Detect Them Before They Get Away: Fenceline Monitoring's Potential To Improve Fugitive Emissions Management

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I. INTRODUCTION

Detecting fugitive emissions before they escape the facilities that produce them poses a significant challenge for industry and public officials. While in-stack concentration and flow-rate instruments often quantify emissions from point sources like stacks and vents, estimating fugitive emissions from leaking equipment, valves, drains, tanks, and fittings requires complicated methodologies that produce variable results.[1] Sources have traditionally relied on emission factors to estimate fugitive emissions.[2] Unfortunately, these existing methods tend to underestimate nonroutine and unexpected emissions, resulting in uncertainty.[3] Regulatory officials then rely on these uncertain estimates to make permitting and enforcement decisions.[4]

Fortunately, advances in monitoring technology now make more accurate and reliable measurements possible.[5] While these measurements often reveal higher emissions than previously estimated, the information they provide enables the development of more effective pollution control strategies.[6] Advanced monitoring could result in improved public health and environmental safeguards, expanded public access to more reliable information about pollution, reduced compliance and enforcement costs,[7] and improved worker safety.[8] To capitalize on this potential, the United States Environmental Protection Agency (EPA) is exploring "next generation" air monitoring strategies and encouraging the development of low-cost monitoring equipment.[9] In a draft roadmap for these efforts, the EPA identified three goals, one of which is the use

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1. Allan K. Chambers et al., *Direct Measurement of Fugitive Emissions of Hydrocarbons from a Refinery*, 58 J. AIR & WASTE MGMT. ASS'N 1047, 1047 (2008).

2. Alex Cuclis, *Why Emission Factors Don't Work at Refineries and What To Do About It*, EPA 11, http://www.epa.gov/ttnchie1/conference/ei20/session7/acuclis.pdf (last visited Feb. 24, 2015).

3. Memorandum from Brenda Shine, Envtl. Eng'r, Ref. & Chem. Grp., to EPA Docket No. EPA-HQ-OAR-2010-0682, NOTICE & COMMENT 11 (Jan. 17, 2014), http://www.noticeandcomment.com/Fenceline-Monitoring-Technical-Support-Document-fn-143776.aspx (follow "Attachment: Inspection" under "Document Attachments").

4. *Case Study Primer for Participant Discussion: Fenceline Air Quality Monitoring*, EPA 4 (May 14, 2012), http://nepis.epa.gov/Exe/ZyPDF.cgi/P100EDIT.PDF?Dockey=P100EDIT.PDF.

5. Cynthia Giles, *Next Generation Compliance*, ENVTL. FORUM, Sept.-Oct. 2013, at 22, 24, *available at* http://www2.epa.gov/sites/production/files/2014-09/documents/giles-next-gen-article-forum-eli-sept-oct-2013.pdf.

6. *Id.*

7. *Draft Roadmap for Next Generation Air Monitoring*, EPA 2 (Mar. 8, 2013), http://www2.epa.gov/sites/production/files/2014-09/documents/roadmap-20130308.pdf.

8. *Case Study Primer for Participant Discussion: Fenceline Air Quality Monitoring*, *supra* note 4, at 3.

9. *Draft Roadmap for Next Generation Air Monitoring*, *supra* note 7, at 1.

of "affordable, near source, fenceline monitoring technologies and sensor network-based leak detection systems for selected hazardous air pollutants and black carbon."[10] Last year, the EPA began moving to implement this roadmap by proposing to amend Clean Air Act (CAA) regulations to require fenceline monitoring around the perimeters of petroleum refineries.

This Comment reviews the EPA's proposal and identifies its potential implications for next generation air monitoring. Part II provides an overview of the legal framework under which the EPA advanced the proposal and the historical context of the EPA regulation under section 112 of the CAA. Part III summarizes the proposal and the process by which EPA developed it. Part IV analyzes concerns about the proposal and suggests potential alternatives for resolving those concerns. Part V assesses the reasoning behind the proposal. Finally, Part VI presents other contexts in which fenceline-monitoring requirements may be useful, including consent decrees, other source category regulations, and general enforcement strategies.

II. THE EPA'S HISTORY REGULATING HAZARDOUS AIR POLLUTANTS FROM PETROLEUM REFINERIES

The EPA predicated its refinery-fenceline monitoring proposal on the CAA's hazardous air pollutant mandate. To understand the proposal in the context of that regulatory scheme, it is helpful to consider the EPA's history regulating hazardous air pollutants under the act. Dissatisfied with the EPA's lack of progress in addressing hazardous air pollution, in 1990 Congress amended the CAA to establish a two-step process for developing National Emissions Standards for Hazardous Air Pollutants (NESHAPS).[11] First, as amended, section 112(d) of the CAA requires the application of maximum achievable control technology (MACT) to major sources of hazardous air pollutants.[12] These MACT standards set the floor for pollution controls within categories of industrial sources[13] and apply to pollutants released from fugitive emissions sources.[14] Section 112(d)(6) further requires that EPA review

10. *Id.* at 2.

11. *See* Arnold W. Reitze, Jr. & Randy Lowell, *Control of Hazardous Air Pollution*, 28 B.C. ENVTL. AFF. L. REV. 229, 247 (2001) (citing Clean Air Act § 112(d), 42 U.S.C. § 7412(d)(1) (2012)).

12. *See id.* at 251 (citing Initial List of Categories of Sources Under Section 112(c)(1) of the CAA Amendments of 1990, 57 Fed. Reg. 31,576, 31,578, 31,580 (July 16, 1992)).

13. *Id.* at 257 (citing National Emission Standards for Hazardous Air Pollutants for Source Categories: General Provisions, 58 Fed. Reg. 42,760, 42,762 (Aug. 11, 1993)).

14. 42 U.S.C. § 7412(d)(2)(C).

improvements in technology and methodology every eight years and, if necessary, update MACT standards to reflect those developments.[15] The second step requires the EPA, under section 112(f)(2), to assess the health and environmental risks remaining after MACT standards take effect.[16] The EPA must determine an acceptable level of risks and, if that level is exceeded, strengthen standards so that they "provide an ample margin of safety to protect public health."[17]

Pursuant to these provisions, the EPA now proposes to update existing refinery MACT standards to require fenceline monitoring.[18] MACT standards apply to sources according to designated industrial categories and subcategories, which the EPA established based on source characteristics.[19] The standards apply uniformly to all sources within a category.[20] Emissions from new sources within a category may not exceed the average emissions produced by the best-controlled sources in that category.[21] MACT floors for existing sources are set based on the average emissions produced by the 12% of existing sources with the best emission controls.[22] The EPA considers costs only when evaluating standards that exceed the mandatory MACT floor.[23]

Refineries are a source category. In 1995, the EPA promulgated Refinery MACT 1 pursuant to section 112(d)(2) and (3).[24] The standard governs "miscellaneous process vents, storage vessels, wastewater, equipment leaks, gasoline loading racks, marine tank vessel loading and heat exchange systems."[25] Refinery MACT 2, a standard promulgated in 2002, applies to process vents not covered by Refinery MACT 1.[26]

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15. *Id.* § 7412(d)(6).

16. Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards, 79 Fed. Reg. 36,880, 36,883-84 (June 30, 2014) (citing 42 U.S.C. § 7412(f)(2)).

17. 42 U.S.C. § 7412(f)(2)(A).

18. 79 Fed. Reg. at 36,920, 36,923 (to be codified at 40 C.F.R. pt. 63).

19. Reitze & Lowell, *supra* note 11, at 251 (citing Initial List of Categories of Sources Under Section 112(c)(1) of the CAA Amendments of 1990, 57 Fed. Reg. 31,576, 31,578 (July 16, 1992)).

20. *Id.*

21. 42 U.S.C. § 7412(d)(3).

22. *Id.* § 7412(d)(3)(A).

23. Reitze & Lowell, *supra* note 11, at 257 (citing National Emission Standards for Hazardous Air Pollutants for Source Categories: General Provisions, 58 Fed. Reg. 42,760, 42,762 (Aug. 11, 1993)).

24. Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards, 79 Fed. Reg. 36,880, 36,886 (June 30, 2014).

25. *Id.*

26. *Id.*

III. DEVELOPMENT OF THE EPA'S FENCELINE-MONITORING PROPOSAL

In 2012, a group of environmental and public health organizations filed a complaint against the EPA for missing deadlines to review Refinery MACT 1 and 2 as required by sections 112(d)(6) and 112(f).[27] The parties settled that case, and as a result of their agreement, EPA completed the required risk and technology review in 2014.[28] The proposed fenceline-monitoring requirement resulted from that review. This Part provides a summary of the risk and technology review the EPA conducted, describes the EPA's proposed requirement, and explores the EPA's selection of passive time-integrated diffusive monitoring as the best technology available for implementing the requirement.

A. The EPA Risk and Technology Review

In conducting its review, the EPA relied on an Information Collection Request (ICR) sent to the entire petroleum refining industry on April 1, 2011.[29] The request, made pursuant to CAA section 114,[30] contained four components:

> (1) A questionnaire on processes and controls to be completed by all petroleum refineries (Component 1); (2) an emissions inventory to be developed by all petroleum refineries using the emissions estimation protocol developed for this effort (Component 2); (3) distillation feed sampling and analysis to be conducted by all petroleum refineries (Component 3); and (4) emissions source testing to be completed in accordance with an EPA-approved protocol for specific sources at specific petroleum refineries (Component 4).[31]

The EPA calculated an emissions inventory for every source in the refining category based on the data it gained through the information request.[32] Although the EPA identified multiple gaps in the information it received,[33] it considers the emissions inventories it developed to be the

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27. *Id.*

28. *See id.*

29. Memorandum from Ted Palma & Darcie Smith, Physical Scientists, Health & Envtl. Impacts Div., EPA, to Brenda Shine, Envtl. Eng'r, Ref. & Chem. Grp., NOTICE & COMMENT 1 (Jan. 7, 2014), http://www.noticeandcomment.com/Fenceline-Ambient-Benzene-Concentrations-surrounding-Petroleum-Refineries-fn-143848.aspx (follow "Attachment: Inspection" under "Document Attachments").

30. *Id.*

31. Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards, 79 Fed. Reg. 36,880, 36,887 (June 30, 2014).

32. Memorandum from Ted Palma & Darcie Smith to Brenda Shine, *supra* note 29, at 1.

33. 79 Fed. Reg. at 36,887.

most current and accurate available.[34] Based on this information, the EPA also estimated "post-control" hazardous air pollutant emissions inventories for facilities in the refining sector to predict emissions levels after implementation of the updated standards it proposed.[35] The EPA then relied on this information in completing the required review.[36]

The EPA considers residual risks acceptable if they pose a maximum individual lifetime cancer risk (MIR) of less than 100 in 1 million.[37] The EPA calculated risks based on both actual and allowable emissions. It determined the MIR posed by actual emissions of hazardous air pollutants from refineries is 60 in 1 million and estimated that those emissions cause 0.3 excess cancer cases annually.[38] The EPA determined the MIR posed by allowable emissions equaled the acceptable limit of 100 in 1 million and 0.6 excess cancer cases annually.[39] The EPA considers the MIR posed by allowable emissions assessment a high-end risk estimate, but acknowledged uncertainties with estimates based on both actual and allowable emissions.[40] While the EPA concluded that risks are within an acceptable range, it nevertheless solicited comment on its methodology, the acceptability of the health information on which it relied, and consideration of "individuals' potential cumulative inhalation and ingestion pathway exposure."[41] The EPA's request for comment reflects the difficulty involved with calculating health risks, which is only further complicated by uncertainty in the underlying emissions estimates used to determine public exposure.[42]

The EPA's conclusion that health risks fall within acceptable limits precluded a finding that those risks necessitate more stringent regulation. Nevertheless, the EPA determined that incorporating a fenceline-monitoring requirement into Refinery MACT 1 is appropriate pursuant to its section 112(d)(6) technology review.[43] The EPA hopes the enhanced monitoring standard, which would apply industry-wide, will

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34. Memorandum from Ted Palma & Darcie Smith to Brenda Shine, *supra* note 29, at 1.
35. *Id.*
36. 79 Fed. Reg. at 36,886.
37. *Id.* at 36,939.
38. *Id.* at 36,938.
39. *Id.* at 36,939.
40. *Id.* at 36,940.
41. *Id.*
42. Kristina W. Whitworth et al., *Kriged and Modeled Ambient Air Levels of Benzene in an Urban Environment: An Exposure Assessment Study*, 10 ENVTL. HEALTH 1 (2011).
43. 79 Fed. Reg. at 36,920.

"ensure that owners and operators properly monitor and manage fugitive HAP emissions."[44]

B. The EPA Refinery Fenceline-Monitoring Proposal

Under the EPA's proposal, concentrations of benzene would be measured in the air around a facility's perimeter.[45] The results would be made available online.[46] The EPA decided to monitor benzene specifically because it considers it a surrogate for other hazardous air pollutants flowing out of fugitive emissions sources.[47] In their joint comments on the proposal, the American Petroleum Institute (API) and the American Fuel and Petrochemical Manufacturers (AFPM) agreed with the EPA's selection of benzene as a surrogate for other hazardous air pollutants, although they questioned the usefulness of the information provided by fenceline monitoring.[48] Benzene "is the most ubiquitous [hazardous air pollutant], present in all refineries, and present in most [hazardous air pollutant] streams common to basic refinery processes."[49] Its relatively high mass makes monitoring easy.[50] Furthermore, benzene normally leaks from near ground fugitive emissions sources like "process equipment, wastewater treatment, storage tanks, and loading operations."[51] As a result, the highest concentrations of the pollutant will likely accumulate near the ground level of the property boundary, better enabling direct measurements through fenceline monitoring.[52]

The costs and complications associated with monitoring other hazardous air pollutants could be significant.[53] Their lower concentrations make them less likely to be detected by fenceline monitors.[54] Including them in the monitoring requirement could lead to higher compliance costs because of the additional equipment and longer sampling periods required for useful analyses.[55]

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44. *Id.* at 36,923.
45. *Id.*
46. Matthew Todd, *API and AFPM Comments on EPA Petroleum Refinery Sector Risk and Technology Review*, AM. PETROLEUM INST. 40 (Oct. 28, 2014), http://www.api.org/globalitems/~/media/Files/Policy/Environment/2014-10-28-API-AFPM-RSR-Comments-Attachment-A-1.pdf.
47. 79 Fed. Reg. at 36,924.
48. Todd, *supra* note 46, at 54.
49. *Id.*
50. *Id.* at 54-55.
51. Memorandum from Brenda Shine to EPA, *supra* note 3, at 3.
52. *Id.*
53. Todd, *supra* note 46, at 55.
54. *Id.*
55. *Id.*

To incentivize refineries to utilize fenceline data to develop more effective emission controls, the proposal includes an ambient air standard for fenceline benzene.[56] Corrective action would be triggered if the benzene concentration measured by the monitors at a facility's perimeter exceeded 9 $\mu g/m^3$.[57] However, according to the fugitive emissions refineries reported in response to the ICR, no refineries violate this standard.[58] In order for a refinery to trigger the corrective action requirement, then, its benzene concentrations would have to exceed the estimates provided to the EPA.[59] The EPA therefore does not anticipate that a reduction in fugitive emissions will result from the fenceline-monitoring requirement.[60] The requirement is not intended to reduce emissions but to ensure that emissions do not exceed the uncertain estimates currently available.

C. Passive Diffusive Monitoring and Alternative Methods Considered by the EPA

The EPA considered six fenceline-monitoring methods, including Differential Absorption Light Detention and Ranging (DIAL), and ultimately selected passive time-integrated diffusive monitoring as the best option.[61] DIAL monitoring relies on differences in light signals to measure fugitive emissions.[62] However, passive diffusive monitoring requires less sophisticated operator training and equipment than alternative methods such as DIAL, reducing installation and maintenance costs.[63] Under the EPA proposal, diffusive tube samplers would be placed at between twelve and twenty-four points around a source's perimeter.[64] Alternative configurations may be implemented at oddly shaped facilities.[65] "These samplers would monitor the level of fugitive emissions that reach the fenceline from all fugitive emission sources at the facility."[66] The systems will provide measurements at two-week time intervals.[67] Although immediate feedback would be ideal, these systems

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56. *See* Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards, 79 Fed. Reg. 36,880, 36,920 (June 30, 2014).
57. *Id.* at 36,926.
58. *Id.* at 36,920.
59. *Id.*
60. *Id.* at 36,923.
61. *Id.* at 36,920, 36,923.
62. *Id.* at 36,921-22.
63. Memorandum from Brenda Shine to EPA, *supra* note 3, at 4.
64. 79 Fed. Reg. at 36,923.
65. Memorandum from Brenda Shine to EPA, *supra* note 3, at 8.
66. 79 Fed. Reg. at 36,923.
67. *Id.*

will provide measurements much more frequently than current methods. Concentrations will be measured on a rolling annual basis, so that compliance with the ambient benzene standard will be determined based on the average result from the twenty-six immediately preceding two-week samples.[68]

There is some concern that relying on passive diffusive tube monitoring will minimize the positive impact of the fenceline-monitoring requirement.[69] Measurements based on an average of the previous two weeks may make it difficult to identify spikes in emissions or determine when spikes occurred. Real-time feedback would allow leaks to be detected and addressed expeditiously.[70] However, the EPA selected passive diffusive monitoring "based on the low costs and relative benefits."[71] The EPA calculates that active monitoring would impose annual costs nearly six times higher than passive monitoring.[72] The EPA also notes, "[G]iven the absence of fenceline monitors at most facilities, there is very limited information available at present about fenceline concentrations and the extent to which they may exceed concentrations modeled from inventories."[73] Imposing further monitoring costs on refineries without first determining the extent to which those methods may be necessary could place an unreasonable burden on refiners. If the data produced through passive diffusive monitoring indicates persistent gaps in emissions measurements or dramatically higher emissions concentrations than currently estimated, the EPA will not be precluded from requiring more detailed monitoring in the future.

Passive diffusive monitoring has proven successful in the past. European refineries have successfully deployed diffusive monitoring for benzene, and a standard method for conducting diffusive sampling has been issued by the International Organization for Standardization.[74] The EPA also used diffusive monitoring in a pilot project in Corpus Christi.[75]

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68. *Id.*
69. *See id.* at 36,921.
70. *See id.*
71. *Id.* at 36,923.
72. *See id.*
73. *Id.* at 36,926.
74. Memorandum from Brenda Shine to EPA, *supra* note 3, at 3 (citing *ISO 16017-2:2003*, ISO, http://www.iso.org/iso/catalogue_detail.htm?csnumber=29195 (last visited Feb. 28, 2015)).
75. *Id.*

IV. OBSTACLES TO THE EPA'S FENCELINE-MONITORING PROPOSAL

While the EPA's fenceline-monitoring proposal would advance its next generation air monitoring goals through updated refinery-sector regulations, outstanding issues need to be resolved to ensure the proposal's successful implementation and address industry concerns. First, measurements of benzene concentrations at a facility's perimeter may reflect emissions released from other sources.[76] To provide reliable information to the public and hold sources accountable for corrective action, it is important to distinguish between emissions attributable to the regulated source and emissions attributable to other sources. Second, the requirement will impose costs on the refining industry, and the extent of those costs is disputed.[77] This Part reviews these issues and suggests options that may prove effective in mitigating or resolving them.

A. Adjusting for Background Emissions To Develop Accurate Measurements

Raw data produced by fenceline monitoring cannot distinguish between emissions from the source within the fenceline and emissions from other sources.[78] Areas where refineries are located next to one another, other industrial sources of benzene, or transportation corridors only exacerbate this problem.[79] Recognizing this issue, the EPA requested input on options for making adjustments to fenceline-monitoring measurements to exclude emissions generated from sources beyond a refinery's boundaries.[80] The EPA's proposal would allow refineries to subtract "lowest measured fenceline concentrations" from the maximum measured level to account for background concentrations.[81] Sources would also be allowed to submit site-specific plans for calculating background emissions concentrations and interference from other sources.[82] This may include accounting for interference at specific monitors at the fenceline because external sources may not affect all of a source's fenceline monitors in the same way.[83]

The EPA's plans to share fenceline-monitoring measurements with the public and impose a corrective action requirement make background

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76. 79 Fed. Reg. at 36,924.
77. Todd, *supra* note 46, at 50.
78. 79 Fed. Reg. at 36,924.
79. *Id.*
80. *Id.*
81. *Id.* at 36,925.
82. *Id.*
83. *Id.*

adjustments critically important. Plant workers and community neighbors have an interest in accessing raw data that shows total benzene concentrations in the air. However, unadjusted raw data could also cause confusion or misunderstanding, leading the public to assign blame for emissions to the wrong source. Additionally, holding a refinery responsible for corrective action requires determining the benzene emissions attributable to that refinery. A refinery cannot be held accountable for benzene emissions released beyond its boundaries.

Fortunately, EPA experience suggests accurate and reliable background emissions calculations are possible. Strategically locating monitors to prevent terrain features and other structures from obstructing emission flows and interfering with wind direction, and to prevent interference from other nearby sources, improves the likelihood raw monitoring data will reflect emissions from the regulated source.[84] The 2009 Corpus Christi pilot study further distinguished between source and nonsource contributions by comparing downwind and upwind monitors at the source and using time-series analysis.[85] That study acknowledged the difficulty of distinguishing between sources in complex environments but still identified several potential offsite emissions contributors.[86] Some areas already have extensive air monitoring systems that can provide additional information to formulate appropriate background adjustments.[87] Furthermore, if fenceline monitoring is deployed source-wide, methods for calculating background emissions will improve as industry and public officials gain more experience using the technology and more data becomes available.

Raw and adjusted measurements must be presented to the public in context, though, and should include relevant information about weather data, health and environmental risks, and neighboring sources.[88] Members of the public should be able to distinguish easily between the raw data indicating total benzene concentrations in the air around a source and data detailing fugitive benzene emissions from the specific source. Fenceline monitors are already used to measure emissions at two petroleum refineries in the San Francisco Bay Area. These monitors feed

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84. Eric M. Fujita & David E. Campbell, *Review of Current Air Monitoring Capabilities Near Refineries in the San Francisco Bay Area*, BAY AREA AIR QUALITY MGMT. DISTRICT 4-7 (July 3, 2013), http://www.baaqmd.gov/~/media/Files/Technical%20Services/DRI_Final_Report_061113.ashx.

85. Eben D. Thoma et al., *Facility Fence-Line Monitoring Using Passive Samplers*, 61 J. AIR & WASTE MGMT. ASS'N 834, 839-40 (2011).

86. *Id.* at 841.

87. Todd, *supra* note 46, at 74.

88. *See id.* at 77.

data to a website that reveals detected concentrations of chemicals like ozone and benzene alongside weather conditions that impact those concentrations, including wind direction and speed.[89] This website, www.fenceline.org, serves as a useful template for sharing fenceline measurements with the public online.

B. Estimating and Minimizing Compliance Costs

The EPA projects passive diffusive tube fenceline monitoring will impose $12.2 million in capital costs, $3.83 million in annual operating costs, and $5.58 million in total annualized costs on the petroleum refining industry.[90] This was the least expensive option the EPA considered.[91] API and AFPM estimate costs will be higher because refineries, especially those with disjointed property, will have to install and maintain many more samplers than the EPA predicts to comply with the requirements the EPA has proposed.[92] The industry groups also estimate that monitoring units will cost twice the amount the EPA predicts due to the required participation of outside laboratories, pushing the total industry costs up to around $23 million annually.[93]

Estimating the costs of new regulations is an inexact science, comparable to the task of estimating fugitive emissions itself. Research indicates that federal agencies tend to overestimate costs of proposed regulations.[94] Unanticipated advances in technology, for instance, can reduce the costs of complying with a rule after it takes effect.[95] As sources within an industry seek to comply with federal regulations, they have a competitive incentive to do so in the most cost-effective way. At the same time, equipment providers and other parts of the compliance industry have an incentive to supply products at a lower cost. As more sources begin to comply with a rule and use the required equipment, suppliers have more opportunities to test the effectiveness of their products and develop technologies that lower costs.

There is no reason to suspect these same incentives will not drive compliance costs downward if the EPA moves forward in requiring

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89. *System Status*, RICHMOND CMTY. AIR MONITORING PROGRAM, http://www.fenceline.org/richmond/data.php (last visited Feb. 8, 2015).

90. Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards, 79 Fed. Reg. 36,880, 36,923 (June 30, 2014).

91. *Id.*

92. Todd, *supra* note 46, at 50.

93. *Id.* at 51.

94. Winston Harrington et al., *On the Accuracy of Regulatory Cost Estimates*, RESOURCES FOR THE FUTURE 23 (Jan. 1999), http://www.rff.org/documents/RFF-DP-99-18.pdf.

95. *Id.*

fenceline monitoring around petroleum refineries. Perhaps there is some unfairness for the refining industry, because the EPA has not yet proposed fenceline monitoring for other source categories.[96] If such rules are promulgated in the future, those industries will be able to rely on refiners' experiences to devise strategies that minimize their regulatory burden.

However, other effects of the fenceline-monitoring requirement may mitigate compliance costs for refineries. Addressing leaks in less time, for example, will enable the recovery of product that would otherwise be lost.[97] Additionally, if fenceline monitoring proves successful in measuring fugitive emissions of hazardous air pollutants, the EPA may reduce other regulatory costs imposed on refiners through existing monitoring requirements. For instance, API and AFPM suggest deleting existing RMACT 1 standards that require monitoring for equipment leaks, waste management units and storage tanks.[98] Functioning fenceline-monitoring systems may make these requirements duplicative and unnecessary. In the end, fenceline monitors may also prove less burdensome for refineries to operate and provide more certainty about emissions levels.

Beyond direct costs, there is some concern that fenceline measurements may expose refineries to increased tort liability.[99] However, the opposite is also true. Fenceline measurements may provide refineries with a defense to tort claims.[100] Combined with reliable methods for calculating background emissions, these measurements may prove especially helpful to sources located near other sources, which will be able to distinguish their emissions from those released by other facilities.

V. JUSTIFICATION FOR EPA'S FENCELINE-MONITORING PROPOSAL

API and AFPM argue that refinery emissions are not underestimated and that the fenceline-monitoring requirement is unnecessary.[101] However, this argument faults the EPA for failing to

96. Todd, *supra* note 46, at 41.

97. Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards, 79 Fed. Reg. 36,880, 36,923 (June 30, 2014).

98. Todd, *supra* note 46, at 50.

99. Jacob Hollinger, *EPA's Next Generation Compliance Initiative—The Agency's Latest Proposed Rule for Refineries Shows the Initiative in Action and Provides a Glimpse of the Future for Other Industries*, ENERGY BUS. L. (May 27, 2014), http://www.energybusinesslaw.com/2014/05/articles/environmental/epas-next-generation-compliance-initiative-the-agencys-latest-proposed-rule-for-refineries-shows-the-initiative-in-action-and-provides-a-glimpse-of-the-future-for-other-ind/.

100. *Id.*

101. Todd, *supra* note 46, at 48.

prove a negative. In updating standards meant to protect the public from hazardous air pollutants, the EPA decides whether technology and human knowledge have developed to enable the application of new techniques and equipment. It cannot fully assess the impact of those practices until they are successfully implemented.

The EPA advances several reasons for requiring fenceline monitoring at petroleum refineries. First, the EPA notes the difficulty involved with estimating fugitive emissions and points to available research indicating those emissions are currently underestimated.[102] Second, the EPA points to its reliance on estimates submitted through the ICR in conducting its review and promulgating new standards.[103] Third, the EPA hopes the proposal will enable more effective emissions management.[104] Finally, the EPA intends to use the information gathered by fenceline monitors to understand the impact benzene and other fugitive emissions have on surrounding communities.[105] This Part explores each of these rationales and the effect fenceline monitoring may have in resolving the EPA's concerns.

A. More Certain Emission Measurements

The EPA studies demonstrate discrepancies between reported emissions, data modeling, and measured concentrations.[106] For instance, in 2010 the city of Houston used DIAL monitoring to measure emissions at an industrial complex that included a petroleum refinery.[107] The Houston study revealed that the emission factors currently relied on to estimate fugitive emissions, when compared to the DIAL measurements, underestimated benzene emissions from a factor of five to a factor of ninety-three.[108]

In 2006, the EPA Office of Inspector General concluded that "[m]ore advanced, accurate, continuous, and short-term determinations

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102. 79 Fed. Reg. at 36,920; Memorandum from Brenda Shine to EPA, *supra* note 3, at 2.

103. 79 Fed. Reg. at 36,920.

104. *Id.* at 36,923.

105. *Id.* at 36,938.

106. Memorandum from Brenda Shine to EPA, *supra* note 3, at 2.

107. Loren Raun & Dan W. Hoyt, Bureau of Pollution Control & Prevention, City of Houston, *Measurement and Analysis of Benzene and VOC Emissions in the Houston Ship Channel Area and Selected Surrounding Major Stationary Sources Using DIAL (Differential Absorption Light Detection and Ranging) Technology To Support Ambient HAP Concentrations Reductions in the Community (DIAL Project)*, GREEN HOUS. 1, 9 (July 20, 2011), http://www.greenhoustontx.gov/dial20110720.pdf.

108. *Id.* at 99.

of emissions are needed for major emitters."[109] The report suggested that "shifting to direct emissions measurement and monitoring systems" would be preferable to reliance on emissions factors.[110] The EPA's subsequent 2009 pilot project at the Flint Hills West Refinery in Corpus Christi, Texas, demonstrated the viability of fenceline monitoring in an industrial setting.[111] The year-long study yielded "high data completeness rates" while informing the EPA's development of fenceline-monitoring methods.[112] EPA concluded that the project produced "cost-effective, relatively robust" information.[113]

As noted in Part III, the Corpus Christi project relied on passive diffusive monitoring,[114] the same technology the EPA has selected in its regulation.[115] API and AFPM argue that this monitoring will not validate emissions estimates "because mass emission rates from refinery sources are not correlated with refinery fenceline concentrations."[116] This argument assumes that the EPA and industry officials will not be able to devise reliable methods for identifying background emissions concentrations and assign responsibility for emissions to the appropriate source. However, as Part III discussed, the EPA has proposed a number of potential solutions for determining background concentrations. While resolving that issue may require innovation and flexibility, at a minimum fenceline monitoring can be expected to lend some certainty to emissions measurements and indicate whether additional efforts may be helpful in quantifying fugitive emissions and identifying their sources.

B. Better Information for Regulatory Decision Making

The EPA noted that although it relied on data from the ICR in conducting its review, many refineries did not follow the "emissions estimation protocol" it attached to the ICR to provide uniform guidelines for emission calculations.[117] The guidelines were intended "to address gaps in emissions inventories and the methodologies used to determine

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109. Office of the Inspector Gen., *EPA Can Improve Emissions Factors Development and Management*, EPA 33 (Mar. 22, 2006), http://www.epa.gov/oig/reports/2006/20060322-2006-P-00017.pdf.

110. *Id.* at 33, 35.

111. Thoma et al., *supra* note 85, at 841.

112. *Id.*

113. Memorandum from Brenda Shine to EPA, *supra* note 3, at 3.

114. Thoma et al., *supra* note 85, at 834.

115. Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards, 79 Fed. Reg. 36,880, 36,923 (June 30, 2014).

116. Todd, *supra* note 46, at 48.

117. 79 Fed. Reg. at 36,887.

emissions," but as a result of noncompliance several gaps remained.[118] For instance, the EPA provided instructions and reporting forms for assessing emissions from wastewater systems, but "approximately 20% of the major source refineries" reported no such emissions.[119] Consistent information from fenceline-monitoring systems would allow the EPA to draw comparisons with other estimates, enabling it to identify flaws in methodology and form a more comprehensive understanding of fugitive emissions. This information would provide a much stronger basis for regulatory decision making in the future.

C. Improved Emissions Management

Fenceline-monitoring systems would encourage better emissions management. As noted in Part III, the EPA does not expect the requirement to reduce emissions. However, if a pollution source underestimates fugitive emissions or new leaks develop, it will improve emissions detection and leak identification.[120] Identifying these leaks with current methods often requires considerable effort and may be impractical in some circumstances.[121] A single plant may host several leaks,[122] and accessing them may be difficult or even dangerous.[123] As a result, some leaks remain unrepaired and continue releasing "fugitive emissions of volatile organic chemicals (VOCs) and other hazardous chemicals."[124] Fenceline-monitoring information could help identify these leaks, enabling faster repairs and providing an additional backstop against fugitive emission spikes.

These increased capabilities could prove especially helpful in managing and reviewing spontaneous accidents and emergency events. For example, in June 2012, a failed bleeder plug at an ExxonMobil refinery in Baton Rouge, Louisiana, leaked more than 31,000 pounds of benzene.[125] The leak began at approximately 1:54 AM, and a Louisiana

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118. Memorandum from Brenda Shine to EPA, *supra* note 3, at 1, 2.

119. *Id.* at 2.

120. *See* 79 Fed. Reg. at 36,920, 36,923.

121. *Case Study Primer for Participant Discussion: Fenceline Air Quality Monitoring*, *supra* note 4, at 2.

122. *Id.*

123. Chambers et al., *supra* note 1, at 1048.

124. *Proper Monitoring Essential To Reducing 'Fugitive Emissions' Under Leak Detection and Repair Programs*, ENFORCEMENT ALERT (EPA, Wash., D.C.), Oct. 1999, at 1, http://www2.epa.gov/sites/production/files/documents/emissions.pdf.

125. Letter from J. Derek Reese, Senior Section Supervisor, ExxonMobil Chem. Co., to Louisiana Department of Environmental Quality, NPR (Aug. 14, 2012), http://media.npr.org/documents/2013/may/exxon-60-day-8-14-12.pdf (attaching ExxonMobil's Unauthorized

Department of Environmental Quality emergency responder arrived to conduct fenceline monitoring approximately seven hours later at 9:00 AM.[126] More benzene leaked from that accident than the refinery reported emitting over two preceding years.[127] While the Louisiana Department of Environmental Quality did not consider those levels extremely hazardous,[128] it determined Exxon violated state law by failing to provide notice of the scope of the leak and by releasing pollutants without authorization.[129] A permanent fenceline-monitoring system would have begun collecting data the instant the leak began and officials would be able to rely on that data later to assess the extent of the release.

D. Consequences for Surrounding Neighborhoods

Improved understanding of the impact fugitive emissions like benzene have on surrounding areas could have especially strong consequences for communities in Gulf Coast states. Texas is home to twenty-seven refineries, more than any other state.[130] Louisiana comes in second with nineteen, and Alabama and Mississippi each have three.[131] The Texas refining industry spans the entire state, but is most concentrated along the coastline.[132] The Louisiana refining industry is heavily concentrated in communities along the Mississippi River between New Orleans and Baton Rouge.[133] Some Louisiana communities, like Norco and Lake Charles, host multiple refineries.[134]

The information gathered in these communities could provide more precise exposure estimates, enabling more reliable health risks assessments. Regardless of whether fenceline-monitoring measures

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Discharge Notification Report issued by the Louisiana Department of Environmental Quality, dated June 14, 2012).

126. *In re* ExxonMobil Corp., Enf't No. AE-CN-12-00835, at 2 (La. Dep't of Envtl. Quality July 19, 2012), http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=8458721&ob=yes&child=yes.

127. Elizabeth Shogren & Robert Benincasa, *Baton Rouge's Corroded, Overpolluting Neighbor: Exxon Mobil*, NPR (May 30, 2013), http://www.npr.org/2013/05/30/187044721/baton-rouge-s-corroded-overpolluting-neighbor-exxon.

128. Letter from J. Derek Reese to Louisiana Department of Environmental Quality, *supra* note 125, at 2.

129. *In re ExxonMobil Corp.*, Enf't No. AE-CN-12-00835, at 2-3.

130. *Number and Capacity of Petroleum Refineries*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/dnav/pet/PET_PNP_CAP1_A_(NA)_8O0_COUNT_A.htm (last visited Mar. 18, 2015).

131. *Id.*

132. *Map of Texas Energy Industry*, U.S. ENERGY INFO. ADMIN. (Mar. 27, 2014), http://www.eia.gov/state/?sid=TX.

133. *Map of Louisiana Energy Industry*, U.S. ENERGY INFO. ADMIN. (Mar. 27, 2014), http://www.eia.gov/state/?sid=LA.

134. *Id.*

higher concentrations of hazardous air pollutants than currently estimated, the security and assurances provided to communities around sources, by itself, could have a positive impact on local real estate markets, community engagement, and even worker moral and retention. As residents of Baton Rouge learned in 2012, even if current emissions measurement practices are adequate most of the time, they are poorly suited for spontaneous accidents and emergency events. Access to concrete information about hazardous air pollutants is most critical in those situations.

Fenceline-monitoring data could also have a positive impact on efforts to promote environmental justice, another goal the EPA identified in its "Roadmap for Next Generation Air Monitoring."[135] The EPA found that, nationwide, the population living within fifty kilometers of a petroleum refinery is disproportionately African-American, Hispanic, below the poverty level, or without a high school diploma.[136] African Americans, for instance, make up only 13% of the national population, but comprise 28% of the population living near petroleum refineries.[137] The EPA expects the data it collects as a result of the requirement will enhance its understanding of the impact fugitive emissions have on these surrounding communities.[138]

VI. POTENTIAL FOR FENCELINE MONITORING BEYOND REFINERY MACT 1

Outside of the formal rulemaking process, the EPA already includes fenceline-monitoring requirements in its CAA enforcement strategy. In settlements to resolve CAA litigation, BP agreed to invest $2 million in a fenceline-monitoring system at its refinery in Whiting, Indiana,[139] while Shell agreed to invest at least $1 million in a fenceline-monitoring system at its Deer Park, Texas, refinery.[140] Under both agreements, the monitoring data will be accessible to the public online.

As litigation and regulation lead more sources to install fenceline monitoring, the EPA will likely push to expand the technology to other

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135. *Draft Roadmap for Next Generation Air Monitoring*, *supra* note 7, at 2.

136. Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards, 79 Fed. Reg. 36,880, 36,938 (June 30, 2014).

137. *Id.* at 36,937.

138. *Id.* at 36,938.

139. Consent Decree at 61-62, United States v. BP Prods. N. Am., Inc., No. 2:12 CV 207, 2012 WL 5411713 (N.D. Ind. Sept. 28, 2012), http://www2.epa.gov/sites/production/files/documents/whiting-cd.pdf.

140. Consent Decree at 69, United States v. Shell Oil Co., No. 4:13-cv-2009, (S.D. Tex. July 10, 2013), http://www2.epa.gov/sites/production/files/2014-07/documents/sdp-cd.pdf.

source categories.[141] The draft "Roadmap for Next Generation Air Monitoring" already identified fenceline monitoring as a specific priority,[142] and a variety of legal avenues provide the EPA with opportunities to advance its use. MACT standards developed under section 112(d), revisions to existing MACT standards promulgated under section 112(d)(6) or (f), or standards adopted pursuant to section 111 could all require fenceline monitoring for sources in other categories.[143]

Fenceline monitoring is an appealing regulatory tool for measuring the hazardous air pollutants emitted by sources in other industries for many of the same reasons the EPA has determined it is appropriate for petroleum refineries. Beyond the more reliable emissions measurements, more informed regulatory decision making, more effective emissions management efforts, and more comprehensive understanding of neighborhood impact discussed in Part V, fenceline monitoring has broader potential to alter the incentives that affect source behavior and improve regulatory enforcement strategies.

More accurate and widely available information about emissions stimulates conversation between industry and the communities that support it.[144] Published data alerts interested stakeholders and company leaders to pollution problems and focuses their attention on developing solutions.[145] The open flow of information allows peers within industries to compare themselves to one another and facilitates competition between them.[146] Such information may also prove helpful to insurers and investors.[147]

The EPA's Toxic Release Inventory (TRI) provides a good example of the impact publicly available information can have in altering incentives to encourage voluntary emissions reductions. Congress passed the Emergency Planning and Community Right To Know Act in 1986 to expand public access to information about toxic chemical releases.[148] Section 113 of the Act establishes TRI, which requires sources in covered industry sectors to report releases of specified toxic

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141. Jeff Civins et al., *Recent Developments in Clean Air Act Enforcement Tactics May Spell Increased Risk for Many Companies*, LEXOLOGY 3 (Sept. 25, 2014), http://documents.lexology.com/a32ab0f2-1531-44ee-94fb-742daaa205d4.pdf.

142. *Draft Roadmap for Next Generation Air Monitoring*, *supra* note 7, at 2.

143. Civins et al., *supra* note 141.

144. Giles, *supra* note 5, at 24.

145. *Id.*

146. *Id.* at 25.

147. *Id.* at 25-26.

148. *Learn About the Toxics Release Inventory*, EPA (Jan. 14, 2015), http://www2.epa.gov/toxics-release-inventory-tri-program/learn-about-toxics-release-inventory#What%20is%20the%20Toxics%20Release%20Inventory?.

chemicals annually.[149] The program has proven "enormously successful" in reducing toxic releases,[150] even though it does not impose any emissions reduction requirement. Environmental law professor Bradley Karkkainen argues that these reductions result from the establishment of an objective and accessible metric that allows firms to understand their environmental performance and compare it with their peers, forcing them to confront deficiencies.[151] At the same time, external parties like government agencies, investors, and members of the public "exert powerful pressures on poor performers to upgrade their performance as measured by the TRI yardstick."[152]

In addition to providing useful data to communities around industrial sources, fenceline monitoring allows sources themselves to shape conversations with their neighbors. For example, when flaring at one of the monitored refineries in the San Francisco Bay Area caused public concern in late 2014, Chevron, the refinery's operator, relied on fenceline-monitoring measurements to reassure the public and show that air quality standards had been maintained.[153]

Finally, fenceline monitoring can help the EPA improve its enforcement strategies. For instance, information that enables the EPA to identify violations minimizes its reliance on source self-reporting and public complaints.[154] It also improves the EPA's ability to verify compliance with settlement agreements.[155] This results in stronger compliance incentives and less government spending.[156]

VII. CONCLUSION

All new regulations bring uncertainty. Industry understandably worries about compliance costs, and regulators anticipate the complex mechanics of regulatory enforcement. The EPA's proposed refinery fenceline-monitoring requirement has given rise to these familiar

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149. *Id.*

150. Andrew Schatz, Note, *Regulating Greenhouse Gases by Mandatory Information Disclosure*, 26 VA. ENVTL. L.J. 335, 338 (2008).

151. Bradley C. Karkkainen, *Information as Environmental Regulation: TRI and Performance Benchmarking, Precursor to a New Paradigm?*, 89 GEO. L.J. 257, 295 (2001) (citing Louis Lowenstein, *Financial Transparency and Corporate Governance: You Manage What You Measure*, 96 COLUM. L. REV. 1335, 1342 (1996)).

152. *Id.*

153. Bob Egelko, *Flaring at Richmond Refinery Lights Up East Bay Skies*, S.F. GATE (Dec. 18, 2014, 9:06 PM), http://www.sfgate.com/bayarea/article/Flaring-at-Richmond-refinery-lights-up-East-Bay-5967595.php.

154. Giles, *supra* note 5, at 26.

155. *Id.*

156. *Id.*

concerns. The suggestions made here identify options for addressing these issues in a way that facilitates the effective implementation of the EPA's proposal. Fenceline monitoring offers the potential to stimulate conversations between industrial sources and their neighbors, promote competition that encourages better environmental management, and enable better regulatory decision making. Reasonable steps to minimize costs and gain industry buy-in can further promote compliance and simplify enforcement. If successful, the EPA's proposal could have a tremendous impact not only in providing more certain measurements of hazardous air pollution escaping oil refineries, but in encouraging better emissions management in other industrial sources as well.