



Economic Analysis of Methane Emission Reduction Opportunities in the U.S. Onshore Oil and Natural Gas Industries

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Executive Summary

Methane is an important climate change forcing greenhouse gas (GHG) with a short-term impact many times greater than carbon dioxide. Methane comprised 9% of U.S. greenhouse gas (GHG) emissions in 2011 according to the U.S. EPA Inventory of US Greenhouse Gas Emission and Sinks: 1990-2011¹, and would comprise a substantially higher portion based on a shorter timescale measurement. Recent research also suggests that mitigation of short-term climate forcers such as methane is a critical component of a comprehensive response to climate change². Emissions from the oil and gas industry are among the largest anthropogenic sources of U.S. methane emissions. At the same time, there are many ways to reduce emissions of fugitive and vented methane from the oil and gas industry and, because of the value of the gas that is conserved, some of these measures actually save money or have limited net cost.

Environmental Defense Fund (EDF) commissioned this economic analysis of methane emission reduction opportunities from the oil and natural gas industries to identify the most cost-effective approaches to reduce these methane emissions. The study projects the estimated growth of methane emissions from these industries through 2018 as a future date at which new emission reduction technologies could be installed. It then identifies the largest emitting segments and estimates the magnitude and cost of potential reductions achievable through currently available technologies. The key conclusions of the study include:

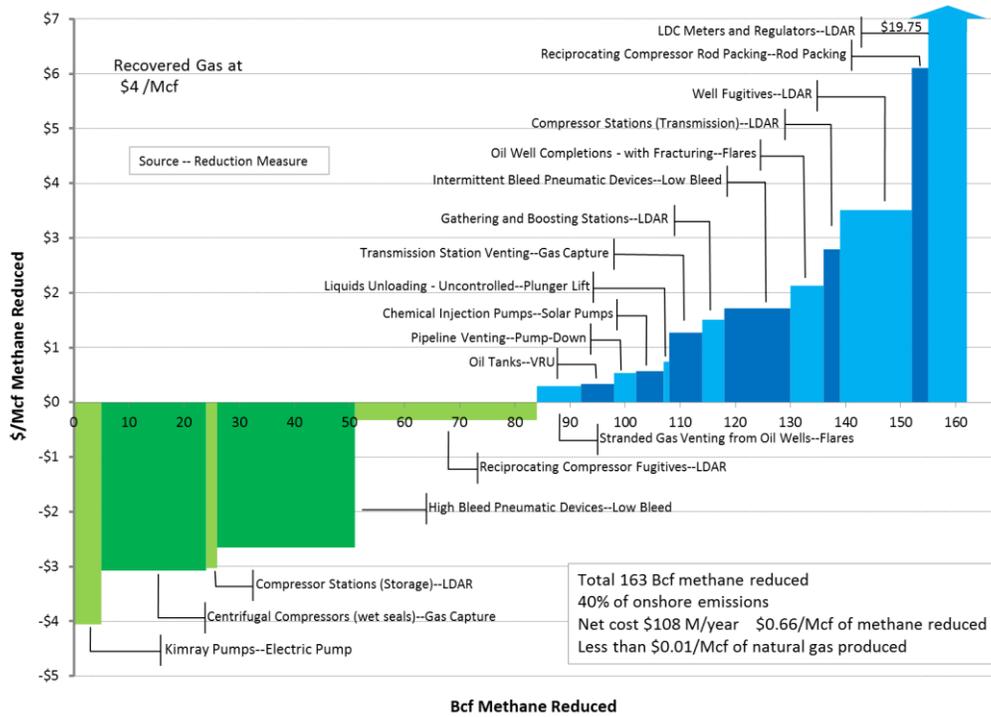
- **Emission Growth** - Methane emissions from oil and gas activities are projected to grow 4.5% from 2011 to 2018 including reductions from EPA regulations adopted in 2012 (known as New Source Performance Standards (NSPS) Subpart OOOO). All of the projected net growth is from the oil sector, largely from flaring and venting of associated gas. Growth from new natural gas sources is offset by the NSPS and other continuing emission reduction activities. Nearly 90% of the emissions in 2018 come from existing sources (sources in existence in 2011).
- **80/20 Rule for Sources** - 22 of the over 100 emission source categories account for over 80% of the 2018 emissions, primarily at existing facilities.
- **Abatement Magnitude and Economics** - A 40% percent reduction in onshore methane emissions is projected to be achievable with existing technologies and techniques at a net total cost of \$0.66/Mcf of methane reduced, or less than \$0.01/Mcf of gas produced, taking into account savings that accrue directly to companies implementing methane reduction measures (Figure 0-1). If the full economic value of recovered natural gas is taken into account, including savings that do not directly accrue to companies implementing methane reduction measures, the 40% reduction is achievable while saving the U.S. economy and consumers over \$100 million per year. The cost for some

¹ Calculated at a 100 year GWP of 21 – see Section 2.3.

² Shoemaker, J. et. al., “What Role for Short-Lived Climate Pollutants in Mitigation Policy?”. Science Vol 342 13 December 2013

measures and segments of the industry is more or less than the net total. The initial capital cost of the measures is estimated to be approximately \$2.2 billion with the majority of the costs in the oil and gas production segments.

Figure 0-1 - Marginal Abatement Cost Curve for Methane Reductions by Source



- **Abatement Opportunities** – By volume, the largest opportunities target leak detection and repair of fugitive emissions (“leaks”) at facilities and gas compressors, reduced venting of associated gas, and replacement of high-emitting pneumatic devices.
- **Co-Benefits** – Reducing methane emissions will also reduce - at no extra cost - conventional pollutants that can harm public health and the environment. The methane reductions projected here would also result in a 44% reduction in volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) associated with methane emissions from the oil and gas industry.

There are several caveats to the results:

- The 2011 EPA inventory is the best starting point for analysis, but it is based on many assumptions and some older data sources. Although the inventory is improving with new data, it is designed to be a planning and reporting document and is imperfect, especially at the detailed level, for a granular analysis of this type.
- Emission mitigation cost and performance are highly site specific and variable. The values used here are estimated average values.
- The analysis presents a reasonable estimate of potential cost and magnitude of reductions within a range of uncertainty.