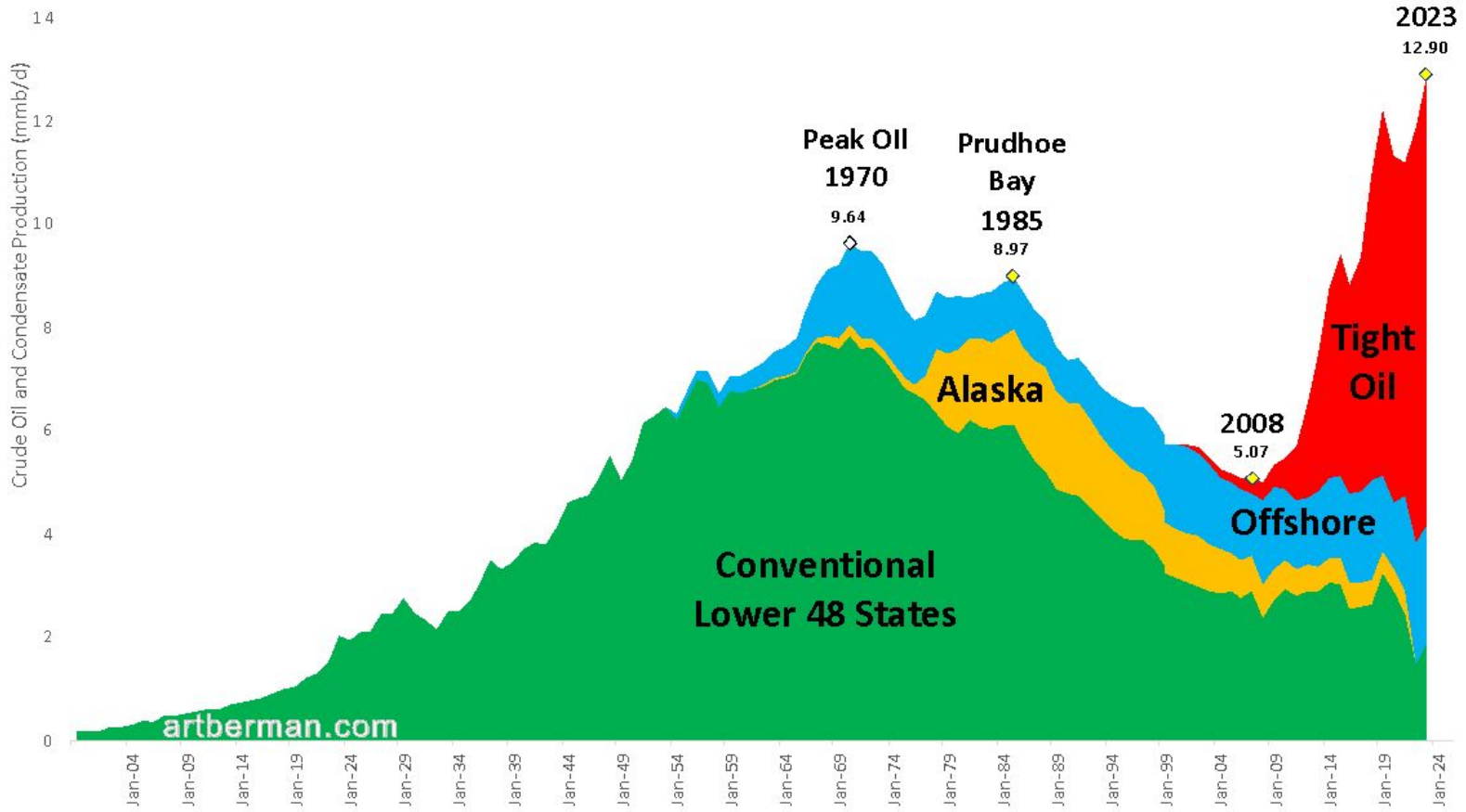


- Shale plays saved U.S. oil production from a peak-oil outcome in the first decade of this century.
- Today, U.S. output has regained pre-Covid highs.
- 70% of U.S. oil is tight oil and 47% is from the Permian basin.
- EIA expects 2024 oil output to average 13 mmb/d.
- Much of this good news is about to change.
- An 18-24 month lag between drilling and first oil production masks the potential urgency of the situation.
- Permian per-well EUR has fallen about 50% since 2019.
- The most-likely reason is that the play has been over-drilled and wells are interfering with each other. This was anticipated by engineering studies but operators believed that the Permian basin was different.
- 2023 wells require about \$100 per barrel oil to break even including all costs at an 8% discount rate.
- Bakken and Eagle Ford well performance has fallen by similar amounts.
- The situation is one of diminishing returns. Production may continue to increase or flatten if enough wells are drilled.
- This is the pattern for all fields and plays, and was anticipated by many a decade ago.
- The oil and gas industry struggles for outside investment even with record free cash flow in 2022 and 2023.

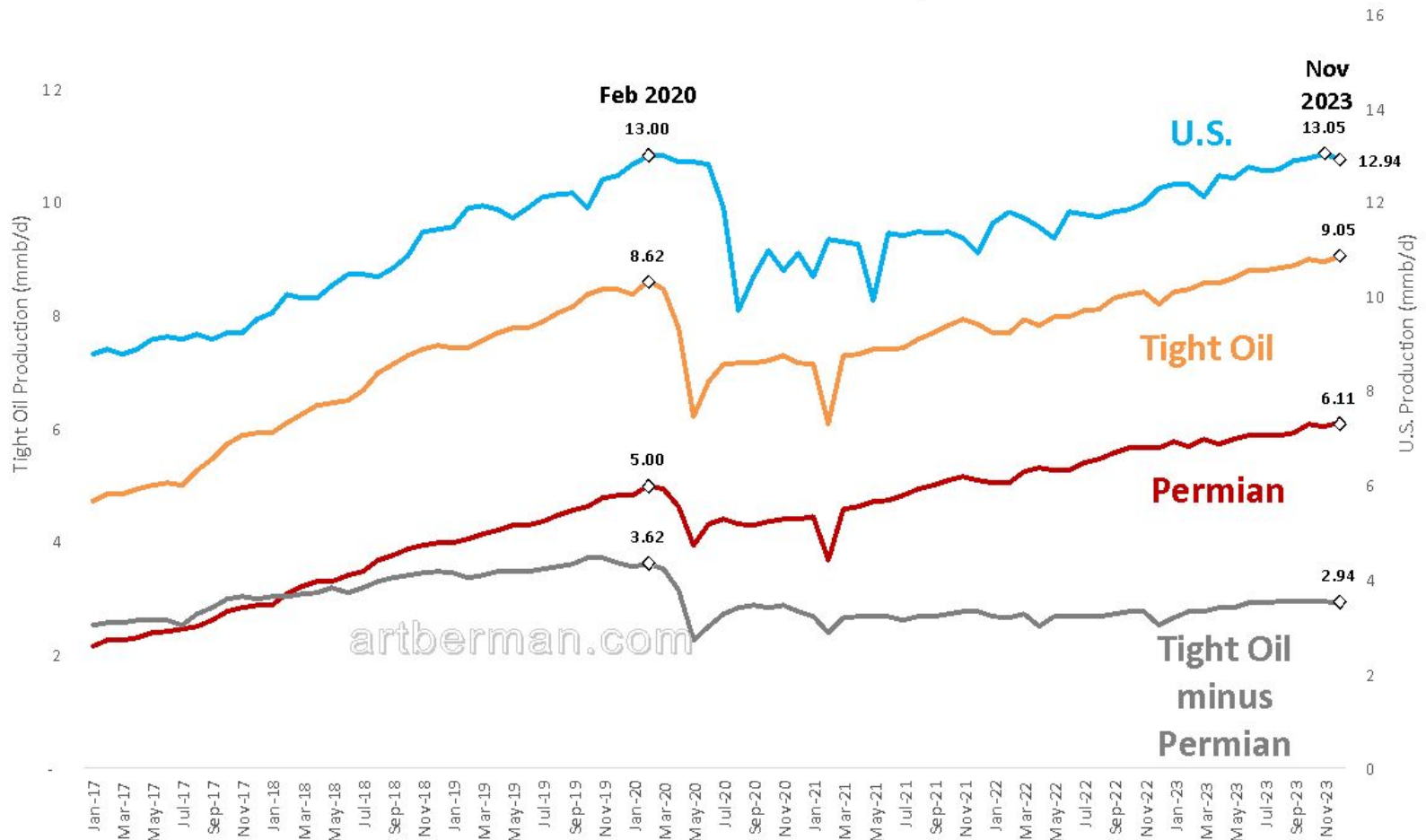
## Tight oil estimated to be 69% of U.S. oil production in 2023 Alaska fading toward zero



Source: EIA, Enverus & Labyrinth Consulting Services, Inc.

Monthly Updates/CRUDE OIL PRODUCTION ANNUAL

**U.S. oil output slightly exceeded its February 2020 peak of 13 mmb/d in November 2023**  
**Tight oil accounts for 70% of U.S. output and Permian is 68% of tight oil output**  
**Permian accounts for 47% of U.S. oil production**

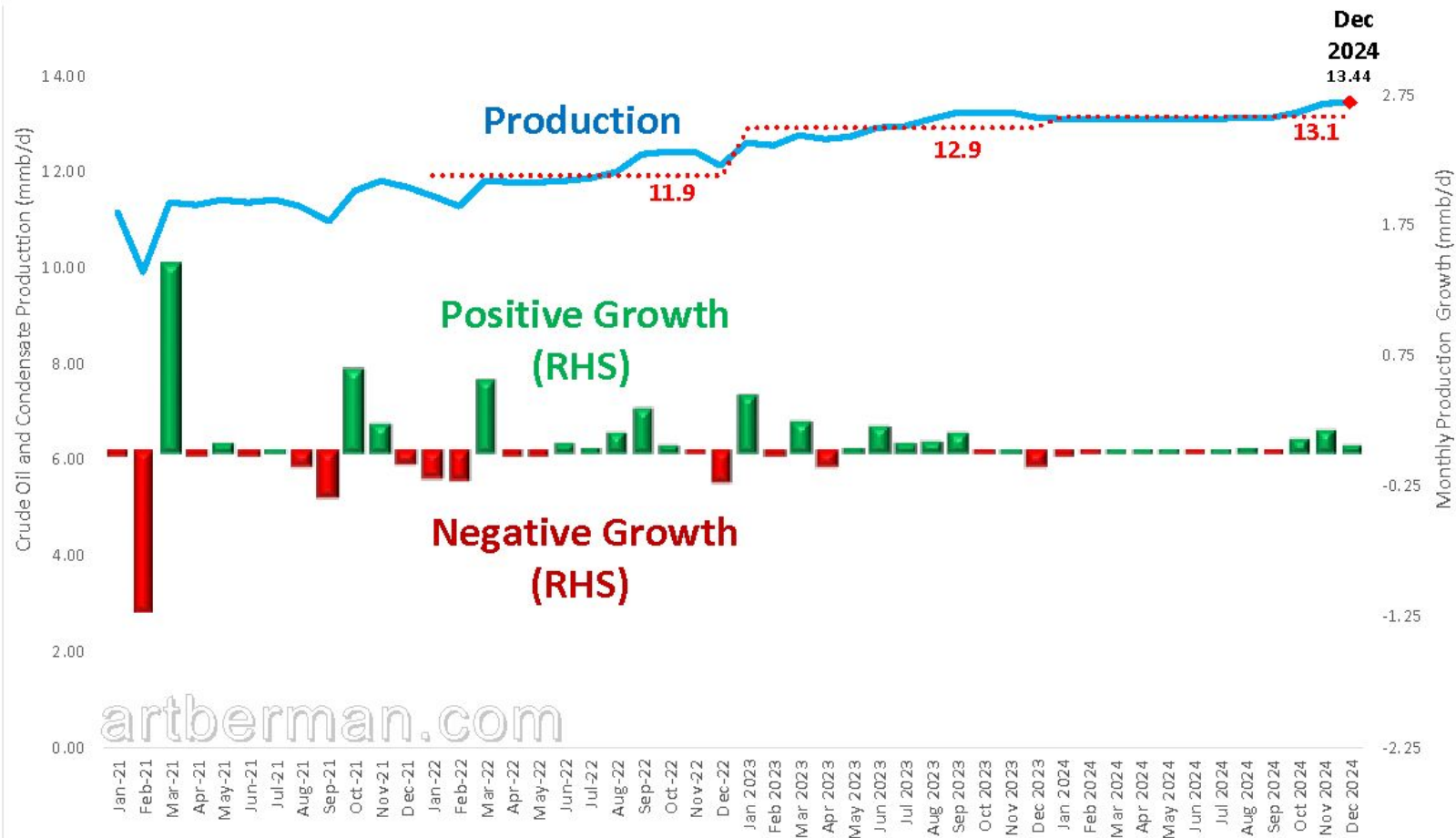


Source: EIA & Labyrinth Consulting Services, Inc.

EIA Current/DUC-DPR/dpr-data\_MASTER

# EIA expects U.S. oil production to average 13.1 mmb/d in 2024

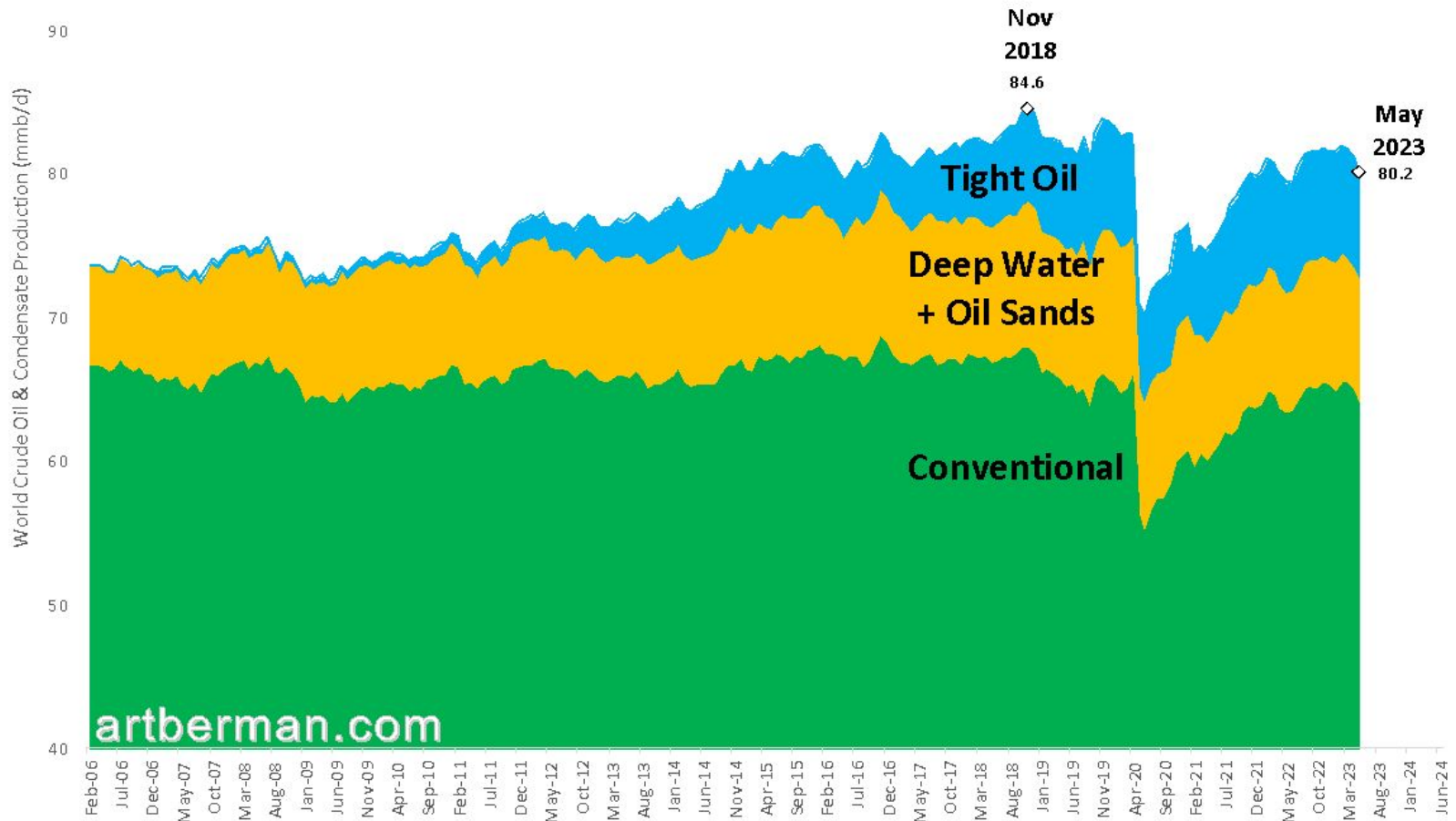
## Stronger production growth in the last quarter of 2024 to 13.44 mmb/d



Source: EIA STEO & Labyrinth Consulting Services, Inc.

EIA Current/STEO/STEO Master 2022

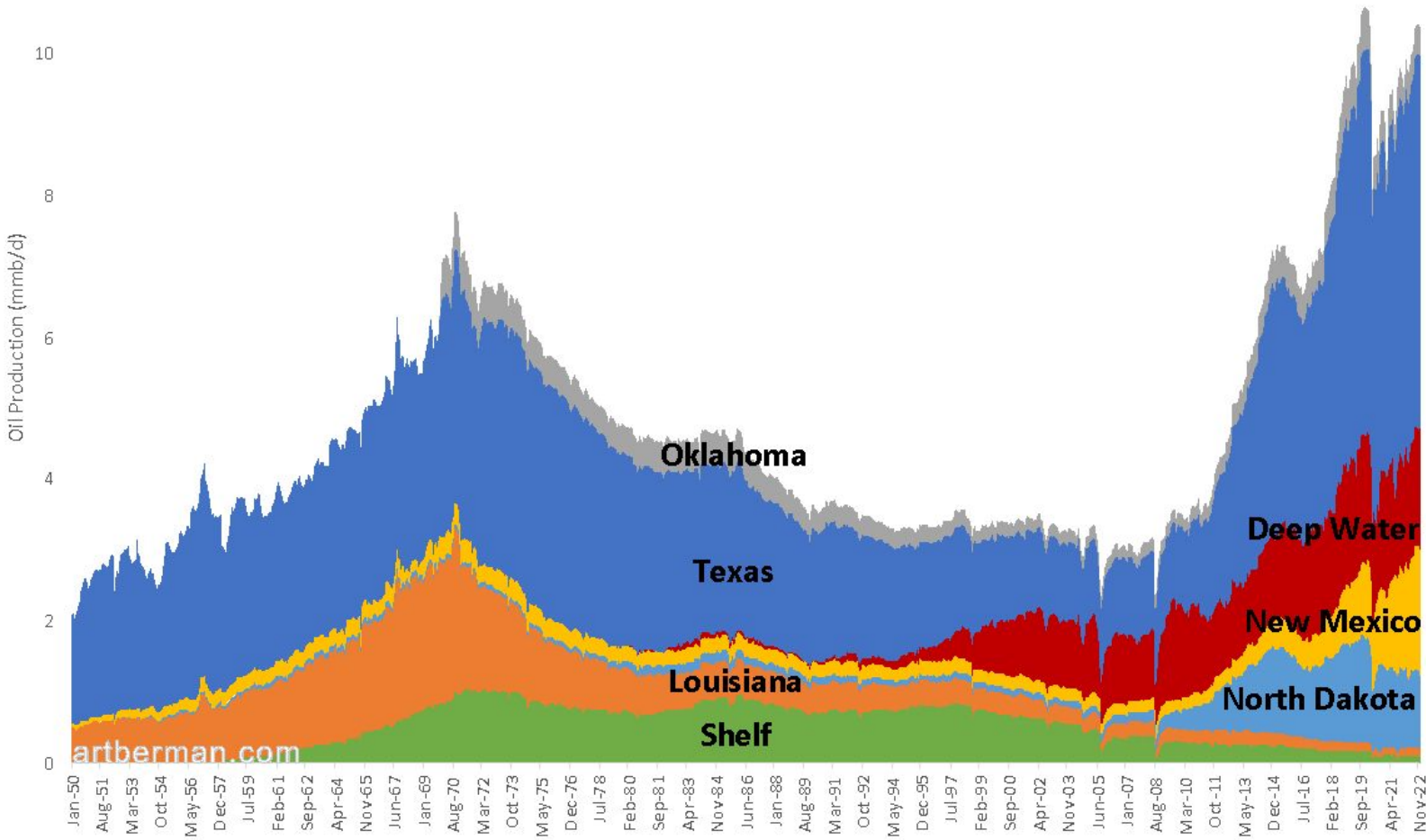
# U.S. tight oil has accounted for all world crude + condensate growth since 2010



Source: EIA, Cansim, Enverus & Labyrinth Consulting Services, Inc

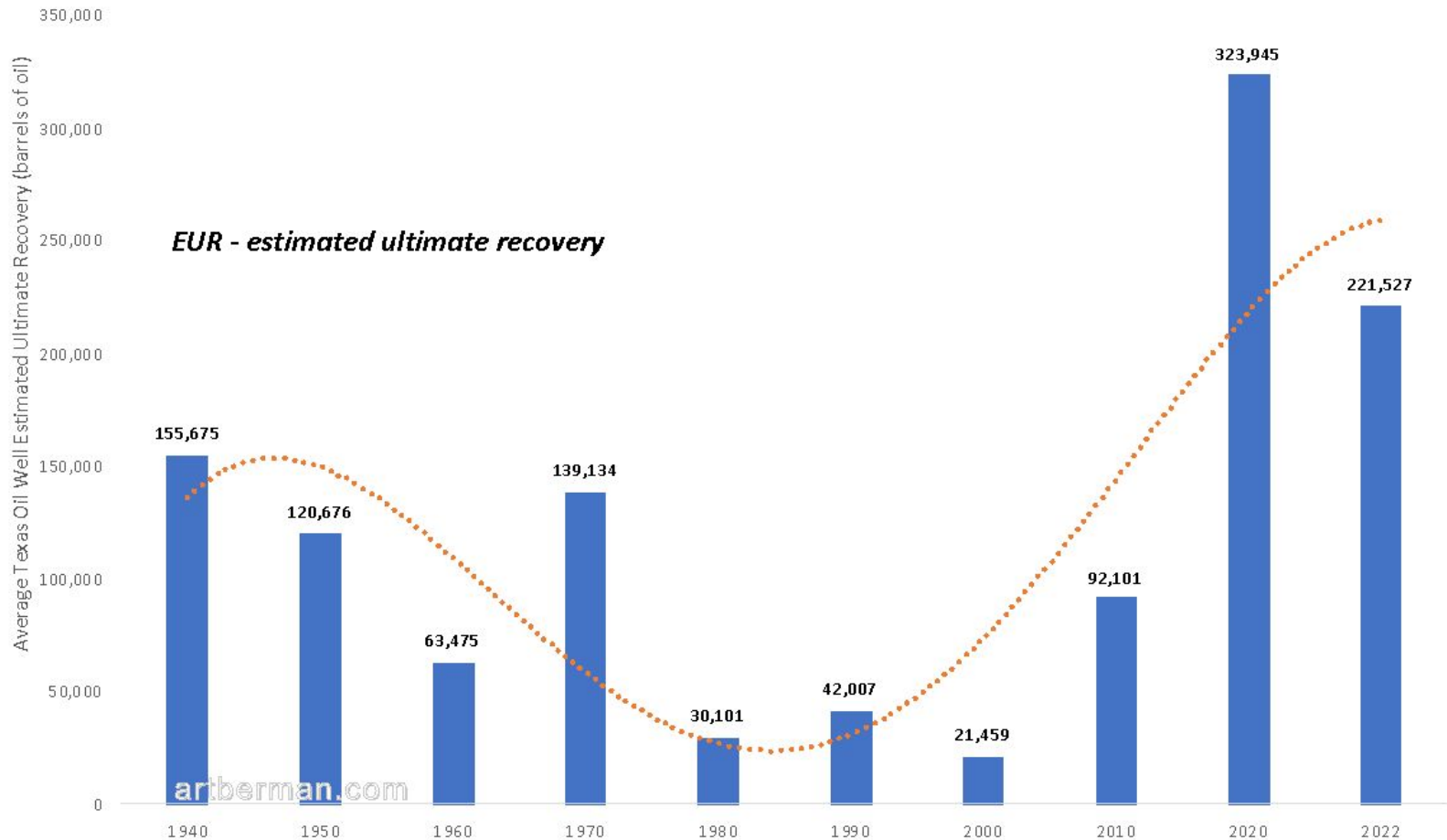
EIA/EIA International/International\_data MASTER\_2020.xlsx

**Texas has always dominated U.S. oil production**  
**Deep water, New Mexico and North Dakota production have increased**  
**Shelf, Louisiana and Oklahoma have decreased**



Source: Enverus & Labyrinth Consulting Services, Inc.

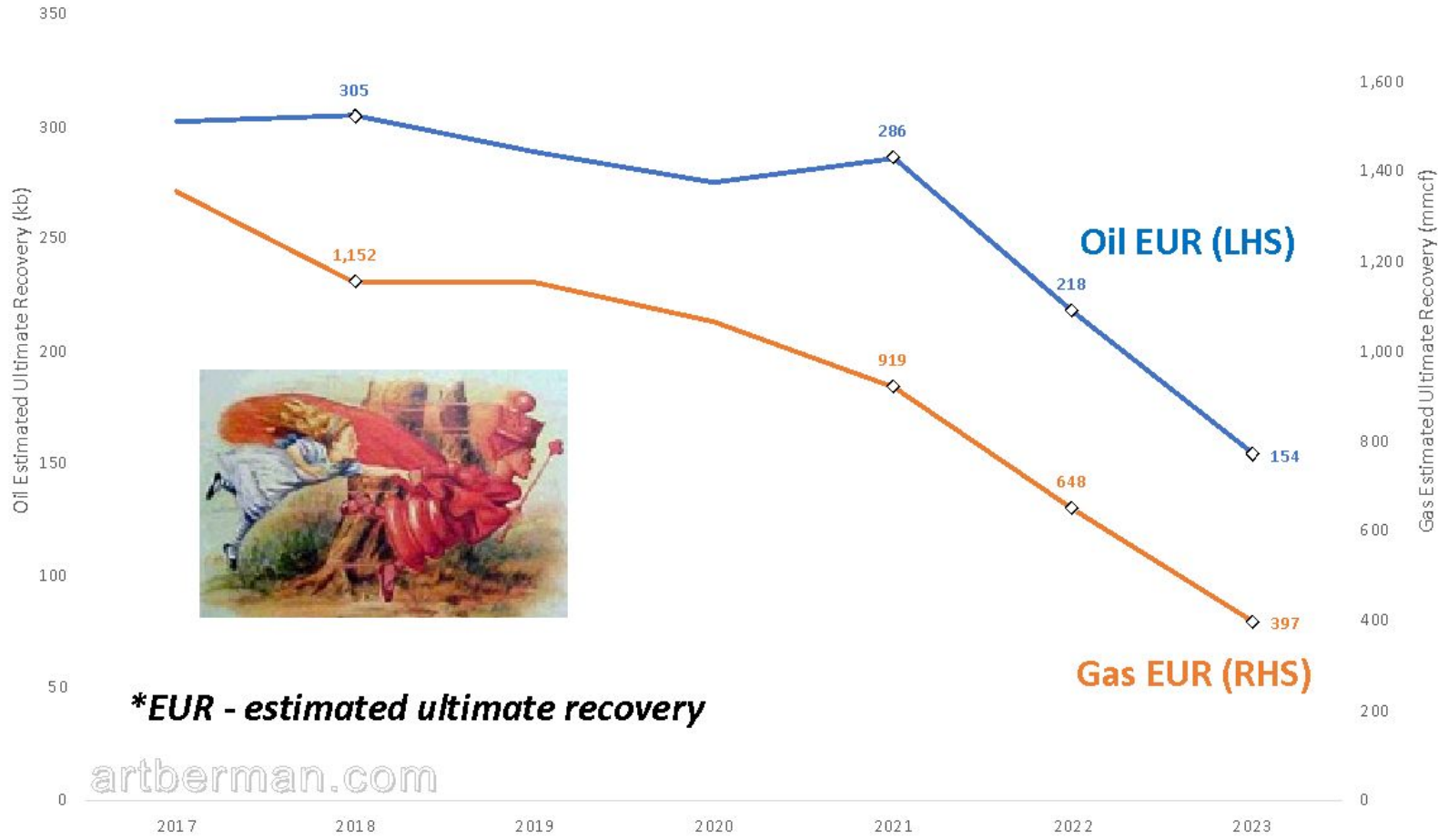
**EUR\* for the average Texas well decreased to only 21,000 barrels of oil in 2000 before increasing to 324,000 barrels in 2020 and decreasing to 222,000 barrels in 2022**



Source: Enverus & Labyrinth Consulting Services, Inc.

Oil & Gas General/TX-ND-NM-OK-FO/TX NOV 2023

**Permian basin well performance has decreased by about 50% since 2019**  
**Oil EUR\* has fallen -151,000 barrels (-50%) from 305,000 to 154,000 barrels per well**  
**Gas EUR has fallen -755 million cubic feet (-66%) from 1,152 to 397 mmcf per well**



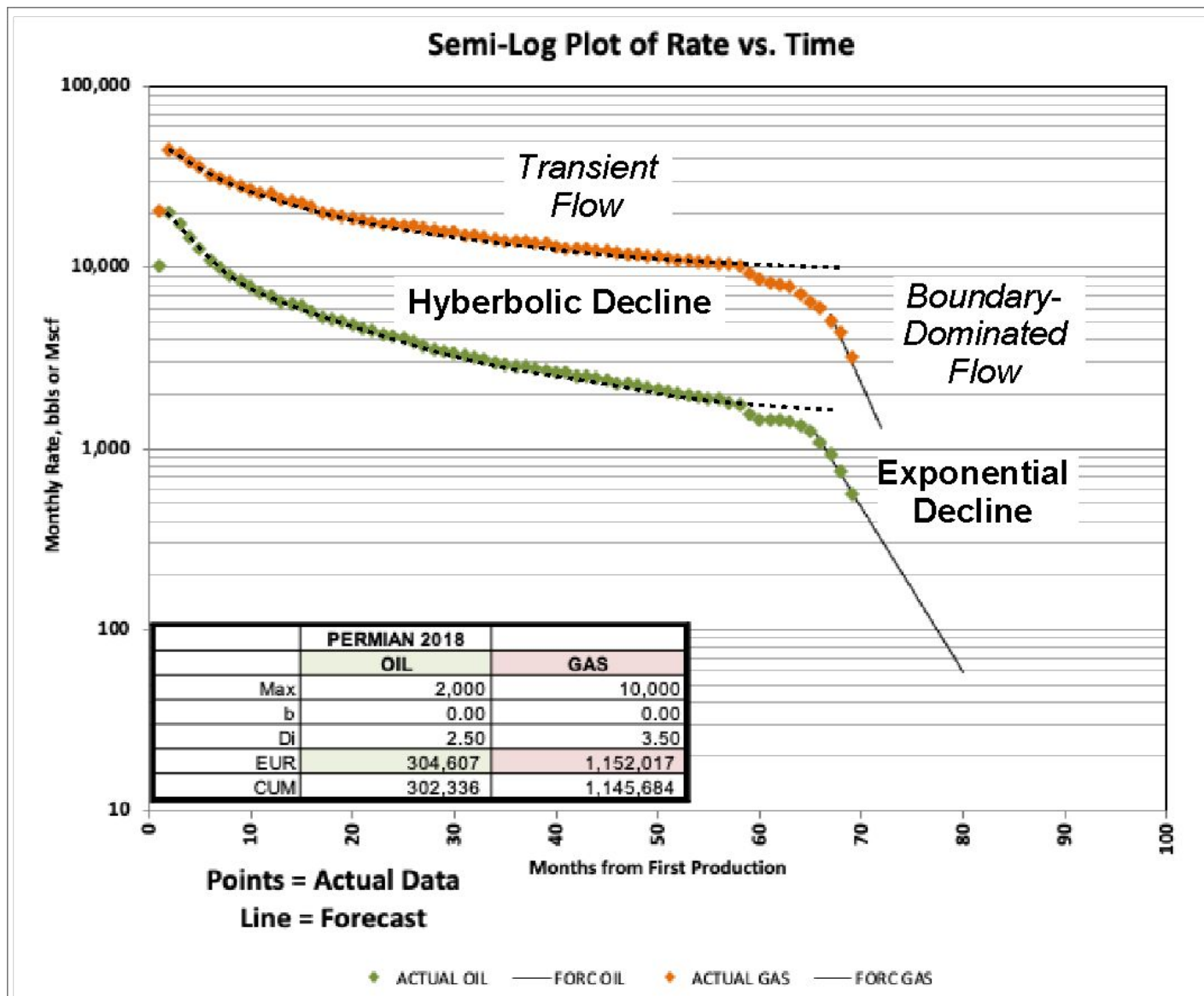
**\*EUR - estimated ultimate recovery**

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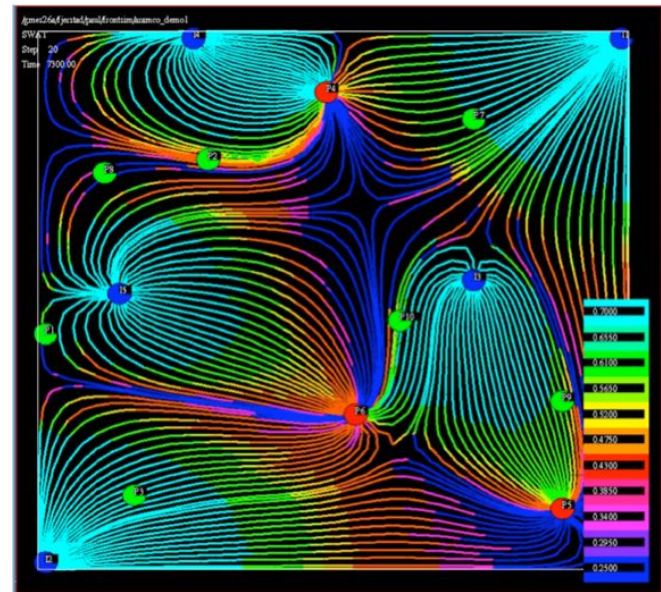
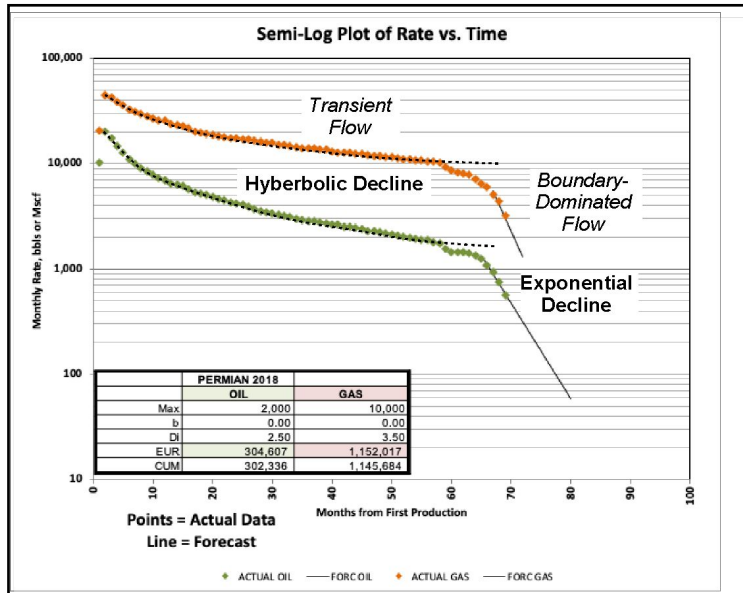
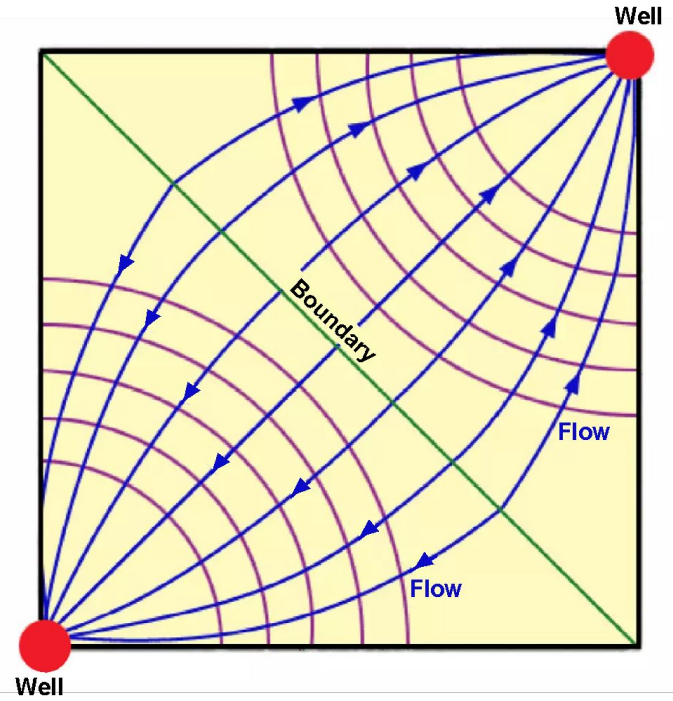
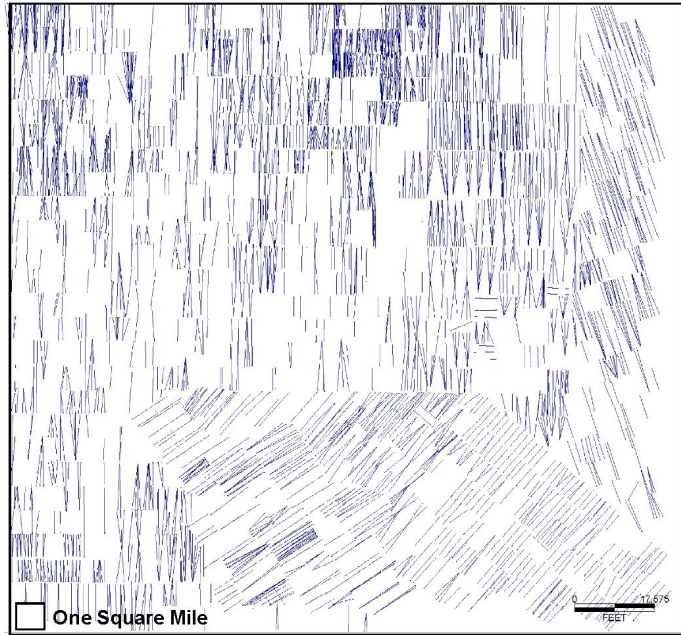
Source: Enverus & Labyrinth Consulting Services, Inc.



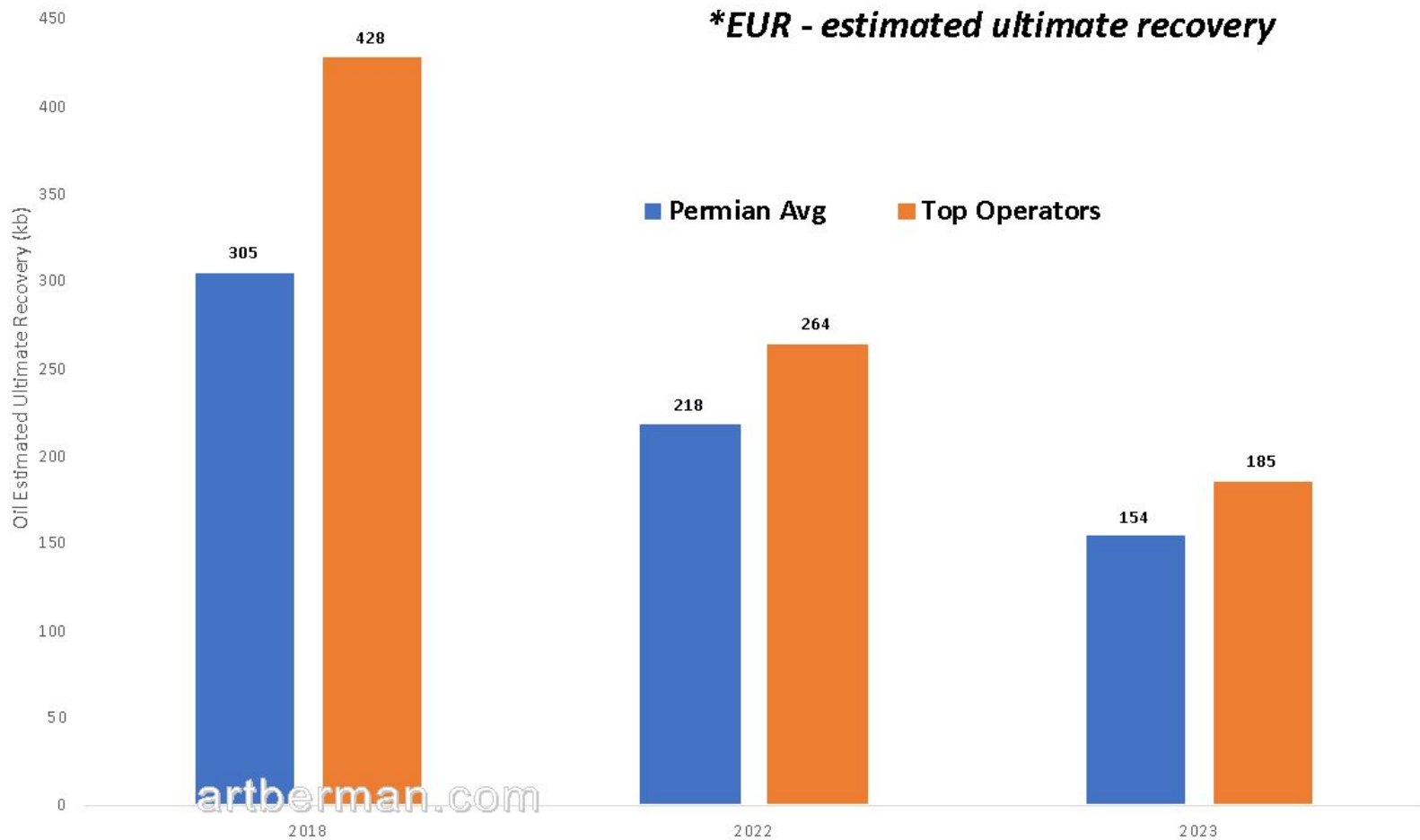
# Permian Basin wells have reached boundary-dominated flow



# Boundary-Dominated Flow



**Permian oil EUR\* declined -151 kb (-50%) from 305 kb in 2018 to 154 kb in 2023 per well**  
**EUR for top operators declined -763 kb (-57%) from 428 to 185 kb per well**



Source: Enverus & Labyrinth Consulting Services, Inc.

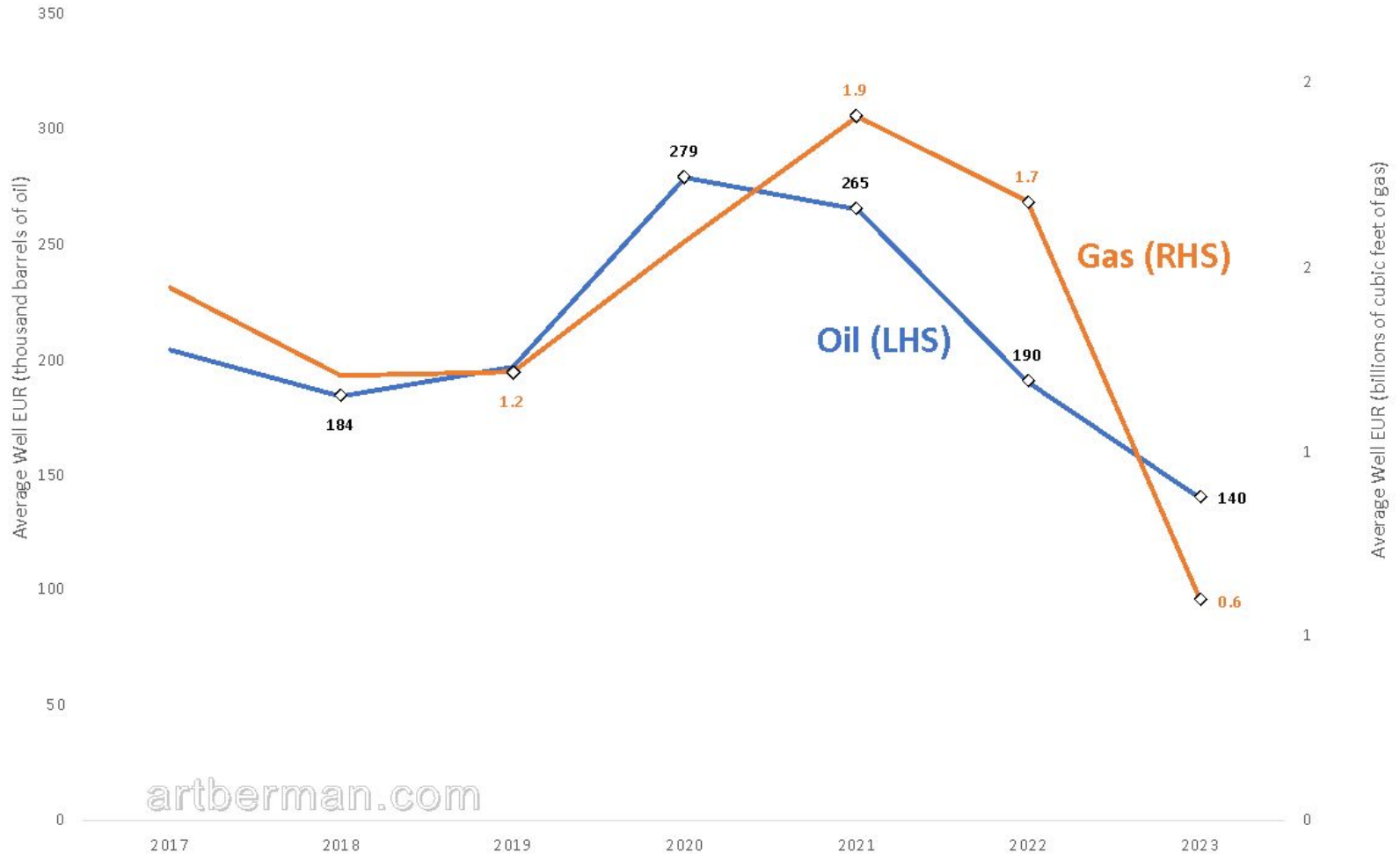
PERMIAN CURRENT/PERMIAN NOV 23

## Permian Basin Economic Data

ALL OPERATORS	OIL EUR	GAS EUR	WELLS	EUR BOE	B/E
2017	302,091	1,353,126	3098	386,661	\$68
2018	304,607	1,152,017	4325	376,608	\$70
2019	288,877	1,149,181	4943	360,701	\$73
2020	275,087	1,063,014	3688	341,525	\$77
2021	285,755	918,658	4023	343,171	\$77
2022	217,968	648,129	4915	258,476	\$100
2023	153,982	397,340	3310	178,816	\$141
WTD AVG	262,396	952,999	4,156	321,958	\$82
KEY OPERATORS	OIL EUR	GAS EUR	WELLS	EUR BOE	B/E
2017	433,144	1,673,976	972	537,768	\$50
2018	423,570	1,417,024	1367	512,134	\$51
2019	428,309	1,462,462	1708	519,712	\$51
2020	373,641	1,410,181	1245	461,778	\$57
2021	386,316	1,255,185	1507	464,765	\$57
2022	264,352	896,018	1772	320,353	\$82
2023	185,049	457,884	1241	213,667	\$120
WTD AVG	354,365	1,209,262	1,450	429,944	\$62

Drilling & Completion	\$8.75 mm
Operating Expenses	\$13/barrel
Severance Tax	5%
Net Revenue Interest	80%
\$700/lateral ft	12500 ft lateral

**Eagle Ford oil EUR has declined 139,000 barrels (-50%) per average well since 2020**  
**Gas EUR has declined 0.97 bcf (-62%)**

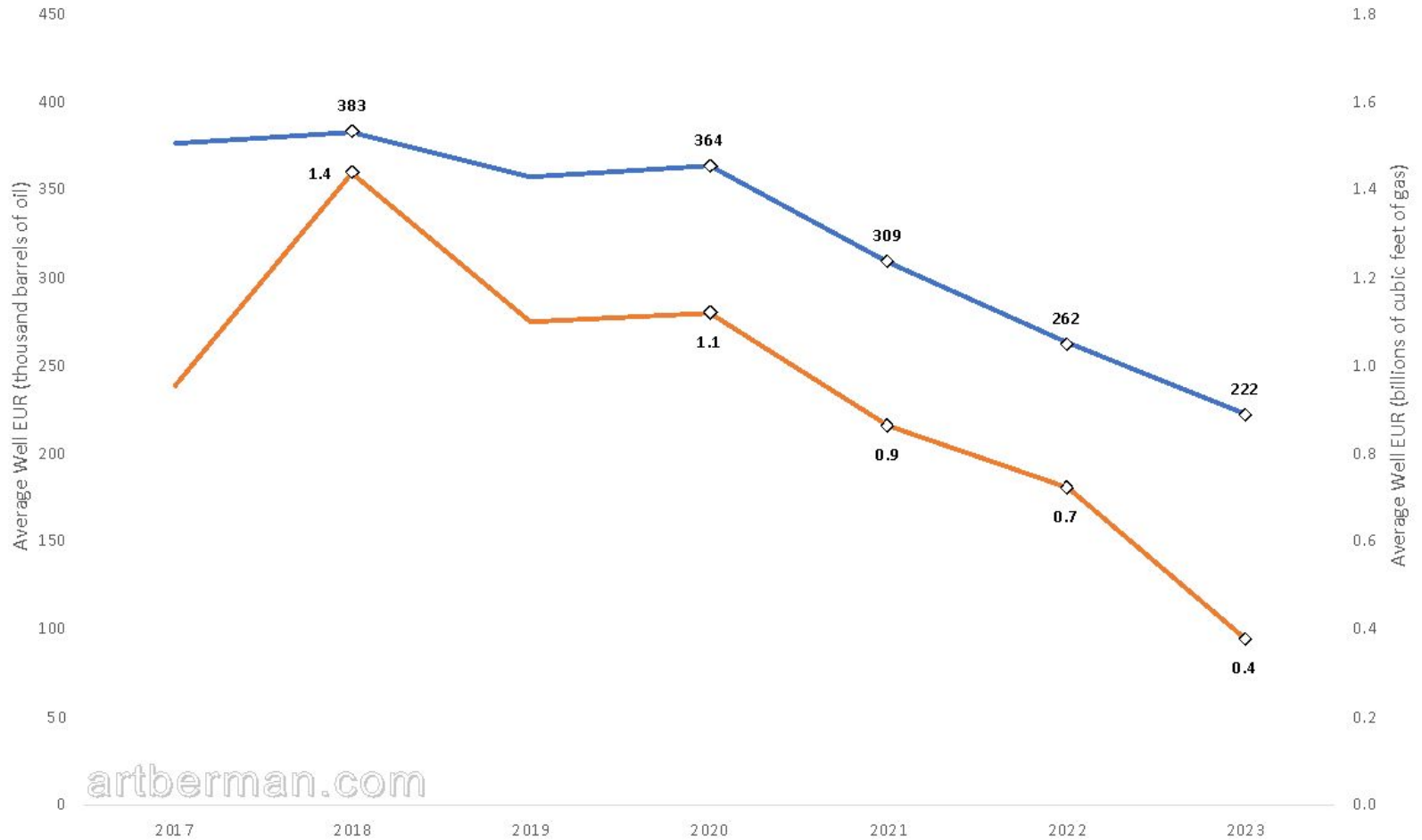


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Source: Enverus & Labyrinth Consulting Services, Inc.

Shale Plays/EAGLE FORD/EAGLE FORD CURRENT/EAGLE FORD NOV 2023

**Bakken oil EUR has declined 161,000 barrels (-42%) per average well since 2018**  
**Gas EUR has declined 1.1 bcf (-74%)**

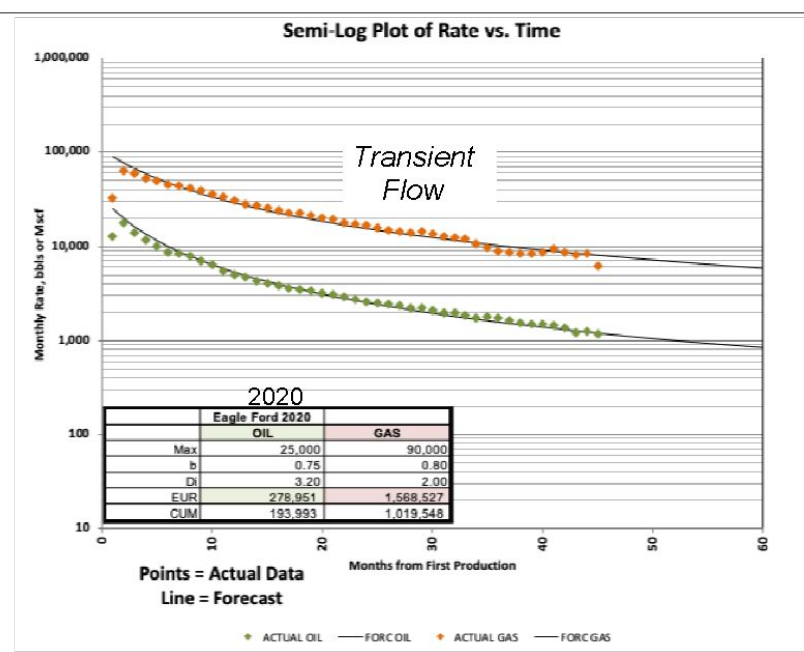
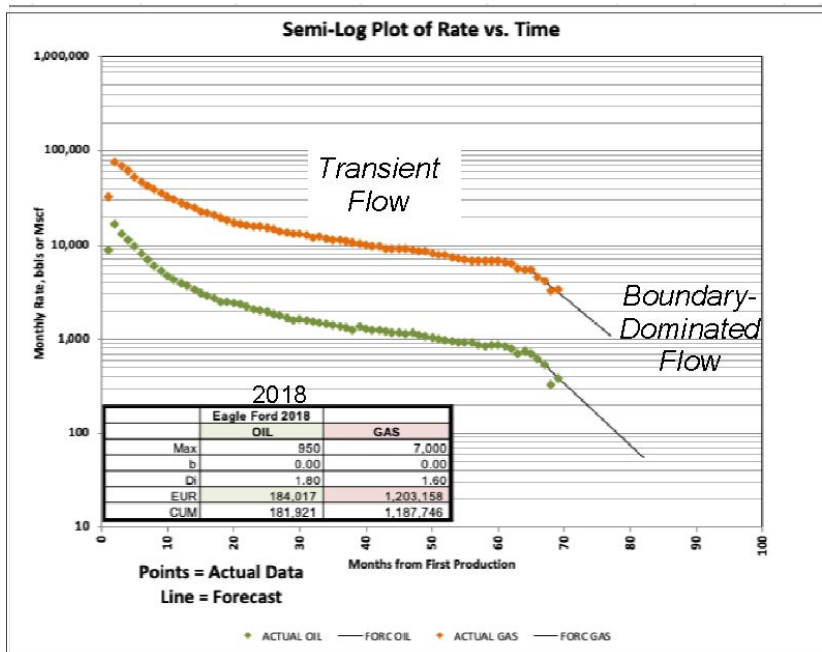


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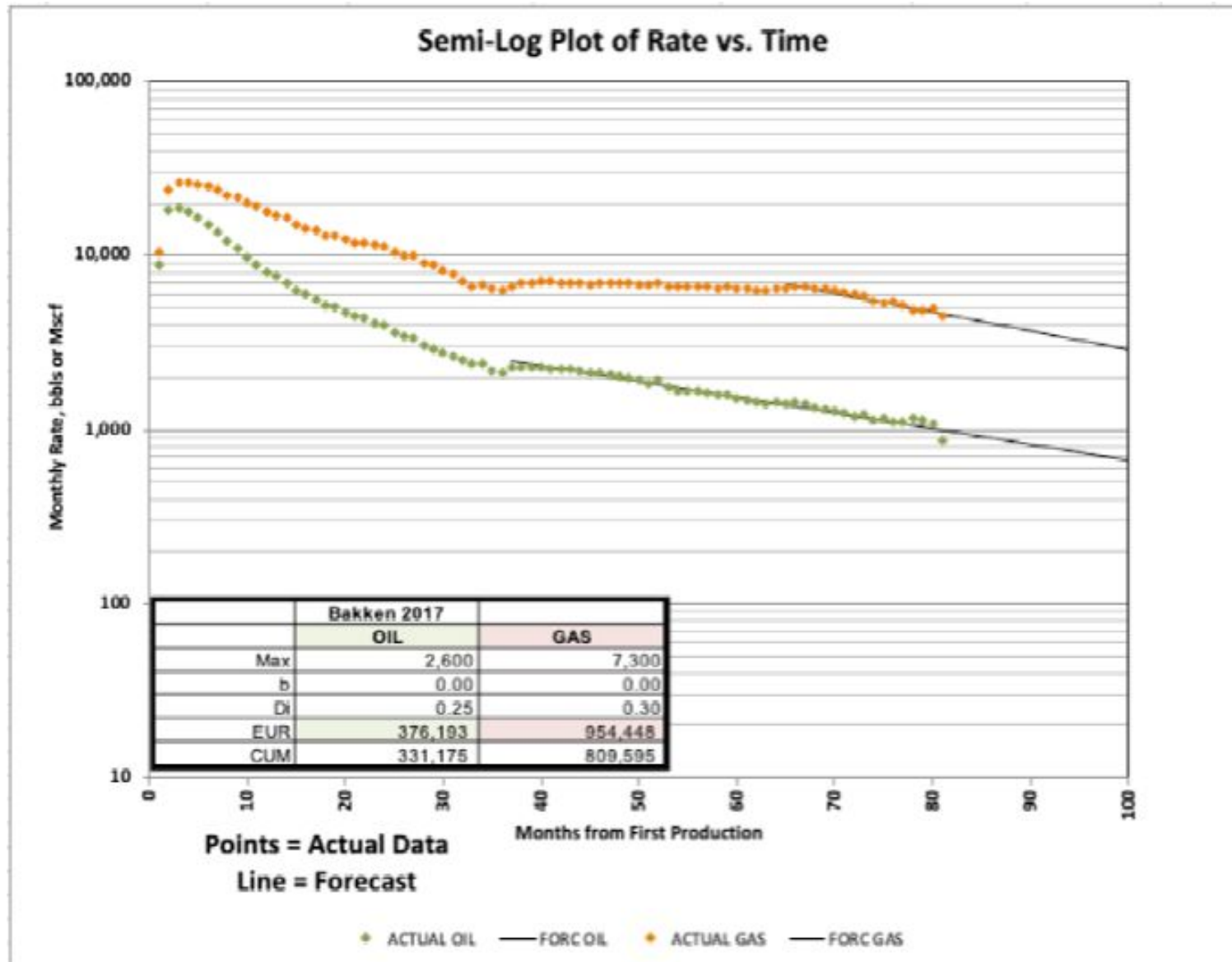
Source: Enverus & Labyrinth Consulting Services, Inc.

Shale Plays/BAKKEN/BAKKEN CURRENT/EAGLE FORD NOV 2023

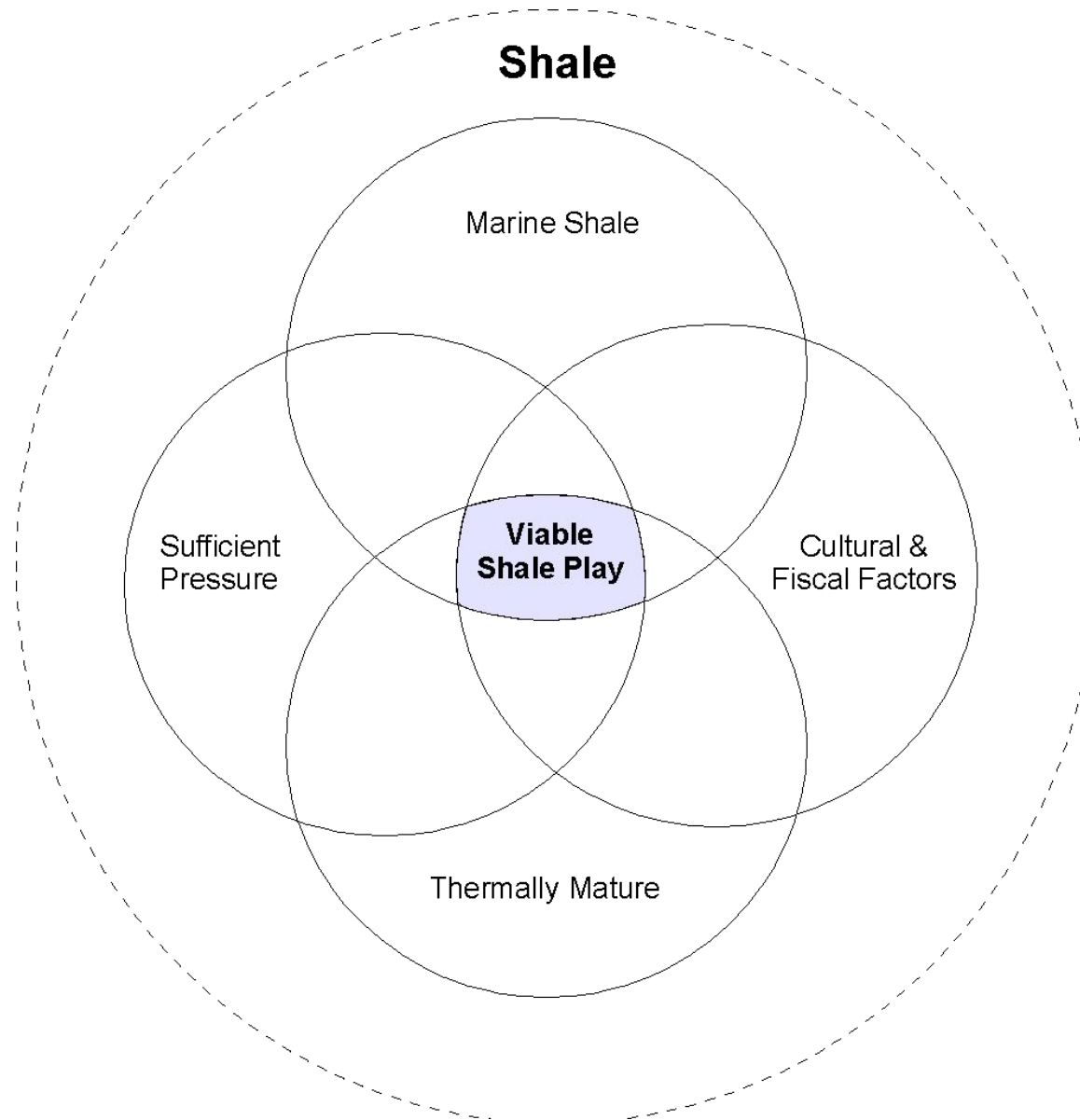
# Many Eagle Ford wells have reached boundary-dominated flow



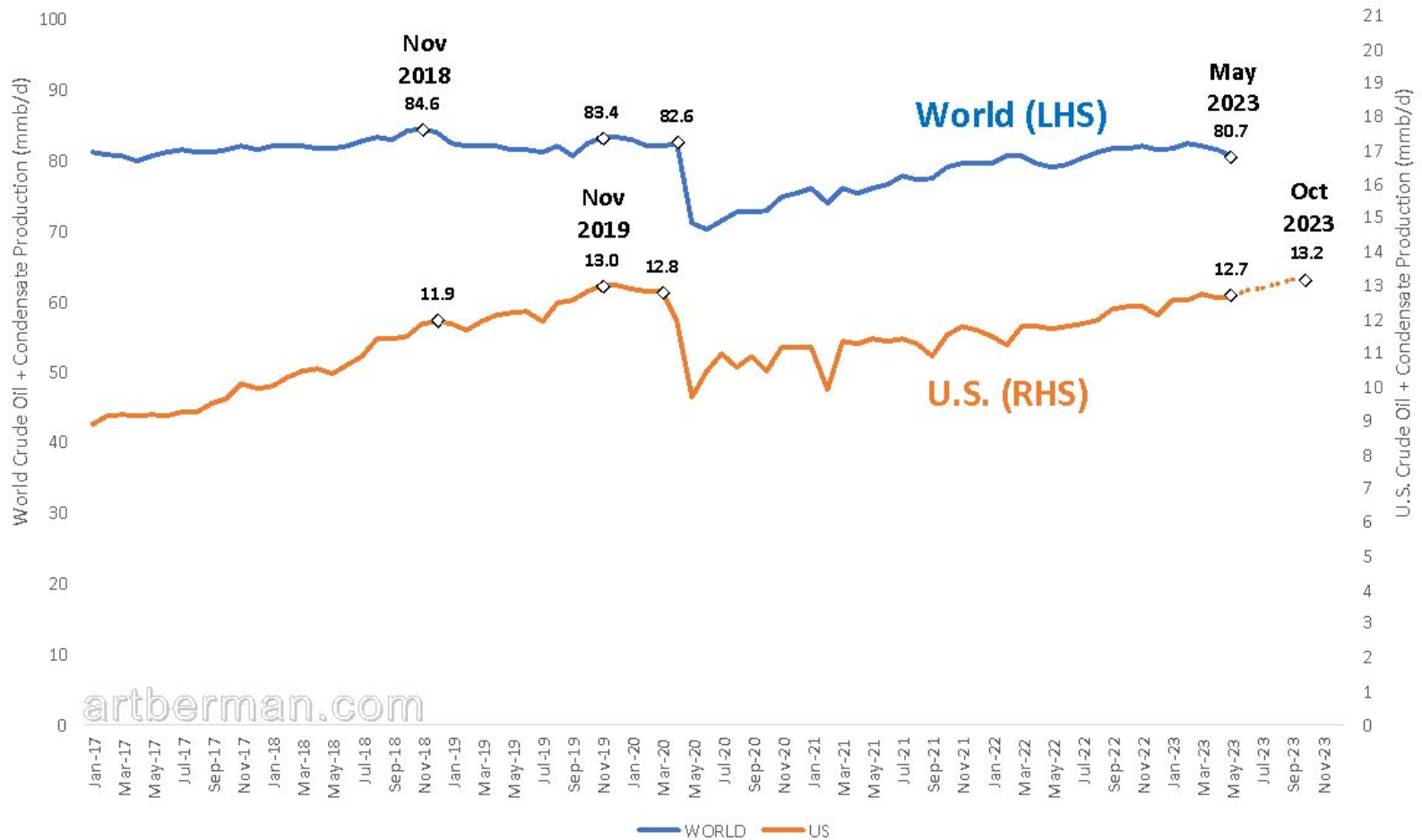
# Bakken wells have reached boundary-dominated flow







**May 2023 world oil production was 3.9 mmb/d less than December 2018 peak level**  
**October U.S. output is estimated to have exceeded December 2019 peak of 13 mmb/d**



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