federal distribution

147
Awarded projects

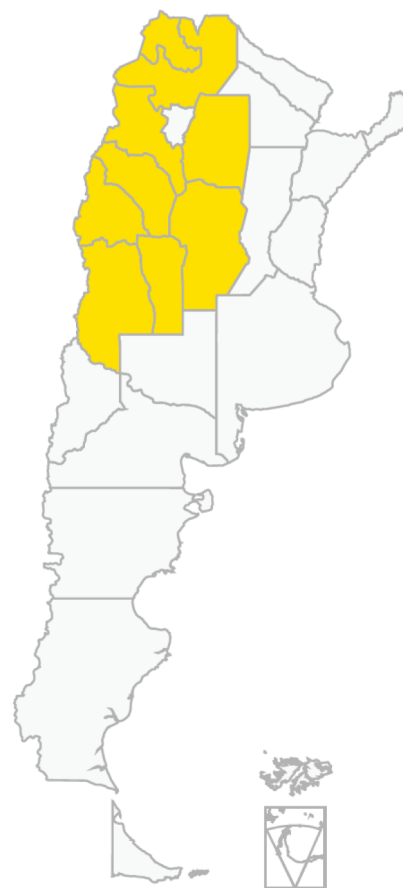
4,466.5 MW
Power

15,835 GWh
Energy



WIND

34 projects
2.466 MW 9.778
GWh/year



SOLAR PV

41 projects
1.732 MW
4.290 GWh/year



BIOGAS AND BIOMASD

58 projects
236 MW
1.665 GWh/year



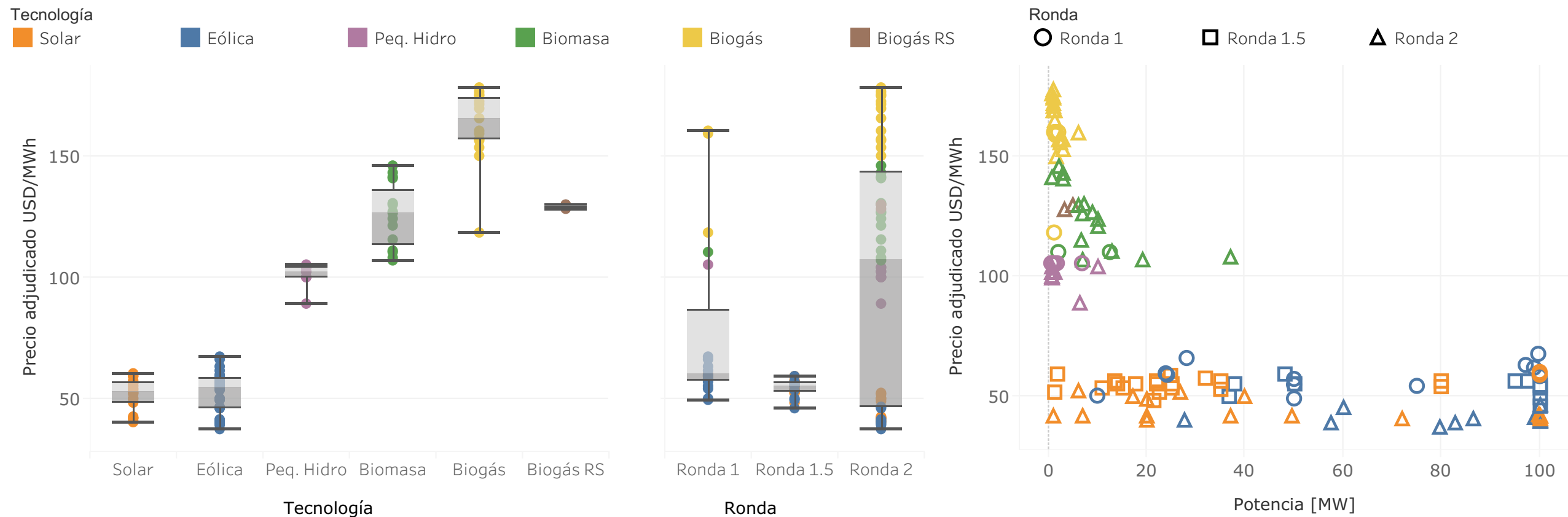
MINI HYDRO

14 projects
32 MW
103 GWh/year

Results of the RenovAr program

Decreasing prices in each competitive bidding.

Weighted average price: 54,72 USD/MWh





Thank

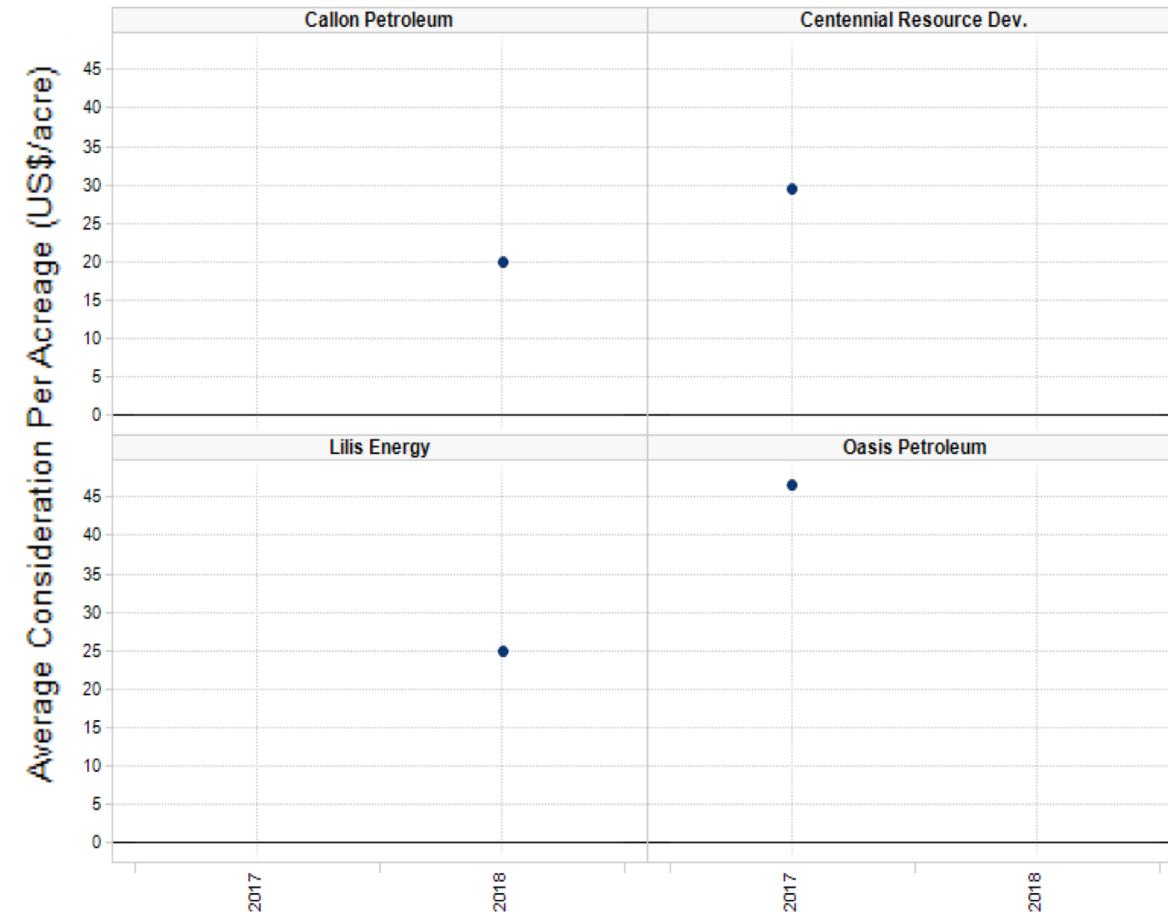
you.

Appendix

The image features a monochromatic blue color scheme. In the background, there are several oil pumpjacks (jack-o'-lanterns) silhouetted against a sky filled with soft, white clouds. The pumpjacks are positioned at various heights and angles, with the largest one in the foreground on the left and others receding into the distance. The overall composition is clean and industrial.

- Anadarko holds approximately 240,000 net acres in the Delaware Wolfcamp NE Extension.
- Remaining PV post-tax of this acreage is US\$ 4286 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%
<u>Income Tax</u>	
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

Basin	Gross Acres	Net Acres
	('000 acres)	('000 acres)
Delaware	590	240

Type Well Assumptions

EUR	Initial Production	Initial Production	Initial Production	Royalty Rate
(mmboe)	Gas (mmcf/d)	Oil (b/d)	NGLs (b/d)	(%)
1.1	1.54	770	173	18.00

Remaining Recoverable Reserves (at 01/01/2018)

Proved Developed			Proved + Probable (2P)		
Liquids (mmbbl)	Gas (bcf)	Total (mmboe)	Liquids (mmbbl)	Gas (bcf)	Total (mmboe)
36.50	75.56	49.80	916.37	1,571.67	1,192.98

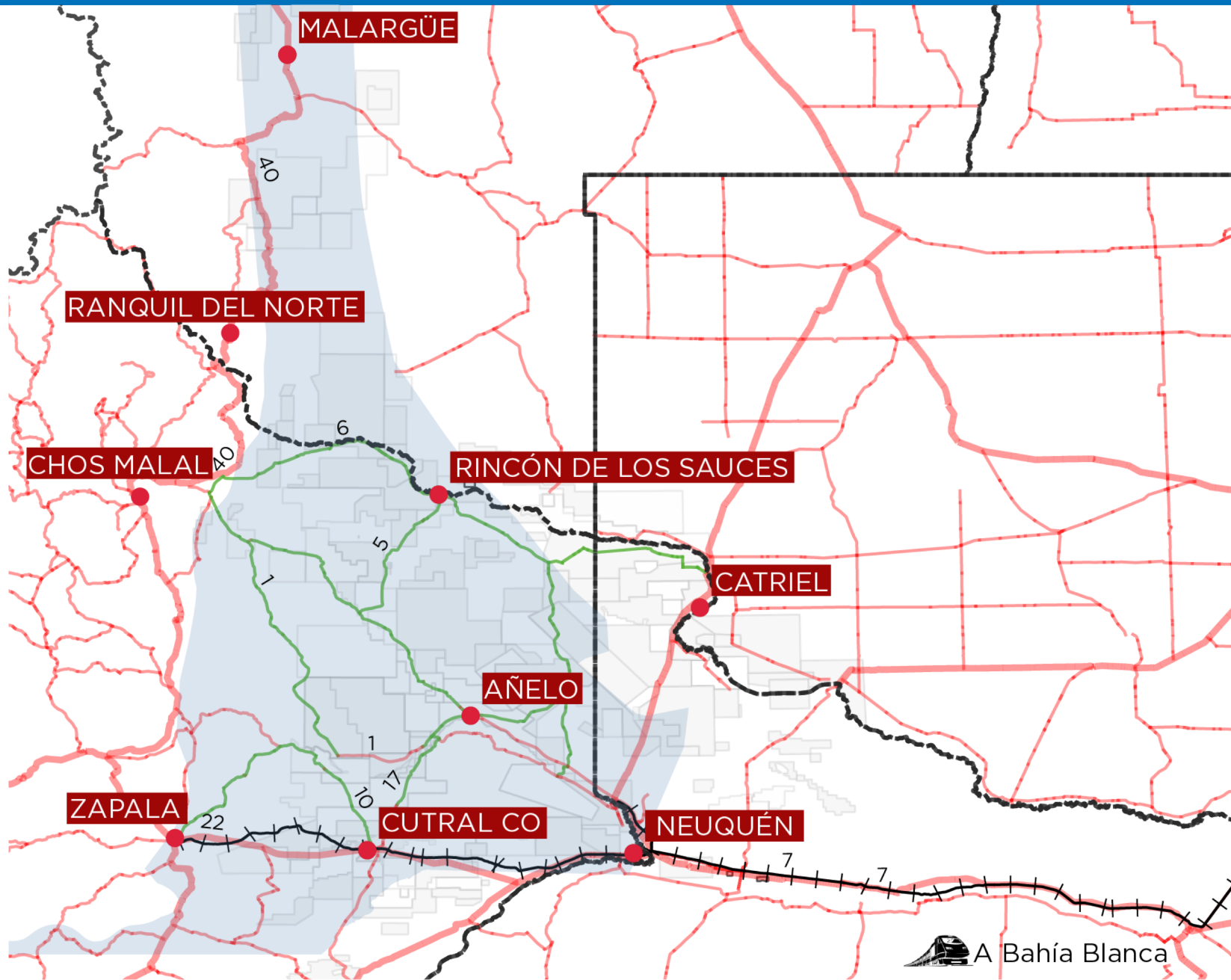
Net Development Drilling in the play

2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
25	33	16	80	77	46	46	62	46	31

Applicable Tax Rates by State

State		Severance	Ad Valorem	Income
New Mexico	Oil	8.24%	2.50%	7.60%
	Gas	9.09%		
Texas	Oil	4.60%	4.00%	n/a
	Gas	7.50%		

Cities and Interconnections - Resources from Res. 46/2017



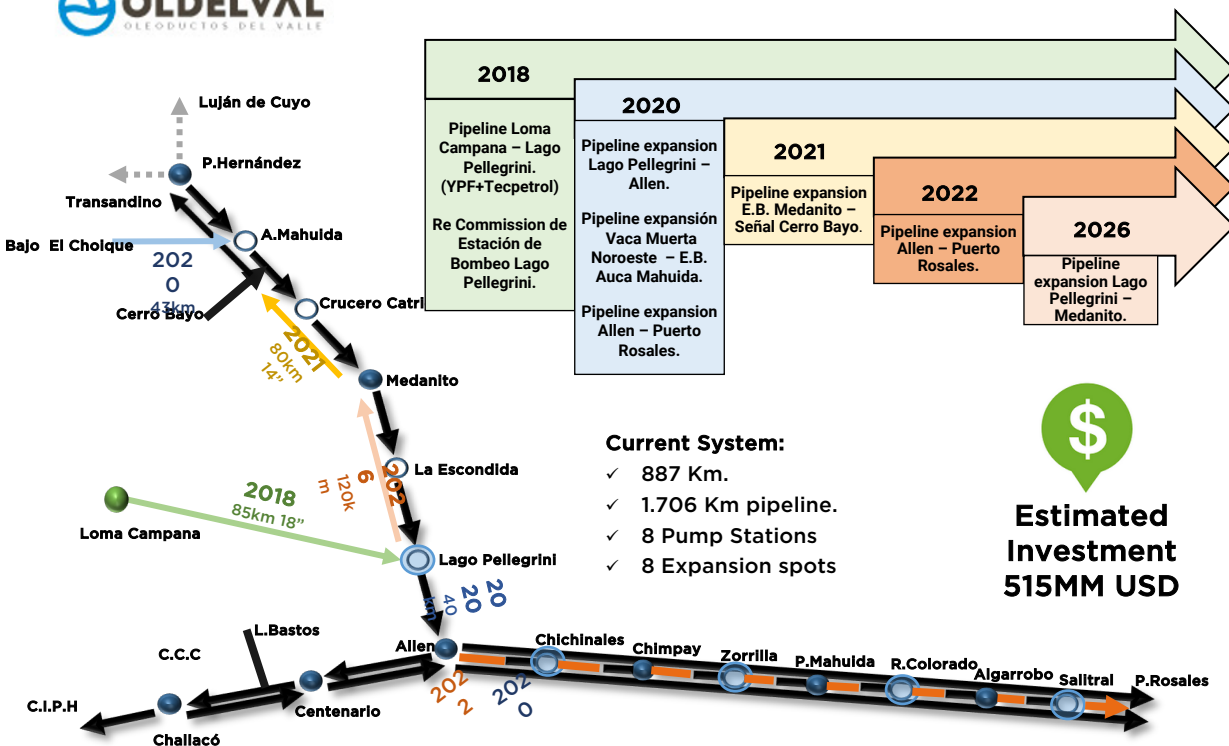
Current situation

- ❖ 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.

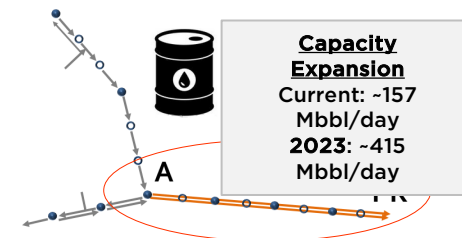
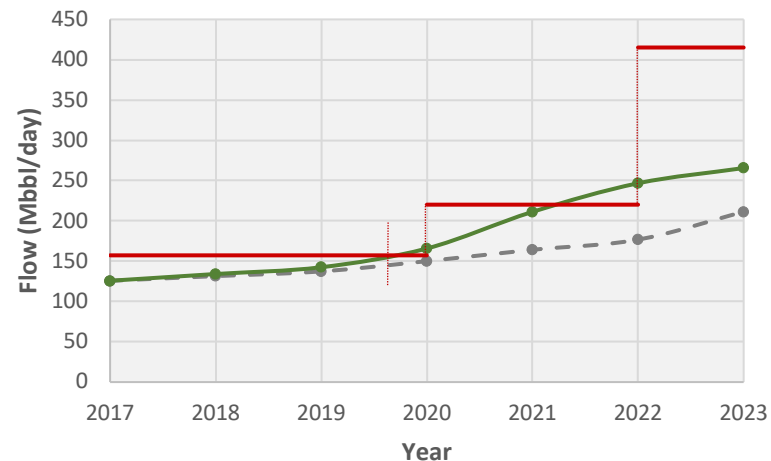
Oil Transport System Expansion (OldelVal)



Works needed to supply demand forecast (2019-26)



Allen-Puerto Rosales Expansion Forecast



✓ TA-PR pipeline: most relevant of the oil pipeline system.

Next Steps

OldelVal Proposition

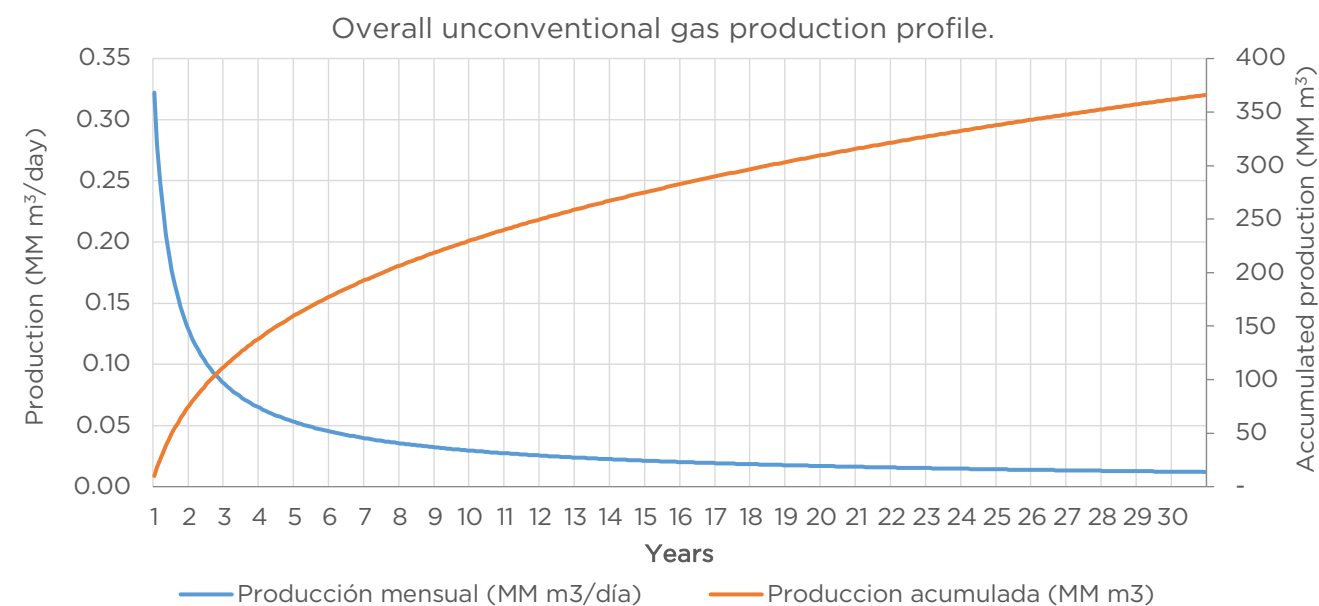
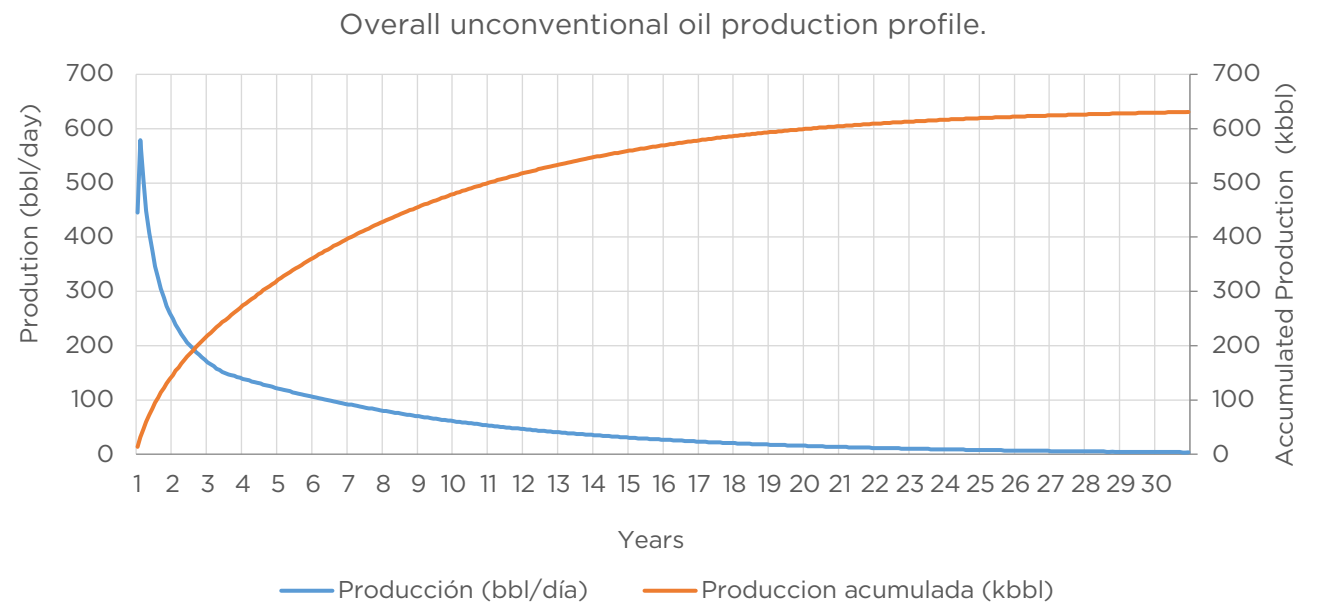
- ❖ New Contract Carrier regulation to enable firm offer transport contracts.
- ❖ Time extension of Oldelval concession to match investment amortization period.

Expected Results

- ❖ Financial viability of oil pipeline expansions.
- ❖ More flexibility for producers to match transport contracts with upstream projects.

Main assumptions about profiles

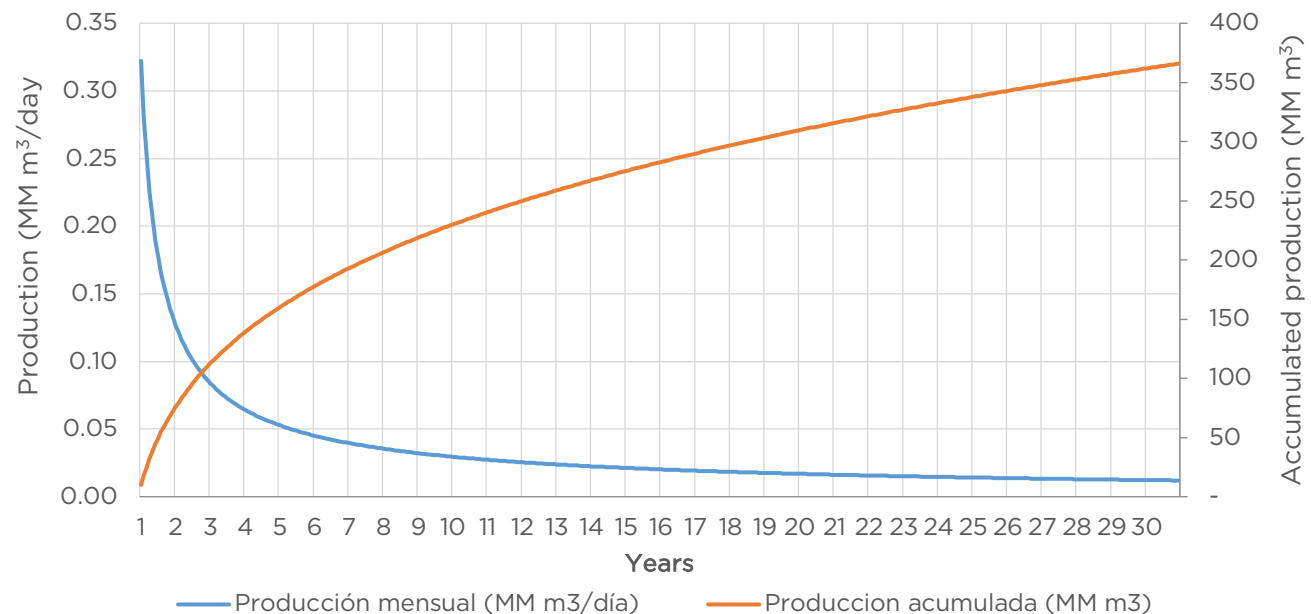
	Natural Gas	Oil
Conventional assumptions		
EUR (y15)	1,5 BCF	180 kbbl
Declination	-15%	-9%
Risked P1ND/P2/P3	100% / 50% / 10%	100% / 50% / 10%
Incorporation of reserves in the first year	5%	5%
Incremental incorporation reserves	+0,3% per year	+0,3% per year
Production in the first year of the reserves incorporated	16.4%	11.9%
Capex	2.5 MM USD	2.5 MM USD
Total reserves incorporated	6 TCF	25 MM BBL
Unconventional assumptions		
EUR (y30)	12,9 BCF	631 kbbl
EUR total (y30)	2388 kboe	820 kboe
Condensed	1 m ³ oil per 28,000 m ³ gas	-
GOR	-	300 m ³ gas per m ³ oil
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



Main assumptions about Natural Gas production

Conventional production:

- P1D (72%): declination -15%
 - P1ND (100%) + P2 (100%) + P3 (50%):
- 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 MM USD

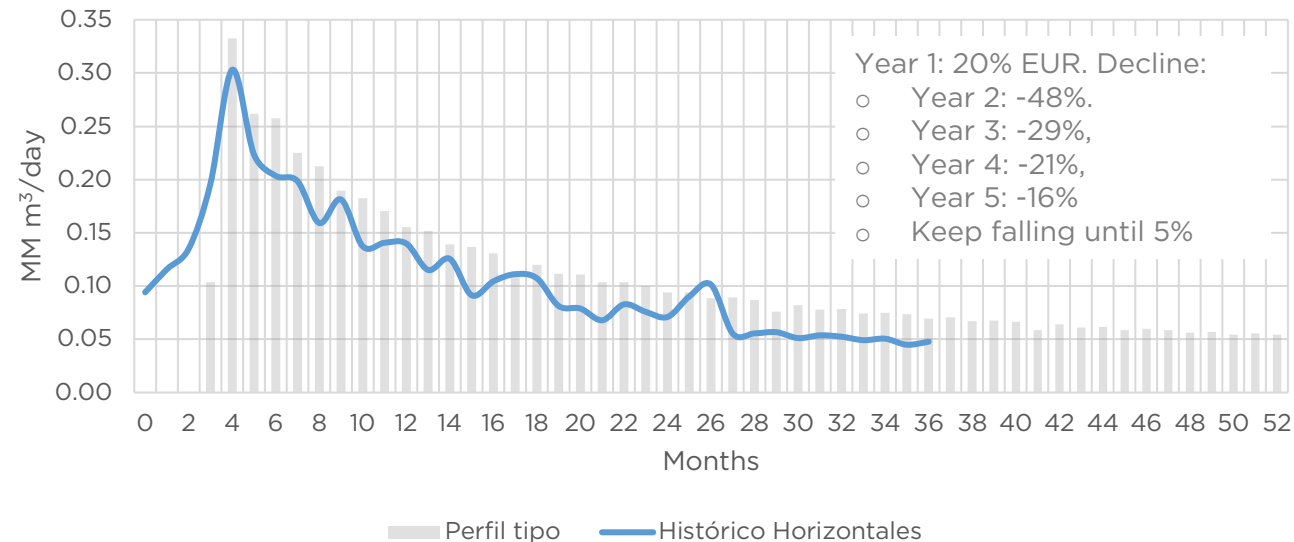


Overall unconventional production profile

- EUR_{y30} = 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/d 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

Profile of 30% of the best shale gas horizontal wells



Main assumptions about Oil production

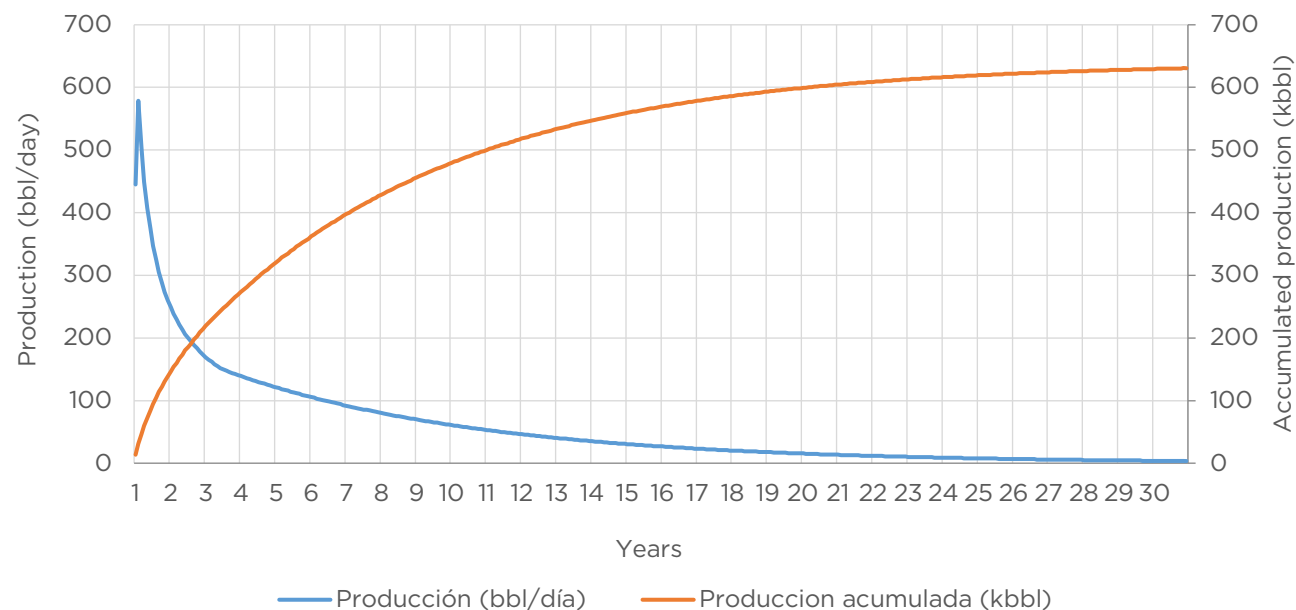
Conventional Production:

- 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 12% of the incorporated reserves, then decline equal to developed reserves (-9%).
- Accumulated production per well: 28.6 mil m³ (180 kbbbl)
- Cost per well: 2 MM USD.

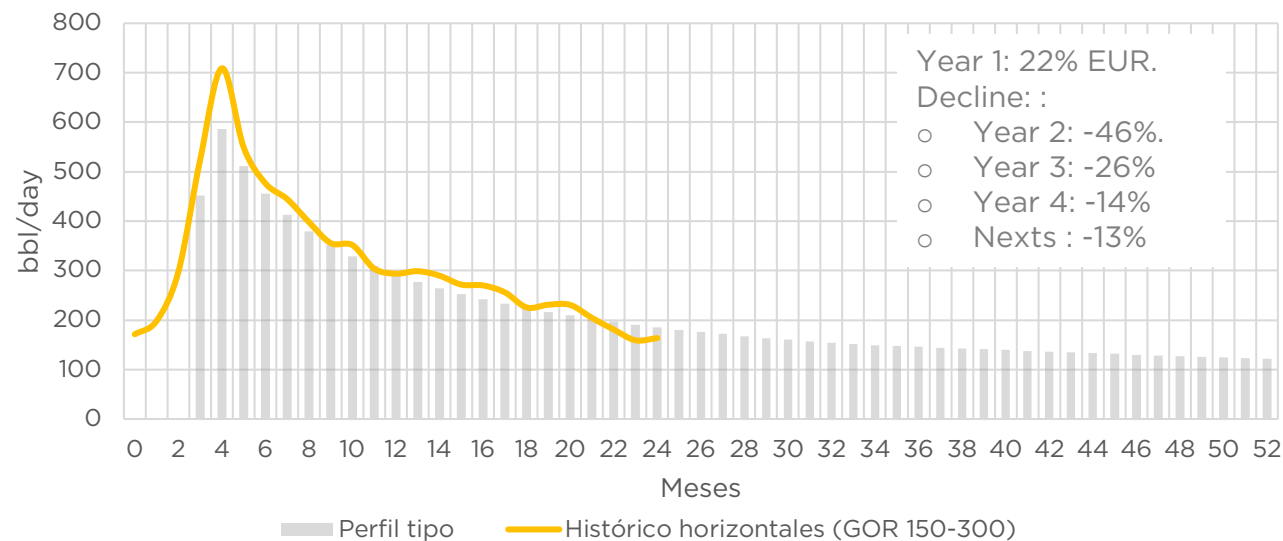
Overall unconventional production profile

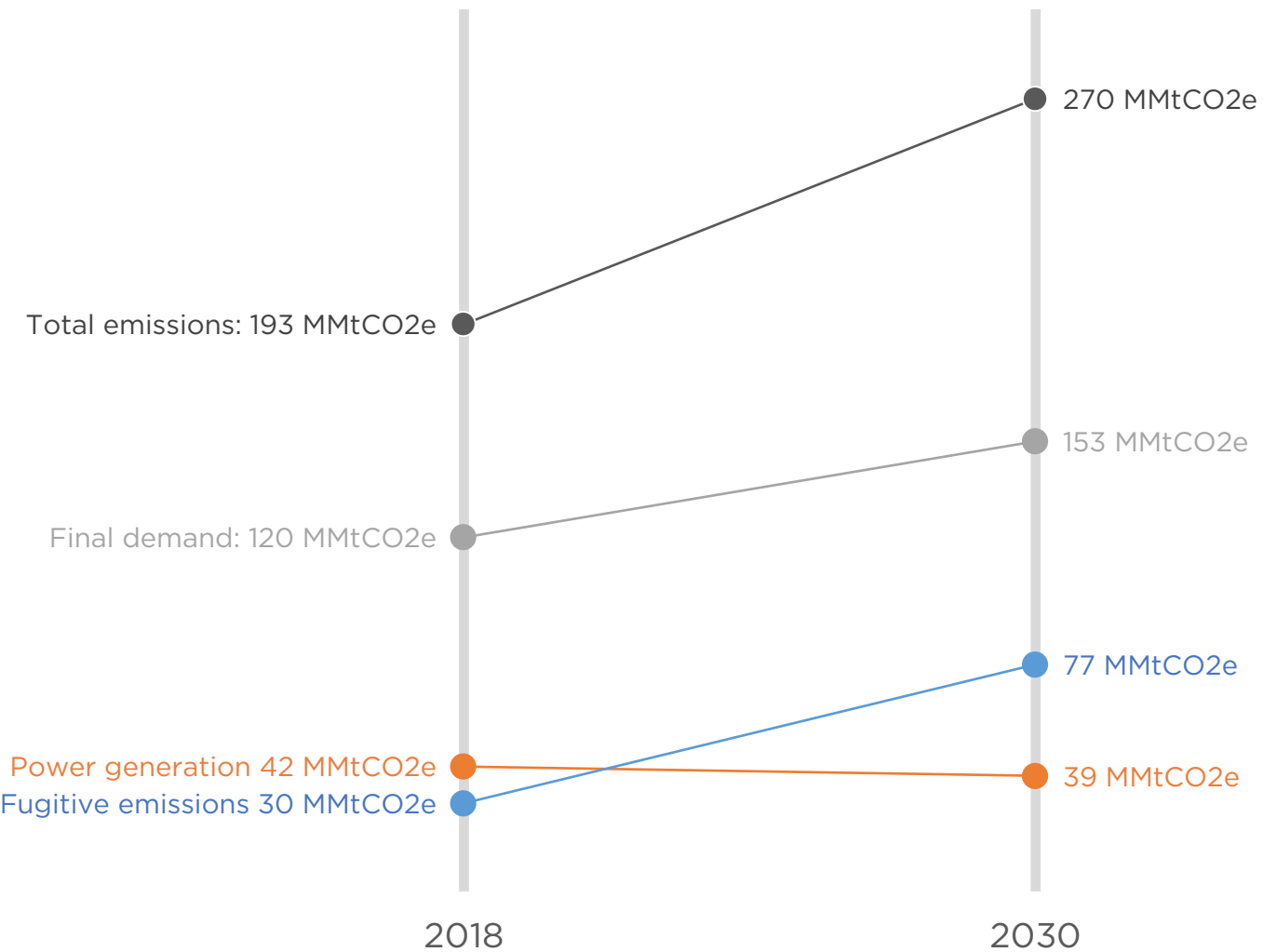
- EUR_{y30} = 100.3 mil m³ oil (631 kbbbl).
- EUR Total = 820 kboe.
- Capex = 10.2 MM USD + 15% de *facilities*.
- Opex = 7 USD/boe
- IP 30: 92 m³/d oil (579 bbl/dday)
- GOR = 300 m³ gas/m³ oil
- Horizontal well with 33 fracture stages, 250 tons of sand per fracture
- 40 perforation's days

Break-even: 46.7 USD/BBL



Profile of 30% of the best shale oil horizontal wells





- 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 369MMtCO₂e 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.

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%

• 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.

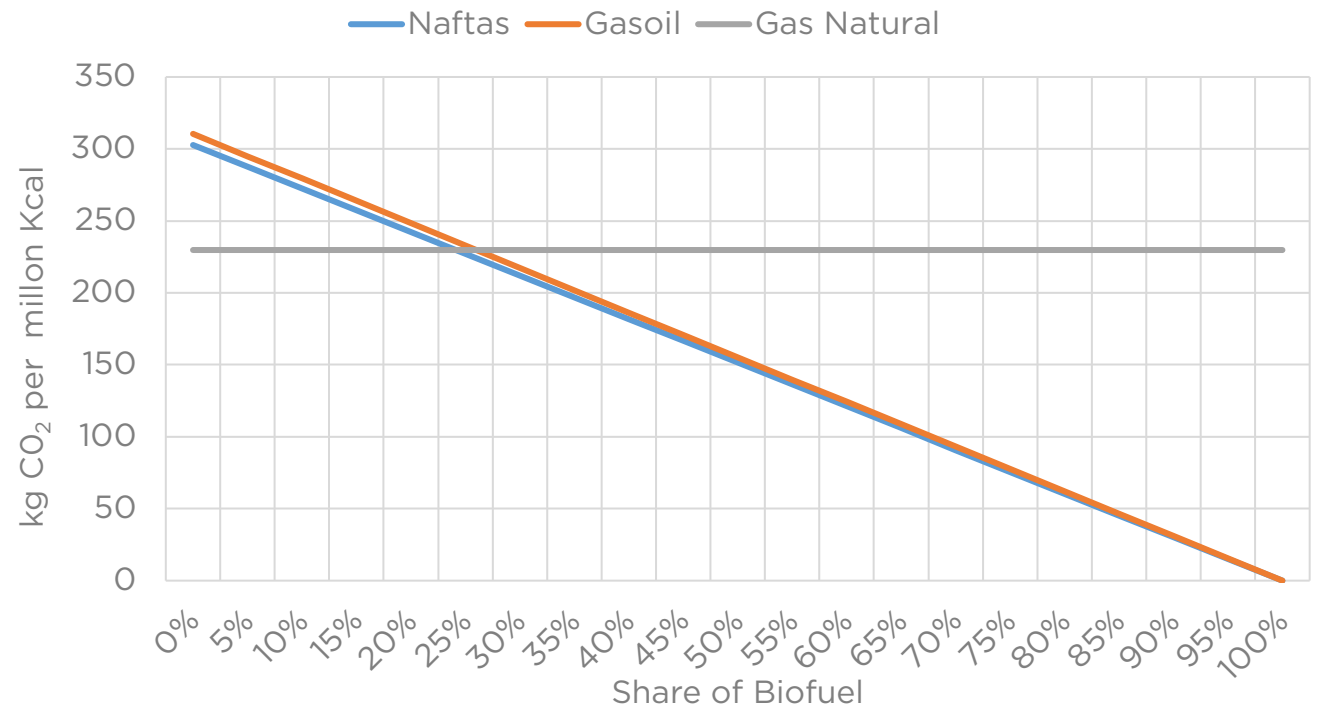
• Due to the substitution of liquid fossil fuels, it is possible to save 0.85 million tCO₂e of GHG in 2025 and 0.57 million in the year 2030.

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:

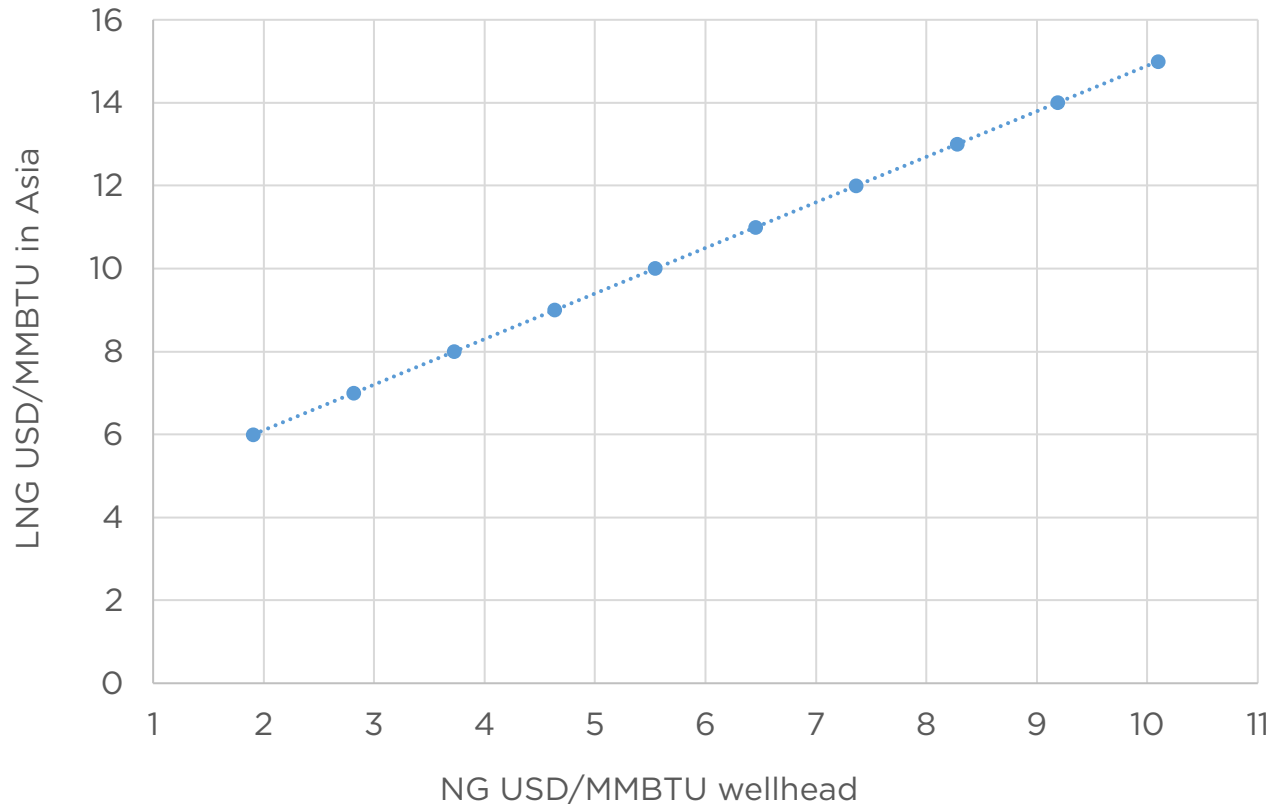
- 20% replacement to CNG in the fleet in 2030.
- Annual gasoline consumption per car: 1.53 m³
- Annual GNC consumption per car: 1.38 thousand m³
- Fleet growth in vehicle fleet: 3.8% (a.a.)
- Initial fleet 2017 (ADEFA): 9.4 million
- Effective cut bioethanol: 22%



Notes: 1) Includes private cars, taxis or similar and SUVs..

- Gradual incorporation: 40 MMm³/d in 2023, 80 MMm³/d in 2024 and 120 MMm³/d 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).

Gas price at the wellhead that makes the project viable

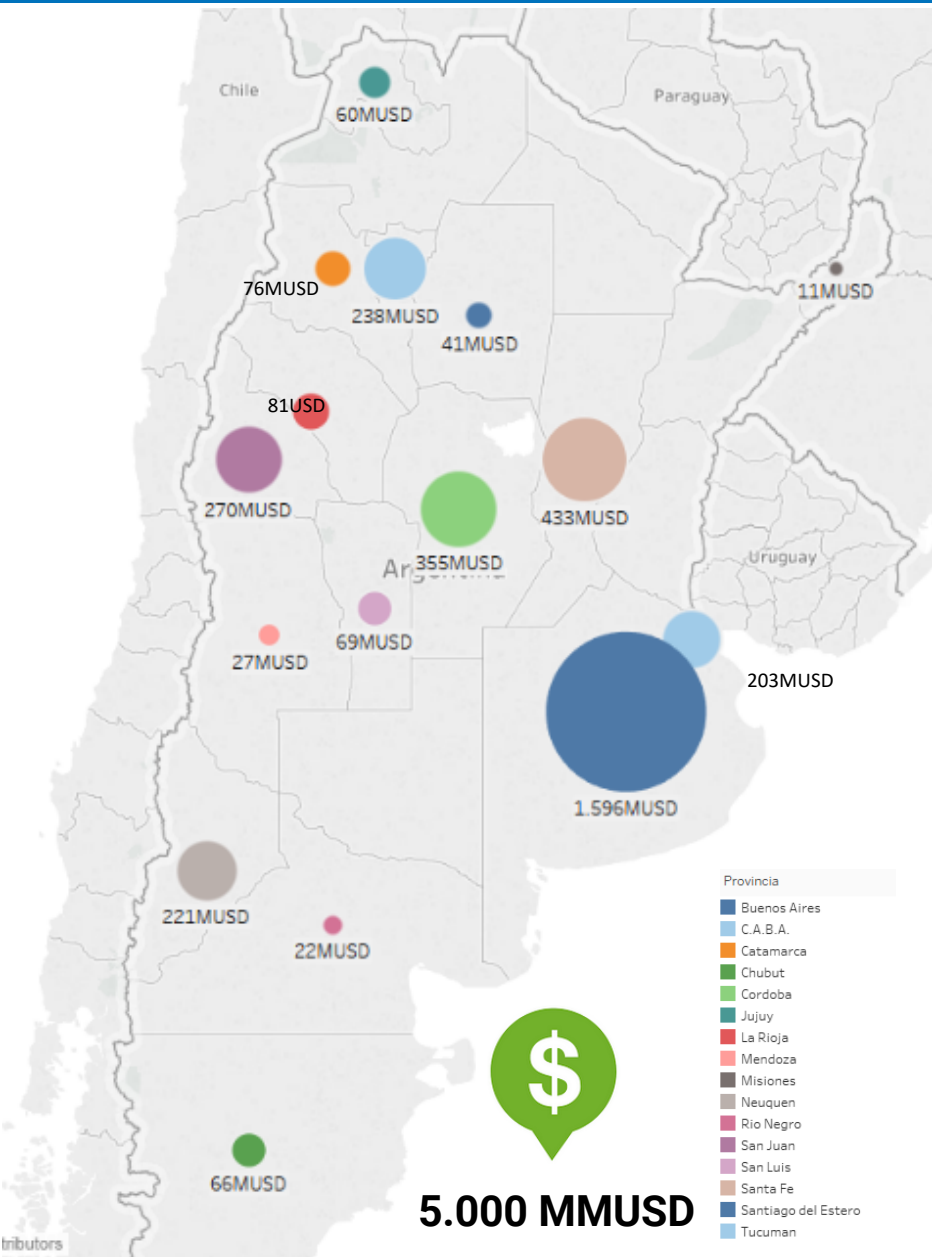


Plant assumptions:

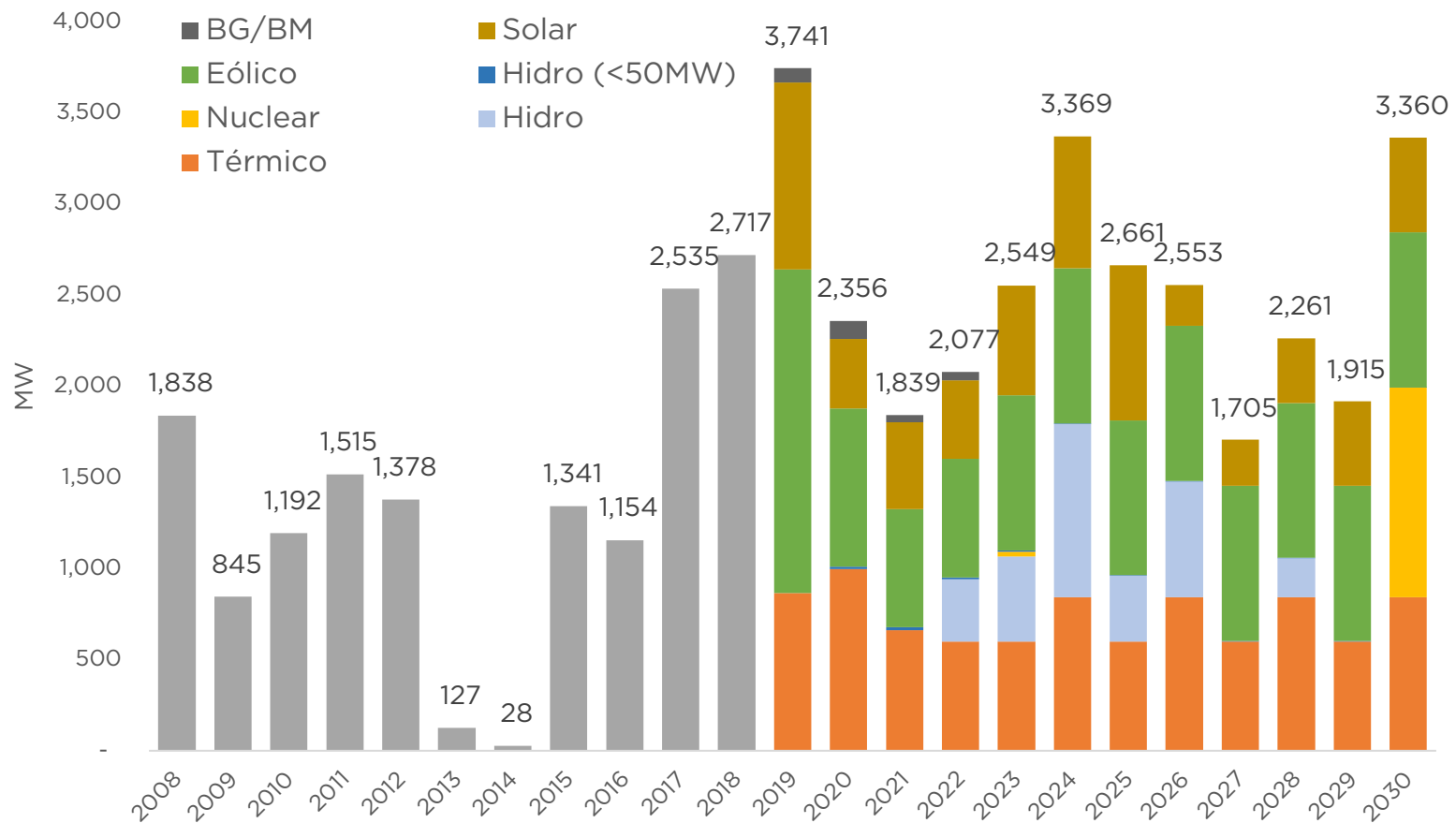
- Capacity per train: 5 MMmtpa (20 MMm³/d)
- Number of trains: 6
- Total capacity: 30 MMmtpa (120 MMm³/d)
- CAPEX: 600 USD/tpa installed
- Total investment: 18 mil MMUSD
- Discount rate: 9% in USD
- Amortization period and useful life: 25 years
- Natural gas own consumption: 9%
- OPEX: 0.65 USD / MMBTU

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



Nominal power incorporated per year [MW]



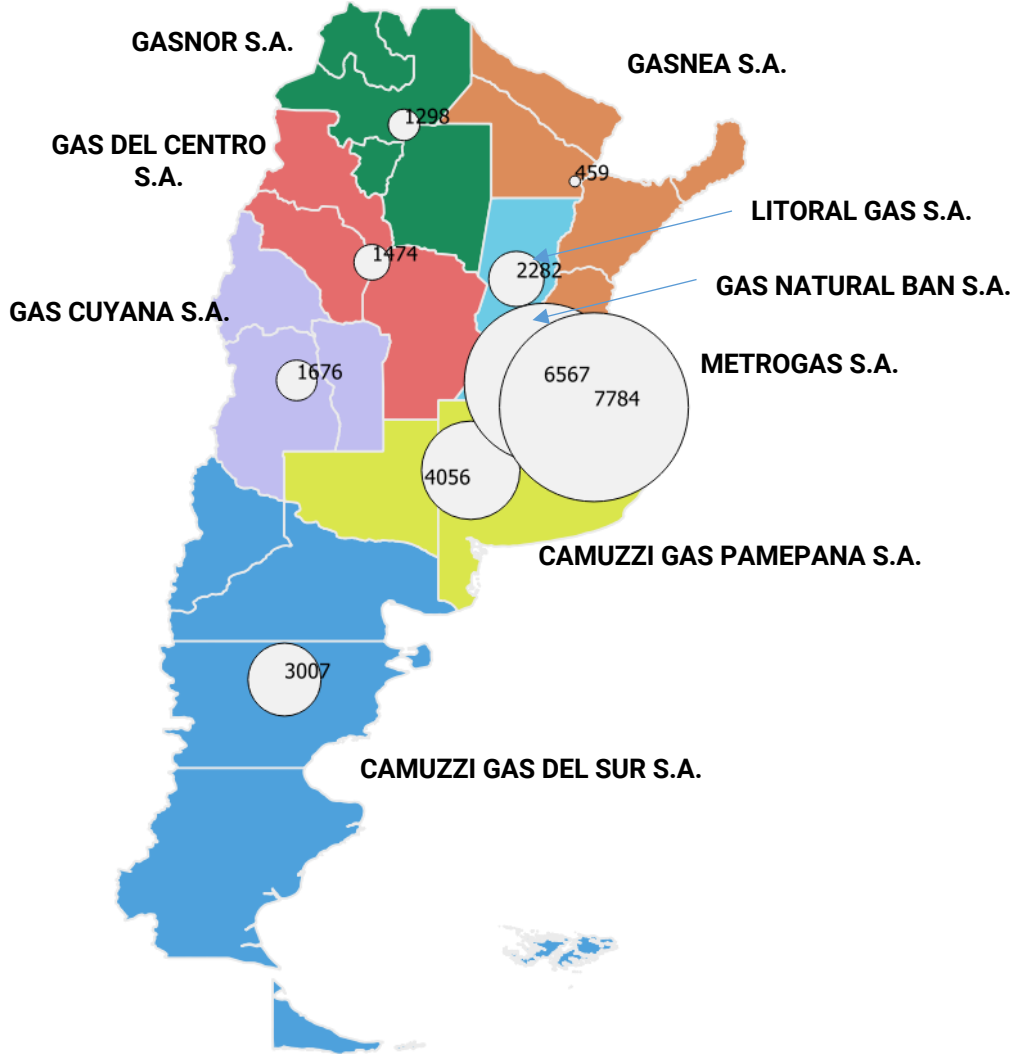
5 BUSD

Estimated value 2017 – 2018

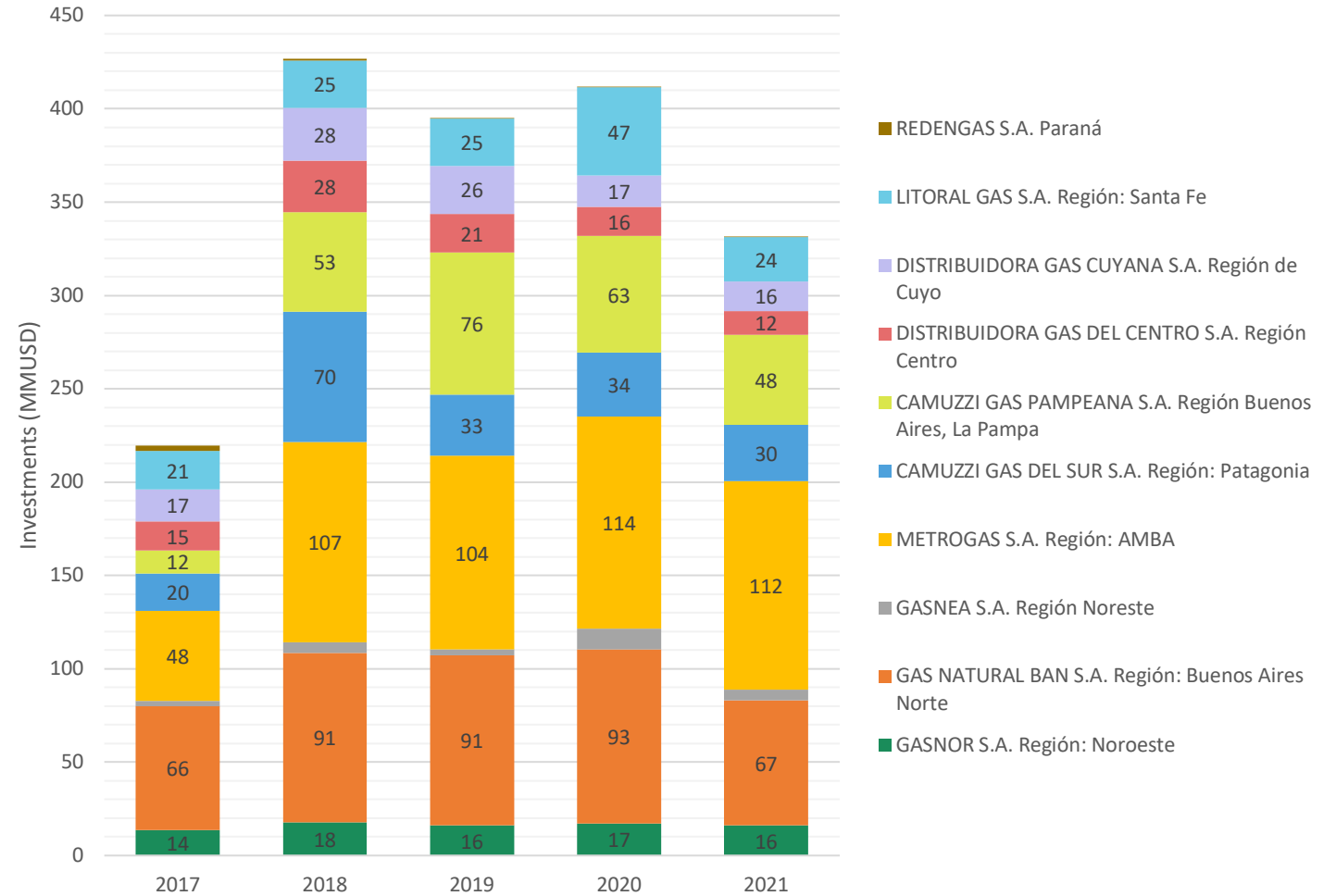
46 BUSD

Estimated value 2019 – 2030

Investment dates are based on project commissions

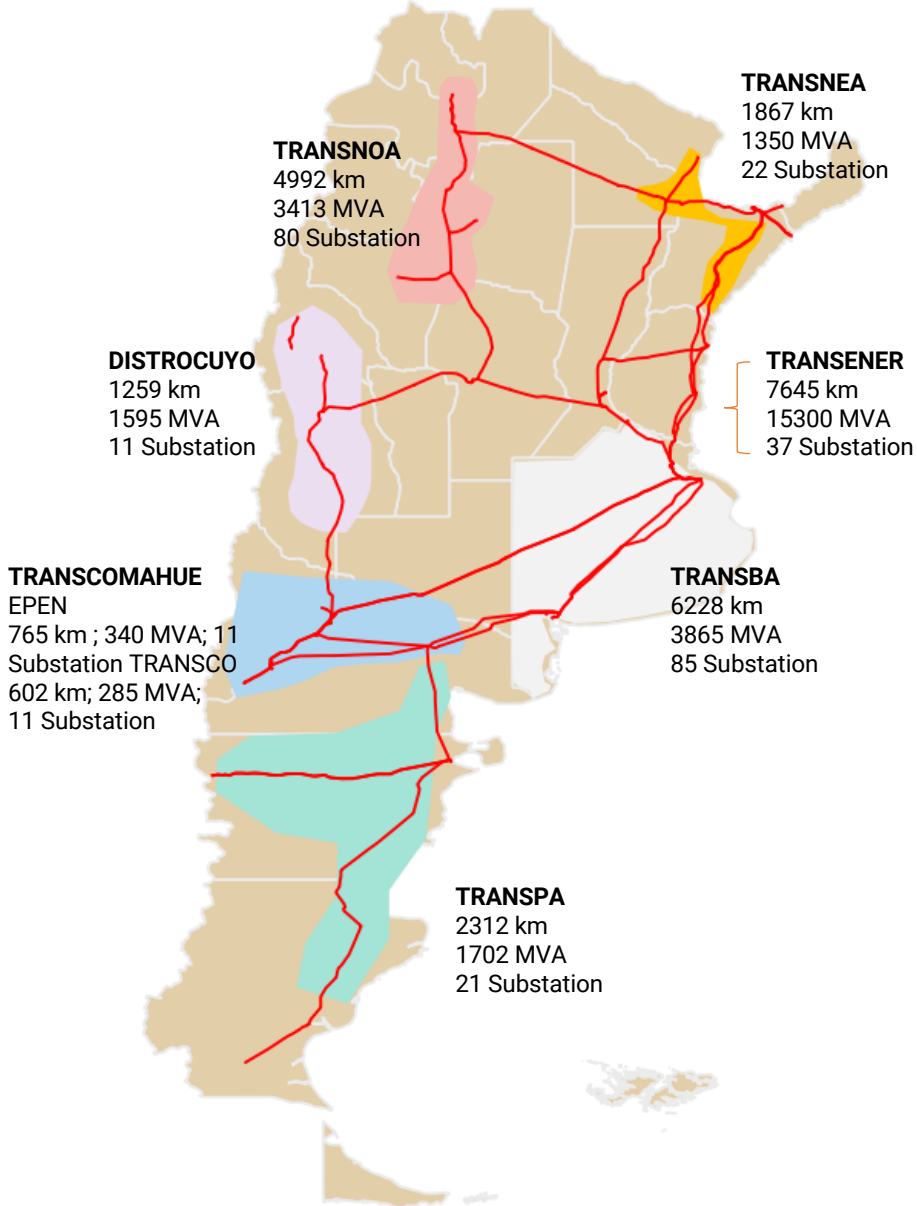


Investments (RTI) in Gas Distribution

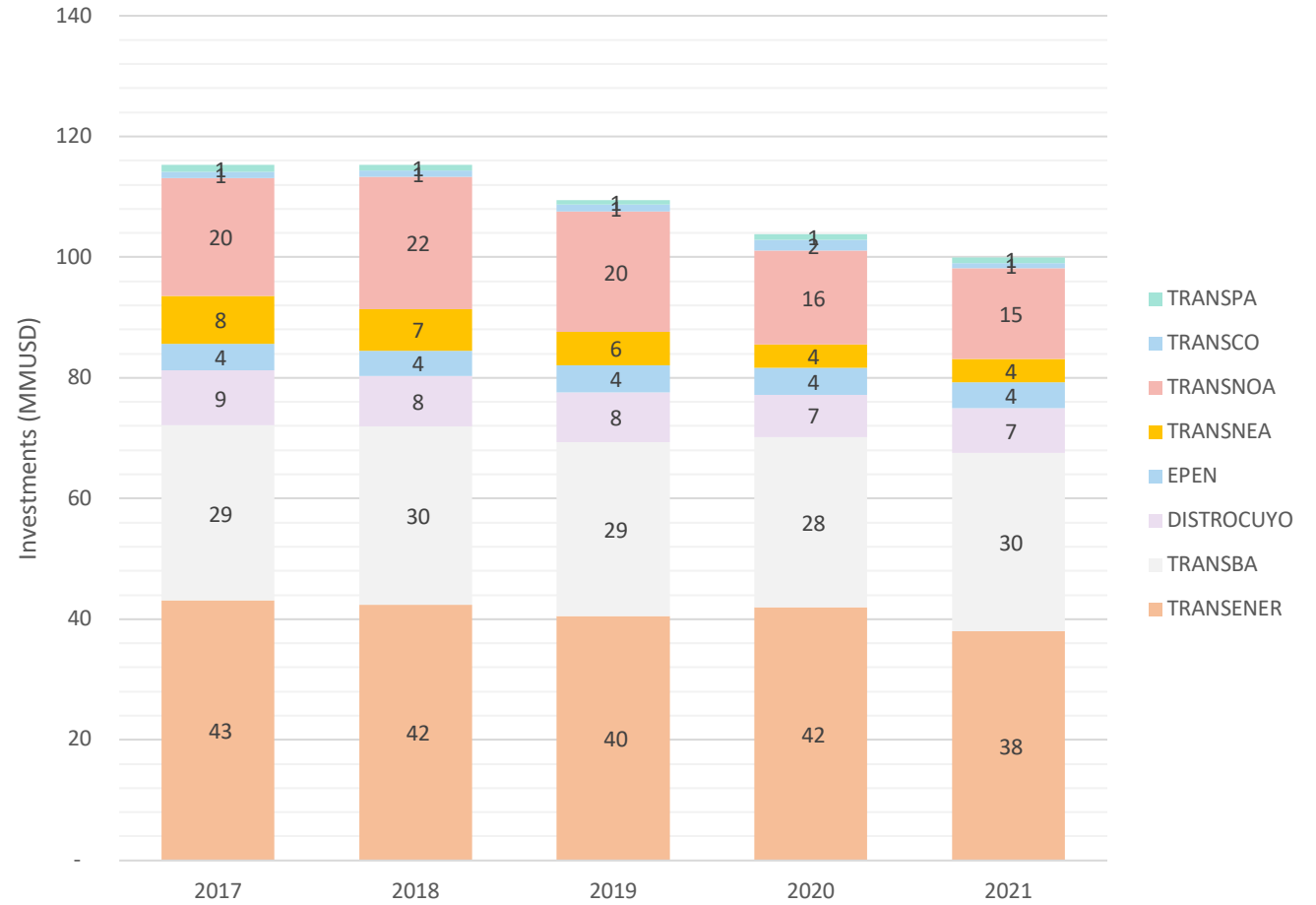


RTI values expressed in dollars using 16 ARS/USD exchange rate

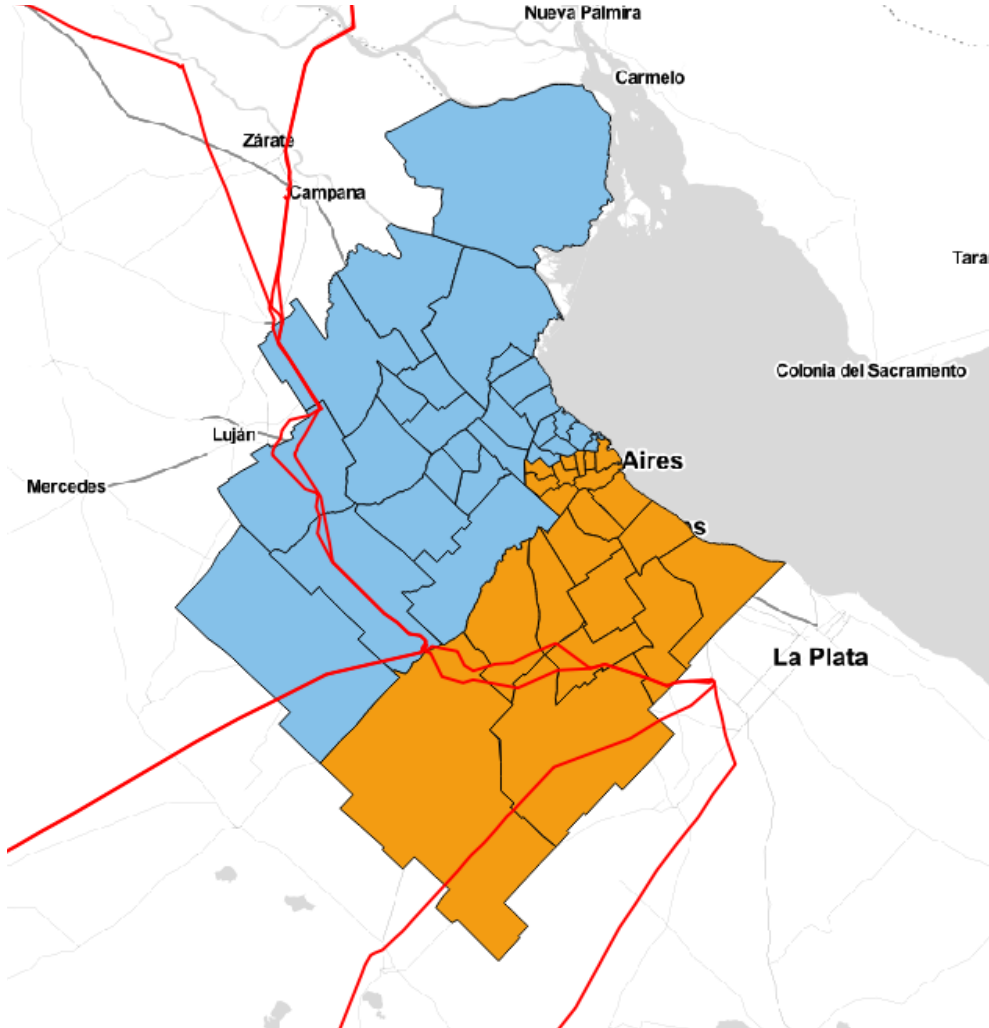
Investment includes in system expansion and maintenance



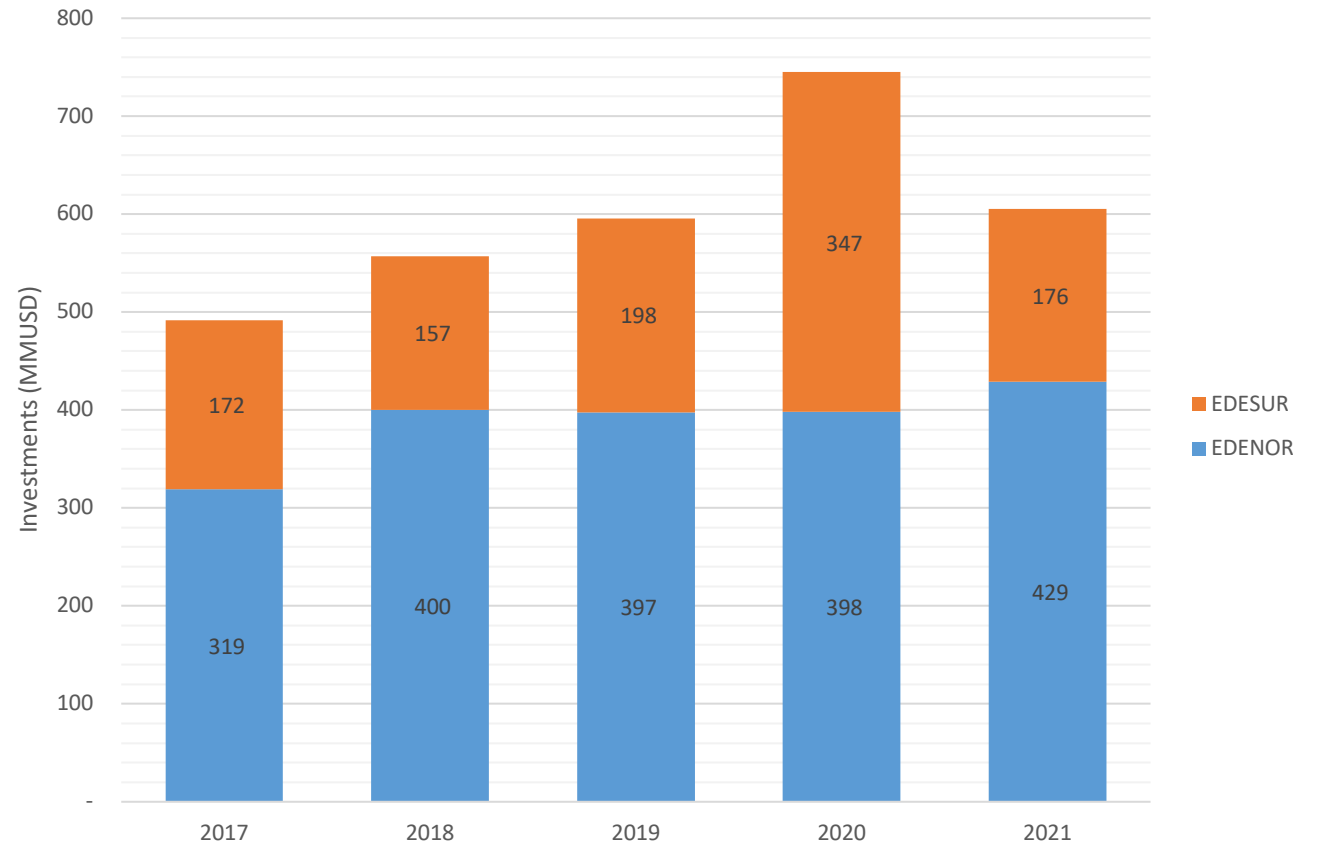
Investments in Power Transport



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



Investments in Electrical Distribution (Buenos Aires Metropolitan Area)

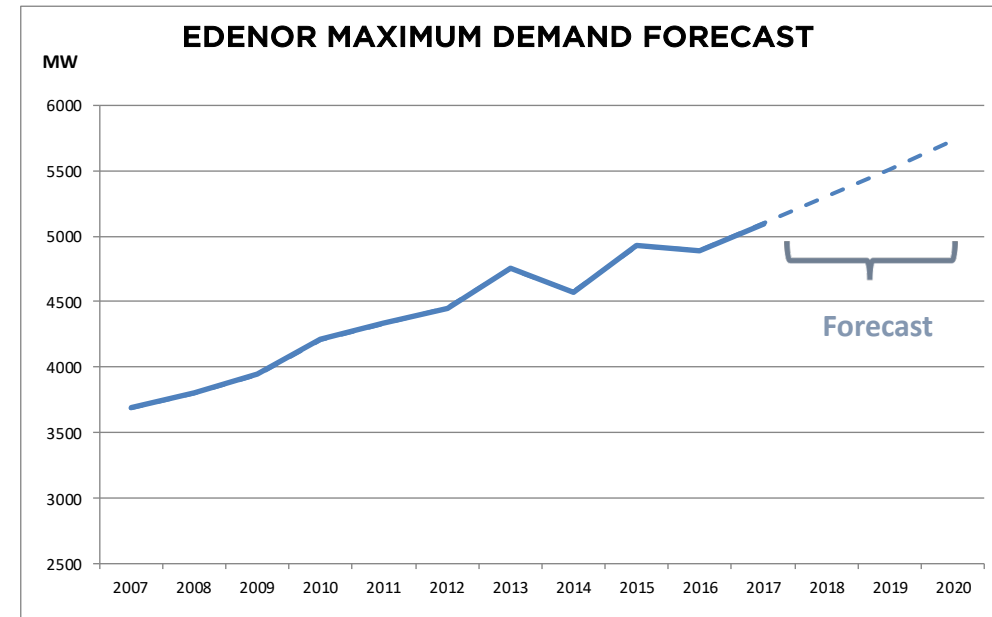
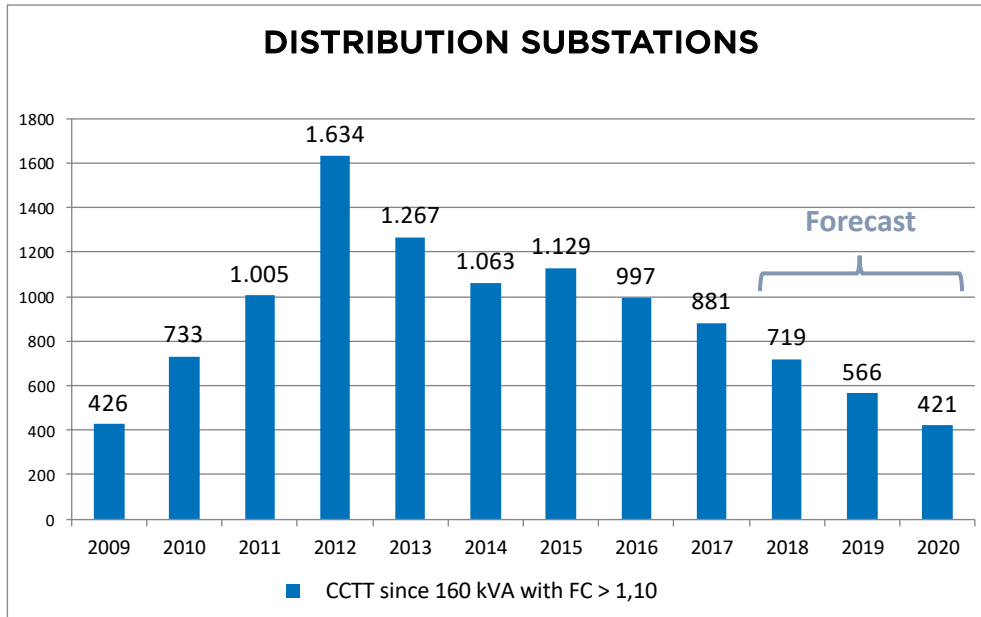
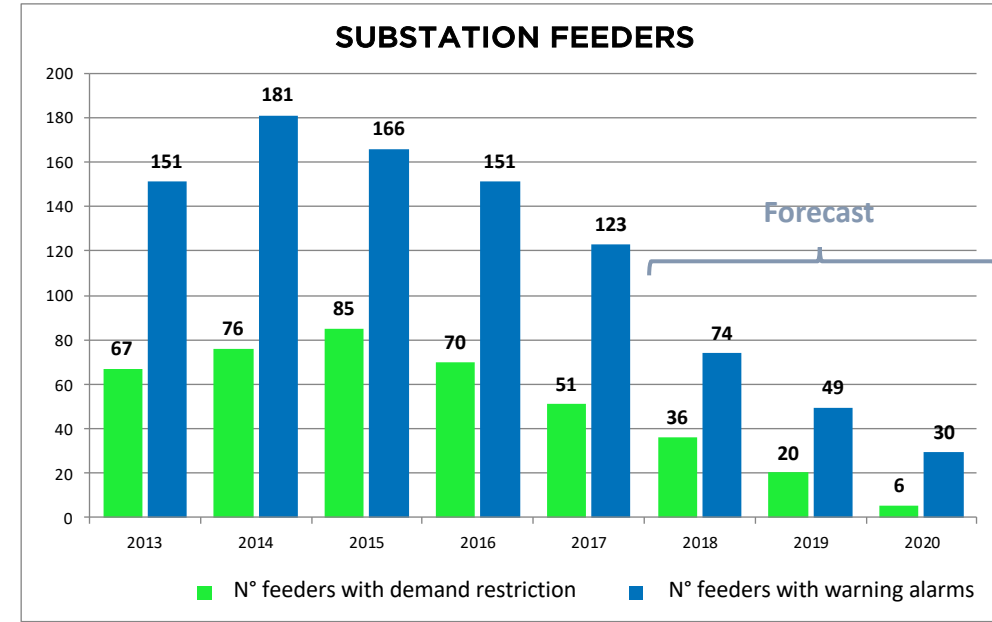
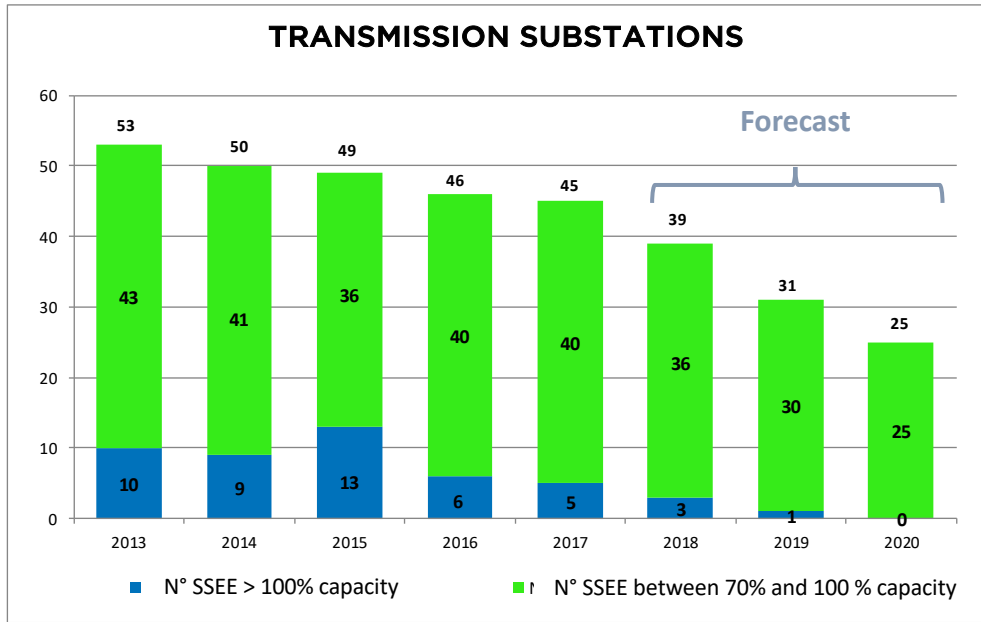


Amounts in ARS at May 2018 using 23 ARS/USD exchange rate

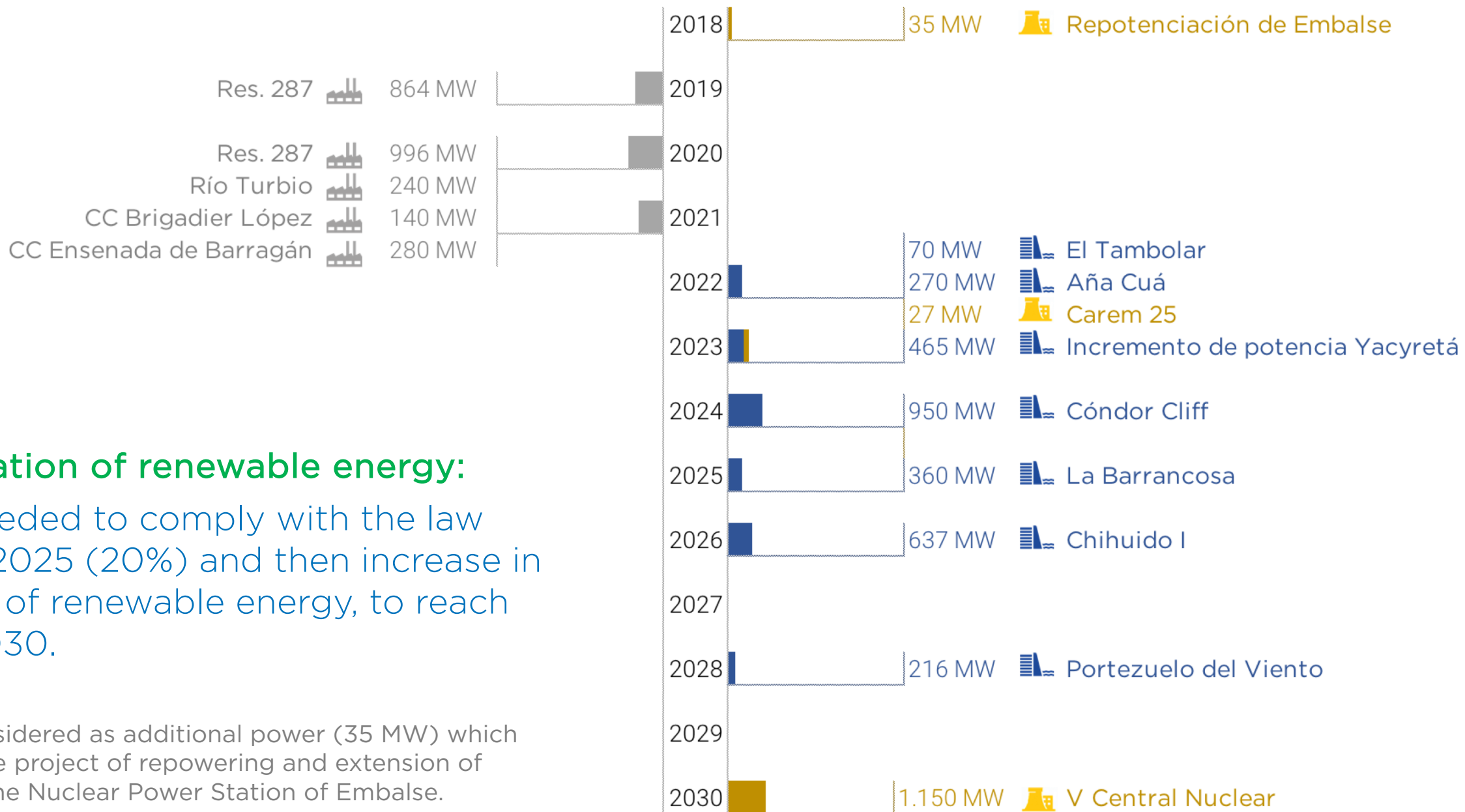
Only EDENOR and EDESUR expansion and maintenance are considered

EDENOR Investment Plan: Expected results

Requirements in High, Medium and Low Voltage networks



Entrance of main generation projects



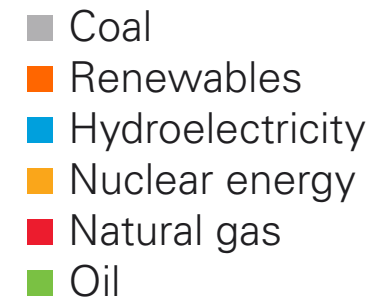
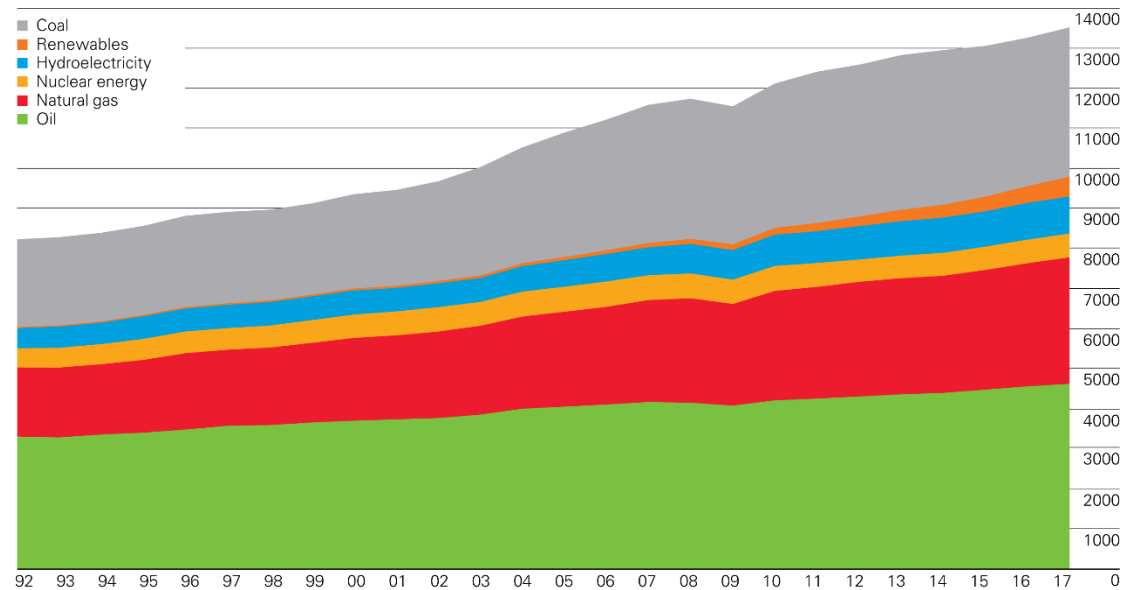
Incorporation of renewable energy:

Power needed to comply with the law 27,191 to 2025 (20%) and then increase in the share of renewable energy, to reach 25% in 2030.

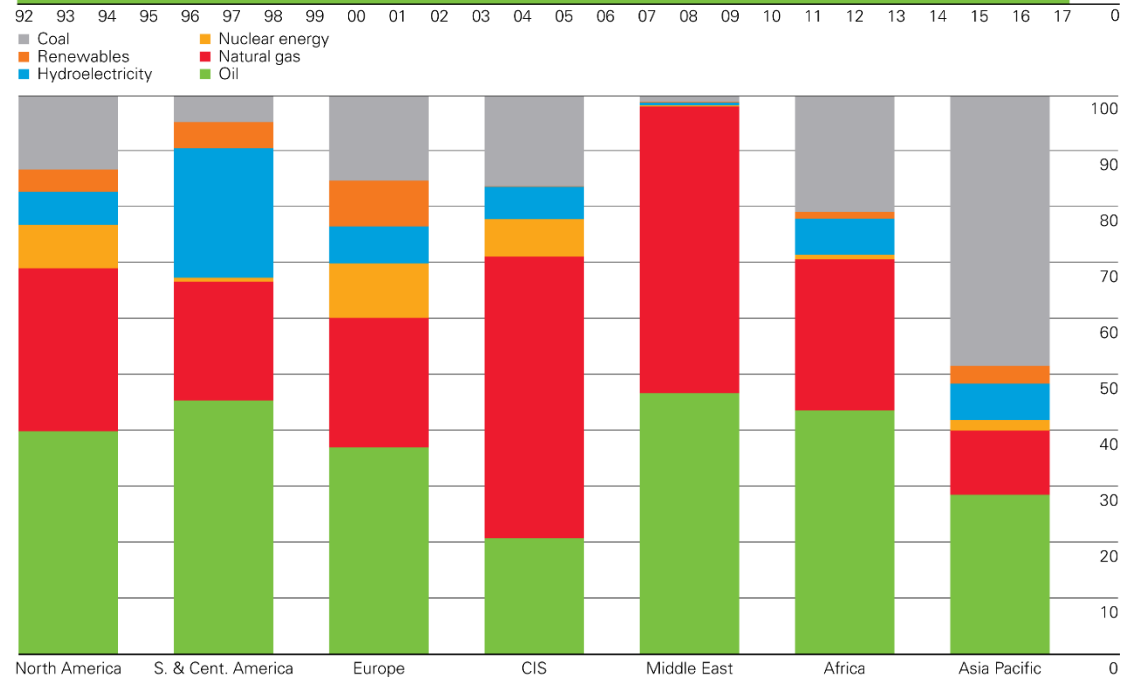
Note: It is considered as additional power (35 MW) which arises from the project of repowering and extension of useful life of the Nuclear Power Station of Embalse.

World Energy Matrix - Primary Energy Offer (MMTOE)

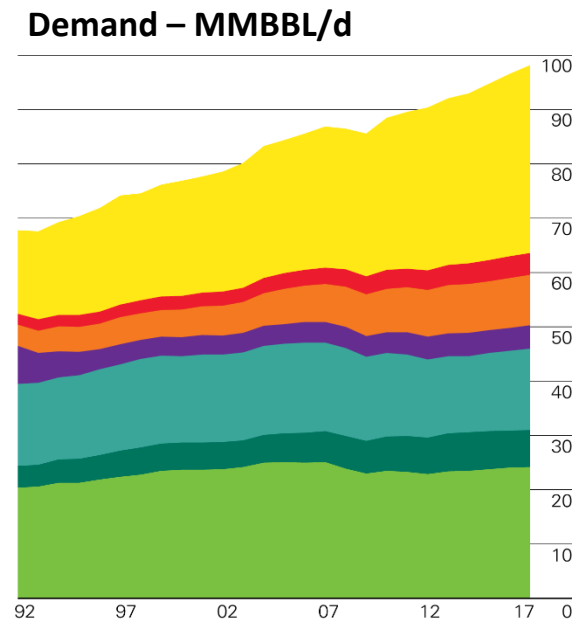
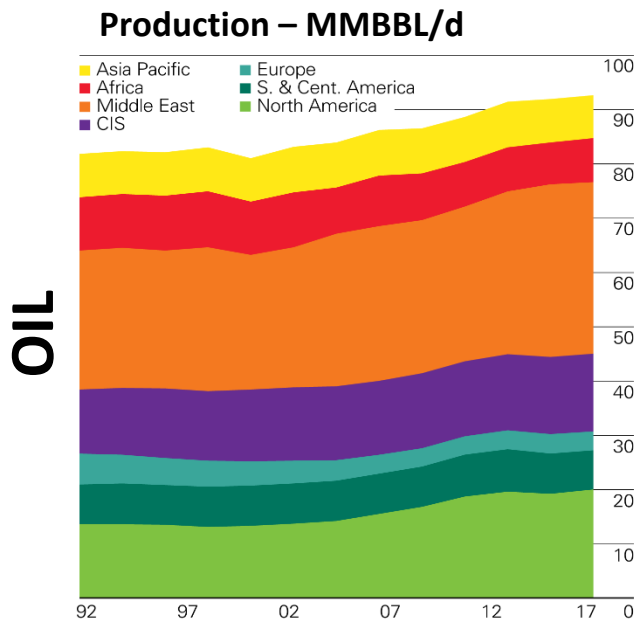
GLOBAL



BY REGION



Global energy context - Production, demand and reserves



Reserves – %

