Proposed Alternative Method for Calculating Emissions from Hydraulic Fracturing Operations

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Summary

The US Environmental Protection Agency (EPA) developed the Mandatory Greenhouse Gas Reporting Rule, published in the Code of Federal Regulations (CFR) at Title 40, Part 98 (40 CFR 98), as a tool to help policy makers assess potential actions to take regarding greenhouse gases (GHGs). Subpart W, "Petroleum and Natural Gas Systems," of 40 CFR 98 prescribes GHG-emission-estimation methodologies and reporting requirements for the oil and gas industry. One area where significant issues remain to be resolved is the estimation of GHG emissions from the act of flowing back gas wells after recent hydraulic fracturing operations. As an alternative to measuring the flowback volume of GHG emissions from a fractured well, EPA presented equations for sonic and subsonic flow, which appear to be derived from the ideal-gas law. Anecdotal evidence from member companies of multiple trade organizations indicated that these equations may overestimate flow rates by as much as 600%. Noble Energy Incorporated (Noble), with the help of Trimeric Corporation (Trimeric), investigated and evaluated empirical methods to estimate GHG emissions from flowback operations that follow hydraulic fracturing. A number of earlier developed correlations for multiphase flow were considered before choosing the Gilbert-type correlation as a potentially applicable equation for this case. The goal of this analysis was to compare the accuracy of the ideal-gas-type equation in a multiphase-flow regime with a Gilbert-type predictive multiphase-flow correlation by use of site-specific and field-regressed coefficients. Measured data for daily and total cumulative gas, water, and oil produced, choke size, and tubing pressure for several wells within a field are needed to develop field-regressed coefficients for the Gilbert-type equation. However, once they have been determined, singular daily average values of choke size, tubing pressure, and rate of produced liquid (oil and water) are all that is required to predict the total volume of produced-gas emissions for other flowback operations in the field. The results of this study indicate that the Gilbert-type correlation with field-regressed coefficients predicts the overall volume of gas produced during a flowback operation more accurately than the single-phase flow EPA Eq. W-11B in 40 CFR 98.