WESTERN ENERGY ALLIANCE

Natural Gas: Meaningful Greenhouse Gas Reductions

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The United States leads the world in several measures of greenhouse gas (GHG) emission reductions, and the primary reason is natural gas. In the latest inventory, the Environmental Protection Agency (EPA) notes that net total U.S. GHG emissions are 17% below 2005 levels, mostly due to a shift to natural gas and renewable energy in the electric power sector.[1] Natural gas generation (in kWh) represented 10.7% of electric power generation in 1990, growing to 38.8% in 2022.[2]

U.S. Leads the World in GHG Reductions

Since 2005, the United State reduced GHGs by 1,033 million metric tons of carbon dioxide equivalent (MMT CO2 Eq). Meanwhile, China and India have increased their emissions by 6,270 and 1,821 MMT CO2 Eq, respectively. The same is true for methane, with a 42.8 MMT CO2 Eq reduction since 2005. China's and India's methane emissions increased 519.1 MMT CO2 Eq and 137.4 MMT CO2 since 2005.

The United States has also made great strides in reducing per capita emissions, and is in the top quartile of countries, having reduced GHG emissions by 6.9 tons per person since 2005, exceeded only among wealthy, industrialized countries by the United Kingdom 8 tons, the United Arab Emirates 9.5 t, Australia 9.6 t, New Zealand 9.8 t, and Luxembourg by 20.3 t.[3]

In 2022, total gross U.S. GHG emissions were 6,343.2 MMT CO2 Eq. Total U.S. methane emissions, 760.8 MMT CO2 Eq, are down 19.4% since 1990. Methane emissions account for 11% of U.S. GHGs, down 12% since 2005 and 19% since 1990. Agriculture is the largest source of U.S. anthropogenic methane emissions, at 39.1%, with oil and natural gas second at 31%.[4]

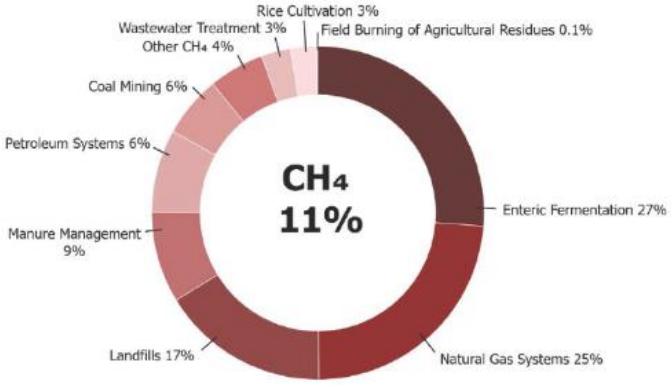


Figure 3: *2022 U.S. Sources of Methane (CH_4) Emissions, excluding CH_4 emissions from LULUCF sector from flooded lands, forest, and grassland fires.*
EPA 1990-2022 GHG Emissions Inventory

[1] *Data Highlights: Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2022*, EPA, April 2024, p. 1.
[2] *Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2022*, EPA, April 2024, p. ES-11.
[3] Our World in Data, Annual greenhouse gas emissions dataset from Jones et al., "National contributions to climate change 2024."
[4] EPA Data Highlights, April 2024, p. 3. Emissions for agriculture consist of livestock enteric fermentation and manure management, rice cultivation, and field burning of agricultural residue.

Solutions from the Oil & Natural Gas Industry

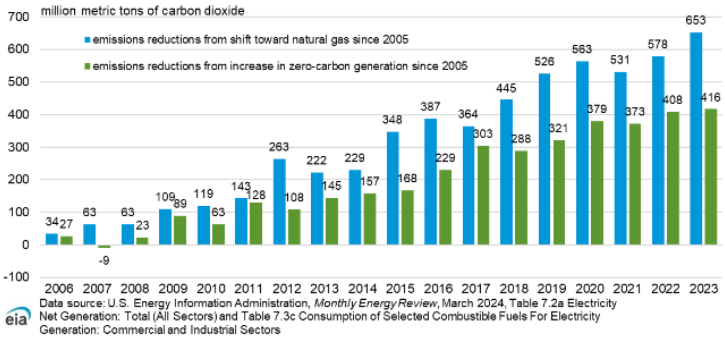
Total GHG emissions (CH_4, CO_2, and N_2O) from natural gas systems in 2022 were 209.7 MMT CO2 Eq, a decrease of 17% from 1990 and a decrease of 0.3% from 2021, both primarily due to decreases in methane emissions. Overall, natural gas systems emitted 173.1 MMT CO2 Eq of methane in 2022, a 21% decrease compared to 1990 emissions, even as national gas production increased by 104%.[5]

For petroleum systems, total GHG emissions of 61.6 MMT CO2 Eq are up 4% since 1990, due to increases in CO_2, but are down 6% since 2010 and 15% since 2021. Methane emissions, at 39.6 MMT CO2 Eq, are down 20% since 1990 and down 24% and 19% since 2010 and 2021, respecitively. Oil production has increased 56% since 1990.[6]

All together, the entire U.S. oil and natural gas industry accounts for just 4.2% of U.S. GHGs (271.3 out of 6,343.2 MMT CO2 Eq.) The upstream industry (exploration and production) accounts for 58% of industry emissions and just 2.4% of U.S. GHGs.

Coal-to-gas switching was the largest driver behind GHG reductions in the United States in 2023.[7] Emissions in the electricity sector, at 25% of U.S. GHGs,[8] are an order of magnitude higher than from the oil and natural gas industry. Natural gas has reduced more GHG emissions from the electricity sector than have wind and solar energy combined, because not only does it emit 81% less carbon dioxide per kilowatthour (kWh) than coal,[9] but so much more electricity is generated because natural gas doesn't suffer from the intermittency problems of wind and solar. As a result, natural gas has delivered 61% (653 MMT CO_2 Eq) of the GHG reductions from fuel switching, whereas wind and solar have only reduced GHG emissions by 416 MMT CO_2 Eq , or 39%.[10]

Figure A-7. CO_2 emissions reductions relative to 2005 caused by changed in the fuel mix of electricity generation



[5] *Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2022*, EPA, April 2024, p. 3-94.
[6] *Id.*, p. 3-74.
[7] *Global CO2 Emissions in 2023*, International Energy Agency (IEA), February 2024, p. 14.
[8] EPA Data Highlights, April 2024, p. 1.
[9] *How much carbon dioxide is produced per kilowatthour of U.S. electricity generation?*, EIA Frequently Asked Questions, updated December 7, 2023.
[10] *U.S. Energy-Related Carbon Dioxide Emissions, 2023—Report Appendix and Methodology*, EIA, April 2024, p. 11.