How is the methane leakage rate estimated?

1. EIA bottom up approach based on sample measurements and activity inventory data

2. EPA GHG emission inventory says 360 BCF annually

3. EIA says Natural Gas Production in the US was ~23,000 BCF

4. Divide!

\[
\frac{360}{23,000} = 1.5\%
\]

What do Independent Studies Say?

1. Estimation methodology (top down vs bottom up analysis). In top down takes atmospheric samples, some sources not in the GHI inventory, such as abandoned gas wells (Mary Kang Thesis 2014).
2. Sampling error. EPA is ignoring a small group of superemitters (Brandt et al. 2014).
3. EPA might be underestimating leakage by 20-40%
4. Leakage rate is likely 1.85% - 2.95% in natural gas systems

How does it affect the WTW of natural gas fuels?

WTW CI at 1.5% Leakage
- We can see majority of emissions come from the vehicle (grey).
- Methane in the vehicle (methane slip) contributes as much as upstream methane

Sensitive parameters
- 1.5% leakage not a large contributor to the WTW
- Vehicle slip and lower fuel economy are major aspects

WTW CI at different leakages
- Leakage affects CNG more than LNG
- Even at low upstream methane leakage, natural gas vehicles more carbon intensive than diesel due to relative lower engine efficiency and higher vehicle methane slip

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