

US OIL AND ASSOCIATED GAS PRODUCTION TO 2040

MARCH 2021



INTRODUCTION

In 2020 US crude oil production dropped 8.6% from previous year due to lower oil prices and reduced demand.

This report includes current trends and forecast of US Crude Oil and Associated gas production to 2040:

- Crude oil and associated gas production for major Tight Oil basins: Permian, Bakken, Eagle Ford, DJ Niobrara
- US Offshore oil production outlook
- Alaska oil production
- Crude oil and associated gas production to 2040

Forecast assumptions

- Oil price is USD \$55 during the forecast period
- Lease condensate is not included. Oil production with API higher than 45 degrees considered to be a lease condensate.

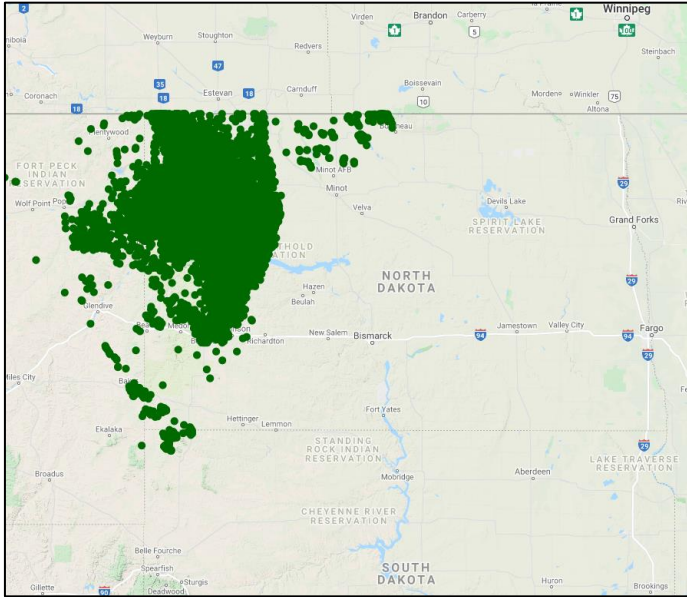


SUMMARY

- In 2020 US crude oil production dropped 8.6% to 8,500 MBbl/d down from 9,470 MBbl/d in 2019 due to lower oil prices and reduced demand.
- In 2021 US crude oil production is expected stay flat as producers prioritize strengthening balance sheets over increased CAPEX spend.
- US crude oil production will start growing after 2021 and reach its peak at 11,400 MBbl/d in 2029.
- US crude oil production growth will slow down after 2029 due to maturity of main Tight Oil production basins and reach 9,460 MBbl/d in 2040.
- Permian will remain primary US crude oil production basin at least until 2030. Permian production will reach its peak of 5,100 MBbl/d in 2029 up from 2,800 MBbl/d in 2020
- On January 27, 2021 President Joe Biden's temporary halted drilling on federal lands, which may affect Gulf of Mexico's production
- On March 25, 2021 The US Interior Department announced that it will launch its review of the federal oil and gas leasing program. It may lead to complete halt of new leases on federal land and water.

BAKKEN TIGHT OIL (WILLISTON BASIN)

Wells drilled in US portion of the basin since 2010



Active development of tight oil using horizontal wells and fracking started after 2010. Williston basin extends into Canada, however Canadian portion of the basin is less productive than US portion and not included

Location: North Dakota, East Montana

Number of oil wells drilled since 2010: ~10,000

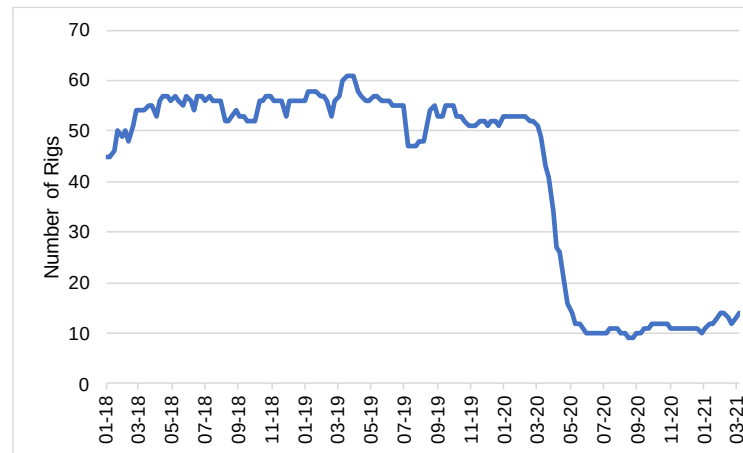
Average New Well Initial Productivity in 2020: 1,100 Bbl/d

Peak Production: 2019 (1,410 MBbl/d)

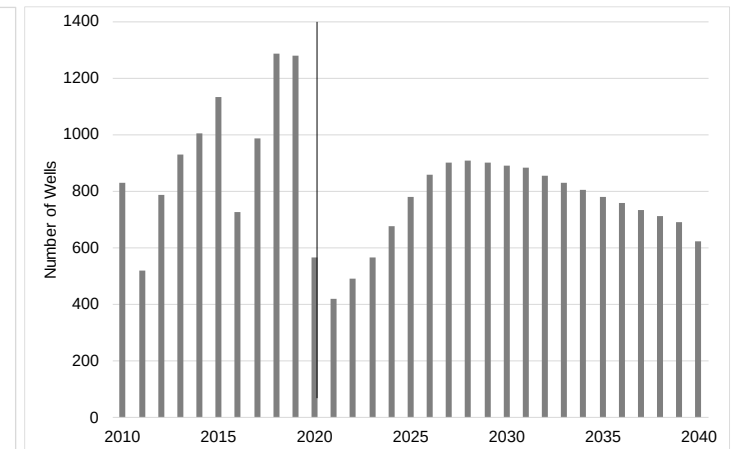
Average First Year Decline in 2020: 73%

Major Operators: Continental Resources, Whiting Petroleum, Hess, Oasis Petroleum, Marathon Oil, XTO Energy, EOG Resources

Historical Rig Count

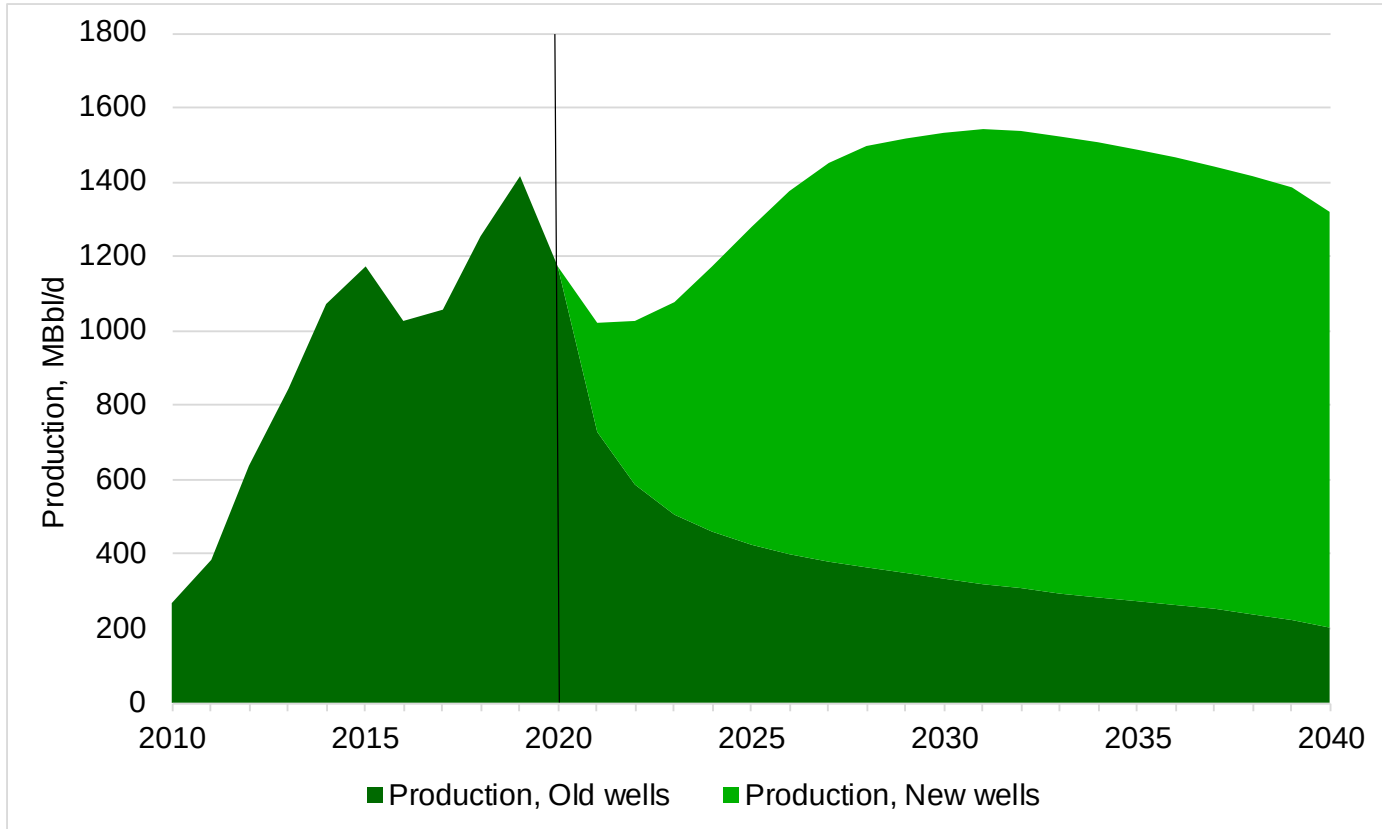


Number of New Wells



Source: Baker Hughes

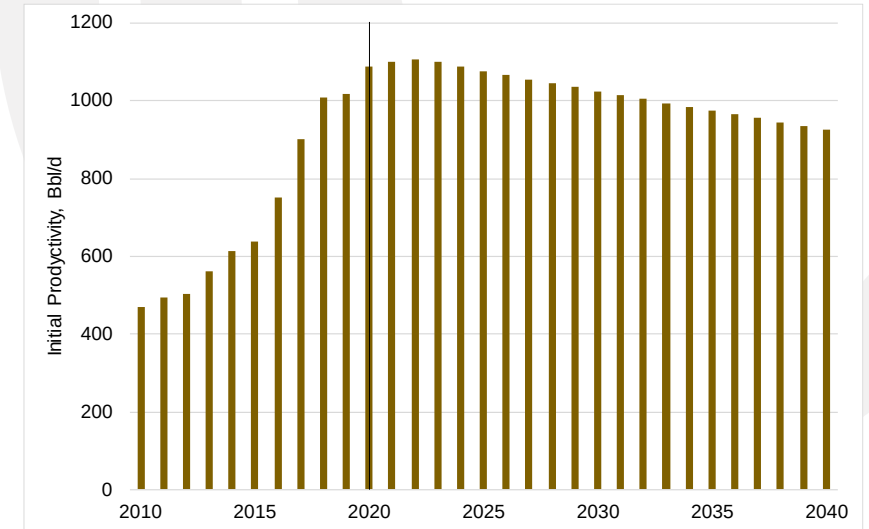
BAKKEN OIL PRODUCTION



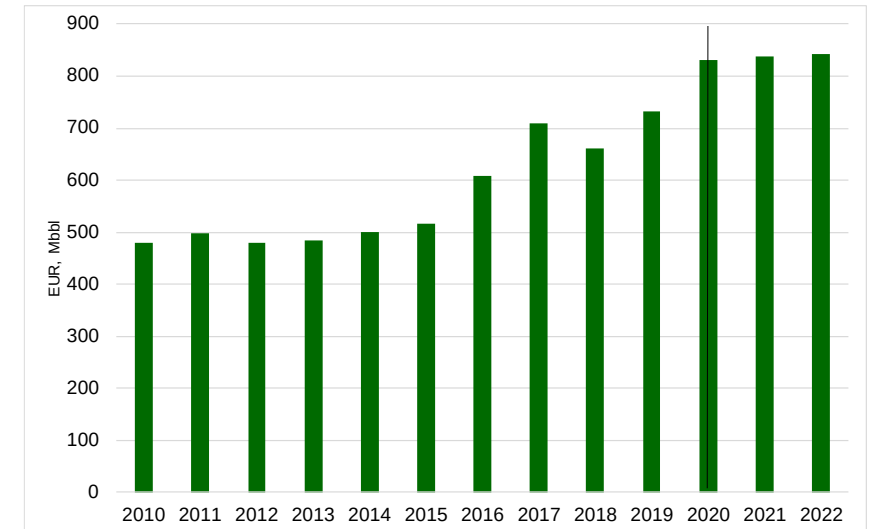
Bakken oil production dropped from over 1,400 MBbl/d in 2019 to less than 1,200 MBbl/d in 2020. Average 2021 production is expected to be around 1,000 MBbl/d and is expected to grow after 2022.

Only Bakken/Three Forks and Sanish formations are included

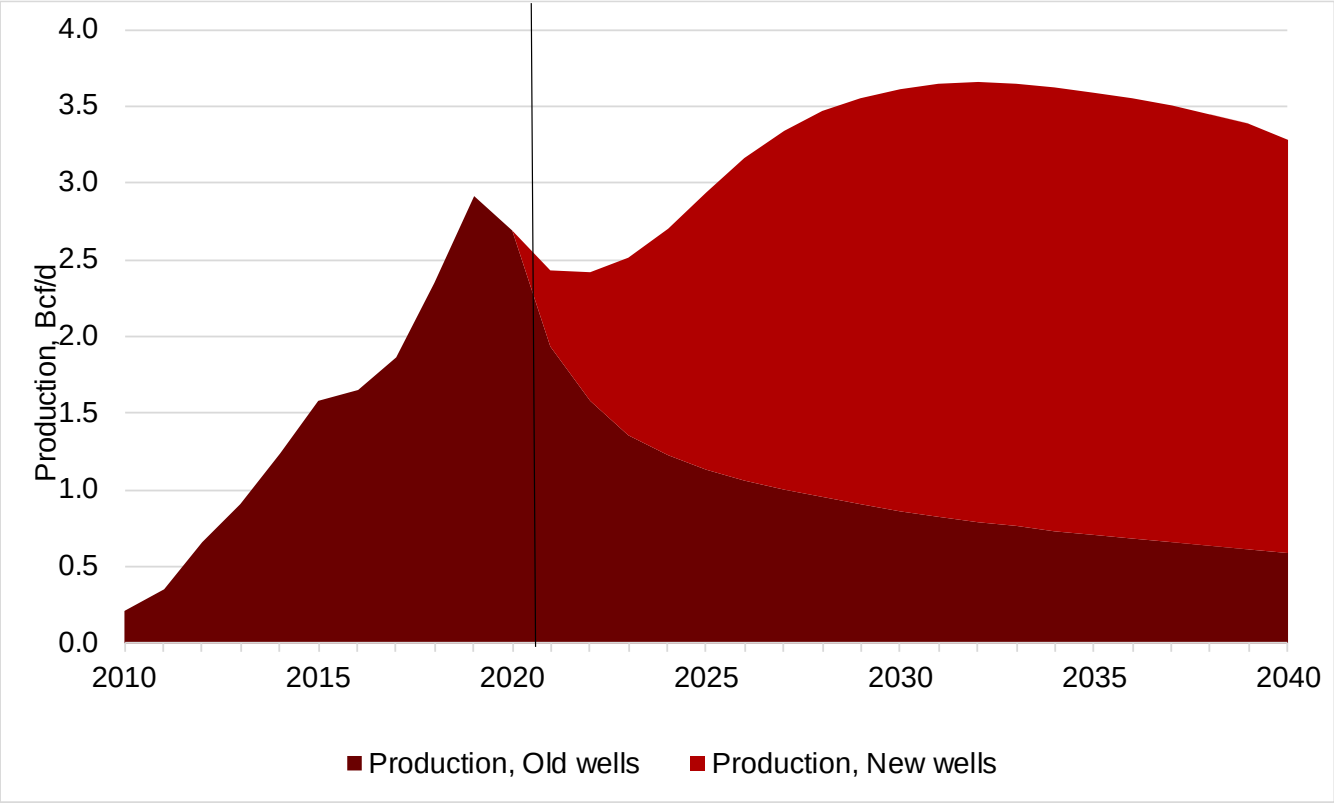
Crude Oil Well Initial Productivity, Bbl/d



Well EUR, MBbl



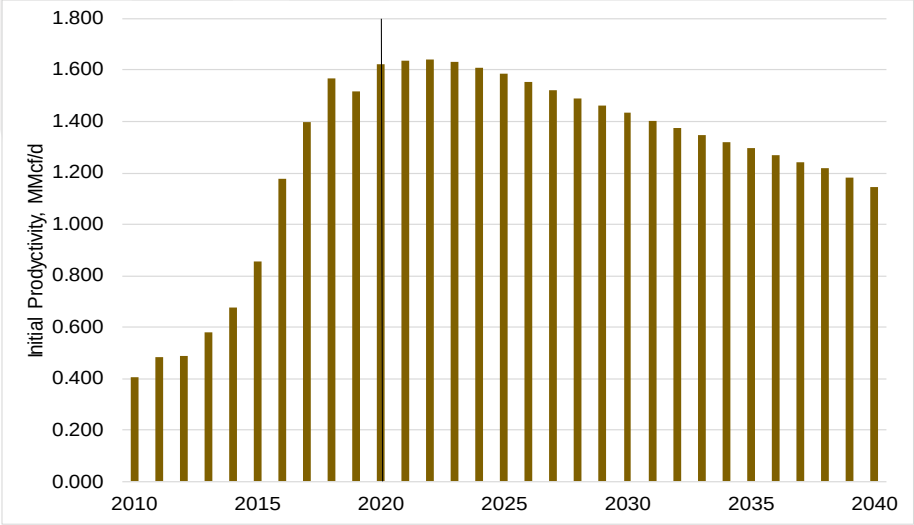
BAKKEN ASSOCIATED GAS PRODUCTION



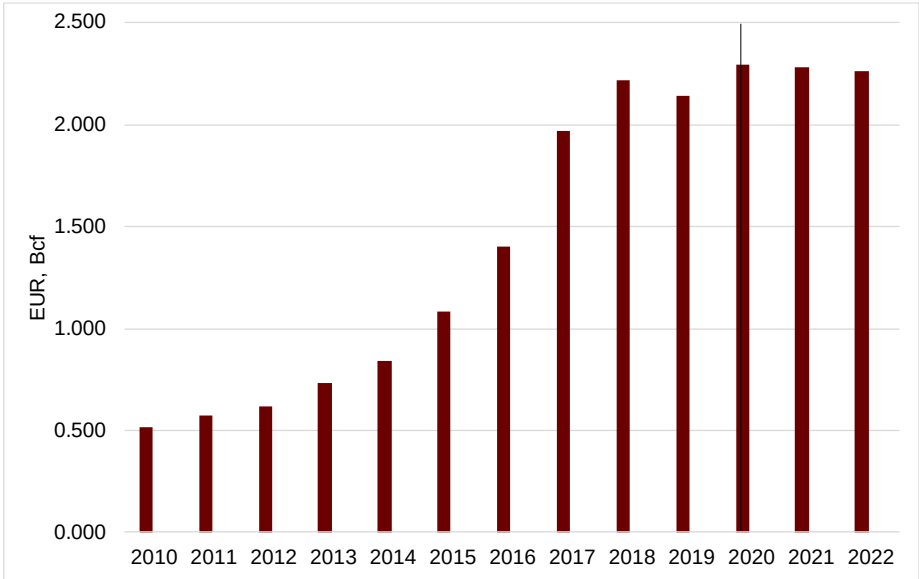
The chart shows Bakken raw associated gas production forecast. Raw associated gas is expected to reach its peak over 3.6 Bcf/d in 2032.

Only Bakken/Three Forks and Sanish formations are included

Associated Gas Initial Productivity, MMcf/d

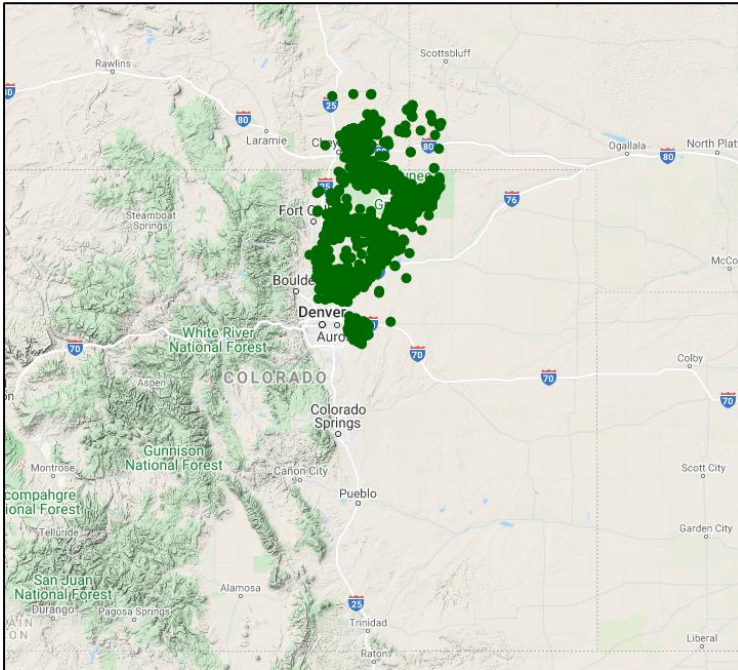


Associated Gas EUR, Bcf



DJ-NIOBRARA TIGHT OIL

Wells drilled since 2010



DJ Niobrara oil wells produce mostly volatile oil and condensate.

Location: Colorado, south of Wyoming

Number of oil wells drilled since 2010: ~11,200

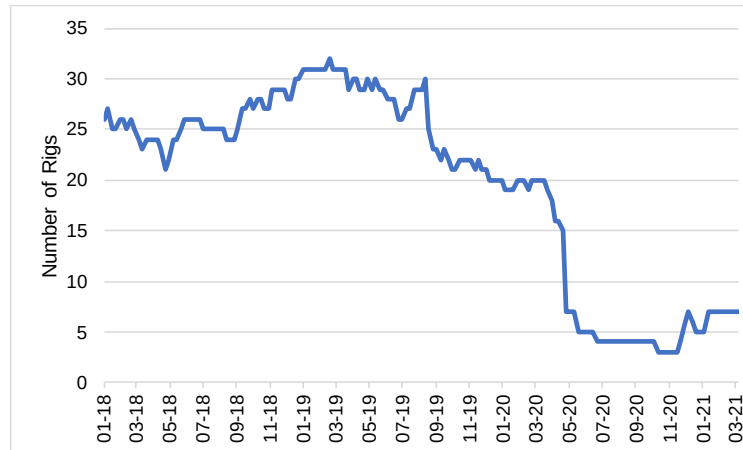
Average New Well Initial Productivity in 2020: 500 Bbl/d

Peak Production: 2019 (530 Bbl/d)

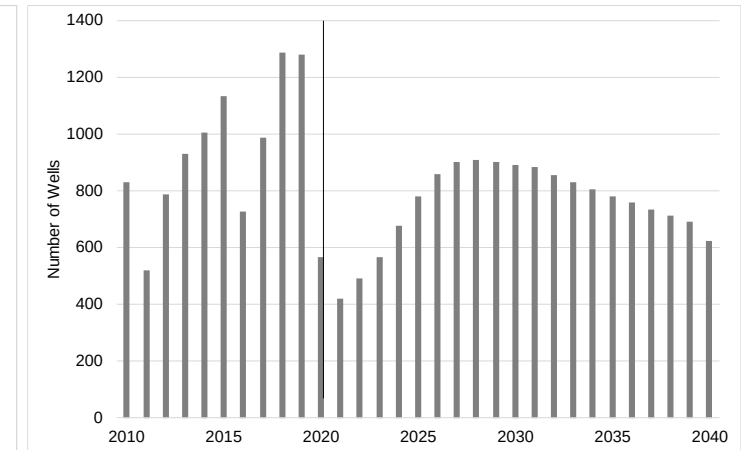
Average First Year Decline in 2020: 73%

Major Operators: Occidental, Chevron, PDC Energy, Extraction Oil and Gas, Crestone Peak Resources, Bonanza Creek Energy, Highpoint Operating

Historical Rig Count

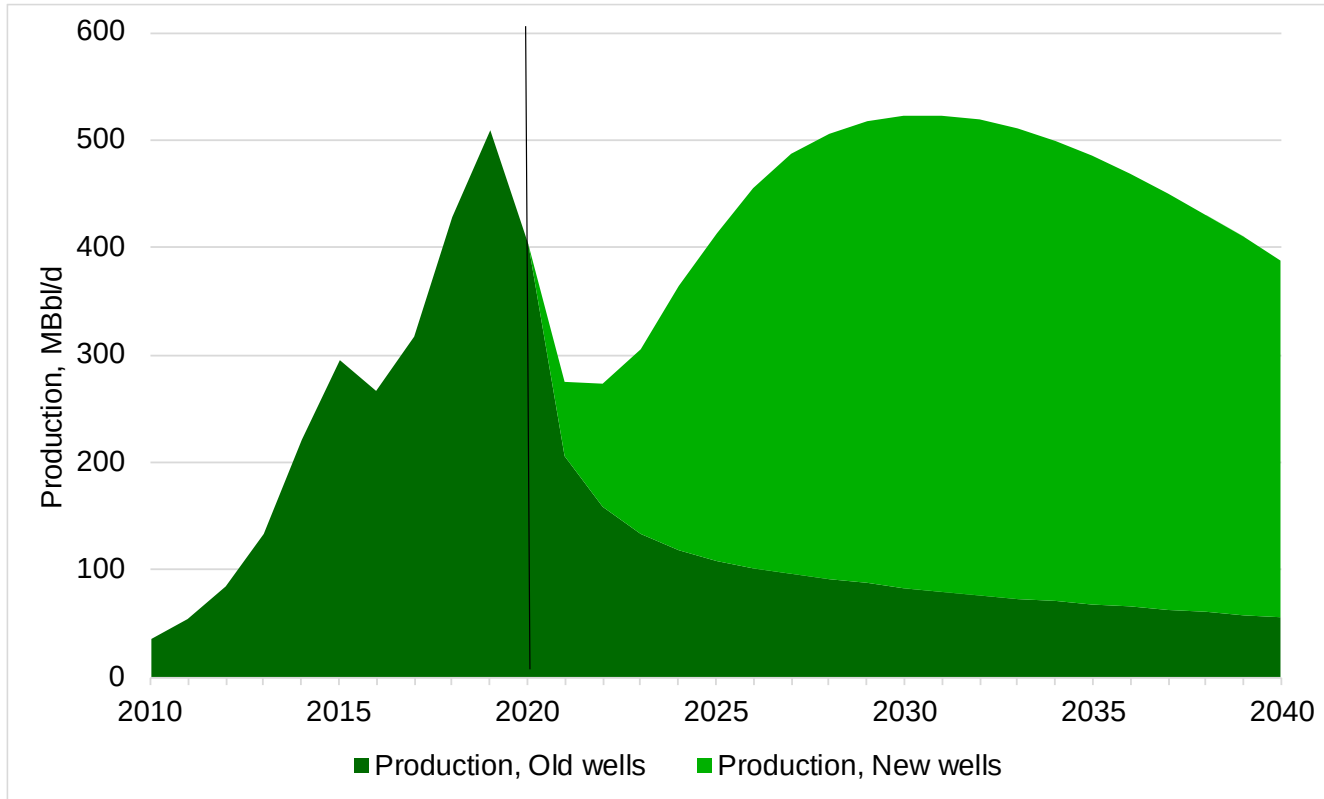


Number of New Wells



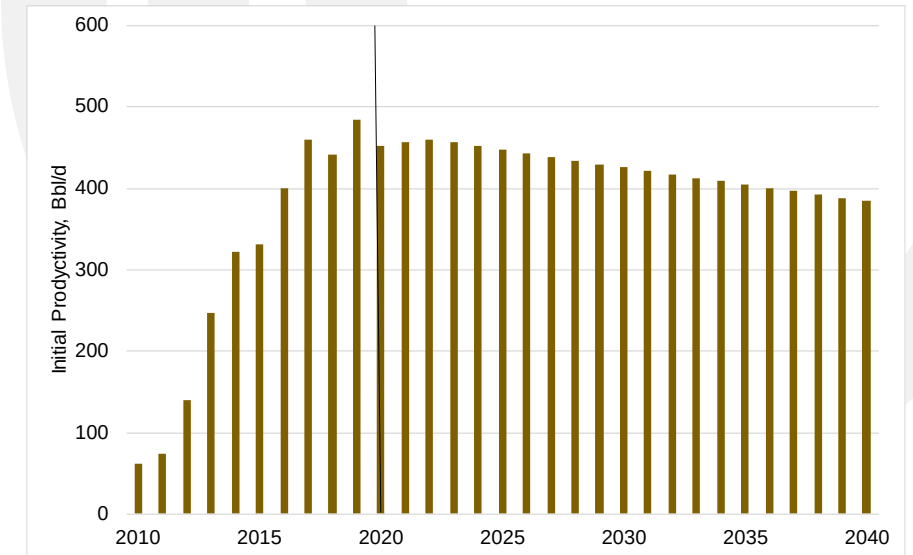
Source: Baker Hughes

DJ NIOBRARA OIL PRODUCTION

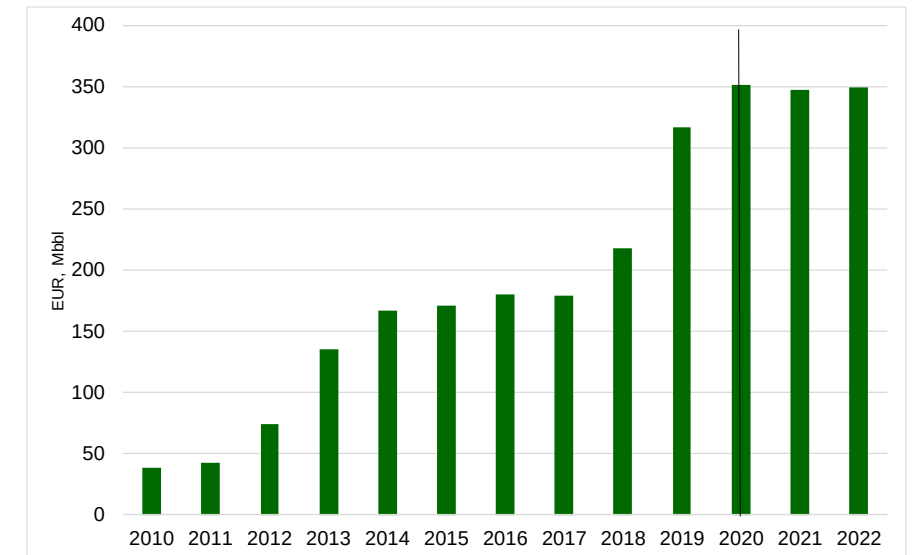


DJ Niobrara oil well productivity is lower than in other Tight Oil basins such as Permian and Bakken. DJ Niobrara 2021 production is expected to be around 350 MBbl/d down from its peak of over 510 MBbl/d in 2019.

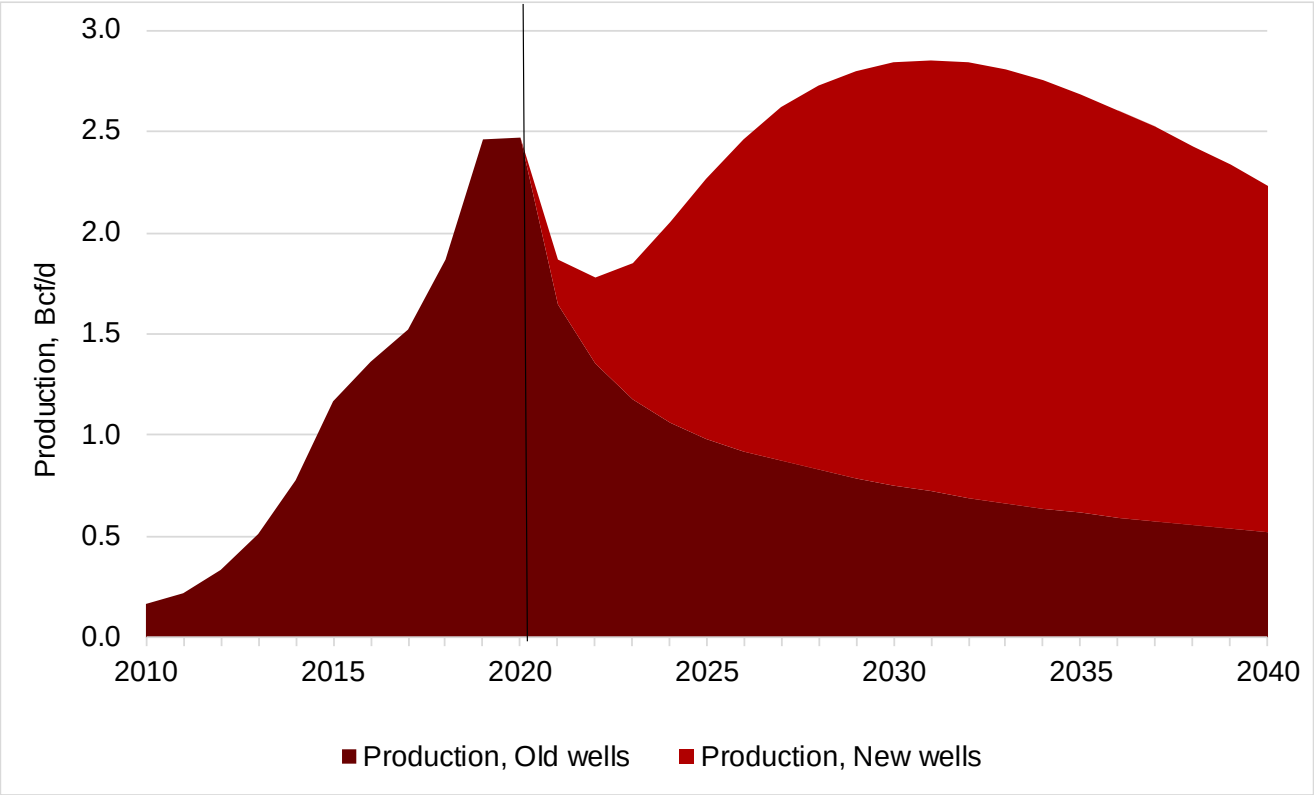
Oil Well Initial Productivity, Bbl/d



Well EUR, MBbl

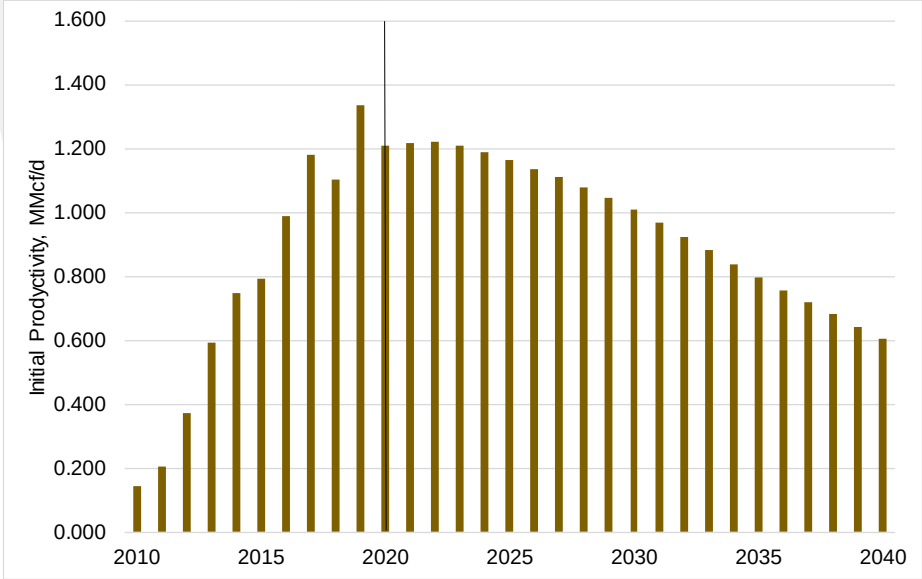


DJ NIOBRARA ASSOCIATED GAS PRODUCTION

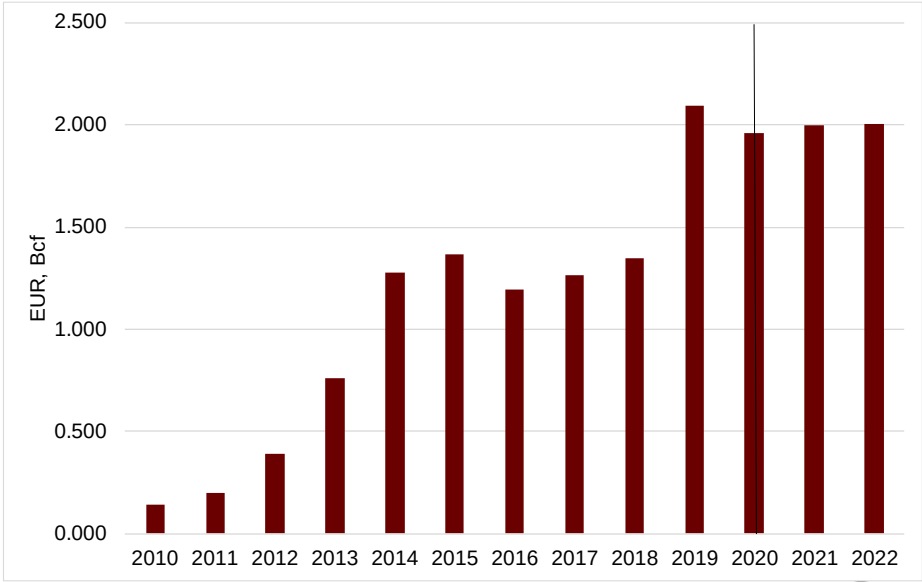


The chart shows DJ Niobrara raw associated gas production forecast. Raw associated gas is expected to reach its peak over 2.8 Bcf/d in 2028-2030.

Associated Gas Initial Productivity, MMcf/d

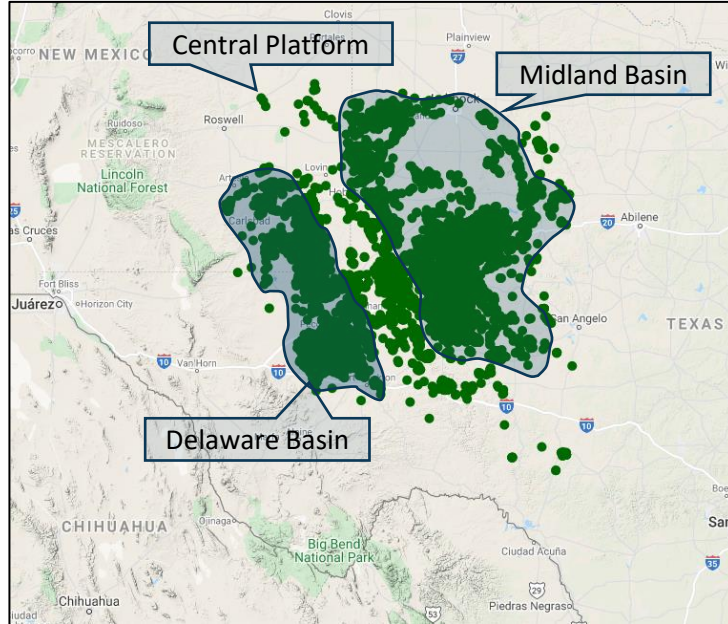


Associated Gas EUR, Bcf



PERMIAN OIL

Oil wells drilled since 2017



Permian is a major Tight Oil producing basin in US. Drilling is performed towards different formations including Spraberry, Wolfcamp, Bone Spring, and San Andres.

Location: East New Mexico, West Texas

Number of oil wells drilled since 2010: ~49,000

Average New Well Initial Productivity in 2020: 967 Bbl/d*

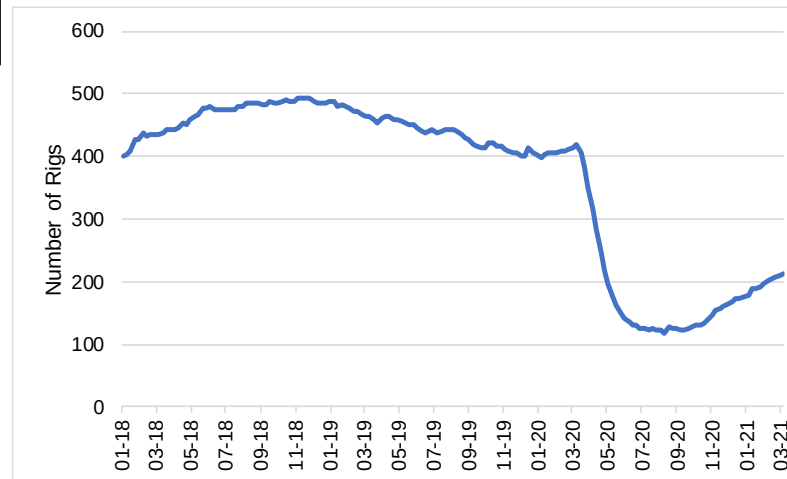
Peak Production: 2019 (3,620 MBbl/d)

Average First Year Decline in 2020: 74%

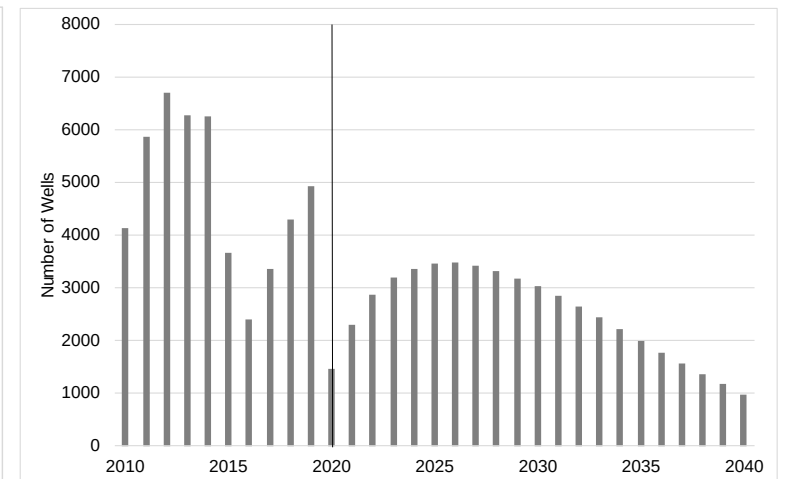
Major Operators: Pioneer, XTO Energy, Devon Energy, COG Operating, Ovintiv, Surge Operating, Chevron

*Average initial productivity of vertical and horizontal wells in Permian basin. Almost 30% of all wells drilled in Permian basin in 2020 are vertical.

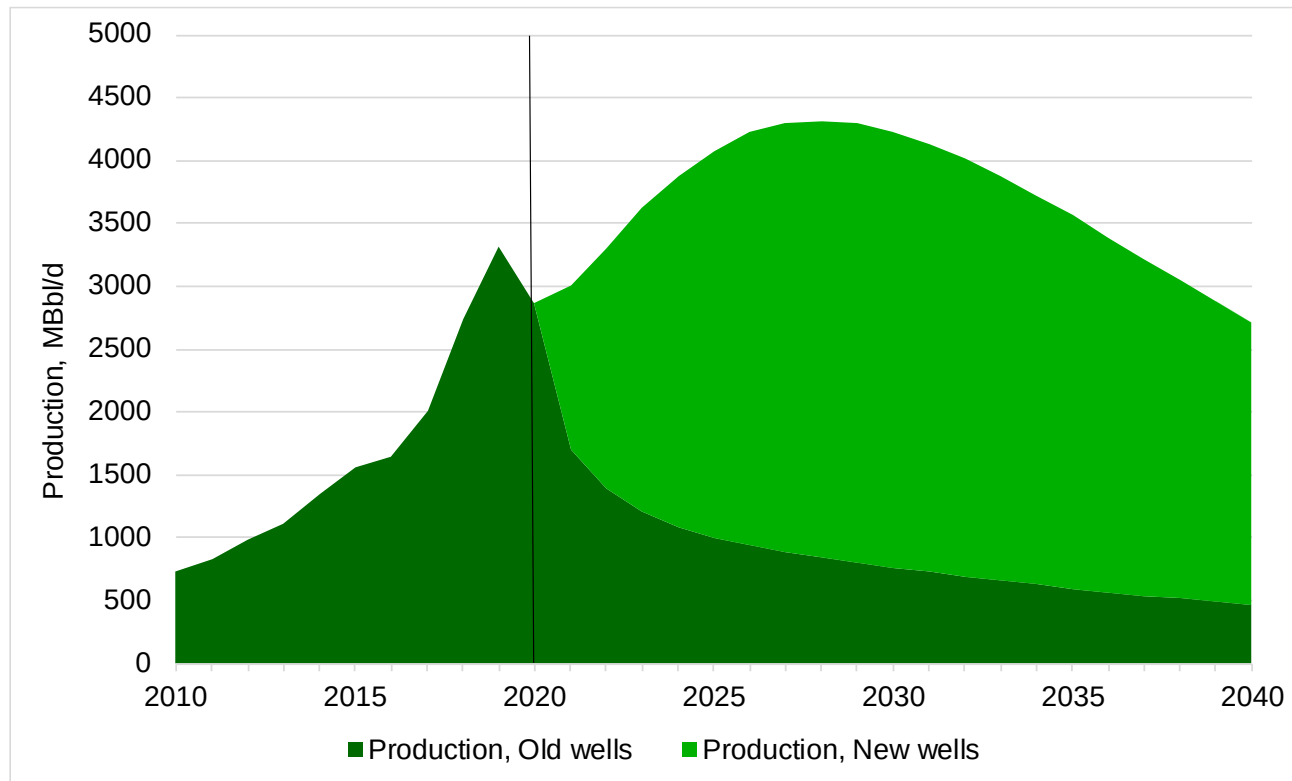
Historical Rig Count



Number of New Wells

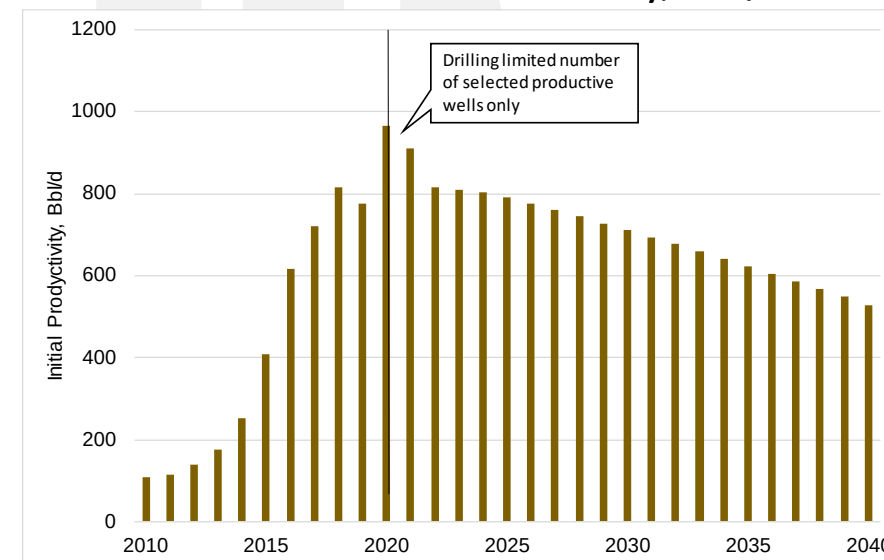


PERMIAN OIL PRODUCTION

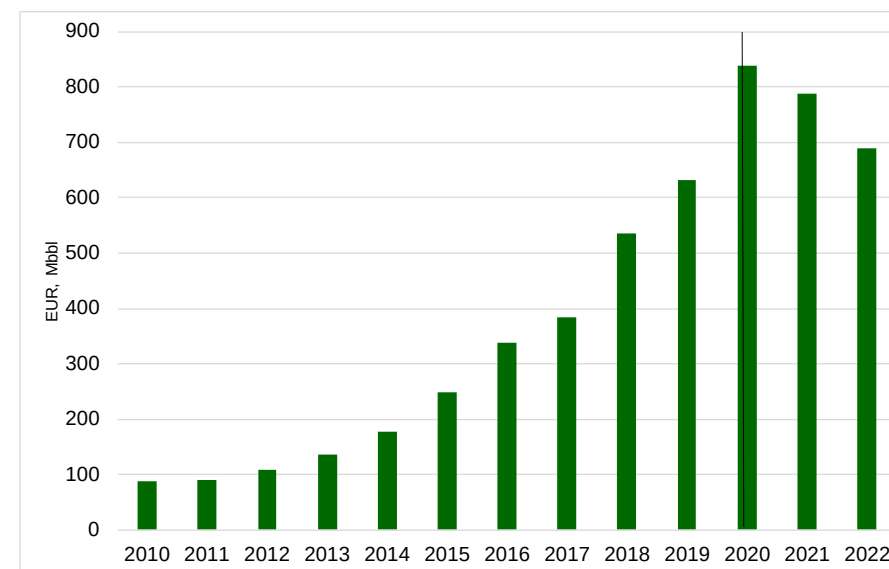


Permian crude oil production is expected to recover quickly from the 2020 drop and reach its peak of 4,300 MBbl/d in 2027. Production will gradually decline after 2027 due to maturity of the basin.

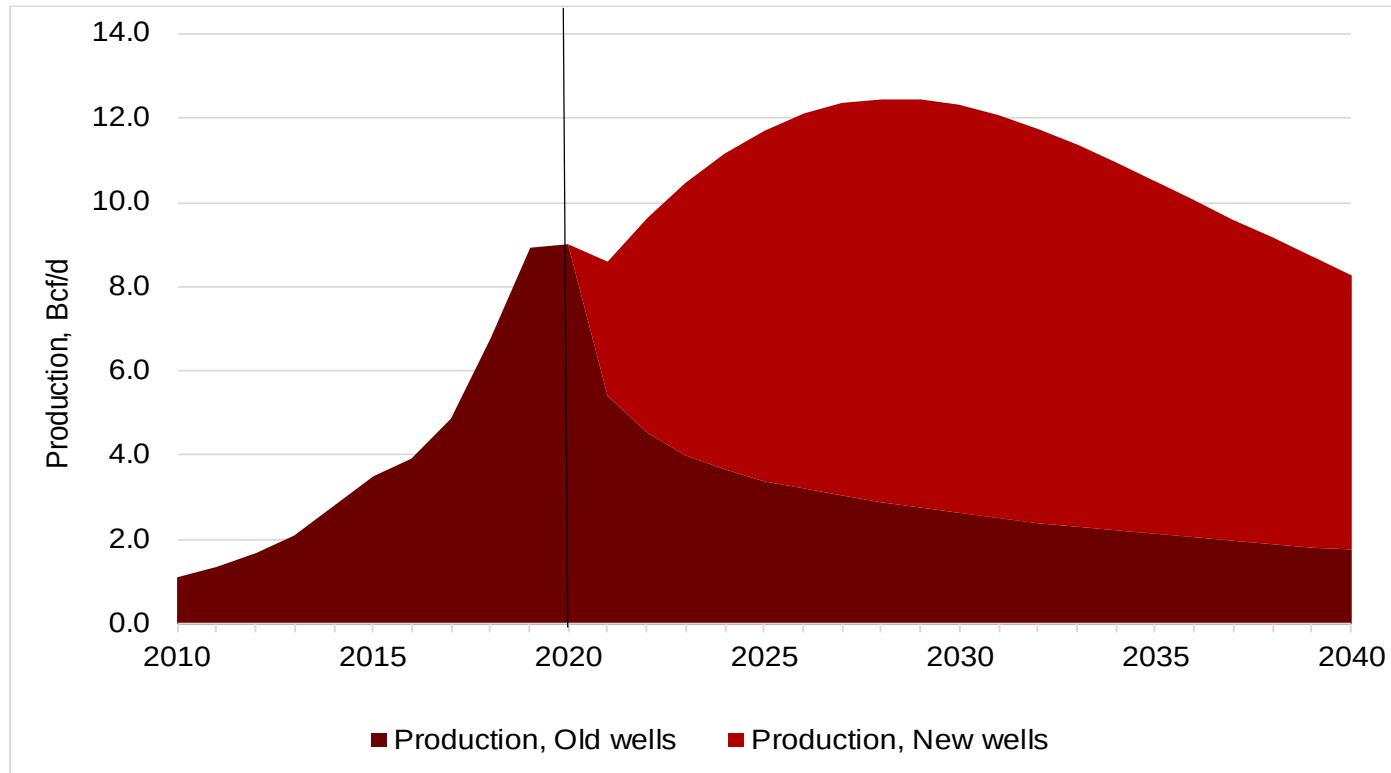
Oil Well Initial Productivity, Bbl/d



Well EUR, MBbl



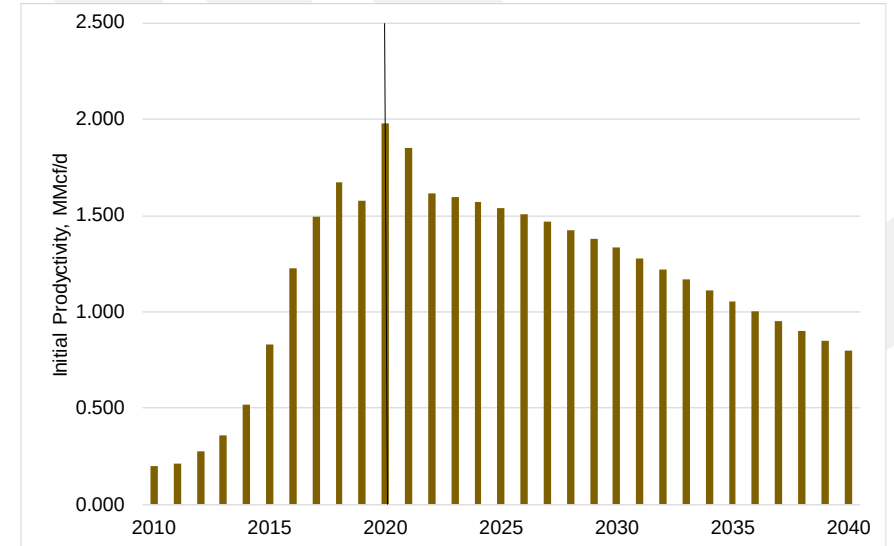
PERMIAN ASSOCIATED GAS PRODUCTION



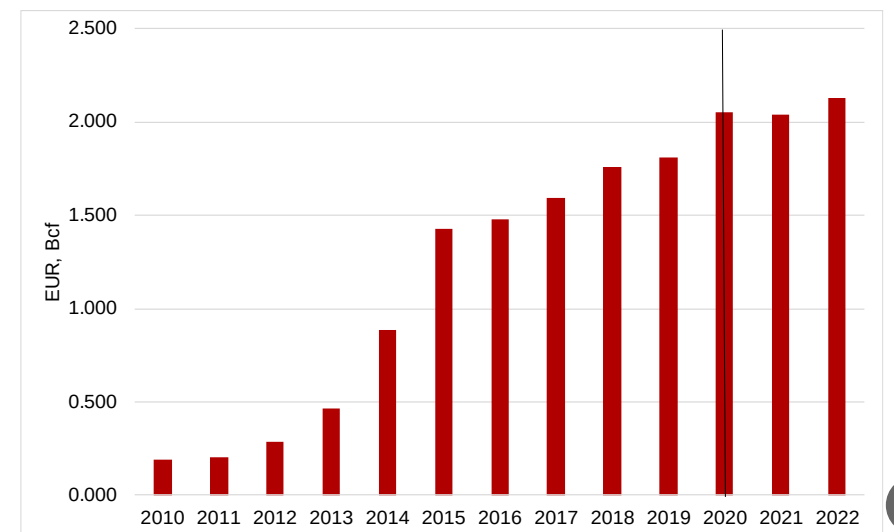
Even though the Permian is a predominately Tight Oil basin, it has become a major US gas producing area due to significant associated gas production.

Does not include condensate wells. According to EIA raw associated gas production from overall Permian including condensate well in 2020 is 16.8 Bcf/d

Associated Gas Initial Productivity, MMcf/d



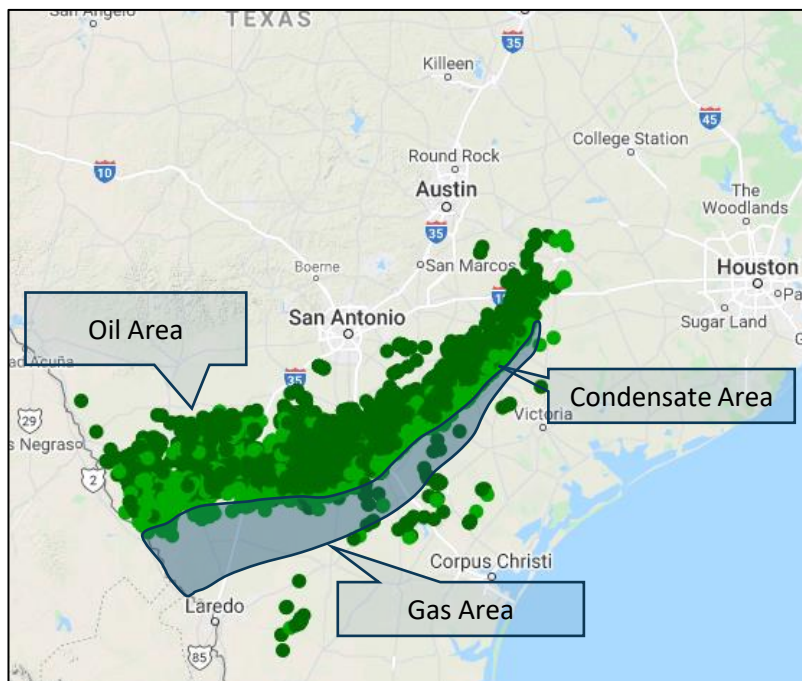
Associated Gas EUR, Bcf



EAGLE FORD TIGHT OIL

Wells drilled since 2014

● Oil ● Condensate and volatile oil



Eagle Ford consists of crude oil, condensate, and gas windows. Wells classified as oil produce condensate as well.

Location: South West Texas

Number of oil wells drilled since 2010: ~19,000

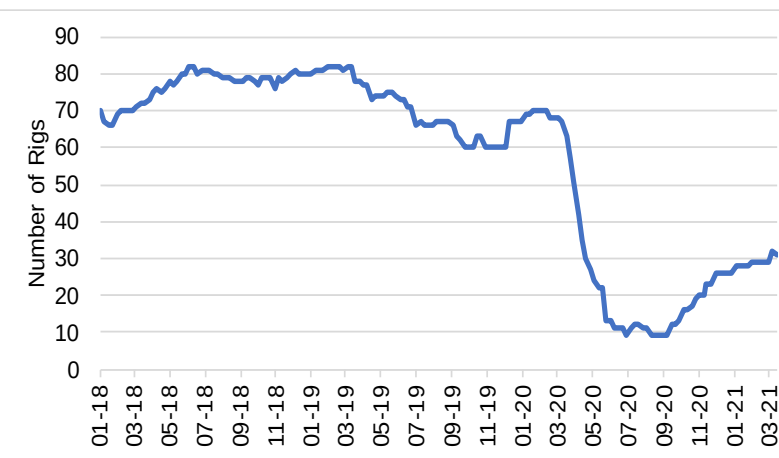
Average New Well Initial Productivity in 2020: 800 Bbl/d

Peak Production: 2015 (1,370 MBbl/d)

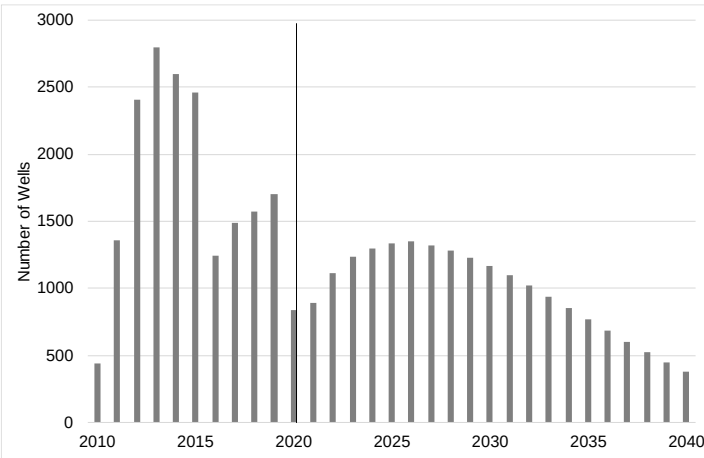
Average First Year Decline in 2020: 82%

Major Operators: EOG Resources, Chesapeake, Marathon Oil, Murphy, Carrizo Oil and Gas

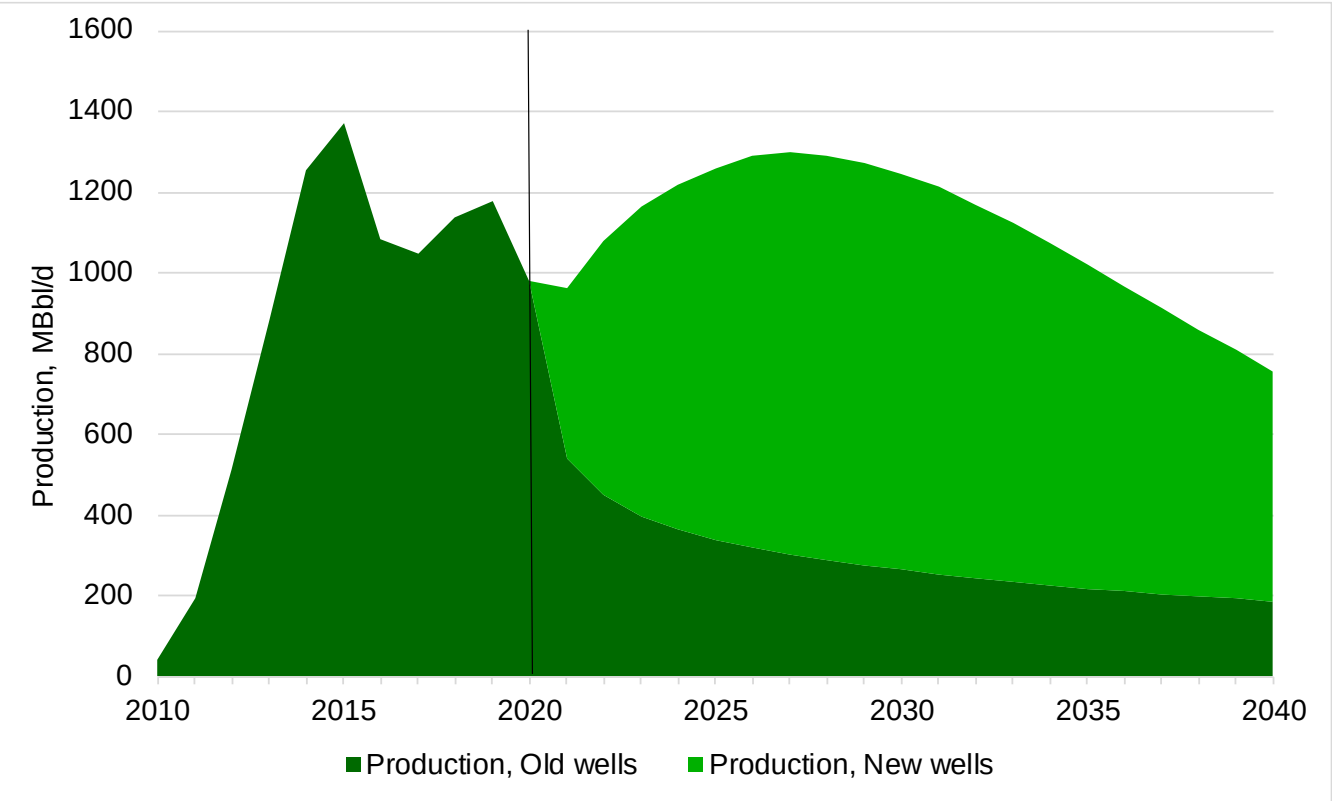
Historical Rig Count



Number of New Wells

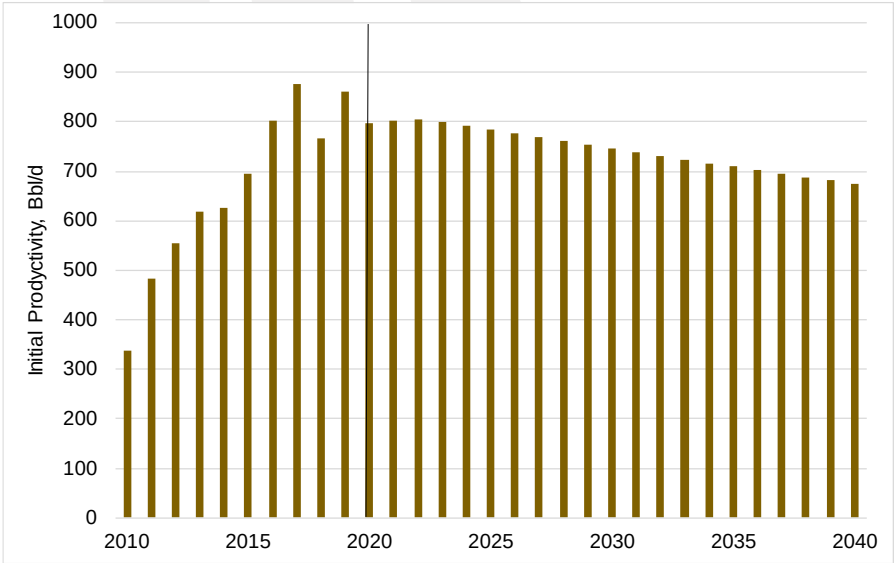


EAGLE FORD PRODUCTION

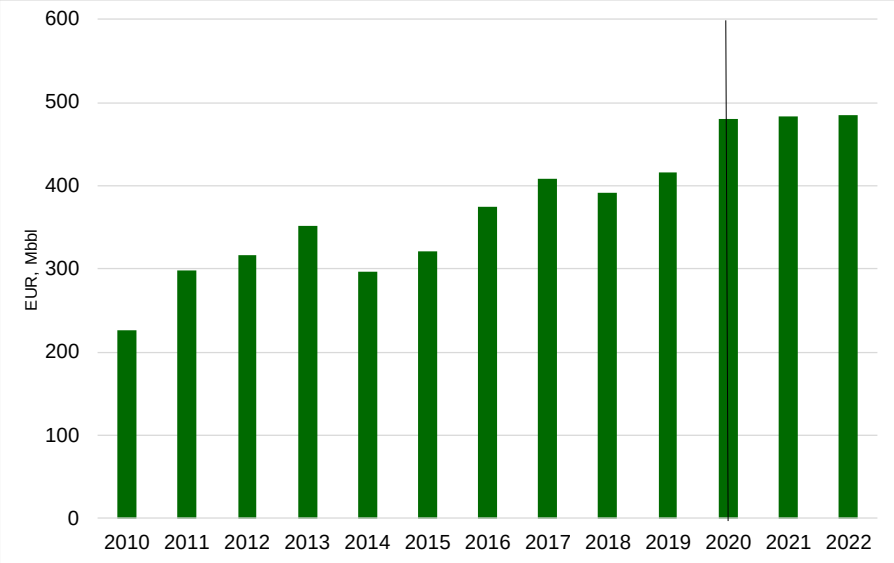


Eagle Ford oil production peaked in 2015 at 1,370 MBbl/d. It has dropped to less than 1,000 MBbl/d in 2020 and is expected to start growing again post 2021, reaching near previous peak (1,300 MBbl/d) in 2027.

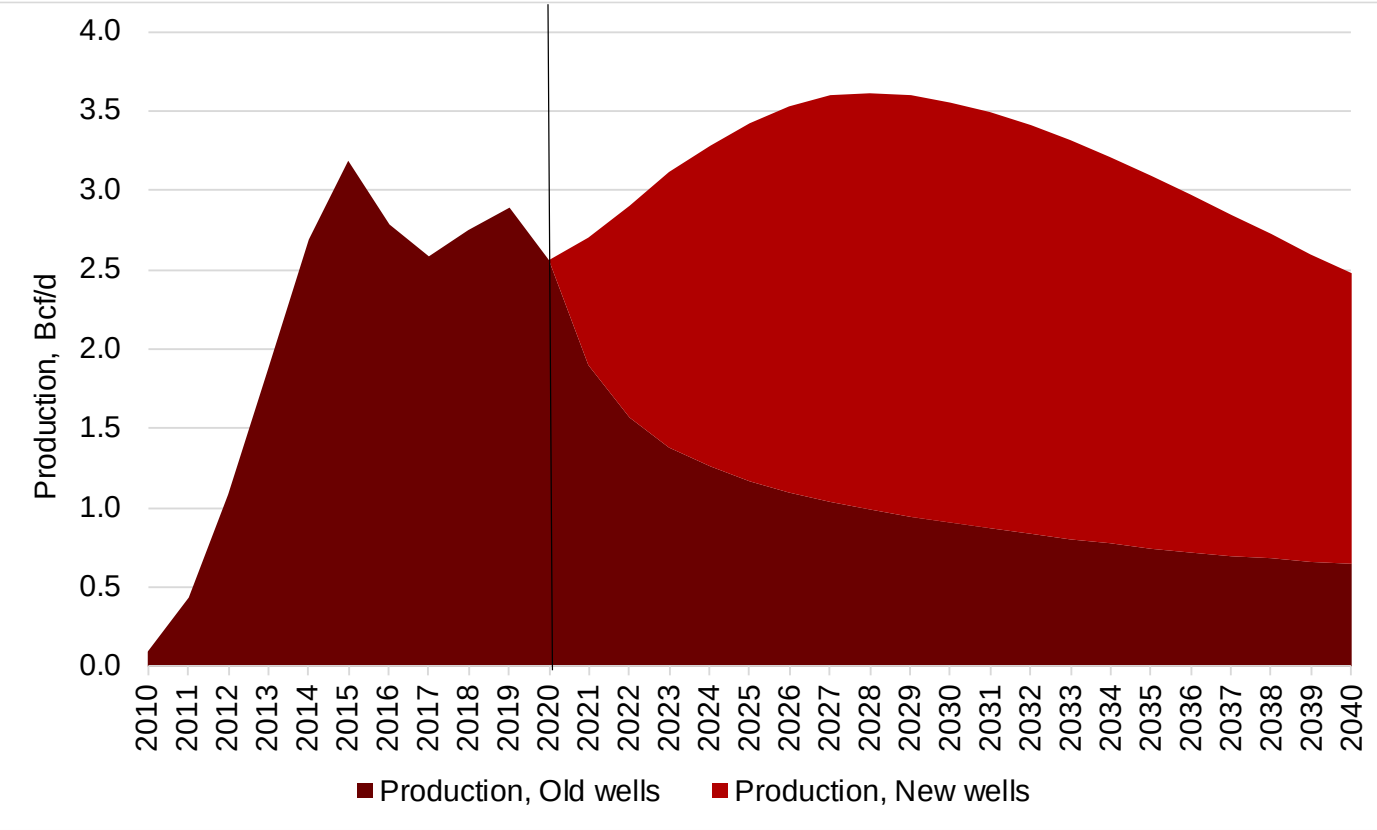
Oil Well Initial Productivity, Bbl/d



Well EUR, MBbl

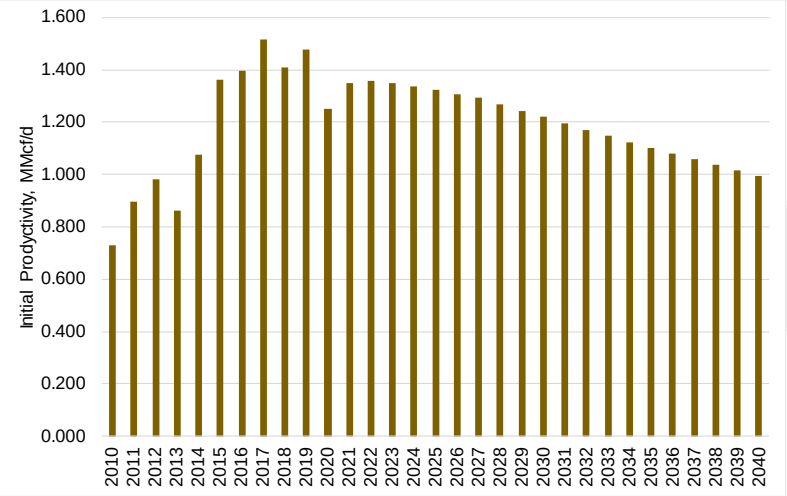


EAGLE FORD ASSOCIATED GAS PRODUCTION

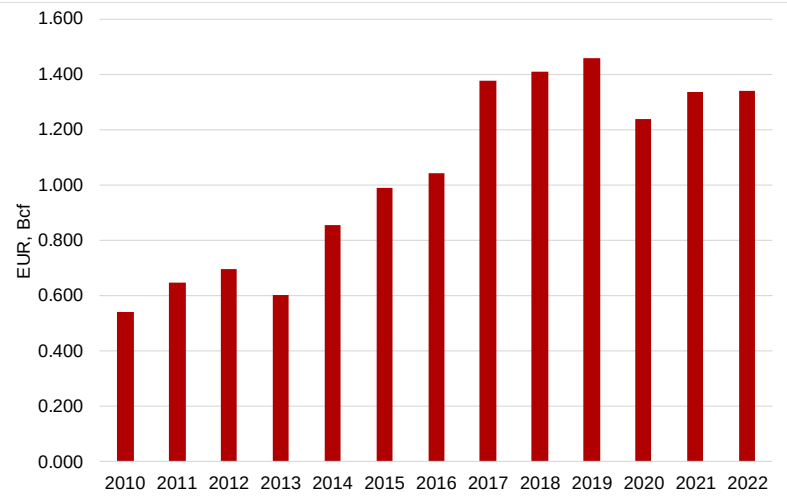


Eagle Ford raw associated gas production will reach its peak of 3.6 Bcf/d in 2027-2029 range. Eagle Ford also has additional gas production from gas and condensate wells - with the total 2020 raw gas production in Eagle Ford area of 6.3 Bcf/d.

Associated Gas Initial Productivity, MMcf/d

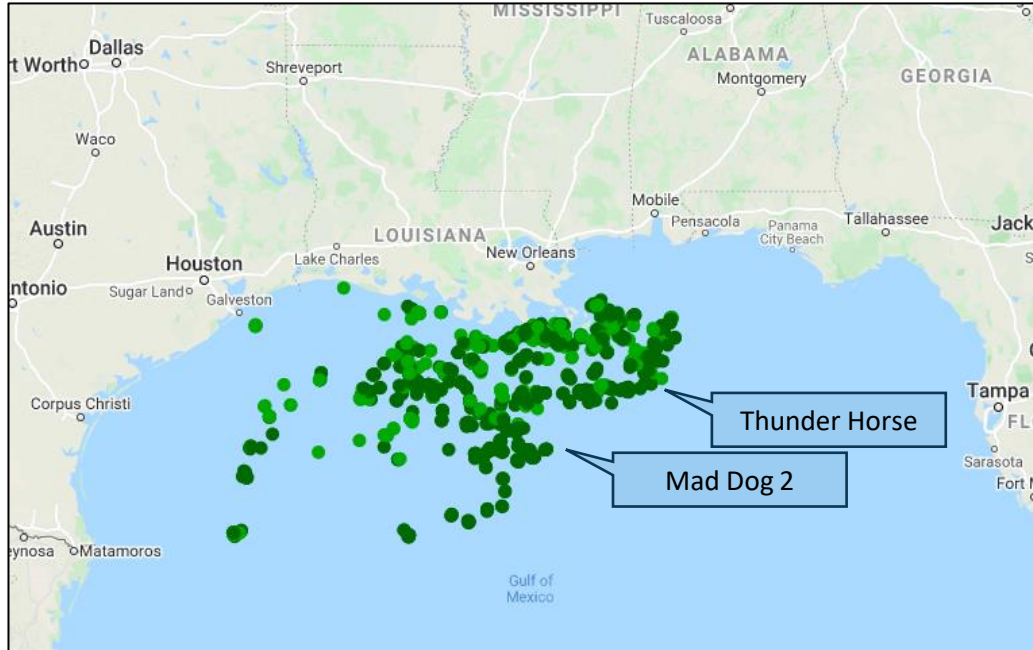


Associated Gas EUR, Bcf



GULF OF MEXICO OFFSHORE OIL

Active oil wells on January 2021 ● Black oil ● Volatile oil



On January 27, 2021 President Joe Biden's temporary stopped issuing new permits on federal lands, potentially impacting Gulf of Mexico's offshore production. Currently US government is reviewing its leasing program.

Number of wells drilled since 2010: ~865

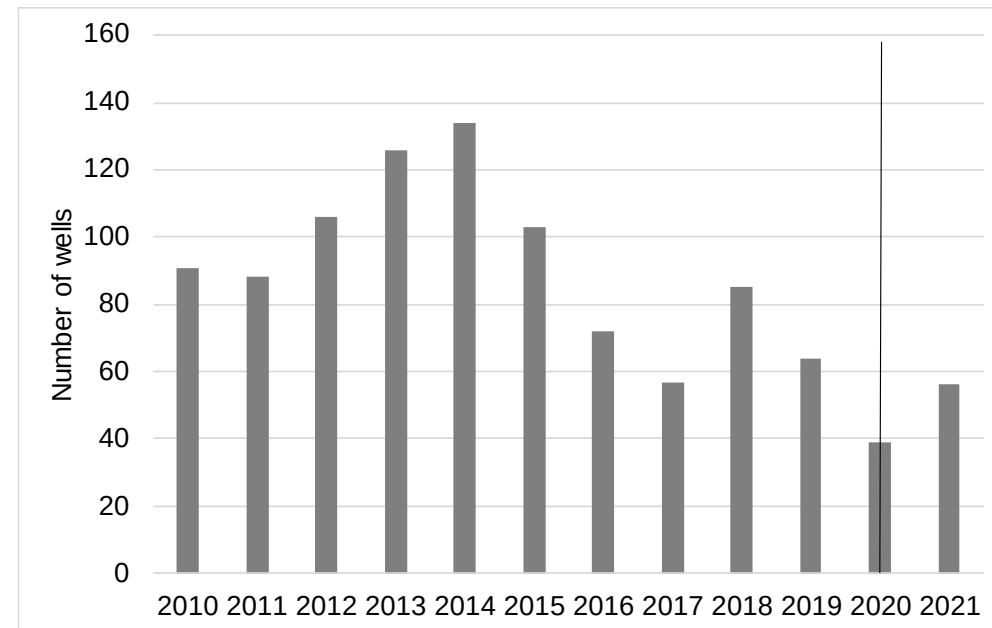
Average New Well Initial Productivity in 2020: 5,600 Bbl/d

Peak Production: 2019 (1,850 MBbl/d)

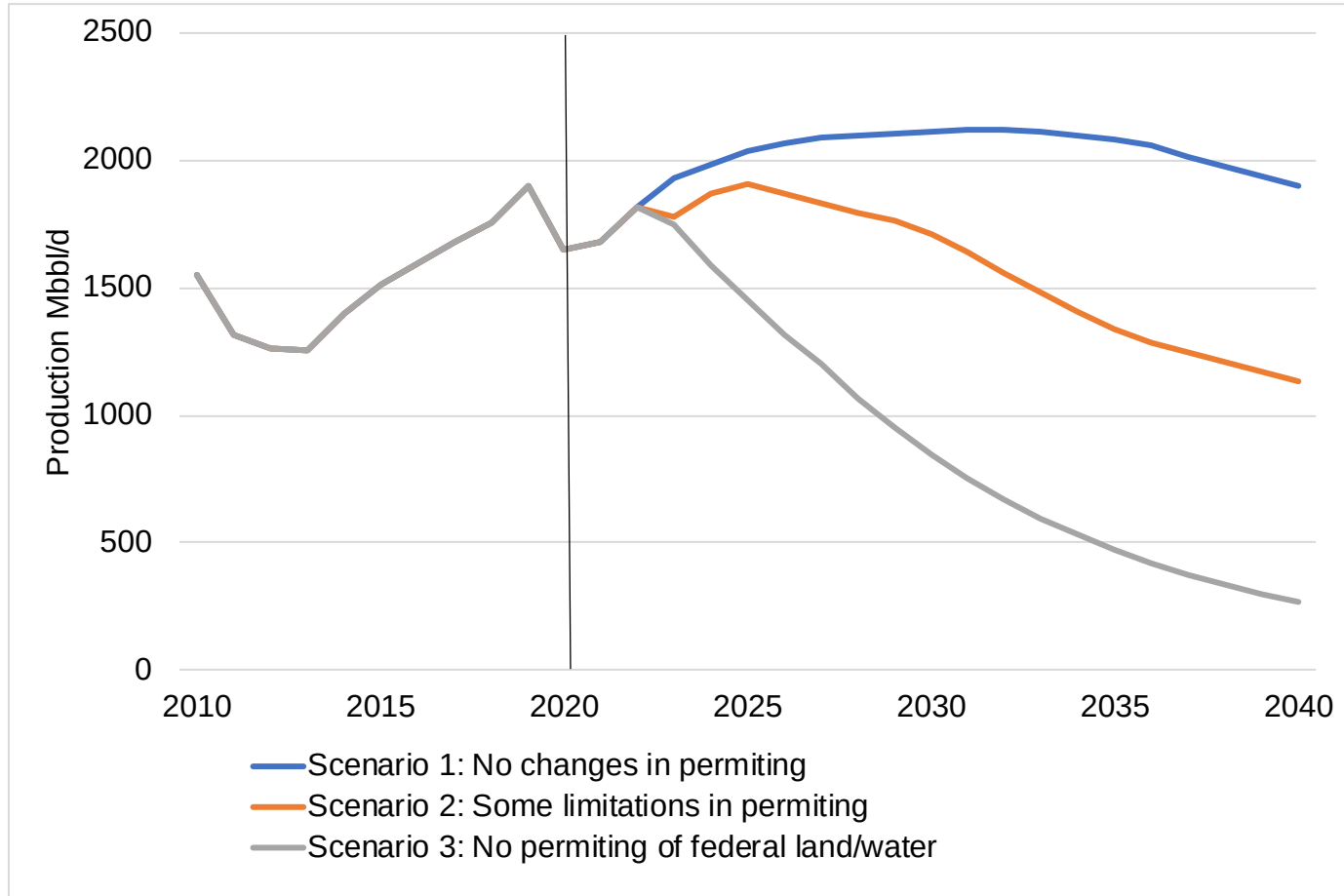
Average First Year Decline in 2020: 37%

Major Operators: Shell, Chevron, Occidental, Murphy, BP, LLOG Exploration, Hess

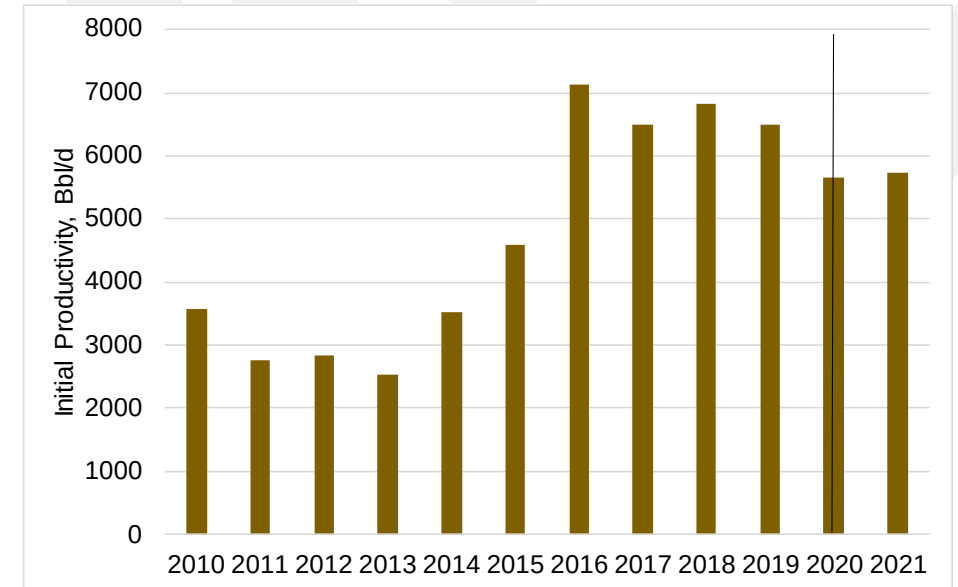
Gulf of Mexico Well Count



GULF OF MEXICO OFFSHORE OIL PRODUCTION



Oil Well Initial Productivity, Bbl/d

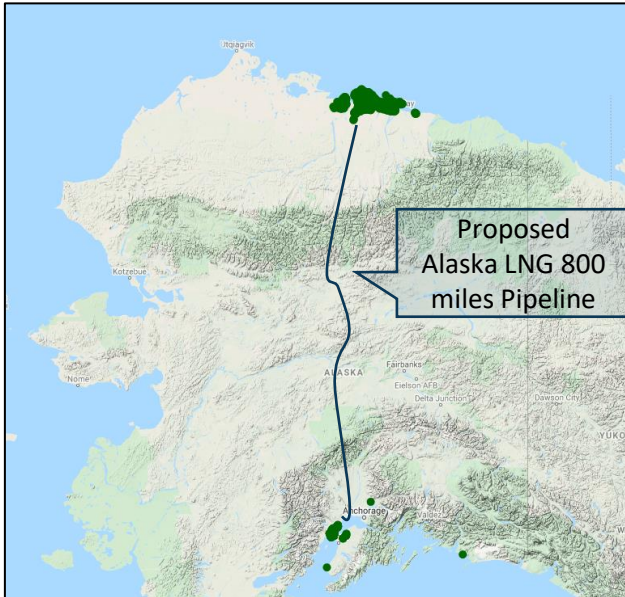


Major New Projects:

- Mad Dog 2 project by BP (140,000 Bbl/d) and Thunder Horse South Phase 2 (50,000 Bbl/d), were scheduled to come online Q4 2021 however, slippage into 2022 is expected.
- Shell Vito project (100,000 Bbl/d) has been postponed to 2022 due to covid delays.
- North Platte by Total (75,000 Bbl/d) is expecting FID

ALASKA OIL

Wells drilled in US portion of the basin since 2010



Active development started in 1977 in North Slope following by South Slope 1981. Currently development is very limited. Associated gas in Alaska mostly injected because of lack of gas pipeline.

Location: North and South Shore of Alaska

Number of wells drilled since 2010: ~410

Average New Well Initial Productivity in 2020: 1,340 Bbl/d

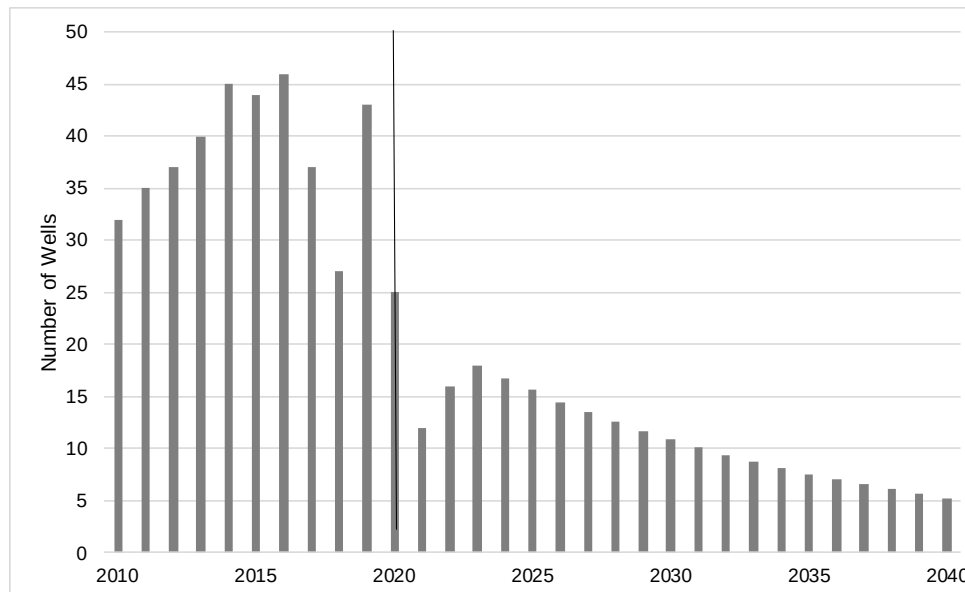
Peak Production: 1988 (2,000 MBbl/d)

Average First Year Decline in 2020: 47%

Major Operators: Hilcorp Alaska LLC*, ConocoPhillips, BlueCrest Alaska

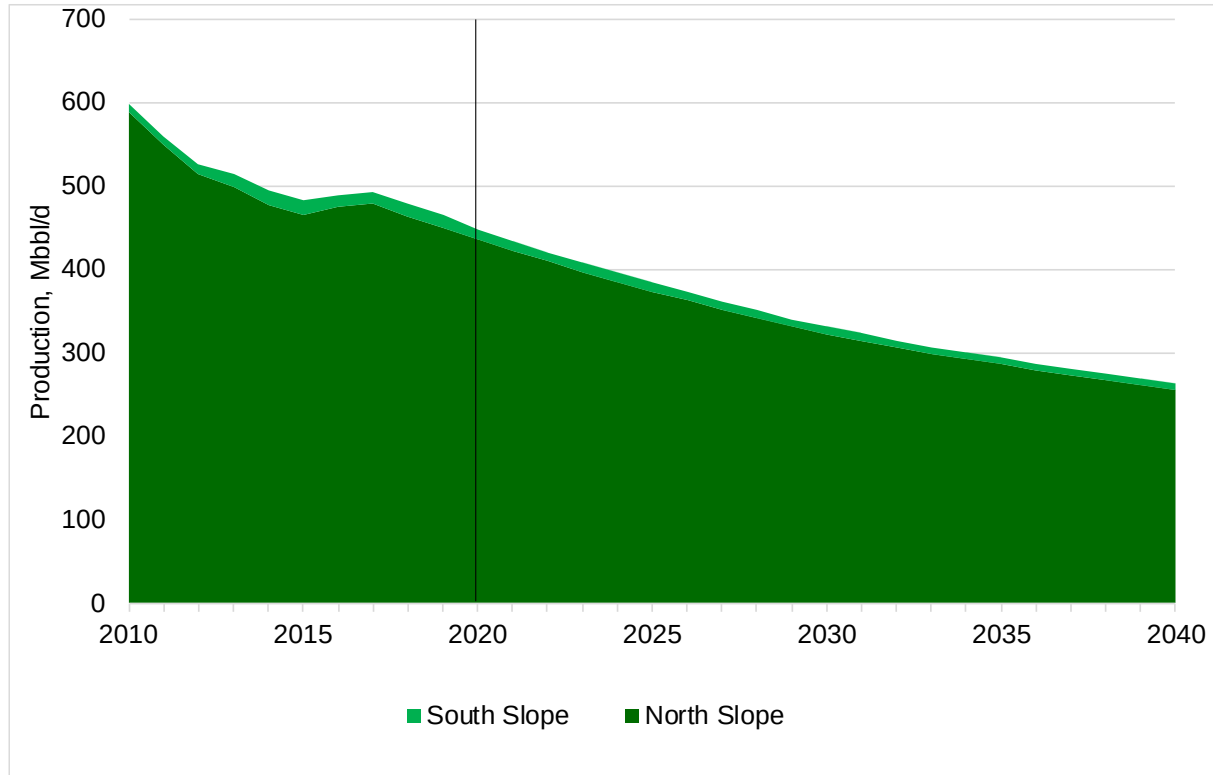
* In 2020 BP sold its Alaska operation to Hilcorp. It includes 49.1% ownership share of the Trans Alaska Pipeline

Number of New Wells



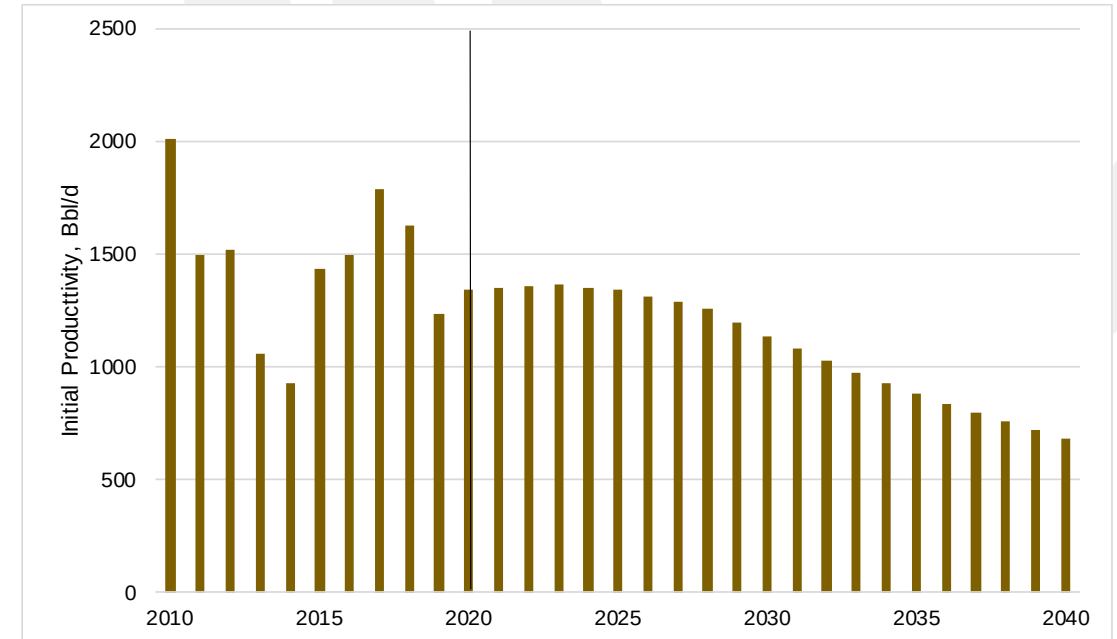
Alaska LNG is proposed to bring 3.5 Bcf/d of associated gas from North Shore to Nikiski (South Shore). If pipeline, gas processing facilities and LNG facilities are built, it may boost oil drilling.

ALASKA OIL PRODUCTION



The Trans-Alaska Pipeline has a capacity of 2 MMBbl/d, with declining utilisation cold weather operations become challenging to maintain reliable throughput. Incorrays forecast assumes that the pipeline will continue to be operational during the forecast period, overcoming flow challenges with improvements and toll increases.

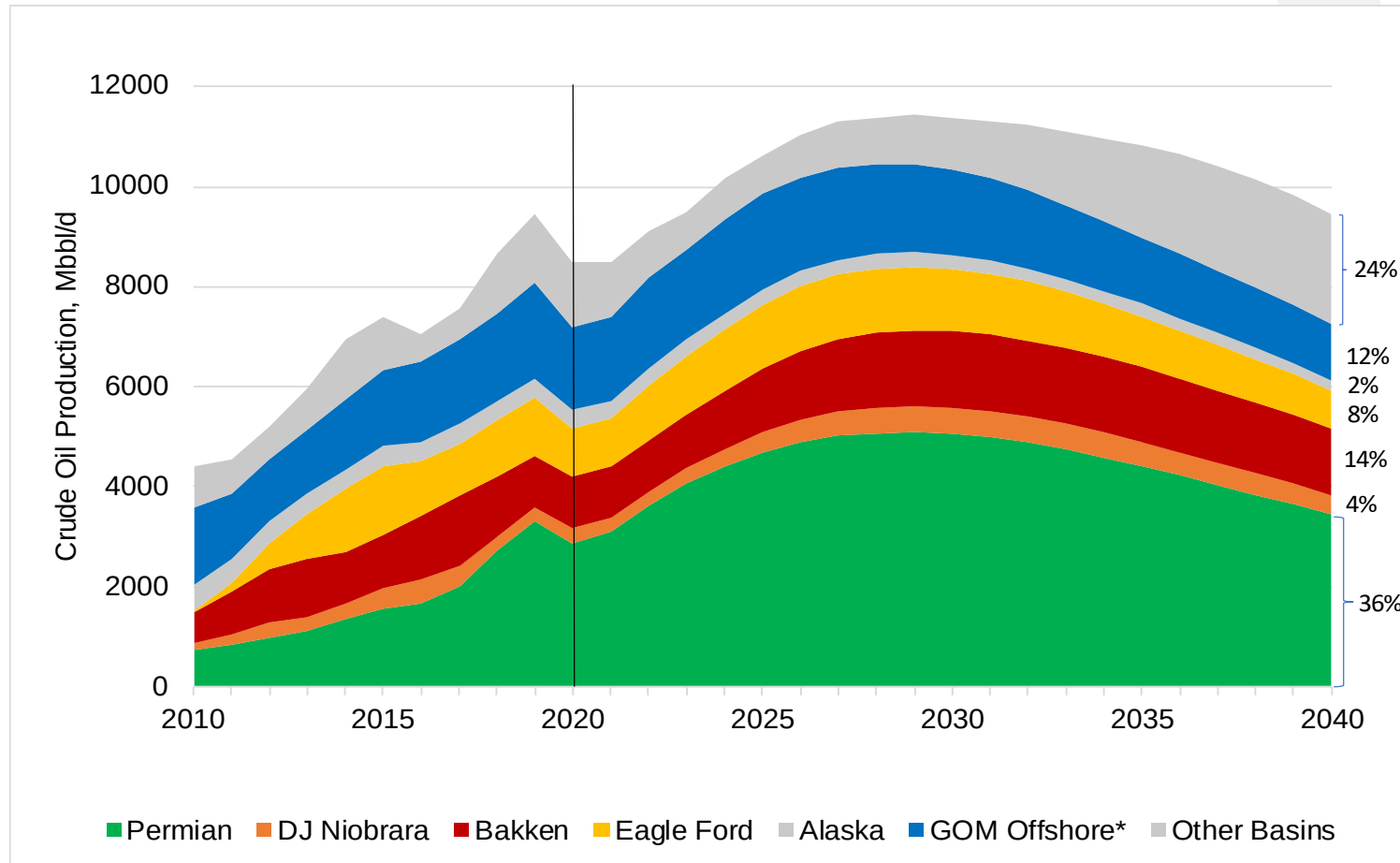
Oil Well Initial Productivity, Bbl/d



Production forecast does not include upside potential from Alaska LNG. Existing production is declining and will reach 250 MMBbl/d in 2040 unless Alaska LNG has become operational.

In May 2020 U.S. approves \$43B Alaska LNG project which still seeks investors. Alaska LNG has a number of advantages: lower gas production cost, proximity to Asian market, and LNG liquefaction cost advantaged by cooler ambient temperatures.

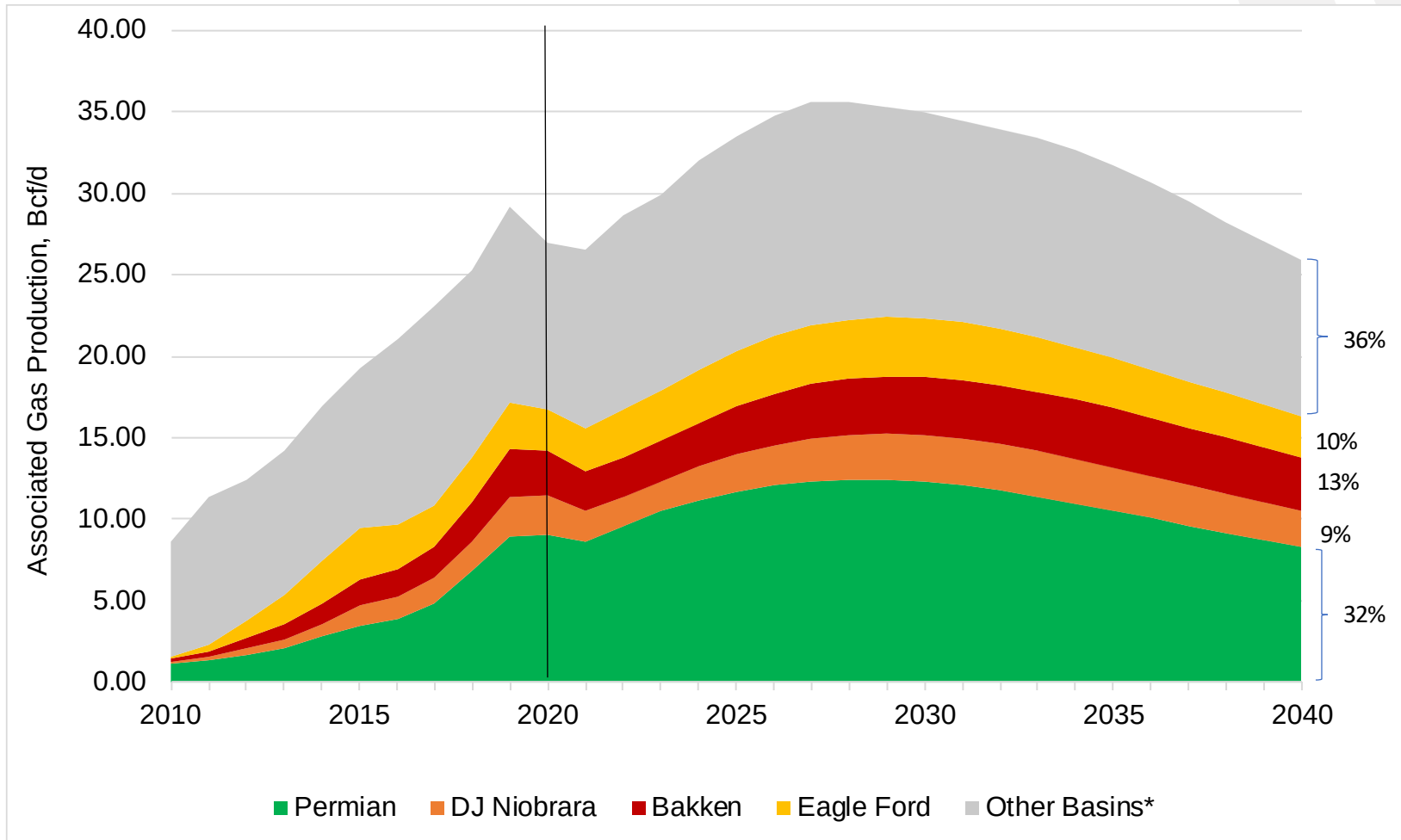
TOTAL US OIL PRODUCTION



* Some limitations in permitting scenario for GOM offshore drilling

- In 2020 almost 61% US Crude oil production came from Tight Oil basins: Permian, Eagle Ford, DJ Niobrara, and Bakken
- US crude oil production will continue to grow and reach 11,400 MBbl/d in 2029
- US crude oil production will decline after 2029 due to maturity of Tight Oil basins

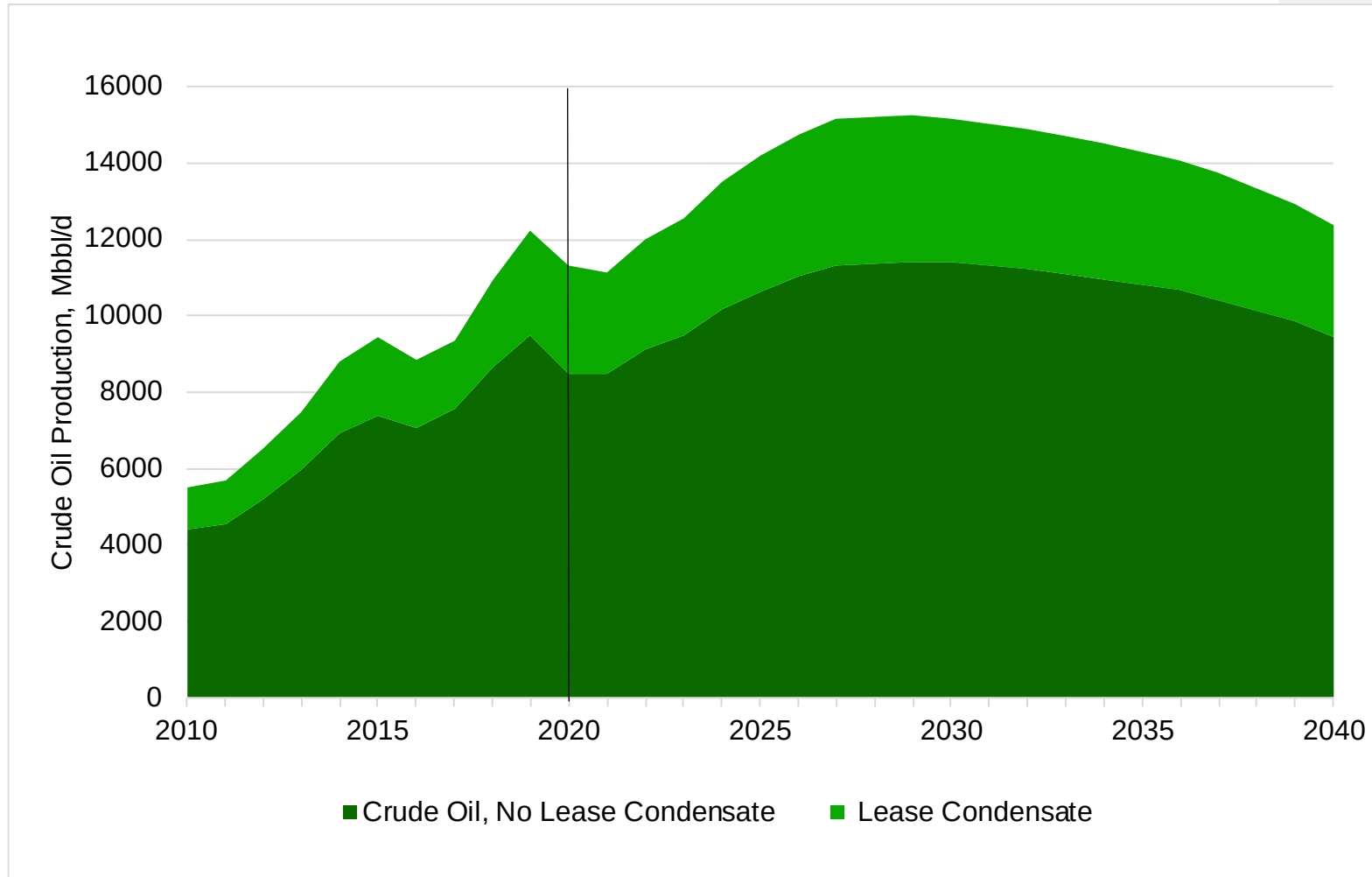
TOTAL US RAW ASSOCIATED GAS PRODUCTION



- Raw associated gas production in US increased to 29 Bcf/d in 2019 up from 8.5 Bcf/d in 2010 – 2.4 times growth due to the increase in Tight Oil production
- In 2019 almost 1.5 Bcf/d of gas or 5% of total raw associated gas production was vented or flared due to lack of takeaway or processing capacity
- Incorrays estimates that dry associated gas production in 2027-2030 will be 26.5 Bcf/d, up from 22 Bcf/d in 2019

* Includes associated gas production from condensate well in all basins

CRUDE OIL VS. LEASE CONDENSATE PRODUCTION



- Lease condensate is defined as field liquids production with API greater than 45 degrees from wells classified as oil or condensate.
- Many wells produce oil, gas, and condensate at this time. Ratio of crude oil and condensate changes over time. Some states don't report or partially report oil production by API gravity. Therefore, this chart represents only *estimate* of lease condensate
- Lease condensate production grew to 2,820 MBbl/d in 2020 from 1,070 MBbl/d in 2010 due to strong focus on drilling in condensate rich Tight Oil Basins

WHY INCORRYS INFORMATION SYSTEM



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