

Vaca Muerta's potential

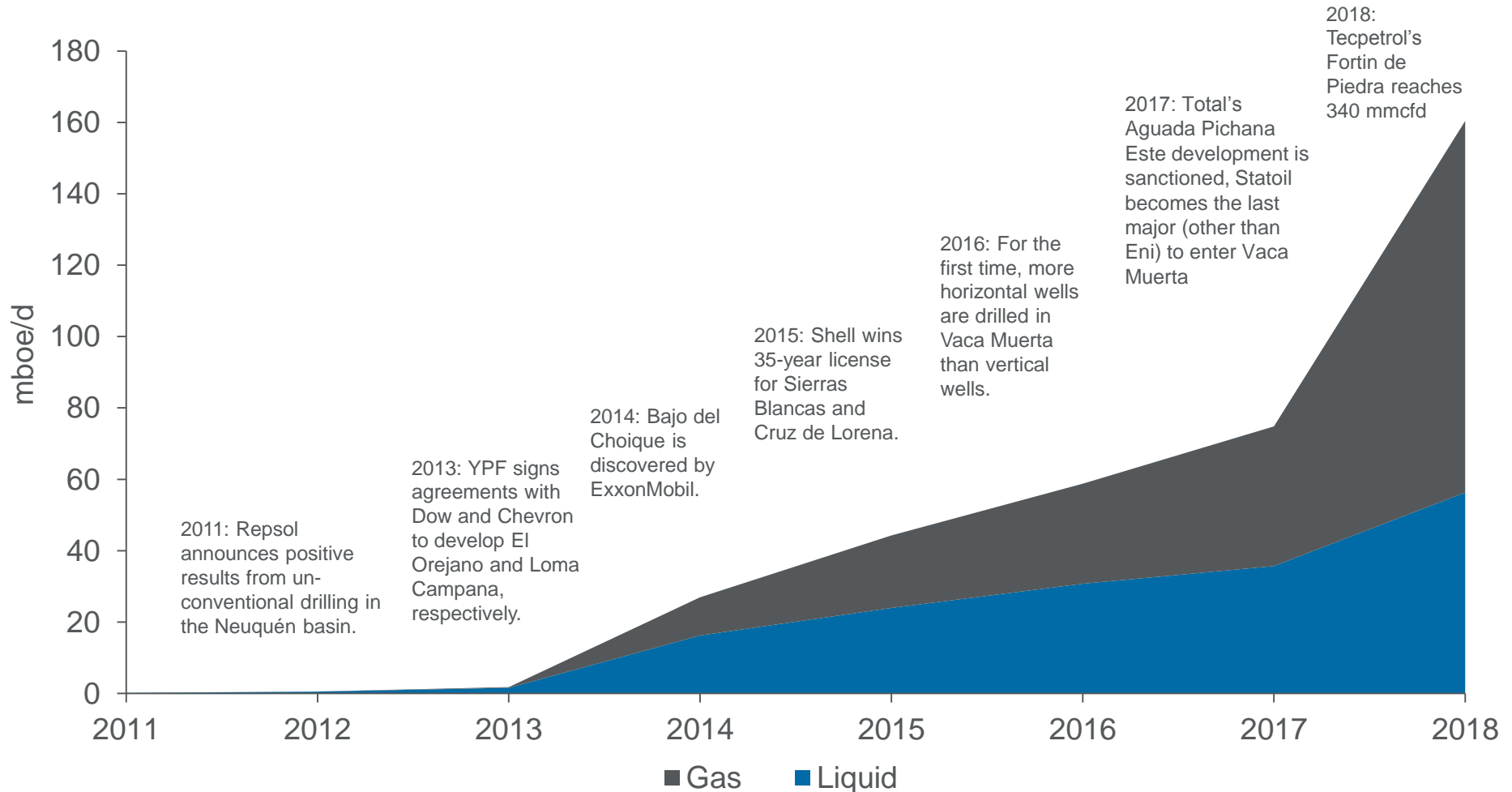
Growth ahead for the international shale play

Amanda Kupchella, 14 November 2018

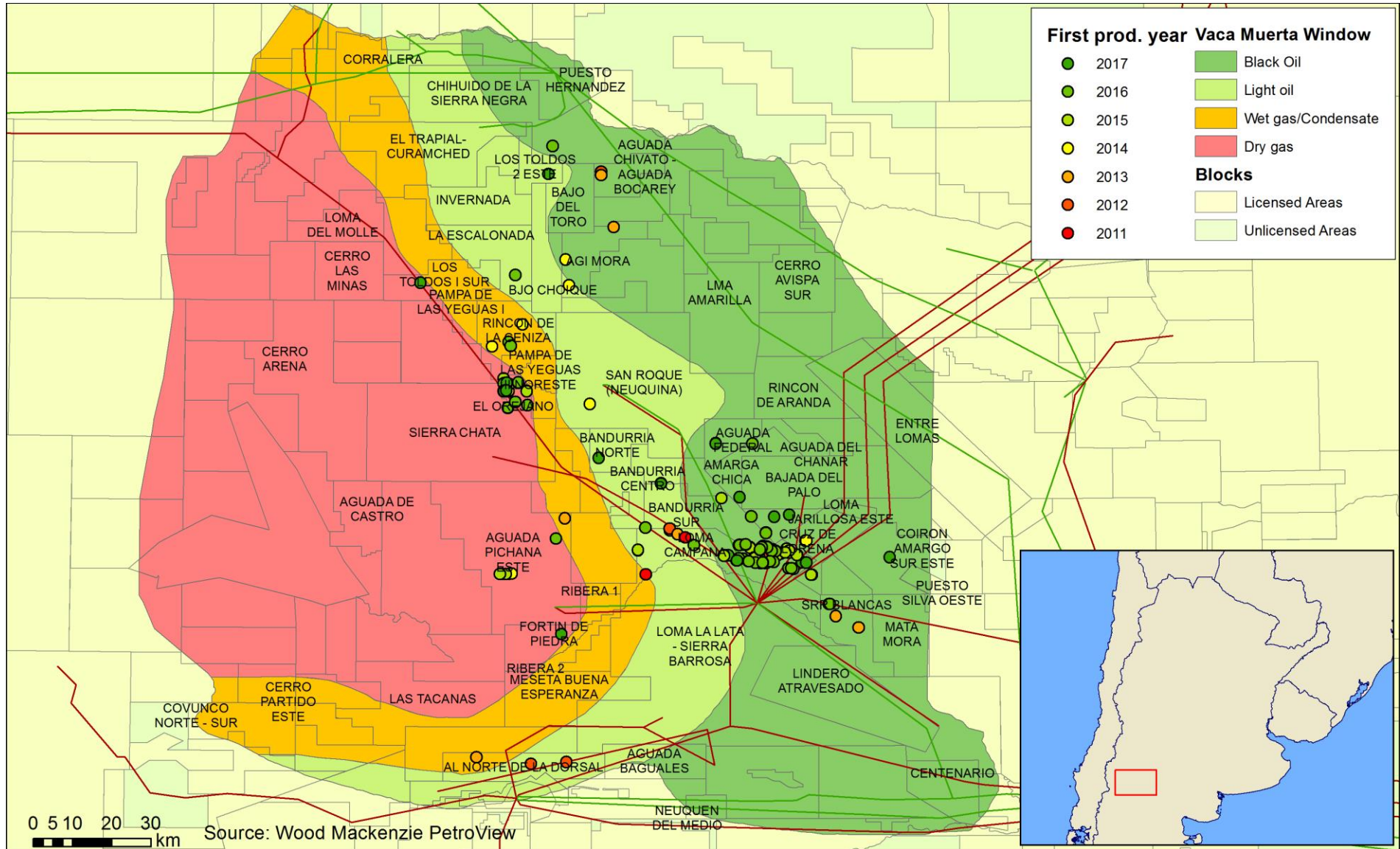
Steady progress in Vaca Muerta was led by YPF in early years

Other operators are now contributing to growth and will play an important role in the future of the play

Vaca Muerta production



Most activity has taken place close to existing infrastructure at the Loma Campana project

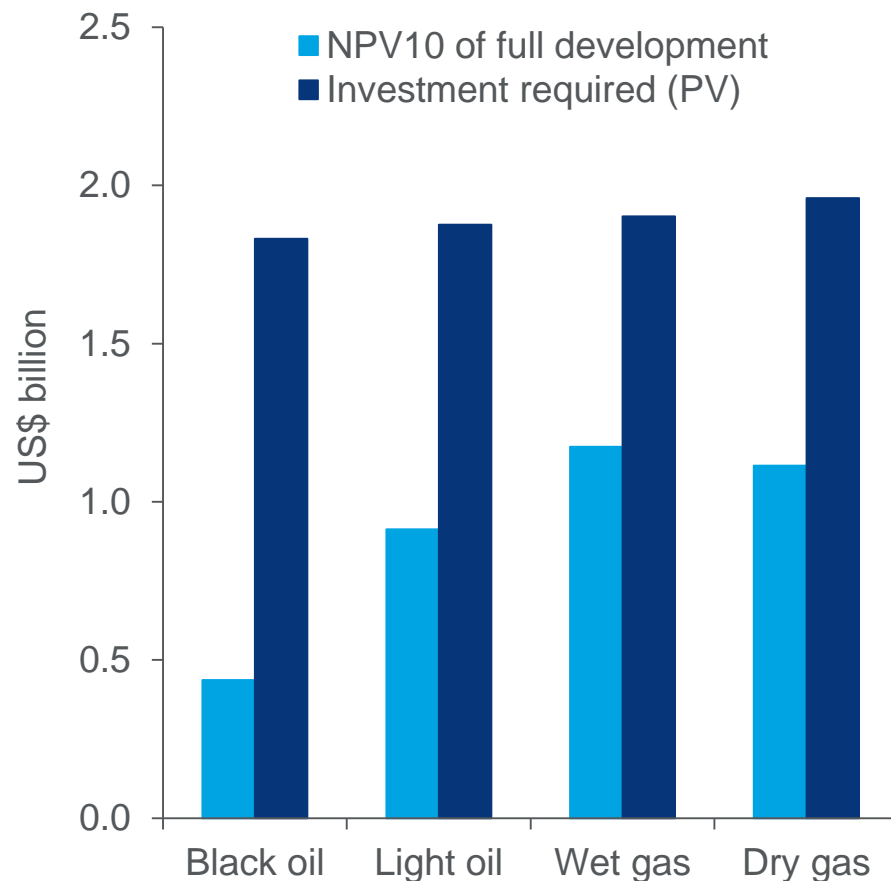




To fully develop a Vaca Muerta block, US\$1.9 billion is required on average

A typical Vaca Muerta block is 50,000 acres

50,000-acre Vaca Muerta section by window



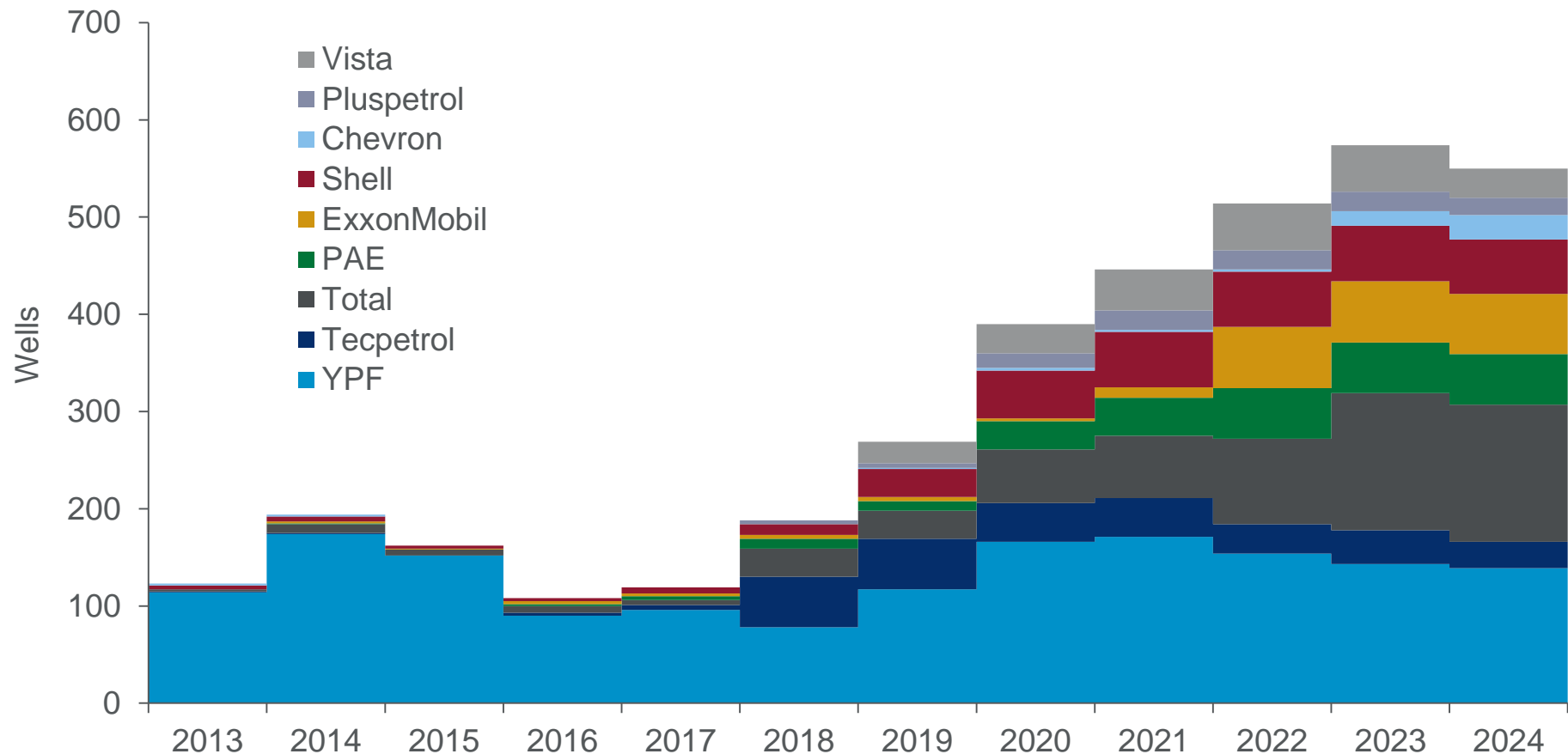
- An unconventional license in Neuquen province lasts 35 years
- Commitments range from US\$200-\$400 million within the first 2-5 years
- Typical lead time to full development is 3-5 years, though there are exceptions
- An accelerated development timeline adds value (a three year delay at Fortin de Piedra could have eroded US\$390 million in value)



Future activity will come mainly from greenfield blocks where few shale wells have been drilled

Shift from vertical to horizontal wells allowed for increased production with fewer wells

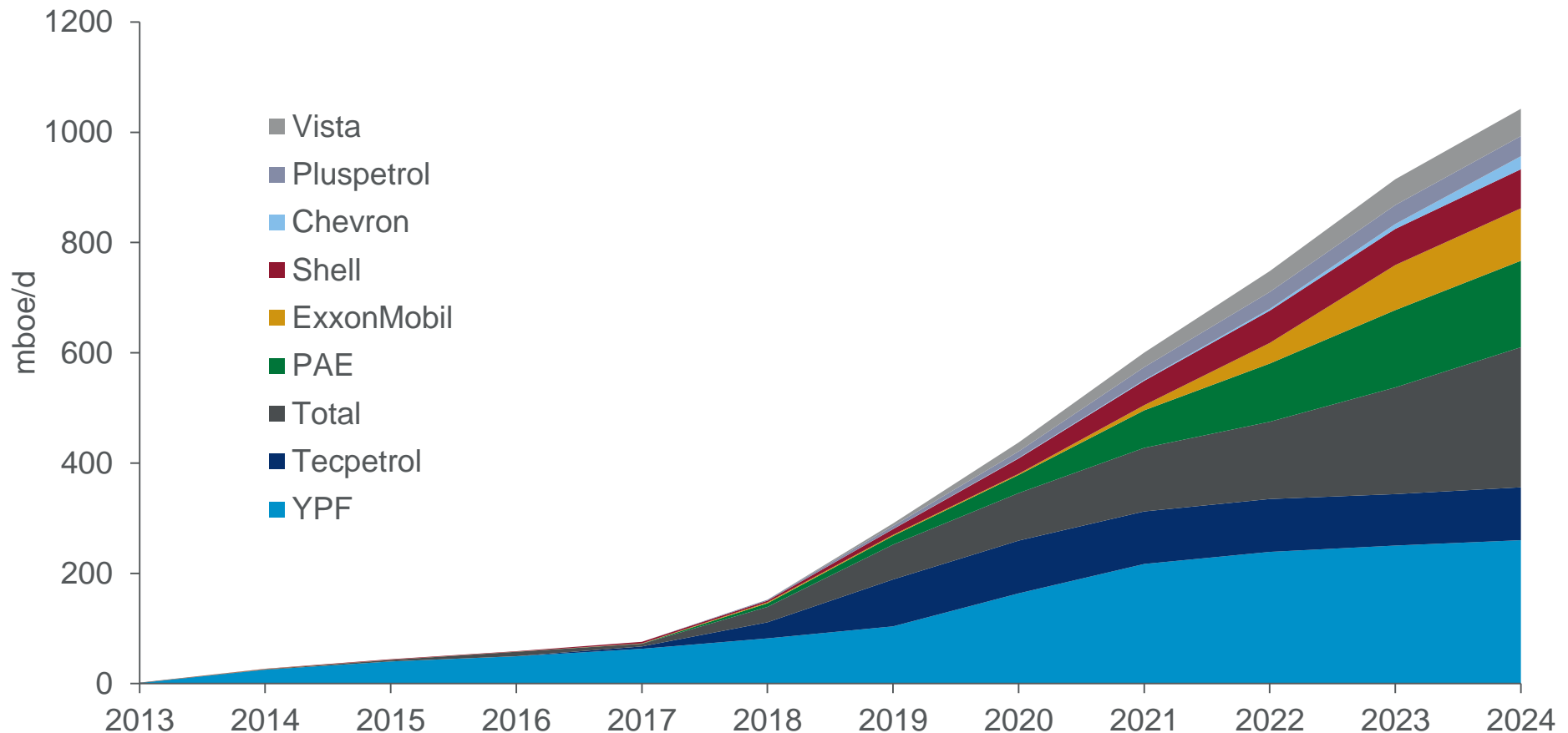
Vaca Muerta wells drilled by operator



Shift in operatorship: we expect companies other than YPF to claim 75% of the play's production by 2024

Tecpetrol is implementing an aggressive development at Fortin de Piedra; Total operates almost all of the blocks where it has participation

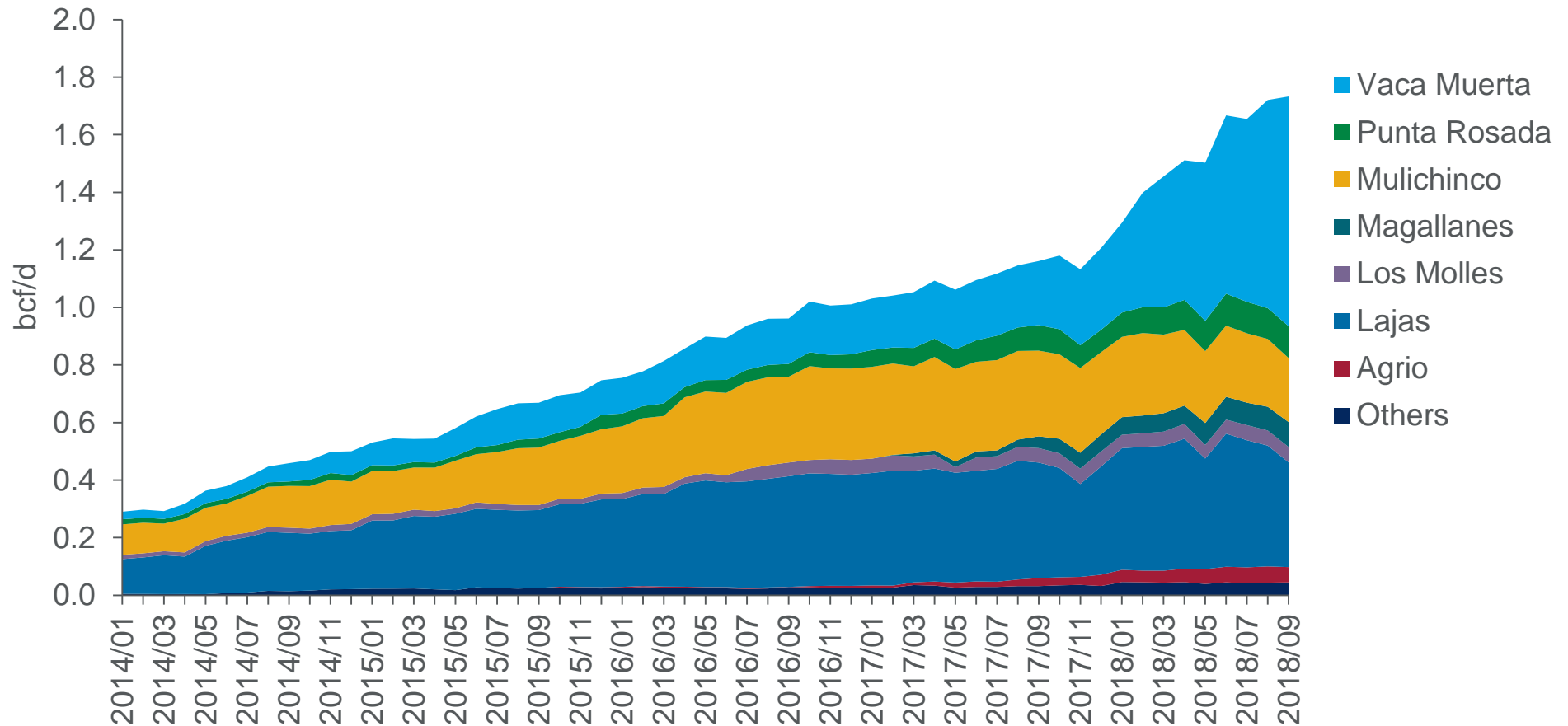
Vaca Muerta production by operator



Vaca Muerta accounts for half of Argentina's unconventional gas production

Vaca Muerta shale production will continue to grow as tight gas from other formations remains relatively constant

Argentina unconventional gas production by formation

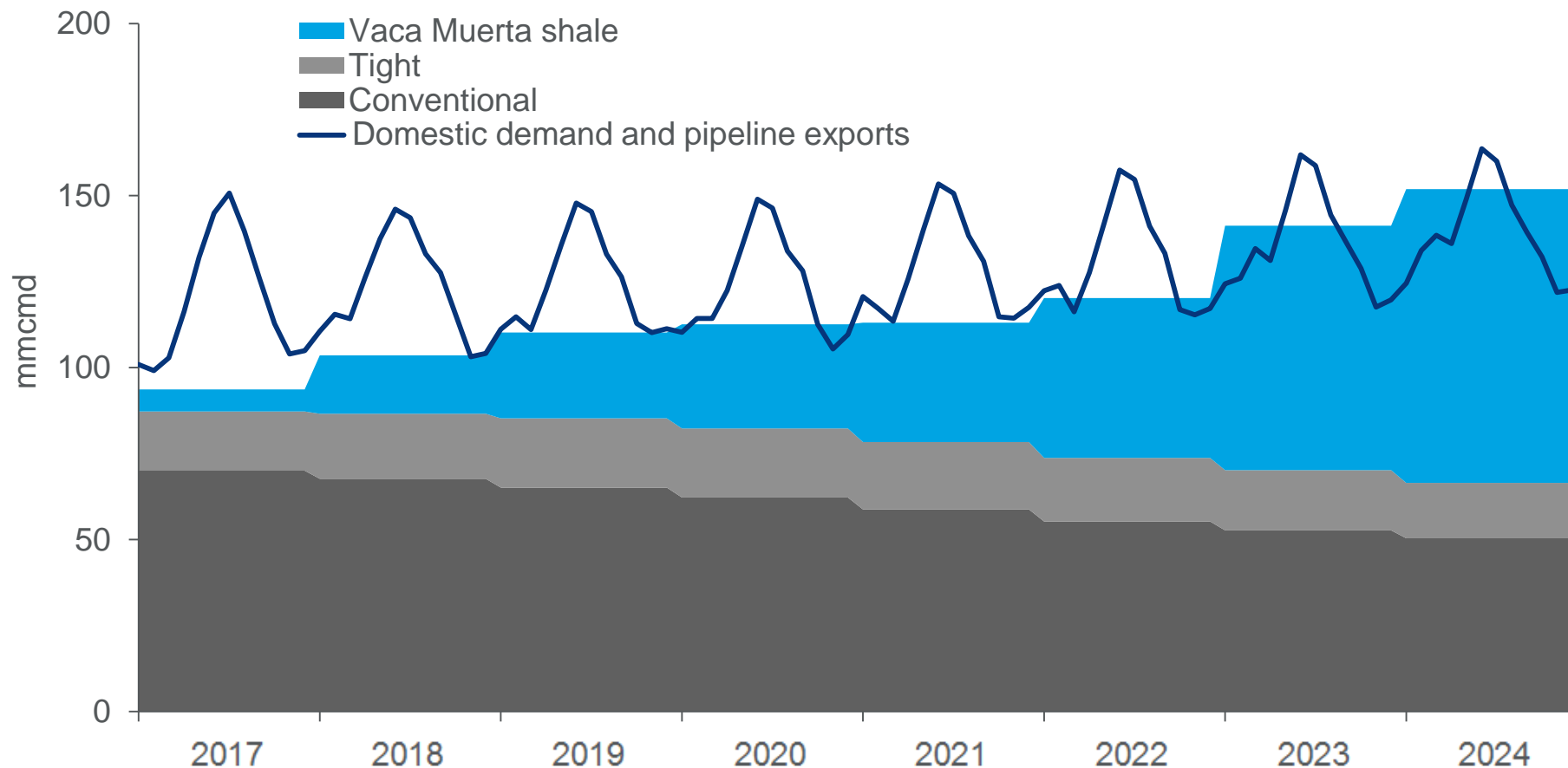




Market constraints limit upside for gas

Argentina is already meeting its domestic gas needs during the summer months, when demand is at its lowest

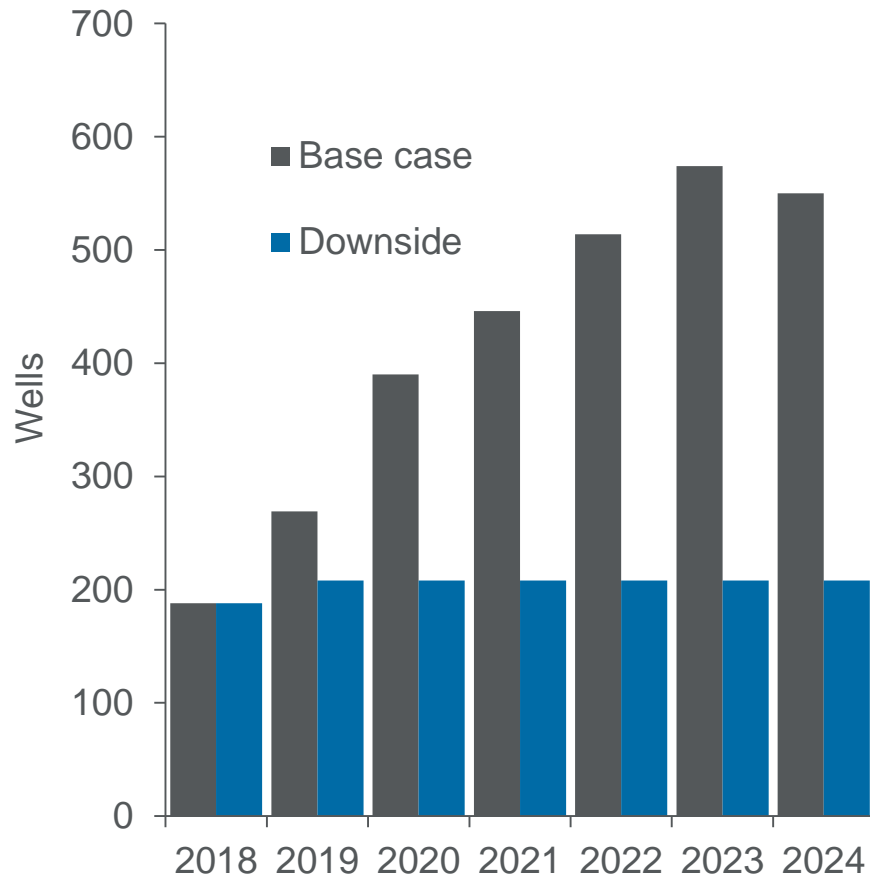
Argentina gas supply and demand balance



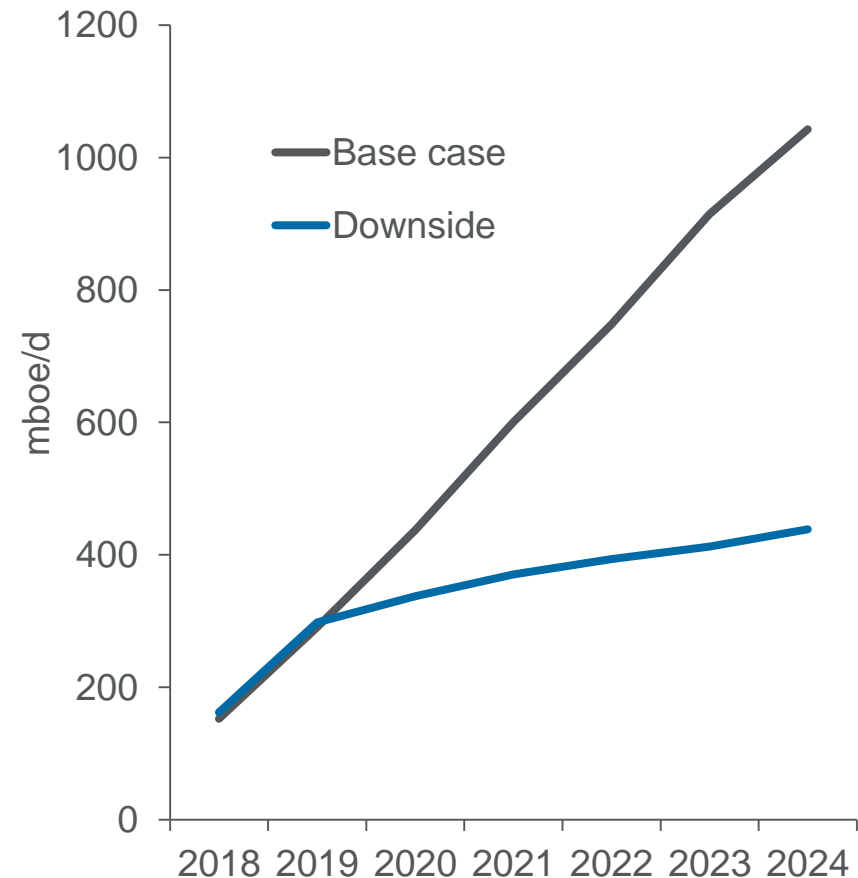
Our base case requires US\$5 billion of investment per year on average; an investment shortfall would slow growth

In our downside, we assume constant investment of US\$3 billion per year, resulting in less than half of our base case production by 2024

Vaca Muerta drilling by scenario



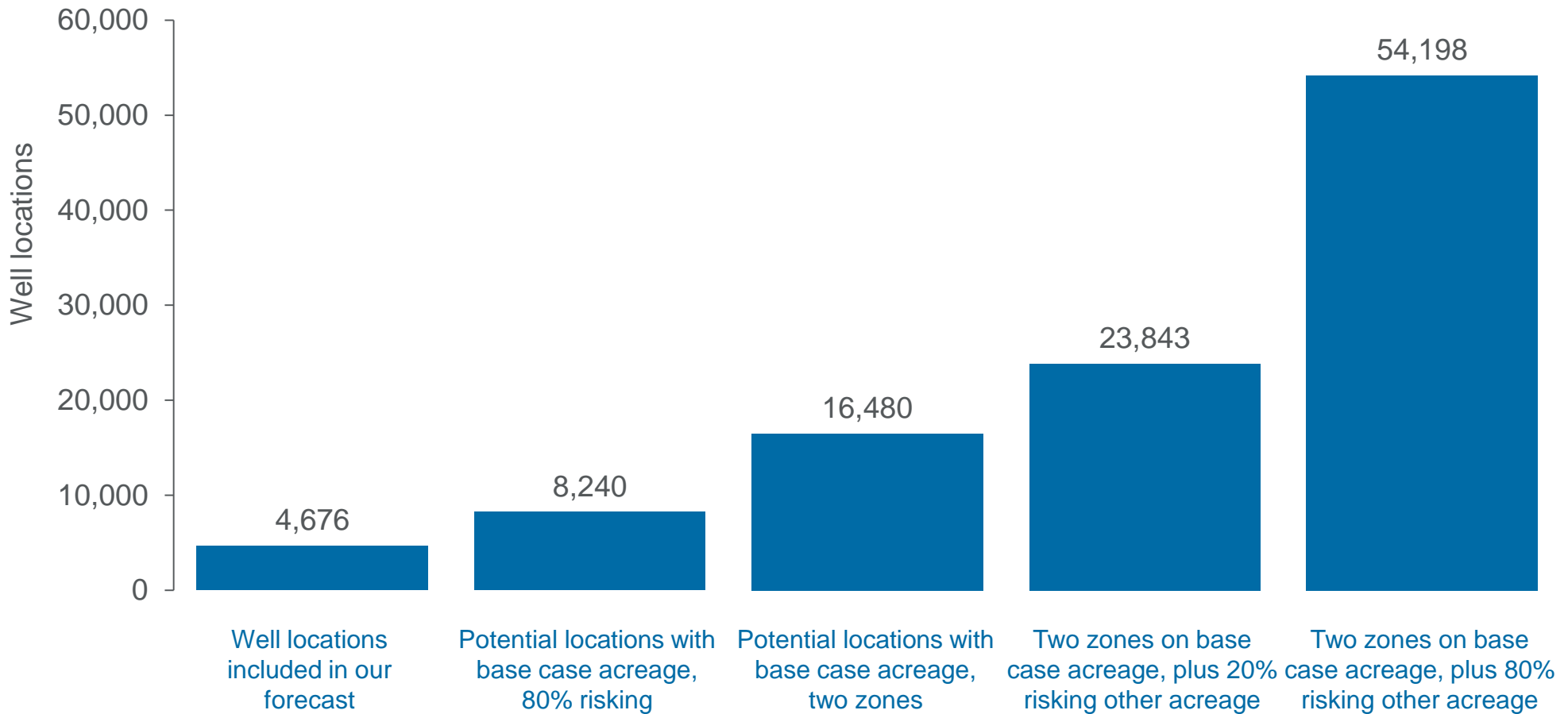
Vaca Muerta production scenarios



Enormous upside remains from potential beyond our base case

The large shale play contains plenty of untapped acreage; some operators are already developing multiple zones

Vaca Muerta well locations





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