



Is the rate of fugitive methane gas migration around Alberta's energy wells adequately estimated?

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Summary

Recent methane emission reduction efforts (e.g. by the IPCC, and the Governments of Canada and Alberta) make the assessment of fugitive emission sources important. Fugitive methane emissions around petroleum wells have been recognized by industry and regulators in Alberta since the early 1990s, but have proven problematic to remediate. They are classified, based on their expression at ground surface, as either Surface Casing Vent Flow (SCVF; where methane migration from the subsurface occurs via outermost casing) or Gas Migration (GM; where methane gas is observed at ground surface outside of the outermost casing and/or cement sheath). Well licensees are obligated by regulation to measure SCVF and GM at certain points in a well's lifetime and/or at abandonment.

Previous work reported that GM was observed in 0.73% of the ~450,000 Alberta energy wells in 2013 (Bachu, 2017). Since tests with no GM observed do not have to be reported, it is difficult to estimate how many GM tests were conducted overall.

We critically evaluated the degree to which methane gas migration is understood around Alberta's energy wells by considering the fraction of these wells that have required GM testing by regulation either: during their lifetime (i.e. before abandonment), or prior to abandonment, in addition to the current standard of practice for GM testing. This review considered the 3,961 GM reports (for 3,574 unique wells) available in January 2017, for an estimated 593,353 energy wells in Alberta at that time.

An estimated 3.8% of Alberta's wells have required GM testing with 90 days of drilling - specifically the 22,547 wells that were drilled after 1995 in a defined 'Required Testing Area' (RTA) near Lloydminster. Gas migration was reported for 904 (or 4.0%) of these wells, which is much less than previously estimated (DACC, 1993; Erno & Schmitz, 1993).

Gas migration testing is not required around other wells unless an environmental (groundwater or soil contamination) or public safety (fire, explosion, toxic effluent) hazard is identified. Gas migration was observed in 3,574 unique wells, or an estimated 2,670 wells outside the RTA (where GM testing is not required).

Although 61% of wells have had SCVF measurement reported (and all wells require SCVF testing upon abandonment), poor correlation between SCVF and GM occurrence was found in the provincial database.

An estimated 4.4% of Alberta's energy wells were abandoned (before 1991) without GM testing. Of the remaining wells, an estimated 6.2% located in the 'RTA' will require GM testing upon abandonment. Insufficient information was available to assess the fraction of remaining wells that will require GM testing upon abandonment, but it is greater than 39.4% of the total.

The currently recommended GM test is based on a 'practical and affordable' procedure developed by an industry working group in the early 1990s that was reportedly 'not intended [to be used] as a regular testing requirement' due to its lack of validation and testing. We found no evidence that the recommended GM testing approach has been critically evaluated.

We conclude that fugitive GM rates around Alberta's energy wells are not well known under current regulations.

References

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