EXECUTIVE SUMMARY

Control of VOC Emissions from Unconventional Oil and Natural Gas Sources
25 Pa. Code Chapters 121 and 129

Purpose and Summary of the Final-form Rulemaking

The Environmental Quality Board (Board) amends Chapters 121 and 129 (relating to general provisions; and standards for sources) to read as set forth in Annex A. This final-form rulemaking adds §§ 129.121—129.130 to adopt reasonably available control technology (RACT) requirements and RACT emission limitations for unconventional oil and natural gas sources of volatile organic compound (VOC) emissions as required under the Clean Air Act (CAA). These sources include natural gas-driven continuous bleed pneumatic controllers, natural gas-driven diaphragm pumps, reciprocating compressors, centrifugal compressors, fugitive emissions components and storage vessels installed at unconventional well sites, gathering and boosting stations and natural gas processing plants, as well as storage vessels in the natural gas transmission and storage segment. The Board adds definitions, acronyms and United States Environmental Protection Agency (EPA) methods to § 129.122 (relating to definitions, acronyms and EPA methods) to support the implementation of the control measures, as well as amends certain terms in and adds an abbreviation to § 121.1 (relating to definitions) to support the amendments to Chapter 129.

VOC emissions are precursors to the formation of ground-level ozone, a public health, welfare and environmental hazard. However, ground-level ozone is not emitted directly to the atmosphere from any sources, including oil and natural gas sources. Ground-level ozone is formed by a photochemical reaction between emissions of VOC and nitrogen oxides (NO_x) in the presence of sunlight; oil and gas sources do emit these two pollutants. Ground-level ozone is a highly reactive gas, which at sufficiently high concentrations can produce a wide variety of effects harmful to public health and welfare and the environment. Additionally, climate change may exacerbate the need to address ground-level ozone. According to the EPA, atmospheric warming, as a result of climate change, may increase ground-level ozone in regions across the United States. This impact could also be an issue for states trying to comply with future ozone standards.

In accordance with sections 172(c)(1), 182(b)(2)(A) and 184(b)(1)(B) of the CAA (42 U.S.C.A. §§ 7502(c)(1), 7511a(b)(2)(A) and 7511c(b)(1)(B)), this final-form rulemaking establishes the VOC emission limitations and other RACT requirements consistent with the EPA's recommendations in the "Control Techniques Guidelines for the Oil and Natural Gas Industry," EPA 453/B-16-001, Office of Air Quality Planning and Standards, EPA, October 2016 (2016 O&G CTG) as RACT for these sources in Pennsylvania. See 81 FR 74798 (October 27, 2016). The EPA defines RACT as "the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility." See 44 FR 53761 (September 17, 1979).

The Department reviewed the RACT recommendations included in the 2016 O&G CTG for their applicability to the ground-level ozone reduction measures necessary for this Commonwealth, and determined that the VOC emission reduction measures and other requirements are

appropriate for this source category. However, based on analysis of data available to the Department during the development of the proposed rulemaking as well as additional and updated data available during the final-form rulemaking development phase, the Department determined in three cases that RACT requirements, more stringent than the recommendations in the 2016 O&G CTG, are cost-effective and necessary to continue the Commonwealth's progress in attaining and maintaining the ground-level ozone NAAQS.

In the first case, the Department established in proposed § 129.123(a)(1)(i)—(vi) (relating to storage vessels) a tiered emissions threshold based on potential to emit for the affected owners or operators of subject storage vessels to prevent backsliding on the amount of controlled emissions for storage vessels subject to the Department's Air Quality Permit Exemptions 38(b) or 38(c). The tiered emission threshold established in proposed § 129.123(a)(1)(i) and (ii) was the potential to emit 6.0 tons per year (TPY) or greater VOC emissions for a storage vessel installed at a conventional well site or at an unconventional well site before August 10, 2013. The tiered emission threshold established in proposed § 129.123(a)(1)(iii)—(vi) was the potential to emit 2.7 TPY or greater VOC emissions for a storage vessel installed at an unconventional well site on or after August 10, 2013, a storage vessel installed at a gathering and boosting station, a storage vessel installed at a natural gas processing plant and a storage vessel installed at a facility in the natural gas transmission and storage segment.

However, during the development of this final-form rulemaking, the Department performed additional analysis which shows that the 2.7 TPY VOC emission threshold for storage vessels is RACT, as it is both technically and economically feasible for both potential to emit and actual emissions from all covered storage vessels. The analysis examined the sensitivity to the initial capital cost of the control device and found that the total cost per ton of VOC reduced is below the RACT benchmark of $6,600/ton reduced. Therefore, a single 2.7 TPY VOC emission threshold is established in § 129.123(a)(1) in this final-form rulemaking that applies to affected owners or operators of storage vessels at unconventional well sites, gathering and boosting stations and natural gas processing plants, and in the natural gas transmission and storage segment. The tiered emissions thresholds, including requirements for storage vessels at conventional well sites, in proposed § 129.123(a)(1)(i)—(vi) are deleted in this final-form rulemaking.

In the second case, the proposed rulemaking included an exemption in § 129.126(d) for the owner or operator of a reciprocating compressor or a centrifugal compressor located at an unconventional well site or located at an adjacent well site and servicing more than one well site. However, the Department's additional analysis for this final-form rulemaking shows that it is both technically and economically feasible to require reciprocating compressor rod packing replacements every 26,000 hours of operation or every three years for reciprocating compressors located at unconventional well sites. The analysis showed that the cost-effectiveness of the rod packing replacement is highly sensitive to the emissions factor used to represent emissions from reciprocating compressors. Using the average of several emission factors from the University of Texas at Austin's Emission Factor Improvement Study, the cost per ton of VOC reduced is approximately $6,600 which is consistent with the RACT benchmark. See Harrison, M., Galloway, K., Hendler, A., Shires, T., Allen, D., Foss, M., Thomas, J., Spinhirne, J., Natural Gas Industry Methane Emission Factor Improvement Study Final Report Cooperative Agreement No. XA-83376101, Dec. 2011,

https://dept.ceer.utexas.edu/ceer/GHG/files/FReports/XA_83376101_Final_Report.pdf. Therefore, the exemption in proposed § 129.126(d) for reciprocating compressors is deleted in this final-form rulemaking, meaning this final-form rulemaking requires affected owners or operators to implement reciprocating compressor rod packing replacements on reciprocating compressors located at well sites. This is a new requirement that was not included in the proposed rulemaking and was not one of the recommendations in the 2016 O&G CTG.

In the third case, the Department established a requirement in proposed § 129.127(b)(1)(ii)(A) and (B) (relating to fugitive emissions components) that affected owners or operators shall conduct monthly audible, visual, and olfactory (AVO) inspections and quarterly instrument-based leak detection and repair (LDAR) inspections of fugitive emissions components for well sites with at least one well that produces, on average, 15 barrels of oil equivalent (BOE) per day. In proposed § 129.127(b)(2), the Department also established a stepdown provision which enabled affected owners or operators to track the percentage of leaking components at each inspection and if, in two consecutive quarterly inspections, less than 2% of components were leaking emissions, the owner or operator could reduce the quarterly schedule of instrument-based LDAR inspections to semiannual.

This final-form rulemaking deletes the stepdown provisions of proposed § 129.127(b)(2)(i) and (ii). The Department's additional analysis shows that it is both technically and economically feasible for an affected owner or operator to implement instrument-based LDAR inspections at an unconventional well site with an average production of 15 BOE or more per day, with the frequency of inspections based on the production from each individual well at the well site. The owner or operator of an unconventional well site with an average production of 15 BOE or more per day and with at least one individual well producing 15 BOE or more per day, on average, shall conduct quarterly instrument based LDAR inspections. The owner or operator of an unconventional well site with an average of 15 BOE or more per day and at least one individual well producing 5 BOE or more but less than 15 BOE per day, on average, shall conduct annual instrument-based LDAR inspections. In this final-form rulemaking the Department also included an option for the owner or operator of an unconventional well site producing, on average, equal to or greater than 15 BOE per day, and at least one well producing, on average, equal to or greater than 5 BOE per day but less than 15 BOE per day to submit to the Department a request for an exemption from the annual instrument-based LDAR requirement. However, the request must include, among other information, a demonstration that the annual LDAR requirement is not RACT (technically or economically feasible) for the well site.

The Department estimates that in 2020, sources installed at unconventional well sites, gathering and boosting stations and natural gas processing plants emitted an estimated 5,648 TPY VOC and that implementation of the control measures in this final-form rulemaking could reduce VOC emissions by as much as 2,864 TPY. These VOC emission reductions will contribute to reductions in the formation of ground-level ozone and to achieving and maintaining the ozone NAAQS.

While this final-form rulemaking requires VOC emission reductions, methane emissions are also reduced as a co-benefit, because both VOC and methane are emitted from oil and gas operations. Methane is a potent greenhouse gas with a global warming potential more than 28 times that of carbon dioxide over a 100-year time period, according to the EPA. The EPA has identified

methane, the primary component of natural gas, as the second-most prevalent greenhouse gas emitted in the United States from human activities. The Department estimates that unconventional well sites, gathering and boosting stations and natural gas processing plant emitted 102,297 TPY methane in 2020, and that the co-benefit methane emissions reduction from this final-form rulemaking may be as much as 45,278 TPY.

Furthermore, the technically and economically feasible RACT determinations in this final-form rulemaking for storage vessels, reciprocating compressors at well sites and fugitive emissions components will result in a greater reduction of VOC emissions than implementing the EPA's RACT recommendations from the 2016 O&G CTG, resulting in an additional 411 TPY of VOC and 6,124 TPY of methane emissions reductions.

This final-form rulemaking will be submitted to the EPA for approval as a revision to the Commonwealth's State Implementation Plan (SIP) following promulgation of the final-form regulation.

Affected Parties

This final-form rulemaking will apply statewide to owners or operators of one or more of the following unconventional oil and natural gas sources of VOC emissions constructed on or before the effective date of this final-form rulemaking: natural gas-driven continuous bleed pneumatic controllers, natural gas-driven diaphragm pumps, centrifugal compressors, reciprocating compressors, fugitive emission components and storage vessels installed at unconventional well sites, gathering and boosting stations and natural gas processing plants, as well as storage vessels in the natural gas transmission and storage segment.

The Department identified 577 owners or operators of approximately 3,889 facilities in this Commonwealth which may be affected by this final-form rulemaking. Approximately 306 of the 577 owners or operators may meet the definition of small business as defined in Section 3 of the Regulatory Review Act (71 P.S. § 745.3). Based on information supplied by commentators, the Oil and Gas Production Report, and the Department's Air Information Management System database, the Department estimates there are 3,388 unconventional well sites, 486 gathering and boosting stations, 15 processing plants, and 120 transmission stations. The Department estimates that these owners or operators have at least 44 storage vessels at 12 facilities, 8,572 pneumatic controllers at 3,874 facilities, and 40 pneumatic pumps at 17 facilities will be subject to requirements under this final-form rulemaking. The owners or operators of approximately 2,616 of 3,388 unconventional well sites will be required to implement instrument-based LDAR inspections or increase the current instrument-based LDAR inspection frequency under this final-form rulemaking. The owners or operators of approximately 264 of 486 gathering and boosting stations and 1 of 15 processing plants will be required to implement a new instrument-based LDAR inspection program or will be subject to new requirements under this final-form rulemaking.

Advisory Groups

This final-form rulemaking was presented to the Air Quality Technical Advisory Committee on December 9, 2021, the Citizens Advisory Council (CAC) Policy and Regulatory Oversight

Committee on January 12, 2022 and the CAC on January 18, 2022, and the Small Business Compliance Advisory Committee on January 27, 2022.

Public Comments and Board Hearings

The Board adopted the proposed rulemaking at its meeting on December 17, 2019. On May 23, 2020, the proposed rulemaking was published for a 66-day comment period at 50 Pa.B. 2633 (May 23, 2020). Three public hearings were held virtually on June 23, 24, and 25, 2020. Over 100 persons provided verbal testimony. The comment period closed on July 27, 2020. The Board received 4,510 comments, including comments from the House and Senate Environmental Resources and Energy Committees, members of the Pennsylvania Legislature and the Independent Regulatory Review Commission.

The majority of the commentators expressed their support for the VOC RACT requirements, noting the need to address air emissions from the oil and gas sector and balance societal, environmental, energy, and economic objectives. Some Commentators pointed out that the Commonwealth has some of the strongest emission requirements in the nation, and that other state regulatory agencies use the Commonwealth's program as a reference. Other commentators suggested that the Department is not meeting its obligations to protect this Commonwealth's air, land, and water from pollution, nor providing for the health and safety of its citizens through a cleaner environment, and emphasized that the Commonwealth cannot afford to ignore the threat of climate change, exacerbated by emissions from the oil and gas sector.

Other commentators provided specific comments on this final-form rulemaking. Some commentators suggested that the low-production well exemption for wells that produce less than 15 BOE per day and the LDAR step-down provision should be removed. Some commentators suggested that the frequency of instrument-based LDAR requirements should be higher or lower than in the proposed rulemaking, and similarly, some suggested that the applicability for storage vessels should be at a higher or lower VOC emission threshold than in the proposed rulemaking, and that applicability should be determined with throughputs representative of current operation.

Some commentators claimed that the EQB failed to adhere to requirements in Act 52 of 2016 because the EQB failed to distinguish conventional from unconventional oil and natural gas operations in the proposed rulemaking. However, Act 52 applies to rulemakings promulgated under Title 58 Pa.C.S. Since this final-form rulemaking is being promulgated under the APCA in Title 35, the requirements in Act 52 do not apply. Even so, the Board amended this final-form rulemaking to clarify that the control measures are only applicable to unconventional sources of VOC emissions.

The Department reviewed and considered all comments received in the development of this final-form rulemaking. While some comments directly conflicted with others, the Department incorporated changes based on feedback from IRRC, the legislature, and the public where appropriate and feasible.

Recommendation to the Board

The Department recommends the Board adopt this final-form rulemaking.