

New EPA Report Reveals Significantly Lower Methane Leakage from Natural Gas

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A new report by the EPA significantly lowers estimates of methane leakage from natural gas production, from around 2.8 percent in prior reports down to 1.65 percent in 2011. They also report declining total methane emissions from natural gas production in recent years during the same period in which natural gas production has significantly increased, particularly from unconventional sources.

Natural gas is a potentially significant bridging fuel in the transition away from high-CO₂-emitting coal and toward cleaner sources of energy.^{1,2} The rapid expansion of gas use for electricity generation at the expense of coal has been a major contributor to declining U.S. CO₂ emissions in recent years.³ However, natural gas production, processing, transmission, storage, and distribution all involve some leakage of methane into the atmosphere. Methane is a considerably more powerful greenhouse gas than carbon dioxide, though it has a much shorter atmospheric residence time. Over a 100-year time horizon, a ton of methane has somewhere between 25 and 33 times larger warming potential than a ton of carbon dioxide.⁴

The high global warming potential (GWP) of methane means that leakages need to be carefully weighed against potential CO₂ reductions from displacing coal-based generation. However, careful analysis of lifecycle emissions for both fuels has found that natural gas is responsible for less than half the emissions of coal-based generation.⁵ The recent EPA report reinforces these conclusions with significantly lower estimates of methane emissions from natural gas production.

Calculating Natural Gas Leakage Rates

While the EPA 2013 report does not provide specific natural gas leakage rates, they can be easily calculated based on the methane emission estimates and reported production figures. In 2011, the U.S. emitted approximately 6.89 million metric tons

¹ Moniz et al. 2011. [The Future of Natural Gas: An Interdisciplinary MIT Study](#).

² Levi, M. 2013. Climate Consequences of Natural Gas as a Bridge Fuel. *Climatic Change*. DOI 10.1007/s10584-012-0658-3

³ Shellenberger and Nordhaus. 2013. [Gas Crushes Coal](#). Breakthrough Institute.

⁴ Shindell et al. 2009. Improved Attribution of Climate Forcing to Emissions. *Science*. DOI 10.1126/science.1174760

⁵ Cathles et al. 2012. A commentary on “The greenhouse-gas footprint of natural gas in shale formations”. *Climatic Change*. DOI 10.1007/s10584-011-0333-0

of methane associated with Natural Gas systems.⁶ The U.S. produced 24.25 trillion cubic feet of natural gas in 2011;⁷ assuming that wellhead gas is around 85 percent methane by volume, this translates to 20.61 trillion cubic feet of methane.⁸ Using a methane density of 0.0447 pounds per cubic foot, this amounts to 417.86 million metric tons of methane produced.⁹ A simple ratio of leakage to total production yields a leakage rate of 1.65 percent. The figure below shows leakage rates for each year from 1990-2011 from the 2013 EPA inventory, and compares them with similar data from the EPA's inventory published in 2011.

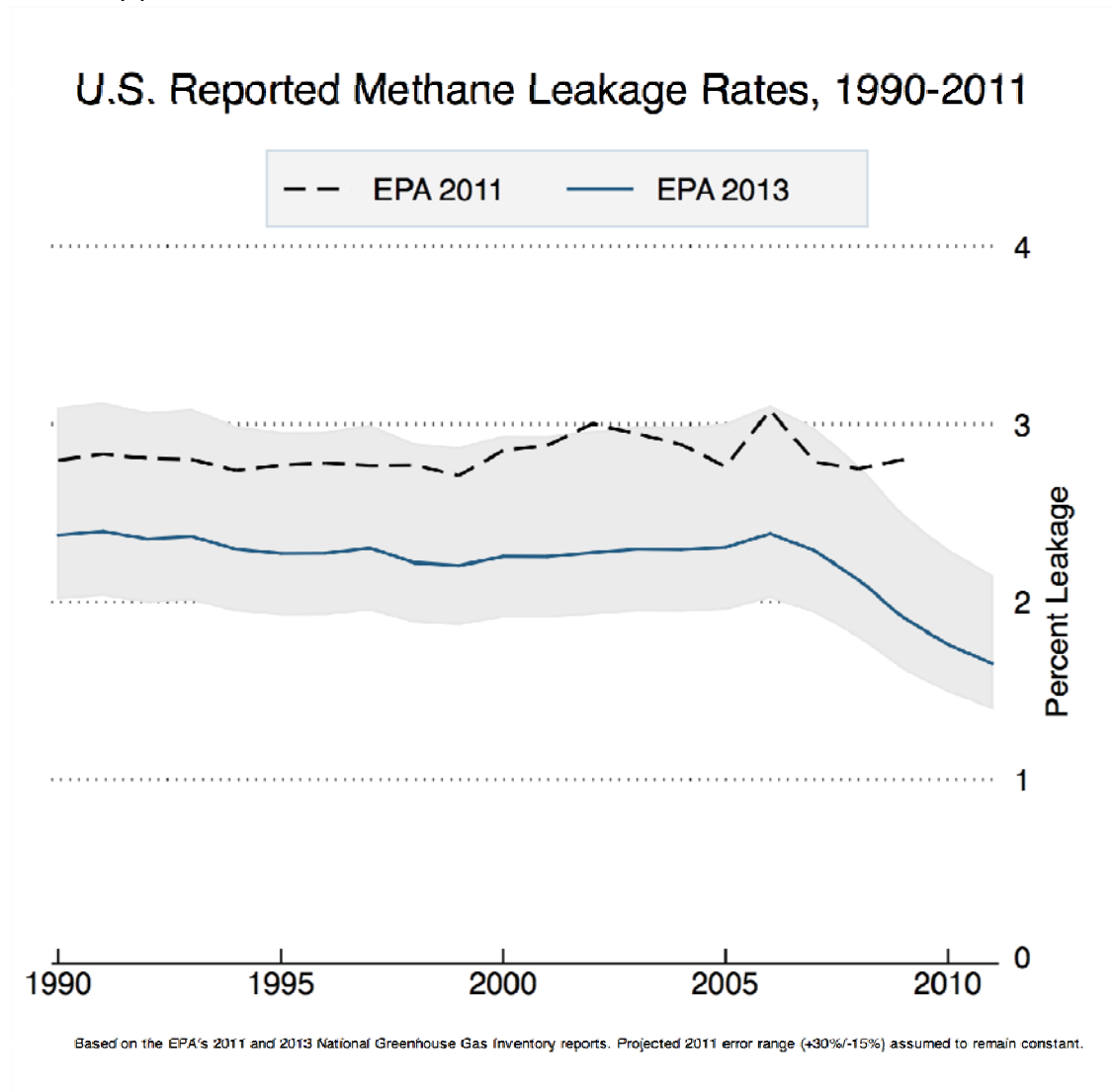


Figure 1: Natural gas lifecycle methane leakage rates by year based on emissions data from the EPA inventory reports (2011, 2013) and natural gas production data via the EIA.

⁶ EPA. 2013. [U.S. Greenhouse Gas Inventory 2013: Chapter 3 – Energy](#).

⁷ EIA 2013. [Natural Gas Gross Withdrawals and Production](#).

⁸ Wellhead natural gas ranges from 70 percent to 90 percent methane per the [Natural Gas Supply Association](#).

⁹ Density at Standard Temperature and Pressure (STP) per [The Engineering Toolbox](#).

The new EPA report has substantially lowered estimates of methane leakage for past years, with reductions ranging from 15 and 30 percent. The new figures also show declining leakage rates in recent years, a somewhat unexpected result if the rapid expansion of shale gas were resulting in higher leakage rates than conventional gas production.

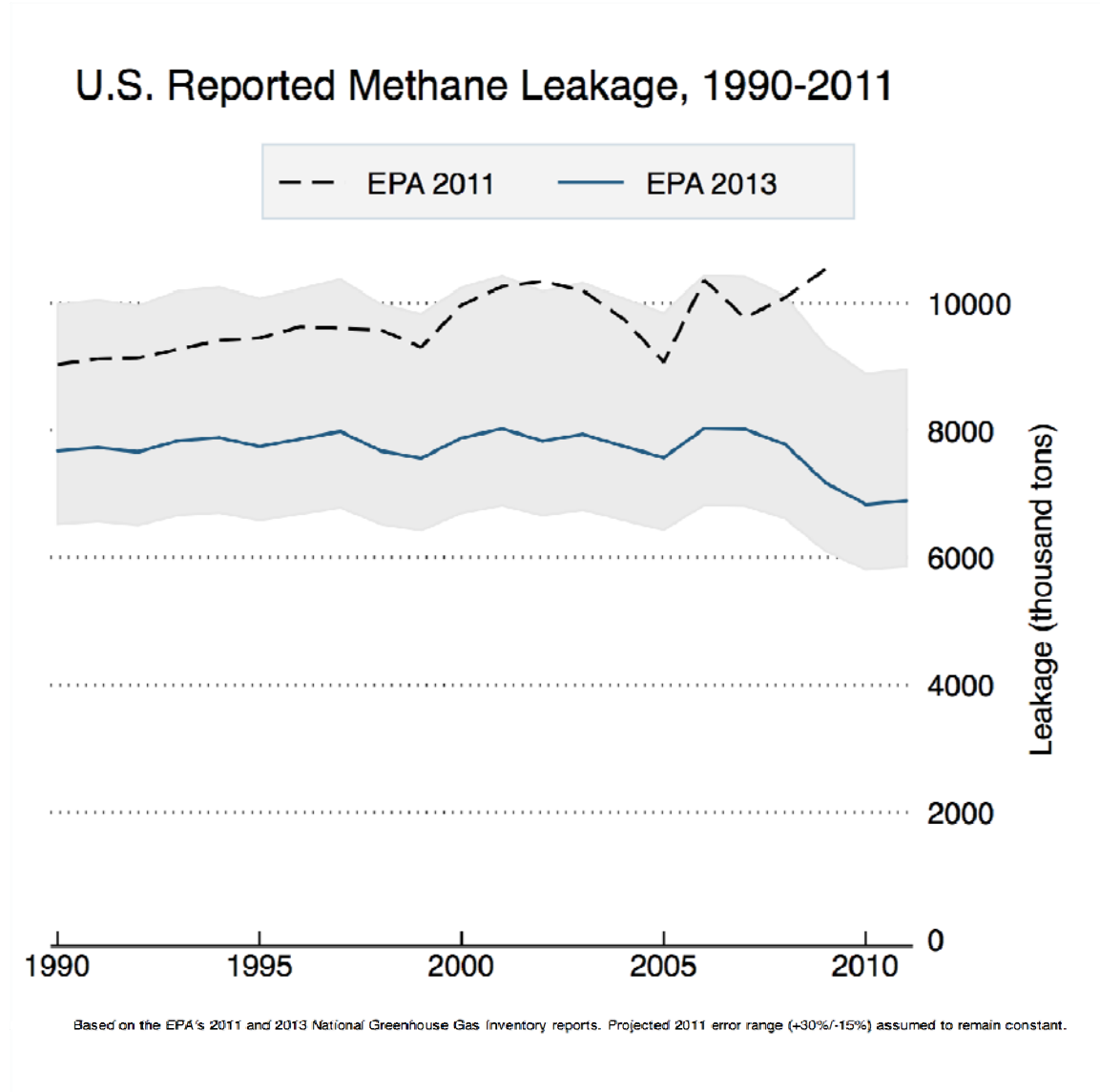


Figure 2: Natural gas total lifecycle methane leakage by year based on emissions data from the EPA inventory reports (2011, 2013). Note that the 2011 report covers the period from 1990-2009 while the 2013 report covers 1990-2011.

Overall methane leakage from natural gas systems has also been declining for the past five years, despite a nearly 20 percent increase in total gas production over that same period.

While the new EPA numbers present a more reassuring assessment of leakage rates from natural gas production, it is important to emphasize that large uncertainties still

exist. While the current report represents a significantly improved estimate of fugitive emissions from unconventional gas production, the EPA will focus on improving the volume of data collected and on better measuring the potential for emission reductions through specific technological measures in next year's emissions inventory. Even leakage rates of only 1.65 percent still represent increased greenhouse warming and loss of revenue for industry, and we expect that further reductions of fugitive methane in a cost-effective manner will be important for both industry and regulators.