Towards Better Characterization of Air Emissions From Oil and Gas Exploration and Production Operations: Implications for Future Regulatory Regimes

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ABSTRACT

Recent expansion of onshore unconventional oil and gas activity has attracted widespread public interest in emissions of GHG's and other air pollutants, increasing pressure on regulatory agencies to better characterize air emissions from exploration and production activities. Accurate emissions inventories are needed to establish carbon budgets for local and regional air quality planning, and for the development of cost-effective control measures and strategies. Emissions from an individual well site may not be significant but in the aggregate all wells in a county or basin can dominate other emission sources of any type. Methodologies for calculating emissions from wellhead equipment often rely on poorly constrained emission factors multiplied by county or basin activity data (e.g., well counts, typical equipment profiles or hydrocarbon liquids production). Key parameters may be derived from outdated studies, incomplete equipment fleet surveys or based on national averages that may not be applicable to a specific basin or development. Another issue is using a single "average well" for a broad geographic area. Practices may vary between companies while the emissions profile for new, high producing wells may be very different from that of nearby older stripper wells in different formations. The resulting potential inaccuracies in estimated emissions can lead to ineffective rules that impose unnecessary costs without improving air quality or to the overcharging of operating fees and/or carbon taxes. Recent academic and NGO studies have raised regulators' awareness of the importance of a small population of super-emitters accounting for a significant proportion of total emissions from all oil and gas production sources. In many cases causes have been attributed to improperly sized equipment at well sites. Super-emitters may reconcile discrepancies between "bottom-up" emissions inventories and "top-down" atmospheric measurements that imply higher fluxes of pollutants. However, designing an effective leak detection program, as well as quantifying the precise population of super-emitters at any one time, is challenging. To succeed in an evolving regulatory environment, operators should consider: (i) the life cycle costs of quantifying emissions; (ii) integrating monitoring equipment and asset databases to capture and process key environmental data; and (iii) incorporating emissions control system design into all project planning activities.