Low-Producing Wells are a Significant Source of Emissions
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Recent studies indicate that emissions from low production wells are disproportionately high relative to their production, and because these wells account for the large majority of existing sources (83% of existing oil wells and 74% of existing gas wells), it is critical that they are covered by a comprehensive leak detection and repair program. A comprehensive leak detection and repair program should ensure operators inspect components that can leak, such as connectors and flanges, as well as equipment that can unintentionally vent when not operating properly, such as controlled storage tank access points. Below, we provide greater detail on some of these recent studies.

Recent Studies

Zavala-Araiza, et al., (2015) "Toward a Functional Definition of Methane Super-Emitters: Application to Natural Gas Production Sites," Environ. Sci. Technol. 2015, 49, 13, at 8167−8174 ("Zavala-Araiza (2015)")

- The Barnett Shale study, which evaluated emissions from a sample made up mostly of natural gas wells, found that average emissions from low-producing wells were approximately 18.4 US ton/ year of methane – over 80% higher than the average emission rate for all wells included in the study.
- These are site-level emissions and include venting equipment like pneumatic devices and uncontrolled storage tanks that would not necessarily be addressed through an LDAR program. The data, however, suggest that improperly operating equipment are an important contributor to these high emissions. Indeed, many of the sites were functional super-emitters (with loss rates greater than 1% of production) and several of these sites had very high production normalized loss rates (greater than 50% of production) that would not be expected from properly operating facilities, even those with uncontrolled storage tanks. Moreover, preliminary analysis attempting to recreate site-level emissions measurements in the Barnett using site-level component counts and emissions factors suggests that there is a gap, with measured emissions higher than calculated component-level emissions. This suggests that improperly operating equipment or other abnormal site-level conditions that could potentially be addressed through an LDAR program were important contributors to overall emissions.
- The Barnett is located in an ozone non-attainment area, and many of the wells measured in the study fall within that area.

David R. Lyon et al., Aerial Surveys of Elevated Hydrocarbon Emissions from Oil and Gas Production Sites, 50 Envtl. Sci. & Tech. 4877 (Apr. 5, 2016).

- This study utilized helicopter surveys to document fugitive emissions from over 8,000 well sites in seven basins nationwide. The helicopter survey detection limit was 1 – 3 g/s total hydrocarbons, or approximately 30 to 100 tons per year, but it is likely that much of the observed tank emissions were VOCs. For instance, a study performed for TCEQ reported an average of 76% VOC in the flashing emissions of oil and condensate tanks.
- The study captured high-emitting sources and was not limited only to leaks. Similar to the Barnett, the authors concluded that not all emissions could be explained by tank flashing if all controls were operating properly. These sources could likely be addressed through a LDAR program to identify issues such as unlit flares and open hatches at controlled storage tanks.
- Based on an oil well definition of GOR ≤12,500 scf/bbl, marginal oil wells had a greater occurrence of observed hydrocarbon emissions (4.9%) compared to all wells (4.0%) in the helicopter IR survey.
- 34% of the high-emitting wells detected in areas with ozone design values above the 2015 standard were marginal wells. These well were located in the Uintah and Barnett.

M. Omara et al 2016, Methane Emissions from Conventional and Unconventional Natural Gas Production Sites in the Marcellus Shale Basin, 50 Envtl. Sci. & Tech. 2099 (Feb. 16, 2016) (DOI: 10.1021/acs.est.5b05503).

- Site-level measurements of 35 well pads in the Marcellus found 85 times higher median production-normalized CH_4 emission rates from low production, conventional wells compared to high production, unconventional wells (11% vs 0.13%). Though these wells had lower absolute emissions rates, the average emissions of conventional wells was 0.82 kg/hr, which is equivalent to 7.9 TPY methane.
- Many of these sites were in the ozone nonattainment area or the ozone transport region.

ERG and Sage Environmental Consulting, LP, "City of Fort Worth Natural Gas Air Quality Study, Final Report" ("Fort Worth Study") (July 13, 2011)

- Though only 27 of the over 300 wells sampled in the Fort Worth study were marginal wells, there are specific data from these wells on leak emissions from components like valves and connectors. These 27 gas wells have an average of 1 OGI detected leak and 1.3 TPY CH4 leak emissions, though 5 of the sites exceeded 1 TPY and 2 exceeded 10 TPY.