Emissions from Unconventional Gas Wells Measured in Devon Study
LM Cathles, March 8, 2012

Harrison (2012) report a study commissioned by The Devon Energy Corporation that documents gas leakage during the completion of 1578 unconventional (shale gas or tight sand) gas wells by 8 different companies with a reasonable representation across the major unconventional gas development regions of the US (Harrison, 2012). To our knowledge, this is the only publicly available syntheses of actual data on fugitive gases associated with unconventional gas, as opposed to estimates based on presumptions about what is done with that gas.

For background, in 2010 the EPA (2010) inferred the leakage that occurred from unconventional shale gas wells largely from data on the amount of gas captured by “green completions” reported to them by industry through their GasSTAR program. Based on this very limited data on capture, the EPA assumed capture was rare, and estimated that 9175 Mcf of gas was emitted during the completion (or workover) of unconventional gas wells. They assumed that half of these emissions were vented and half flared, and they assumed that these numbers and assumptions were “indicative of the rest of the U.S.” (p. 88).

Of the 1578 unconventional (shale gas or tight sand) gas wells in the Devon study, 1475 (93.5%) were green completed - that is they were connected to a pipeline in the pre-initial production stage so there was no need for them to be either vented or flared. Of the 6.5% of all wells that were not green completed, 54% were flared. Thus 3% of the 1578 wells studied vented methane into the atmosphere. This is much less than the EPA’s assumed 50%.

The Devon study goes further, and estimates the maximum gas that could be vented from the non-green completed wells by calculating the sonic venting rate from the choke (orifice) size and source gas temperature of the well, using a formula recommended by the EPA. Since many wells might vent at sub-sonic rates, which would be less, this is an upper bound on the venting rate. The total vented volume was then obtained by multiplying this venting rate by the known duration of venting during well completion. These vented volumes ranged from 340 to 1160 Mscf/completion, with an average of 765 Mscf/completion. This 765 Mscf is only 8% of the 9175 Mscf/completion EPA(2010) estimated was typically vented from a shale gas well.

All together the Devon study indicates that the venting from an average shale gas well is 23 Mscf (= 0.03 x 765 Mscf), which is more than 203 times smaller than the 4587 Mscf (=0.5 x 9175 Mscf) the EPA estimates is typically vented. In fact it suggests the emission from unconventional shale gas wells is similar to or less than from conventional gas wells.
EPA (2010) estimates that conventional gas wells emit 36.65 Mcf during well completion (about half flared and half vented) and 2.45 Mcf during workover.

References Cited