2019 U.S. Oil & Gas Methane Emissions Estimate

Environmental Defense Fund estimates U.S. oil and gas supply chain methane emissions in 2019 were 16 (+3/-2) million metric tons. This includes emissions from wells to customer meters, but excludes emissions from end uses such as home appliances, which research indicates may be substantial.

For most sources, we assume that data from Alvarez et al 2018 are representative of 2019. Most of the underlying measurement data was collected from 2013 to 2016 and since that time there may have been changes to oil and gas operations that have changed the average loss rate. Therefore, our estimate has additional uncertainty given the assumption of no major changes in emissions performance.

Production

With the exception of the Permian, total site-level production emissions are estimated for each basin based on site-based measurements at 433 sites in six production areas (Barnett Shale, Fayetteville Shale, Marcellus Shale [Southwest PA/WV], Uintah County, Upper Green River Basin, and Weld County). Emission factors are correlated with yearly natural gas production (calculated from Enverus/DrillingInfo) and used to calculate emission totals by basin. For more details, please refer to Alvarez et al. 2018. For the Permian, the leak rate found in Zhang et al. is combined with yearly gas production (from Enverus/DrillingInfo) to calculate an emissions total for that basin.

Gathering & Boosting

Gathering station emissions are estimated from Enverus/Drillinginfo gas production and state-specific emission rates reported in Marchese et al., adjusted to more accurately account for heavy-tail emissions.

Processing

Nationwide processing emissions are based on Marchese et al. and the number of processing plants found in the Greenhouse Gas Inventory (GHGI).

Transmission & Storage

Transmission & Storage emissions by source are taken from the GHGI, and an abnormal emissions category is added using the Zimmerle et al. estimate of 200 Mg/station/yr.

Distribution

Nationwide distribution emissions by source are taken directly from the EPA GHGI for the relevant year, with one exception. Emissions from local distribution mains in the GHGI were replaced with the value estimated by Weller et al. 2020 who found that the EPA GHGI underestimates emissions due to large underestimates by utilities in the number of leaks in their systems and a lack of inclusion of the upper tail of the distribution consistently observed.