Institute *for*
Policy Integrity
NEW YORK UNIVERSITY SCHOOL OF LAW

December 4, 2015

Environmental Protection Agency

Subject: Comments on Oil and Natural Gas Sector: Emission Standards for New and Modified Sources; Docket Nos. EPA–HQ–OAR–2010–0505 & FRL–9929–75–OAR

The Institute for Policy Integrity at New York University School of Law[1] respectfully submits the following comments on the Environmental Protection Agency's ("EPA") proposed New Source Performance Standards for methane and volatile organic compound (VOC) emissions from the oil and natural gas sector under Section 111 of the Clean Air Act. Policy Integrity is a non-partisan think tank dedicated to improving the quality of government decision-making through scholarship in the fields of administrative law, economics, and public policy.

EPA has proposed New Source Performance Standards ("NSPS") in the oil and natural gas category for emissions of methane and VOCs. EPA is proposing standards for several emission sources not currently covered by its existing NSPS for this category: hydraulically fractured oil well completions, and fugitive methane emissions from well sites, compressor stations, and pneumatic pumps. In addition, EPA is proposing methane standards for certain sources that are currently regulated for VOCs only, such as hydraulically fractured gas well completions and equipment leaks at natural gas processing plants.

The Proposed Rule is necessary to reduce emissions from this sector, which is the largest contributor to U.S. anthropogenic methane emissions. While EPA should not delay promulgating these new standards, EPA could strengthen the Proposed Rule by:

- Identifying and evaluating a full range of alternatives, in order to maximize net social benefits;
- Conducting a break-even analysis to determine whether the many unquantified benefits of the rule would support selection of more stringent alternatives;
- Calibrating Optical Gas Imaging frequency according to benefit-cost analysis;
- Regulating new and existing sources at the same time, to reduce emissions from existing sources and avoid grandfathering concerns; and
- Considering greenhouse gas emissions trading in this or future rules.

[1] No part of this document purports to present New York University School of Law's views, if any.

This Proposed Rule is a necessary first step; ultimately, more action is needed to reduce methane emissions from the oil and natural gas sector.

I. Because Methane Emissions Are an Externality, the Proposed Rule Is Necessary to Secure All of the Methane Reductions that Are Socially Justified.

This Proposed Rule marks important progress in reducing potent methane emissions from the oil and natural gas sector, the largest industrial source of methane in the United States.[2] While EPA has indicated that it is also interested in voluntary approaches to design and implement programs to reduce fugitive emissions from the sector,[3] a federal regulatory scheme is necessary to correct the under-incentive for individual actors to reduce all of the methane emissions that are socially optimal. Further, the Proposed Rule is cost-benefit justified, using EPA's Social Cost of Methane.

Methane is a potent greenhouse gas. When methane escapes into the atmosphere, it is extremely efficient at trapping heat: its global warming potential is up to 86 times greater than carbon dioxide in the first 20 years after release, and 34 times more powerful on a 100 year timeframe.[4] Methane currently accounts for about 9 percent of total U.S. greenhouse gas emissions,[5] and it contributes directly to the formation of ozone—another source of global warming and impaired air quality.[6] Cutting methane emissions in the near term could slow the rate of global temperature rise over the next several decades, especially when combined with rigorous carbon dioxide mitigation.[7] Sharp methane reductions could also delay imminent climate effects in the earth's most vulnerable regions, such as the Arctic.[8]

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[2] U.S. ENV'T PROT. AGENCY, OVERVIEW OF GREENHOUSE GASES: METHANE EMISSIONS, *available at* http://epa.gov/climatechange/ghgemissions/gases/ch4.html.
[3] U.S. ENV'T PROT. AGENCY, Notice of Proposed Rulemaking: Oil and Natural Gas Sector: Emission Standards for New and Modified Sources, 80 Fed. Reg. 56593, 56599 (proposed Sept. 18, 2015) (to be codified at 40 C.F.R. pt. 60) [Hereinafter "Proposed Rule"].
[4] IPCC WORKING GROUP I, FIFTH ASSESSMENT REPORT, CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS, CHAPTER 8: ANTHROPOGENIC AND NATURAL RADIATIVE FORCING 633, 711-712, 714 (Table 8.7) (2014), *available at* https://www.ipcc.ch/ pdf/assessment-report/ar5/wg1/WG1AR5_Chapter08_FINAL.pdf.
[5] EXECUTIVE OFFICE OF THE PRESIDENT, THE PRESIDENT'S CLIMATE ACTION PLAN 10 (2013), *available at* http://www.whitehouse.gov/sites/default/ files/image/president27sclimateactionplan.pdf.
[6] Prather, M., et al., Atmospheric chemistry and greenhouse gases, CLIMATE CHANGE 2001: THE SCIENTIFIC BASIS, CONTRIBUTION OF WORKING GROUP I TO THE THIRD ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (Cambridge Univ. Press 2001).
[7] *See* Jayni Foley Hein, CAPTURING VALUE: SCIENCE AND STRATEGIES TO CURB METHANE EMISSIONS FROM THE OIL AND NATURAL GAS SECTOR, INSTITUTE FOR POLICY INTEGRITY, NYU SCHOOL OF LAW (Dec. 2014), *available at* http://policyintegrity.org/files/publications/Capturing_Value_-_Methane_Policy_Brief.pdf (citing IPCC, FIFTH ASSESSMENT SYNTHESIS REPORT 95 (2014), http://ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_LONGERREPORT.pdf); National Research Council, Climate Stabilization Targets: Emissions, Concentrations, and Impacts over Decades to Millennia (2011), http://www.nap. edu/catalog/12877.html).
[8] *Id;* Quinn, P. K., et al., *Short-lived Pollutants in the Arctic: Their Climate Impact and Possible Mitigation Strategies*, 8 ATMOS. CHEM. PHYS. 1723-1735 (2008).

The oil and natural gas sector is the largest industrial source of methane in the United States.[9] Emissions from the oil and gas industry represented nearly 29 percent of the total methane emissions from all sources in the United States.[10] Under EPA's 2012 NSPS for VOCs, methane is regulated as a co-benefit. But because the 2012 standards were calibrated to minimize VOCs and not methane, they do not apply to most natural gas transmission, storage, and distribution components, or to oil well completions.[11]

EPA estimates that the Proposed Rule will prevent 340,000 to 400,000 short tons of methane emissions by 2025, as well as 170,000 to 180,000 short tons of VOCs, and 1,900 to 2,500 short tons of hazardous air pollutants.[12] These are likely conservative figures. For example, a study published in the *Environmental Science & Technology Journal* in August 2015 estimated that natural gas-gathering facilities lose 100 billion cubic feet of natural gas a year; this is eight times the number previously estimated by EPA.[13] Further, EPA's Regulatory Impact Analysis does not consider the effects of the Clean Power Plan, which could spur the replacement of some coal-fired power plants with natural gas-fired power plants, and consequently, increase domestic natural gas production and corresponding methane emissions. Natural gas production is projected to continue to increase for the next several decades.[14]

The Proposed Rule is necessary to correct a market failure, which leads to oil and gas producers to capture less pollution than is socially optimal. Since methane (a primary component of natural gas) is a valuable commodity, private operators have some incentive to avoid methane leaks, as some methane can be profitably captured and resold.[15] However, the upfront cost of buying and installing leak detection, repair, and prevention equipment may deter some companies from addressing leaks at their wells. In some cases, site-specific factors,

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[9] U.S. ENV'T PROT. AGENCY, OVERVIEW OF GREENHOUSE GASES: METHANE EMISSIONS, *available at* http://epa.gov/climatechange/ghgemissions/gases/ch4.html.

[10] U.S. ENV'T PROT. AGENCY, REGULATORY IMPACT ANALYSIS OF THE PROPOSED EMISSION STANDARDS FOR NEW AND MODIFIED SOURCES IN THE OIL AND NATURAL GAS SECTOR 3-1 (Aug. 2015) [Hereinafter "REGULATORY IMPACT ANALYSIS"].

[11] Richard K. Lattanzio, CONGRESSIONAL RESEARCH SERVICE, AIR QUALITY ISSUES IN NATURAL GAS SYSTEMS CRS-55 (March 4, 2013), *available at* http://www.civil.northwestern.edu/docs/Tight-Shale-Gas-2013/Air-Quality-Issues-Natural-Gas-Ratner-2013.pdf

[12] REGULATORY IMPACT ANALYSIS, *supra* note 10, at 1-5 to 1-6.

[13] Anthony J. Marchese et al., *Methane Emissions from United States Natural Gas Gathering and Processing*, 49 ENV'T, SCI. & TECH. 10718 (2015), *available at* http://pubs.acs.org/doi/abs/10.1021/acs.est.5b02275.

[14] *See* U.S. ENERGY INFORMATION ADMINISTRATION, ENERGY OUTLOOK 2015 at 20, *available at* http://www.eia.gov/forecasts/aeo/pdf/0383(2015).pdf ("Lower 48 shale gas production (including natural gas from tight oil formations) increases by 73% in the Reference case, from 11.3 Tcf in 2013 to 19.6 Tcf in 2040, leading to a 45% increase in total U.S. dry natural gas production, from 24.4 Tcf in 2013 to 35.5 Tcf in 2040.).

[15] *See* ICF INTERNATIONAL, ECONOMIC ANALYSIS OF METHANE EMISSION REDUCTION OPPORTUNITIES IN THE U.S. ONSHORE OIL AND NATURAL GAS INDUSTRIES 1-1 (March 2014) (prepared for Environmental Defense Fund), *available at* https://www.edf.org/sites/default/files/methane_cost_curve_report.pdf*; see also* U.S. ENV'T PROT. AGENCY, Lessons Learned from Natural Gas STAR Partners (Oct. 2003), *available at* http://www3.epa.gov/gasstar/documents/ll_dimgasproc.pdf. ("A survey of equipment leaks and estimated repair costs at four gas plants found that for a payback of 6 months or less, 78 percent of leaking components were cost-effective to repair. In addition, 92 percent of leak repairs were found to payback in less than 1 year, and 94.5 percent of leaks paid back in less than 4 years.").

such as low flow rates, make methane emission control more challenging or unprofitable.[16] Moreover, there is some uncertainty with respect to the payback period and profit margin of these investments.[17]

Absent regulation, oil and gas producers will only capture as much methane and VOC emissions as they can profitably do, from a private welfare-maximizing perspective.[18] But greenhouse gas and VOC emissions also impose significant costs on society—such as negative climate, health, and welfare impacts—that are not reflected in the market price of methane.[19] In the absence of regulation, these costs will be borne not by the polluting firm, but by society as a whole.[20] Therefore, voluntary programs are insufficient to reach optimal levels of methane reduction. Because methane and VOCs are externalities that impose costs on society—which we can estimate using tools like the Social Cost of Methane—regulation is required to capture all of the methane and VOC emissions that are cost-benefit justified from a social welfare-maximizing perspective.[21]

Additionally, state regulation is insufficient to correct this market failure. Because methane emissions contribute to a global phenomenon, states will experience only a fraction of methane's harms. Thus, state regulators do not have as great of an incentive to limit all of the emissions that are justified using tools like EPA's Social Cost of Methane. A regulatory scheme at the federal level is necessary to correct any under-incentive that states may have to regulate at socially optimal levels.[22]

Finally, EPA monetized the methane reductions of the Proposed Rule by using the Social Cost of Methane, and found the Rule to be benefit-cost justified on this basis.[23] Policy Integrity, along with Environmental Defense Fund, Natural Resources Defense Council, and the Union of Concerned Scientists, submitted separate comments in support of the Social Cost of Methane.[24] The gross benefits of the Proposed Rule, applying the mean Social Cost of Methane at a

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[16] Susan Harvey et al., LEAKING PROFITS: THE U.S. OIL AND GAS INDUSTRY CAN REDUCE POLLUTION, CONSERVE RESOURCES, AND MAKE MONEY BY PREVENTING METHANE WASTE 9 (2012) (citing American Petroleum Institute and the International Petroleum Industry Environmental Conservation Association, Oil and Natural Gas Industry Guidelines for Greenhouse Gas Reduction Projects (March 2007), prepared by URS Corporation), *available at* http://www.nrdc.org/energy/files/Leaking-Profits-Report.pdf.

[17] *See* HEIN, *supra* note 7. Low natural gas prices can also reduce the incentive for operators to make the investments needed to capture marketable natural gas. According to the U.S. Energy Information Administration, gas prices are projected to remain below $5/ Mcf through 2018. U.S. ENERGY INFORMATION ADMINISTRATION, ANNUAL ENERGY OUTLOOK 2013, EARLY RELEASE OVERVIEW (Dec. 5, 2012), *available at* http://www.eia.gov/forecasts/aeo/er/early_prices.cfm.

[18] Jayni Hein, *Curbing Fugitive Methane Costs Little, Buys Time on Climate Change*, THE HILL (Dec. 29, 2014), *available at* http://thehill.com/blogs/pundits-blog/energy-environment/228153-curbing-fugitive-methane-costs-little-buys-time-on; Richard Revesz, *Making Sense of Methane Regulation*, THE HILL (Sept. 1, 2015), available at http://thehill.com/blogs/pundits-blog/energy-environment/252383-making-sense-of-methane-regulation.

[19] *Id.*

[20] *Id.*

[21] *Id*.

[22] *Id*.

[23] REGULATORY IMPACT ANALYSIS, *supra* note 10 at 4-7.

[24] These comments were filed under separate cover in this rulemaking.

standard 3 percent discount rate, are approximately $200 to $210 million in 2020, and $460 to $550 million in 2025.[25] The net benefits are estimated to be $43 million and $160 million, in 2020 and 2025, respectively.[26]

II. EPA Should Identify and Evaluate a Full Range of Alternatives, in Order to Maximize Net Social Benefits

EPA should assess a full range of regulatory alternatives for each of the components of the Proposed Rule. The only difference among the three alternatives EPA currently considers in the proposal is the frequency of optical gas imaging (OGI) for leak detection and repair surveys. EPA should have considered more and less stringent alternatives for the other aspects of the Proposed Rule, to determine whether different requirements would have resulted in greater net benefits.

Option 2, EPA's selected alternative, requires fugitive emissions survey and repair programs to be performed semiannually at new or re-fractured oil and natural gas well sites, new or modified gathering and boosting stations, and new or modified transmission and storage compressor stations.[27] Option 1 requires annual fugitive emissions surveys at new or modified well sites and semiannual frequency at other new and modified sites.[28] Option 3 requires quarterly fugitive emissions surveys at all new or modified sites.[29] These annual, semiannual, and quarterly fugitive emissions surveys are assumed to result in emission reductions of 40 percent, 60 percent, and 80 percent, respectively.[30]

OMB Circular A-4 calls for the consideration of "all appropriate alternatives for the key attributes or provisions of the rule."[31] And Executive Order 13,563 requires that agencies "select, in choosing among alternative regulatory approaches, those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity)."[32] Some experts consider the evaluation of alternatives to be the most important element of policy analysis.[33] For the analysis to be meaningful, agencies should consider "the full set of options deemed to be technically feasible and legally defensible."[34]

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[25] REGULATORY IMPACT ANALYSIS, *supra* note 10 at 1-6.
[26] *Id*. at 1-8.
[27] REGULATORY IMPACT ANALYSIS, *supra* note 10 at 3-7.
[28] *Id.*
[29] *Id.*
[30] *Id.* at 3-18.
[31] OMB CIRCULAR A-4 at 16 (Sept. 17, 2003), *available at* https://www.whitehouse.gov/omb/circulars_a004_a-4/.
[32] Exec. Order No. 13,563 § 1(b), 76 Fed. Reg. 3821, 3821 (Jan. 18, 2011), *available at* http://www.gpo.gov/fdsys/pkg/FR-2011-01-21/pdf/2011-1385.pdf.
[33] *See* Wendy E. Wagner, *The CAIR RIA: Advocacy Dressed Up as Policy Analysis,* in REFORMING REGULATORY IMPACT ANALYSIS: RESOURCES FOR THE FUTURE REPORT, 56, 70 (Winston Harrington, Lisa Heinzerling & Richard D. Morgenstern eds., 2009).
[34] Winston Harrington, Lisa Heinzerling, and Richard D. Morgenstern, *What We Learned,* in REFORMING REGULATORY IMPACT ANALYSIS: RESOURCES FOR THE FUTURE REPORT, *supra* note 33, at 222.

EPA should identify additional regulatory alternatives for each major component of the Proposed Rule and conduct benefit-cost analysis on these options, in order to develop a rule that maximizes net benefits. It is possible that more stringent options not identified in the Proposed Rule may have yielded higher net benefits. For example, EPA should have considered more stringent performance standards for compressors (proposed 95% reduction of methane and VOCs); pneumatic controllers (proposed natural gas bleed rate limit of 6 standard cubic feet per hour); and pneumatic pumps (proposed 95 reduction of methane and VOCs in most segments).[35] Because no more or less stringent alternatives were analyzed for each of these performance standards, it is difficult (if not impossible) for commenters to assess whether these standards maximize net benefits.

Further, the shape of the benefit-cost curve is not yet clear, even for the OGI survey alternatives. The difference in costs and benefits between the least stringent option and selected option is minimal, but there is a large gap between the selected option and the most stringent option. This suggests that there may be a point between the selected option and the most stringent option that would be deliver more net benefits than the selected alternative. Ideally, EPA should identify and evaluate more stringent options, as resource constraints allow, until it can better identify the approximate level of stringency where net social benefits are maximized (i.e., the point where marginal benefits of additional regulation equalize marginal costs).[36]

III. EPA Should Consider Conducting a Break-Even Analysis to Determine Whether Unquantified Benefits Warrant Selection of a More Stringent Alternative.

EPA should not delay implementing the Proposed Rule, but it should consider conducting a break-even analysis to determine whether the unquantified benefits of the rule warrant selecting a more stringent alternative.

Executive Order 12,866 requires that agencies consider "all costs and benefits of available regulatory alternatives," including "qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider."[37] And Executive Order 13,563 requires that agencies "take into account benefits and costs, both quantitative and qualitative."[38]

Benefit-cost analysis is one of the primary tools to use when choosing between regulatory alternatives.[39] If important costs and benefits cannot be monetized, break-even analyses is a useful tool. In a break-even analysis, an agency measures how high the unquantified benefits would have to be for the benefits to justify the costs (the break-even point), and then uses expert judgment to determine whether the unquantified or benefits are likely to be higher or lower than this point. The Office of Management and Budget has endorsed break-even analysis

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[35] Proposed Rule, 80 Fed. Reg. at 56,595.
[36] OMB CIRCULAR A-4 at 8.
[37] Exec. Order No. 12,866 § 1(a), 58 Fed. Reg. 51,735 (Sept. 30, 1993), *available at* http://www.archives.gov/federal-register/executive-orders/pdf/12866.pdf.
[38] Exec. Order No. 13,563 § 1(a).
[39] OMB CIRCULAR A-4 at § A.

as "an important tool … that has analytical value when quantification is speculative or impossible."[40]

In addition to quantifying net benefits using the Social Cost of Methane, EPA qualitatively evaluated reductions in VOCs and hazardous air pollutants (HAPs) with respect to air quality and health effects, as well as methane's impact on health due to exposure to ozone.[41] The unquantified benefits associated with this Proposed Rule may be significant.[42] For example, more frequent fugitive emission surveys would create environmental and health benefits from capturing additional VOCs, HAPs, and methane. To decide whether the unquantified benefits of VOC, HAP, and methane reduction warrant selecting a more stringent alternative, EPA should conduct a break-even analysis. Though EPA states that it is unable to monetize the benefits of VOC reductions due to modeling uncertainty,[43] it can use its professional judgment to determine whether the health and environment benefits discussed qualitatively warrant selecting Option 3, or an even more stringent alternative.

To promulgate the most socially optimal Rule, EPA should use break-even analysis and its professional judgment to determine whether these additional benefits justify selecting a more stringent alternative.

IV. EPA Should Calibrate Optical Gas Imaging Frequency to Maximize Net Social Benefits, Rather Than Using an Arbitrary Schedule.

The Proposed Rule requires that operators use Optical Gas Imaging (OGI) to inspect "fugitive emissions components"[44] for methane leaks, a process by which cameras reveal otherwise invisible gas leaks.[45] As discussed above, EPA analyzed three options with different baseline inspection frequencies. EPA's selected alternative, Option 2, requires baseline semiannual inspection performed at newly drilled or re-fractured oil and natural gas well sites, new or modified gathering and boosting stations, and new or modified transmission and storage

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[40] *Id.*; *see also* OFFICE OF INFORMATION AND REGULATORY AFFAIRS, 2009 REPORT TO CONGRESS ON THE BENEFITS AND COSTS OF FEDERAL REGULATIONS AND UNFUNDED MANDATES ON STATE AND LOCAL TRIBAL ENTITIES 42, *available at* http://www.whitehouse.gov/sites/default/files/omb/assets/legislative_reports/2009_final_BC_Report_01272010.pdf.

[41] Proposed Rule, 80 Fed. Reg. at 56,596.

[42] *See* REGULATORY IMPACT ANALYSIS, *supra* note 10, at 1-9 & 1-10.

[43] *Id*. at 1-6 ("geographic distribution of VOC emissions from the oil and gas sector are not consistent with emissions modeled").

[44] Proposed Rule, 80 Fed. Reg. at 56,695 (fugitive emissions components are defined as "any component that has the potential to emit fugitive emissions of methane or VOC at a well site or compressor station site, including but not limited to valves, connectors, pressure relief devices, open-ended lines, access doors, flanges, closed vent systems, thief hatches or other openings on a storage vessels, agitator seals, distance pieces, crankcase vents, blowdown vents, pump seals or diaphragms, compressors, separators, pressure vessels, dehydrators, heaters, instruments, and meters. Devices that vent as part of normal operations, such as natural gas-driven pneumatic controllers or natural gas-driven pumps, are not fugitive emissions components, insofar as the natural gas discharged from the device's vent is not considered a fugitive emission. Emissions originating from other than the vent, such as the seals around the bellows of a diaphragm pump, would be considered fugitive emissions").

[45] *Id.* at 56,612.

compressor stations.[46] Option 2 is expected to reduce methane emissions by 60 percent; the more stringent Option 3 is expected to reduce emissions by 80 percent and increase corresponding costs and benefits.[47]

Under the Proposed Rule, following baseline semiannual inspection, a sliding scale adjusts inspection frequency depending on the percentage of leaking components identified using OGI technology:

> If fugitive emissions are detected during two consecutive semi-annual monitoring surveys at less than one percent of the fugitive emission components, then the monitoring survey frequency for that compressor station may be reduced to annually. If, during a subsequent monitoring survey, visible fugitive emissions are detected using OGI from one to three percent of the fugitive emission components, then the monitoring survey frequency for that compressor station must be increased to semiannually. If fugitive emissions are detected from three percent or more of the fugitive emission components during two consecutive semiannual monitoring surveys with OGI technology, then the monitoring survey frequency for that compressor station must be increased to quarterly. If, during a subsequent monitoring survey, fugitive emissions are detected from one to three percent of the fugitive emission components using OGI technology, then the monitoring survey frequency for that compressor station may be reduced to semiannually. If fugitive emissions are detected from less than one percent of the fugitive emission components, then the monitoring survey frequency for that well site may be reduced to annually."[48]

Rather than using these arbitrary schedules, EPA should set OGI inspection frequency in order to maximize net benefits. The Regulatory Impact Analysis does not explain how it arrives at semiannual inspection as the optimal survey frequency. EPA recognizes that "fugitive emissions may be underestimated based on emerging studies,"[49] so the benefits used in EPA's calculations are a conservative lower bound. And in estimating the cost of OGI, EPA uses a linear model that makes semiannual inspection twice as expensive as an annual inspection and quarterly inspection four times the cost.[50] In reality, this will only be the case should a firm contract out the inspection with such a fee structure. If a firm purchases the OGI equipment, the cost would be amortized over its useful life. As the frequency of inspection increases, the number of leaks detected should increase, as well as the emissions recovered. Considering the greater potential for large leaks in older equipment,[51] a factor not expressly considered in EPA's analysis, semiannual inspection may not be the most socially optimal inspection frequency.

The Proposed Rule's sliding schedule could also have the undesirable effect of turning attention away from components as they age. As components age, they become more likely to leak,

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[46] REGULATORY IMPACT ANALYSIS, *supra* note 10, at 3-7.
[47] *Id.* at 3-18.
[48] Proposed Rule, 80 Fed. Reg. at 56,613.
[49] REGULATORY IMPACT ANALYSIS, *supra* note 10, at 7-31.
[50] *Id*. at 7-29, fn.6.
[51] Halley L. Brantley et al., *Assessment of Methane Emissions from Oil and Gas Production Pads using Mobile Measurements*, 48 ENV'T, SCI. & TECH. 14508 (2014).

making the need for inspection and repair greater.[52] By decreasing inspection frequency based on past performance, older equipment will be inspected less. Furthermore, there is evidence that natural gas leaks are random events. Components that leaked in the past may not leak again, and components that have never leaked may do so in the future. Large leaks have been found to be particularly episodic, as they may result from maintenance and equipment malfunction or deterioration.[53] In short, EPA may risk more frequent leaks by ratcheting down inspection schedules over time.

Thus, there are several additional factors that EPA could have considered in its benefit-cost analysis with respect to OGI frequency, including but not limited to: the effects of aging equipment on leak frequency and magnitude; the price and availability of OGI technology for purchase; the cost of repeated inspections;[54] the episodic nature of large leaks; and potential technological advancement of OGI technology and its effect on price. Ideally, EPA should use cost-benefit analysis to determine the socially optimal level of OGI frequency. And regardless of how stringently EPA sets OGI frequency rates now, EPA should plan to gather information about compliance cost and inspection efficacy on an ongoing basis, and schedule retrospective review to fine-tune OGI frequency requirements in the future.

V. To Avoid Grandfathering Concerns and Reduce More Methane Emissions, EPA Should Regulate New and Existing Sources at the Same Time.

In this Proposed Rule, EPA solely regulates new sources pursuant to Section 111(b) of the Clean Air Act. But because EPA is setting VOC and methane emission standards for new and modified sources in this sector, it is also required to regulate existing sources pursuant to Clean Air Act Section 111(d).[55] By regulating new sources, alone, without regulating existing sources at the same time, EPA may create a grandfathering effect—an incentive for operators to extend the life of existing sources in order to regulation. Ideally, EPA should issue proposed Clean Air Act section 111(d) emissions guidelines for existing sources alongside these proposed standards for new sources. EPA should simultaneously set coordinated standards for existing and new sources in order to design the most effective and efficient regulatory program and avoid grandfathering concerns.

Grandfathering existing sources typically creates incentives to keep existing plants in operation longer than is economically efficient. This inefficiency is greatest when the difference between the old and new source standards is large, and when the relevant sources have a long potential lifespan. Differential standards for new and existing plants distort the economic analysis that plant owners undertake when deciding whether to build a new plant or to continue operating the existing one.[56] New construction becomes relatively more expensive (and keeping an older

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[52] *Id*. at 14512 ("CH4 emissions were also positively correlated with water production, negatively correlated with mean age, and not correlated with hydrocarbon liquids production (Table 1).").
[53] *Id.* at 14511.
[54] By one account, the abatement costs for quarterly surveys remain below 15 USD/tCO2e and 800 USD/tVOC. CARBON LIMITS, QUANTIFYING COST-EFFECTIVENESS OF SYSTEMATIC LEAK DETECTION AND REPAIR PROGRAMS USING INFRARED CAMERAS 21, *available at* http://www.carbonlimits.no/PDF/Carbon_Limits_LDAR.pdf.
[55] *See* 42 U.S.C. § 7411(d)(1).
[56] *See* Jonathan Remy Nash & Richard L. Revesz, *Grandfathering and Environmental Regulation: The Law and Economics of New Source Review*, 101 NW. U. L. REV. 1677 (2007).

plant in operation becomes relatively cheaper) than it would be if the level of regulation were consistent across all plants. These problematic incentives create an "old plant effect," keeping existing plants running and delaying the timely closure of old and inefficient facilities.[57]

In the Proposed Rule, EPA regulates new and modified sources under section 111(b).[58] But creating performance standards for new sources under section 111(b) automatically triggers requirements for existing sources under section 111(d). To maximize regulatory efficiency and avoid inefficient grandfathering, EPA should coordinate the regulation of new and existing sources.[59] Developing the two programs jointly will yield a more efficient overall outcome than the sequential approach in which a regulator first picks an optimal standard for new sources and then chooses the optimal transition rule for existing sources in light of the new source standard.[60] The joint approach allows regulators to consider options to minimize the disparity between new and existing source regulation.

Regulating existing sources would also reduce more methane emissions. According to analysis by ICF International, existing sources are projected to be responsible for up to 90 percent of emissions in 2018, because new and modified gas sources are covered by the 2012 regulations, leaving older gas wells, existing oil wells and the infrastructure that supports them unregulated. This is a concern in states like North Dakota, where oil production is booming yet methane capture technology has historically lagged behind.[61]

Extending regulation to existing sources would also encourage more timely component retirements or repairs. This is particularly relevant to transmission components, processing plants, and storage facilities, which often have longer useful lives than wells or smaller equipment. A report commissioned by the Clean Air Task Force found that 97 percent of natural gas processing plants surveyed leaked, with up to 80 percent leaking more than 500,000 standard cubic feet of methane per year.[62] Regulating these existing components would help ensure that such large leaks are identified and remedied, and that aging, leak-prone equipment is repaired or replaced.

By contrast, exempting existing sources and extending the life of older equipment may keep the dirtiest components running longer. As equipment ages, it is more prone to leak than newer equipment.[63] Additionally, exempting existing sources from OGI requirements has the potential to exempt the bulk of emissions from being detected, as approximately 55 percent of current

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[57] *Id*. at 1708.
[58] Proposed Rule, 80 Fed. Reg. at 56,601.
[59] Richard L. Revesz & Allison L. Westfahl Kong, *Regulatory Change and Optimal Transition Relief*, 105 NW. U. L. REV, 1581, 1582-83, 1617 (2011).
[60] *Id*.
[61] Hein, *Curbing Fugitive Methane, supra* note 18.
[62] CARBON LIMITS, *supra* note 54 at 4. The results of this report are conservative because "[t]he database largely consists of identified leaks at Canadian facilities that have been subject to regular leak detection and repair for some time. At present, such systematic requirements are generally not in place for most natural gas facilities in the US, outside of gas processing plants built after 1984. As a result, current emissions from most US facilities are expected to be higher than the emissions typical in these surveys." *Id.*
[63] Brantley, *supra* note 51.

methane emissions come from components targeted by the proposed OGI requirements.[64] Existing sources may benefit the most from OGI, as it can monitor many pieces of equipment at a time (new and existing sources), and would be more cost effective if applied to many components at the same time.[65]

Some temporary grandfathering may be appropriate if existing sources face especially high transition costs relative to new sources, and if the benefits of new pollution controls would be limited for a source scheduled to retire in the immediate future. Here, however, the cost of OGI would be the same for both existing and new sources. As both new and existing sources face the same cost to implement the OGI requirements, and as the benefits of OGI may be at least as high or higher for older sources, EPA should require both new and existing sources to comply with the same inspection regulations. In short, a joint regulatory approach may, in the long run, achieve greater overall emission reductions and deliver greater net benefits.

To help mitigate potential grandfathering effects, EPA appropriately defines "modification" to include fractured or refractured wells, as well as the addition of a new well to a site (regardless of whether the well is fractured).[66] Because wells contain a finite amount of oil and gas for extraction, well operators face a choice when a well's output begins to fall: move to a new site or refracture the existing location to stimulate new output. Refracturing has been a traditional tool of well operation for decades, but with the shale boom it is becoming increasingly central. While the lifespan of shale wells is generally short without refracturing, restimulation can extend a well's life by up to 50 years.[67] By 2020, shale refracturing is expected to account for 11 percent of all hydraulic fracturing activity in the country.[68] EPA's definition reflects this reality and helps prevent operators from unduly prolonging a well site's lifespan to avoid compliance requirements.

In sum, to maximize efficiency and net benefits, and avoid grandfathering concerns, EPA should set standards for new and existing standards in tandem. Barring this, EPA should propose standards for existing sources as soon as practicable, as required by Clean Air Act Section 111(d).

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[64] U.S. ENV'T PROT. AGENCY, COST-EFFECTIVE DIRECTED INSPECTION AND MAINTENANCE CONTROL OPPORTUNITIES AT FIVE GAS PROCESSING PLANTS AND UPSTREAM GATHERING COMPRESSOR STATIONS AND WELL SITES ii, *available at* http://www3.epa.gov/gasstar/documents/clearstone_II_03_2006.pdf.
[65] *See* Memorandum from Karen Schaffner and Kristin Sroka, RTI International, to Brenda Shine, EPA/OAQPS. Impacts for Equipment Leaks at Petroleum Refineries (January 24, 2012), *available at* nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=00002U56.TXT (estimating that OGI can monitor 1,875 components per hour); Robinson, D.R. and Luke-Boone, R.E., *Identifying Natural Gas Leaks to the Atmosphere with Optical Imaging*, 2003, http://www.coalinfo.net.cn/coalbed/meeting/2203/papers/naturalgas/NG017.pdf (estimating 2,100 components per hour for OGI).
[66] Proposed Rule, 80 Fed. Reg. at 56,614.
[67] Dan Murtaugh et al., *Refracturing Is the New Fracturing*, BLOOMBERG BUSINESS (July 6, 2015), *available at* http://www.bloomberg.com/news/articles/2015-07-06/refracking-fever-sweeps-across-shale-industry-after-oil-collapse.
[68] *Id*.

VI. EPA Should Consider Allowing Emissions Trading in This or Future Greenhouse Gas Emission Rules.

The Proposed Rule addresses methane emissions from the majority of the natural gas and oil supply chain (production, processing, transportation and storage, distribution). This proposal follows EPA's work to regulate carbon emissions from power plants and greenhouse gases from various mobile sources. Unfortunately, by regulating one industry sector—and sometimes one greenhouse gas—one at a time, and in isolation from other regulatory programs, EPA forecloses the potential benefits of trading emissions reduction credits among types of greenhouse gases and among different regulated sectors.[69] To take advantage of the flexibility offered by Clean Air Act Section 111, EPA should allow trading of different types of greenhouse gases and allow inter- and intra-sector trading.

To increase flexibility, EPA could define "air pollutants" as the mix of greenhouse gases emitted from the oil and gas sector and set emission requirements in terms of carbon dioxide-equivalents. In fact, EPA took this approach in its Section 202 endangerment finding.[70] In addition to fugitive methane emissions, the oil and gas sector emits carbon dioxide during processing as well as flaring,[71] and the reaction of VOCs and nitrogen oxides create ozone in the presence of sunlight.[72] Allowing trading among greenhouse gases could yield substantial efficiency benefits. Setting emission requirements in terms of carbon dioxide-equivalents would allow firms to target emissions abatement efforts towards greenhouse gases and components that have the lowest marginal abatement cost. This flexibility should lead to more cost-effective reduction of greenhouse gas emissions.

There is no express statutory preclusion to trading across or within categories. As defined under Section 111, a standard of performance is based on "the best system of emission reduction . . . taking into account the cost." This language almost certainly is broad enough to enable EPA to use its statutory discretion to permit trading as the most efficient (and therefore the "best") system for reducing emissions at the sector level.[73] In 1990, Congress amended Section 111 to remove the word "technology" from its definition of performance standards, demonstrating congressional intent to increase the flexibility of the "standard of performance" phrase and freeing Section 111(a)(1) from any statutory requirement that the standards be

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[69] *See generally* GREGORY E. WANNIER ET AL., PREVAILING ACADEMIC VIEW ON COMPLIANCE FLEXIBILITY UNDER § 111 OF THE CLEAN AIR ACT, *available at* http://policyintegrity.org/files/publications/Prevailing_Academic_View_on_Compliance_Flexibility.pdf.

[70] *Cf.* Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202 of the Clean Air Act, 74 Fed. Reg. 66,496 (Dec. 15, 2009).

[71] Proposed Rule, 80 Fed. Reg. at 56607.

[72] REGULATORY IMPACT ANALYSIS, *supra* note 10, at 4-23.

[73] *See* Inimai M. Chettiar & Jason A Schwartz, THE ROAD AHEAD: EPA'S OPTIONS AND OBLIGATIONS FOR REGULATING GREENHOUSE GASES 86-88 (Institute for Policy Integrity Report No. 3, 2009). The statutory mandate to "tak[e] into account the cost" could also be important here. While courts have determined that this language does not require EPA to base its determinations on a formal cost-benefit analysis, they have stated, "because Congress did not assign the specific weight the Administrator should accord each of these factors, the Administrator is free to exercise his discretion in this area." *New York v. Reilly*, 969 F.2d 1147, 1150 (D.C. Cir. 1992).

technology-based.[74] Similarly, in the present new and modified sources context, Section 111(b)(5) expressly states that, except as provided for in Section 7411(h) (which addresses work practice and other alternative standards), "nothing in this section shall be construed to require … any new or modified source to install and operate any particular technological system of continuous emission reduction to comply with any new standard of performance."[75] Thus the statutory text and legislative history support EPA's authority to apply flexible compliance mechanisms.

Nearly all economists agree that the most efficient method to reduce greenhouse gas pollution is to give individual polluters maximum flexibility while still creating incentives for economy-wide emissions reductions.[76] To this end, EPA should establish inter- and intra-sector trading. Under the Clean Power Plan, EPA sets and emissions budgets and states permit regulated stationary sources to trade credits to meet carbon dioxide reduction goals.[77] Similarly, EPA could distribute a capped number of credit allowances to the oil and gas sector and allow these credits to be traded among emitters.

Moreover, there may be potential for these two sectors (electricity utility generating units and the oil and natural gas sector) to be linked in a trading scheme. California has already established a cross-sector emissions trading scheme that includes the natural gas industry.[78] Sources that can reduce emissions at a relatively low cost will benefit from doing so and selling any excess credits. Conversely, sources with relatively high abatement costs will be better off buying credits from others. In this way, the market will determine the most efficient allocation of emissions among regulated sources.

Trading provides the most efficient mechanism to regulate emissions. In order to implement a trading scheme, EPA should consider taking advantage of the flexibility in Section 111 to permit intra- and inter-sector trading, as well as allowing trading among greenhouse gases.

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[74] Jonas Monast et al., AVOIDING THE GLORIOUS MESS: A SENSIBLE APPROACH TO CLIMATE CHANGE AND CLEAN AIR ACT 8 (Nicholas Institute for Environmental Policy Solutions Working Paper, Duke University, 2010).
[75] 42 U.S.C. § 7411(b)(5).
[76] *See generally* Jack Lienke & Jason A Schwartz, SHIFTING GEARS: A NEW APPROACH TO REDUCING GREENHOUSE GAS EMISSIONS FROM THE TRANSPORTATION SECTOR (Institute for Policy Integrity Policy Brief No. 13, 2014), *available at* http://policyintegrity.org/files/publications/Shifting_Gears.pdf; *see also* J. Scott Holladay et al., INST. FOR POLICY INTEGRITY, ECONOMISTS AND CLIMATE CHANGE: CONSENSUS AND OPEN QUESTIONS viii (2009), *available at* http://policyintegrity.org/publications/detail/economists-andclimate-change (noting 91.6% of surveyed economic experts on climate change preferred market-based abatement mechanisms); *see also* Robert R. Nordhaus, *New Wine Into Old Bottles: The Feasibility of Greenhouse Gas Regulation Under the Clean Air Act*, 15 N.Y.U. ENVTL. L.J. 53, 55-56 (2007) (citing Climate Stewardship Act of 2003, S. 139, 108th Cong. §§ 311- 372 (2003)); Robert N. Stavins, *Policy Instruments for Climate Change: How Can National Governments Address a Global Problem?,* 1997 U. CHI. LEGAL F. 293, 297-98 (1997)).
[77] *See* Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64,662 (Oct. 23, 2015), codified at 40 C.F.R. Part 60.
[78] CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY, ARB EMISSIONS TRADING PROGRAM, *available at* http://www.arb.ca.gov/cc/capandtrade/guidance/cap_trade_overview.pdf.

CONCLUSION

Methane emissions from the oil and natural gas sector are a substantial portion of the emissions driving climate change. In the absence of federal regulation, these sources will continue to emit at levels that do not account for their full social costs. Ideally, EPA should regulate these sources by analyzing a full range of regulatory alternatives in order to maximize net benefits; conducting break-even analysis for unquantified benefits; proposing requirements for new and existing sources at the same time and at similar levels of stringency; and using its authority to allow flexible trading schemes that allow operators to reduce emissions as efficiently as possible.

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