

Decline in Permian Basin Methane Emissions Equaled the Annual Carbon Emissions Avoided by Every Electric Vehicle in the United States, New S&P Global Commodity Insights Analysis Finds

Analysis provides the most accurate public, basin-wide estimate of methane emissions for the Permian

HOUSTON, Dec. 23, 2024 /PRNewswire/ -- Annual methane emissions stemming from oil and gas production operations in the Permian Basin decreased 26% in 2023 from the previous year—equal to the total amount of carbon emissions avoided by every electric vehicle on the road in the United States that year, according to a new analysis by S&P Global Commodity Insights.

S&P Global Commodity Insights

The data show that methane emissions from upstream oil and gas operations in the Permian Basin fell by more than 34 billion cubic feet (bcf) in 2023, the most recent year that data is available. Given that methane is a potent greenhouse gas, the reduction was equivalent to 18.5 million tons of carbon dioxide emissions avoided (100-year equivalency factor of 28*).

The findings of the latest [analysis for Permian upstream methane](#), produced in partnership with leading methane management firm [Insight M](#), are based on high frequency observation data that include nearly 700 high-resolution aerial surveys covering 88% of the basin's active wells to provide the most accurate, basin-wide estimate of methane emissions.

"The sheer scale of this single-year improvement represents significant progress and demonstrates the potential for what lies ahead," said Daniel Yergin, Vice Chairman, S&P Global. "Continued improvements in the Permian—an area roughly the size of Great Britain that is responsible for almost half of all U.S. oil output—is providing a path to make meaningful contributions that lower overall U.S. emissions."

To put the numbers into perspective, the size of the 2023 reduction in methane emissions was:

- More than the total 2023 driving emissions avoided by every EV ever sold in the United States, even if all the vehicles were powered 100% by zero-carbon electricity.
- Roughly the same as the total GHG emission from all sources for the state of Hawaii during the same period.

The decline in emissions occurred even as total oil and gas production in the Permian increased, the analysis says. As a result, the basin's methane intensity (ratio of total methane emissions to total output) registered an even more pronounced decline, exceeding 30%.

The analysis attributes the emissions decline to ongoing improvements in equipment as well as increasing deployment of new technologies—from AI-driven analysis of operational data to on-the-ground sensors, aircraft overflights and satellites—that make it possible to detect leaks with greater speed and accuracy.

"Improvements and increased accessibility of remote sensing technologies is providing a better understanding of U.S. methane emissions, and more actionable information, said Kevin Birn, Head of the Center for Emissions Excellence, S&P Global

Commodity Insights. "Leaks that previously might have persisted for weeks or months can now be addressed in a matter of days."

Additional findings from the analysis:

- Methane emissions measured as a percentage of the basin's total natural gas output fell 33%. Methane emissions constituted 1.36% of the region's total 2023 production of over 23 bcf per day—roughly 1/5 of all U.S. gas production.
- In terms of total energy (barrel of oil equivalent) produced—notable because Permian production is heavily oil-focused, with associated gas occurring as part of the process—the 2023 methane intensity for the Permian was 0.63% of total production.
- In terms of lost economic value (i.e. had the gas been captured and sold), 2023 methane emissions accounted for just 0.12% of upstream revenues, a 70% drop from prior year as gas prices fell relative to oil. While this revenue loss is minor in the context of total revenues, given ongoing improvements in technology fixing leaks can still deliver positive returns.

"For oil and gas operators, evaluating spending on methane emissions reduction is a dynamic exercise as technologies and data steadily improve, regulations change, and mitigation progress continues," said Raoul LeBlanc, Vice President, Global Upstream, S&P Global Commodity Insights. "Obviously, the economics tighten as the leaks get smaller and harder-to-find. However, detecting and mitigating fugitive methane usually turns a profit simply from the sale of the recaptured gas, even in a lower natural gas price environment."

About the analysis

Produced by S&P Global Commodity Insights Center for Emissions Excellence in partnership with Insight M, the Permian upstream methane analysis combines near-total coverage of the basin and high frequency observations to provide the most accurate public, basin-wide estimate of fugitive methane leaks and venting released to date.

Frequency:

- The 2023 observed data is derived from roughly 700 survey flights which took place on 185 separate days spread over the course of the year.

Coverage:

- 88.2% of the 162,000 active Permian wells, (85.1% of conventional wells and 95.6% of unconventional wells)
- Assets supplying 96.3% of the 3.5 billion boe produced in 2023.

Resolution:

- Overflights offer a level of resolution that is up to 5 times greater than that of satellites, providing reliable attribution not only by facility, but in most cases to specific assets or pieces of equipment.

Threshold:

- Measurements taken detect emissions as low as 10 kg/hr, which account for more than 72% of total methane released to the atmosphere from upstream oil and gas operations. The volumes from all sources below this threshold were estimated using the Rutherford model developed by Stanford University. More information on the methodology employed by Insight M can be found [here](#).

Global Warming Potential Factor:

- S&P Global Commodity Insights conversion of methane to CO₂ equivalency are based on a Global Warming Potential (GWP) factor for 100 years of 28 tons of CO₂ per ton of methane. Using the 20-year factor of 86 would thus increase both the emissions reduction and the continuing emissions to 3.07 times the figures cited in this report.

* Compared with a ton of CO₂, a ton of methane (CH₄) absorbs more energy and thus has a greater impact on earth's warming. However, methane stays in the atmosphere for only about a decade, whereas CO₂ persists for hundreds of years. When looked at on a 100-year basis, methane thus has a Global Warming Potential of 27-30 times that of the same mass of CO₂.

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