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Air Impacts Associated With Natural Gas Drilling and Cost-Effective Solutions for Allegheny County

From well drilling; to fracking; to gas extraction, processing, and transmission, sources of air pollution emissions exist at every step in the process of converting shale gas into a marketable product. Air pollution sources from natural gas operations include:

- vehicle emissions from construction equipment and diesel trucks hauling workers, drilling equipment, frack water, and waste water;
- diesel engines used to power drilling rigs and fracking pumps;
- large natural gas-fired stationary engines used to compress natural gas for pipeline transport;
- emissions of raw natural gas to the atmosphere during well completion and from leaking pipes, valves, storage tanks, and processing equipment; and
- volatilization from open wastewater pits.

Individually the emissions sources listed above may seem insignificant—in fact, they’re often small enough to avoid air pollution permitting and emissions reporting requirements—but taken together, the net impact of these numerous, small sources can be massive. Consider the air impacts in other areas that have recently experienced natural gas booms. For instance, a 2009 Southern Methodist University study of drilling in the Barnett Shale region of Texas concluded that in a year more smog-forming air pollution (NO_x and VOCs) was emitted by natural gas operations in the Dallas-Forth Worth metropolitan area than by all car and truck traffic combined.¹ After several years of elevated ozone levels in southwestern Wyoming, in 2009 the state asked the US EPA to declare the Upper Green River Basin an ozone nonattainment area. This will be the first air pollution nonattainment area in the state’s history. The Wyoming Department of Environmental Quality concluded

¹ Al Armendariz, Emissions from Natural Gas Production in the Barnett Shale Area and Opportunities for Cost-Effective Improvements (Jan. 26, 2009), *available at*: http://www.edf.org/documents/9235_Barnett_Shale_Report.pdf; other efforts to quantify the air impact of oil and gas development reach similar conclusions, *see e.g.* A Comprehensive Oil and Gas Emissions Inventory for the Denver-Julesburg Basin in Colorado (May 2008), *available at*: <http://www.epa.gov/ttn/chief/conference/ei17/session2/amnon.pdf>; James Russel *et. al.*, Oil and Gas Emission Inventories for the Western States (Dec. 27, 2005), *available at*: http://www.wrapair.org/forums/ssjf/documents/eictts/OilGas/WRAP_Oil&Gas_Final_Report.122805.pdf.

the elevated ozone “is primarily due to local emissions from oil and gas (O&G) development activities.”²

Both NO_x and VOCs react in the atmosphere to form ozone and particulate matter. That’s particularly troubling in Pennsylvania because much of the state fails to meet federal health-based standards for particulate matter and ozone.

Air toxics emissions from these sources may be of even greater concern. Air toxics are chemicals that cause severe health effects such as cancer, birth defects, and neurological damage. Air toxics emissions associated with natural gas operations include the BTEX compounds (benzene, toluene, ethylbenzene, and xylene) and hydrogen sulfide. All of these compounds are neurotoxins, and benzene is a potent carcinogen. Several studies from the Barnett Shale region in Texas suggest elevated air toxics concentrations near natural gas operations are commonplace. A Texas Commission on Environmental Quality monitoring study carried out between August and November 2009 detected elevated levels of air toxics at multiple monitor locations near natural gas operations. Benzene concentrations in excess of Texas health standards were detected at 21 out of 94 monitoring locations.³ Several air toxics were detected at concentrations in excess of short-term health-based values.⁴ Air toxics modeling commissioned by the town of DISH, Texas revealed unhealthy air toxics concentrations at 5 of 7 monitoring locations.⁵

Assuming natural gas production in the Marcellus Shale grows at the rapid pace many industry analysts are predicting, what can Allegheny County do to avoid air quality problems like those created by natural gas operations in Wyoming, Texas, and Colorado? PADEP is taking some modest actions relevant to the air impact of natural gas operations, many of which are incorporated by reference into county Article XXI (including narrowing the scope of natural gas equipment exempted from air permitting requirements,⁶ revising the natural gas general operating permit,⁷ and clarifying its natural gas aggregation policy), but there are additional control measures the state and Allegheny County could be pursuing as well. A number of control measures exist that can drastically reduce emissions from natural gas drilling operations, such as:

- “green” well completions;⁸

² WYDEQ, Technical Support Document I For Recommended 8-Hour Ozone Designation For the Upper Green River Basin, WY, p. viii (Mar. 26, 2009), *available at*: http://deq.state.wy.us/out/downloads/Ozone%20TSD_final_rev%203-30-09_jl.pdf.

³ TCEQ, Interoffice Memo: Health Effects Review of Barnett Shale Formation Area Monitoring Projects p.2 (Jan. 27, 2010), *available at*: http://www.tceq.state.tx.us/assets/public/implementation/barnett_shale/2010.01.27-healthEffects-BarnettShale.pdf.

⁴ *Id.* at pp. 1-2.

⁵ Town of Dish, Revised Air Study Documents, *available at*:

http://www.townofdish.com/objects/attachments_2009_10_14.zip

⁶ 40 Pa.B. 2822 (May 29, 2010); Pa. Dep’t of Env’tl. Prot., DEP ID: 275-2101-003, DRAFT - Air Quality Permit Exemptions, § I.B.38, *available at*: <http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-80137/275-2101-003.pdf>.

⁷ 40 Pa.B. 5387 (Sep. 18, 2010).

⁸ *See e.g.*, US EPA, Green Completions - Methane Emissions Reductions, PRO Fact Sheet No. 703 (Sept. 2004), *available at*: <http://www.epa.gov/gasstar/documents/greencompletions.pdf>.

- vapor recovery units on condensate tanks;⁹
- low- or no-bleed pneumatic valves;¹⁰
- closed-loop wastewater storage systems;¹¹
- acoustic and infrared leak detection and repair programs;¹²
- flash tank separators or dessicant dehydrators;¹³
- use of electric compressor station engines;¹⁴ and
- prohibiting gas venting.¹⁵

Usually there are costs associated with the installation, operation, and maintenance of pollution control measures, meaning those advocating for such measures must argue the public health and environmental benefits outweigh any increased economic burden on industry. This need not be the case when developing an effective air emissions control strategy for the natural gas industry. Admittedly, requiring natural gas operations to use these control measures would entail increased up front costs; however, the listed control measures reduce air pollution by reducing loss of valuable methane and other hydrocarbons during the extraction and production process. Most of the natural gas emissions controls mentioned above pay for themselves after relatively short periods of time (often less than a year).¹⁶ The result is a win-win situation: air emissions decrease, recovery of marketable hydrocarbons increase.

County regulations requiring natural gas operations to employ control measures like those listed above (or achieve comparably low emission rates), would:

- reduce local air emissions without creating an economic burden on industry, and
- set an example for other regulatory bodies contending with significant natural gas development—including downwind portions of the Marcellus in Pennsylvania, West Virginia, and Ohio.

⁹ See e.g., US EPA, Installing Vapor Recovery Units on Crude Oil Storage Tanks *available at:* http://www.epa.gov/gasstar/documents/ll_final_vap.pdf.

¹⁰ See e.g., Colorado Department of Public Health and Environment, Air Quality Control Commission, Draft Oil and Gas Ozone Reduction Strategy, Revision 1, High-Bleed Pneumatic Devices (Apr. 10, 2008), *available at:* <http://www.cdphe.state.co.us/ap/ozone/RegDevelop/IssuePapers/April4-08/APCDOZISSUEPAPERpneumaticdevicesRev1.pdf>.

¹¹ See e.g., Railroad Commission Of Texas, Waste Minimization in the Oil Field at 5-6 (July 2001), *available at:* <http://www.rrc.state.tx.us/forms/publications/wasteminmanual/wastemin.pdf>.

¹² See e.g., Directed Inspection and Maintenance and Infrared Leak Detection Lessons Learned from the Natural Gas STAR Program, *available at:* http://www.epa.gov/gasstar/documents/03_dim_in_gas_production_facilities.pdf.

¹³ See e.g., Natural Gas Dehydration, Lessons Learned from the, Natural Gas STAR Program, *available at:* http://epa.gov/gasstar/documents/08_natural_gas_dehydration.pdf.

¹⁴ See e.g., US EPA, Install Electric Compressors - PRO Fact Sheet #105, *available at:* <http://www.epa.gov/gasstar/documents/installelectriccompressors.pdf>.

¹⁵ See e.g., Energy and Biodiversity Initiative, Good Practice in the Prevention and Mitigation of Primary and Secondary Biodiversity Impacts p.7, *available at:* <http://www.theebi.org/pdfs/practice.pdf>.

¹⁶ See e.g., payback estimates from US EPA, Natural Gas STAR Program - Recommended Technologies and Practices, *available at:* <http://www.epa.gov/gasstar/tools/recommended.html>.