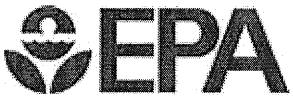

Compendium of Next Generation Compliance Examples In Clean Air Act Programs

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Introduction

Protecting clean air and water, and ensuring our communities are safe from pollution, is more complex today than ever. Whether it's pollution that's not apparent to the naked eye or large numbers of small sources that collectively have a big impact on the environment, new challenges require us to innovate and improve. This Compendium shows how EPA and state air control programs are using modern tools to advance clean air goals in rulemaking, permits, enforcement, and other functions. The Compendium can be a resource for all EPA, state, tribal, and local air programs, both for managers and line staff, in thinking about new ways to achieve those goals.

The Compendium was developed as part of EPA's "Next Generation Compliance" (Next Gen) initiative and is a joint effort of EPA's Office of Enforcement and Compliance Assurance and the Office of Air and Radiation. Next Gen promotes the principle that today's environmental challenges require a modern approach to compliance with the use of new tools and approaches while strengthening vigorous enforcement as the backbone of environmental protection. In addition to new tools based on technological advancements, Next Gen seeks to leverage creative thinking about how to better design rules and permits to maximize compliance and environmental results.[1]

The benefits of using these strategies go beyond improving compliance to enhancing facility operations and overall environmental performance, raising public awareness and understanding of environmental impacts, and strengthening the role of communities as partners in the system of environmental protection. For more information about Next Generation Compliance in general, see the Next Gen website, https://www.epa.gov/compliance/next-generation-compliance.

This Compendium illustrates how Next Gen thinking and tools are being used to enhance compliance and reduce air pollution under the Clean Air Act. The examples are gathered from all aspects of federal, state, and local air programs. The examples are presented together because of their potential for wide application. For instance, a transparency tool incorporated into a permit may also be appropriate to include in an enforcement settlement—or vice versa. In addition, text boxes throughout the

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[1] For a discussion of theoretical and empirical literature demonstrating the effectiveness and limits of traditional individual-facility monitoring and enforcement in promoting compliance and deterrence, see, e.g., *Monitoring, Enforcement, & Environmental Compliance: Understanding Specific & General Deterrence* (State of the Science White Paper prepared for EPA Oct. 2007), *available at* http://www.epa.gov/Compliance/resources/reports/compliance/research/meec-whitepaper.pdf; and *Compliance Literature Search Results – Citations to Over Two Hundred Compliance-Related Books and Articles From 1999 to 2007* (April 2007), *available at* http://www.epa.gov/Compliance/resources/reports/compliance/research/lit-results-2007.pdf. Some other publications on the topic of air program innovation include: Jody Foster, et. al. 2013. *Clean Air and Technology Innovation: Working Concepts for Promoting Clean Technology Innovation Under the Clean Air Act* NI R 13-05 Durham, NC: Duke University. Available at https://nicholasinstitute.duke.edu/sites/default/files/publications/ni_r_13-05.pdf; Jonathan B. Wiener. *The regulation of technology, and the technology of regulation.* Technology in Society 26 (2004) 483–500. Duke University School of Law. Available at http://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=1960&context=faculty_scholarship;

Compendium highlight examples from other environmental programs that might be adapted for use by air programs.

The inclusion of a Next Gen example in this Compendium does not create a requirement for federal, state or tribal regulators to use that tool. Rather, these examples represent ideas that regions, states, and tribes may use or build on as appropriate and practical, with input from affected facilities and communities, and where legal authority exists for doing so. The examples below are intended to stimulate creative thinking on how such approaches might be used in a variety of contexts.

What's in this Compendium

The examples included in this Compendium are grouped by the type of Next Gen tool that they reflect. These tools include:

Each section provides an introduction to a Next Gen tool and explains how that tool has been used to help advance clean air goals; it then describes considerations related to use of that Next Gen tool in rules, permits, and enforcement settlements; finally, it lists examples that illustrate use of that Next Gen tool. A number of the examples included in this Compendium are described in more detail in the attached Appendix by providing excerpts of the relevant rule, permit, or settlement language, as well as links to the complete documents. Throughout the document, there are also text boxes with examples of creative and innovative Next Gen approaches in practice today in other environmental programs, which may stimulate creative thinking by air program staff.

I. Clear requirements

The benefits of clear requirements and effective communication

Clarity and simplicity are important goals for any regulatory program, to minimize the risk of noncompliance due to simple confusion and misunderstanding. These values may be reflected in the requirements themselves, seeking if possible to avoid complexity while achieving regulatory goals. They may also be reflected in how agencies communicate about the requirements. Both can contribute to improved compliance and performance.

The applicability of a requirement—who is subject to it—is one possible source of complexity and confusion. If it is not clear to whom a requirement applies, the intended effect may not be achieved. Also, it may not be clear what the regulated party is required to do. A complex document such as a permit may have many requirements within it. Providing the regulated party a simplified "roadmap" of the applicable requirements in addition to the permit itself may ensure that requirements are not overlooked or misunderstood. (An example of such a roadmap is shown in the text box below.)

EPA has information available that can help permit writers develop permit statements of basis that can serve as a road map for the permitting action. Program guidance and other documents or online materials can also help in preparing permits that are clear and that include all applicable pollution control requirements and monitoring to assure compliance.[2]

Examples

- Oklahoma includes enforcement staff in permit writing. To encourage permit writers to think about compliance, and improve communication between the permitting and compliance staff, Oklahoma DEQ has inspectors review permits as they are being drafted. The purpose of this communication is to ensure that permit terms are written in a way that is clear and that the permittee, compliance staff, and industry can better understand what the permit terms and requirements are. (Note: Where applicable, "co-mingling" policies address how enforcement and permitting staff should interact and communicate, so as to preserve appropriate due process requirements).

> ➢ Innovations from Other Environmental Programs:
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> RCRA permits issued by the New York State Department of Environmental Conservation (NYSDEC) include an executive summary describing permit requirements at a high level for use by senior executives in the company or the State. In addition, the permit's first module lists all the key operational requirements, including reporting requirements and associated due dates, for the benefit of facility personnel and agency staff.

- Puget Sound Clean Air Agency Burn Ban 411 app: In parts of Washington State, wood fires (especially from stoves) can be a significant source of particulate pollution, and the state periodically institutes "burn bans." To clearly communicate to residents when and where burn bans are in effect, the Puget Sound Clean Air Agency has created a "Burn Ban 411" app that users can use to find out whether a burn ban is in effect before lighting a fire in the back yard or starting up a

[2] See for example:
- Title V Petition Orders Database http://www.epa.gov/region07/air/title5/petitiondb/petitiondb.htm
- NSR and Title V Policy/Guidance Database http://www.epa.gov/region07/air/nsr/nsrindex.htm
- http://www.epa.gov/region07/air/title5/t5index.htm
- RACT/BACT/LAER clearinghouse http://cfpub.epa.gov/rblc/
- Monitoring and Operating Permits http://cfpub.epa.gov/oarweb/mkb/permits.cfm
- General Air Monitoring Information http://cfpub.epa.gov/oarweb/mkb/

wood-burning stove. If a burn ban is in effect, users can use the app to find out what restrictions are in place. For more information, see http://www.pscleanair.org/priorities/woodheating/Pages/burnbans.aspx.

II. Transparency

The benefits of transparency

In this context, transparency refers to the opening of the environmental protection system to the public -- making both the regulatory requirements and the performance of regulated parties more visible to the public – for example, by posting permits on websites (ideally with a plain language summary) and requiring regulated entities to post monitoring results or other information on public websites. Making information public in this way can create an added incentive for regulated parties to avoid violations and in some cases to reduce emissions below legal limits.[3] Transparency also serves to increase public awareness, strengthening the role of the public in identifying concerns and potential non-compliance. It can also improve the accountability and performance of regulators by making their decisions more visible and accessible, and can also make regulators more efficient as they can better access information to use and share.[4]

Transparency is not a new idea, but it has gained much more power with the development of new technologies that make it possible to collect and disseminate large amounts of information widely. If monitoring data can be uploaded and reported quickly, and publicized on the web, what was once available only to facilities and regulators can be communicated to a much larger audience. It is important to identify opportunities to communicate emissions information to the affected public and to convey that information clearly.

An example of transparency on a national scale is the website maintained by EPA's Clean Air Markets Division, at https://ampd.epa.gov/ampd/. On that site, members of the public can search based on specific criteria or within a geographical region to find information about emissions, allowances, and compliance for individual facilities, which can be either previewed or downloaded in a table format. For example, a citizen concerned about NOx emissions from a neighboring power plant can learn the facility's compliance history, current emissions, and other information presented in table or graphic

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[3] See, e.g., Laplante, B., Lanoie, P. & Foulon, J., *Incentives for Pollution Control - Regulation and Public Disclosure*, No. 2291, Policy Research Working Paper Series, The World Bank (2000), *available at* http://ideas.repec.org/p/wbk/wbrwps/2291.html.

[4] See, e.g., Fung, A. & O'Rourken, D., *Reinventing Environmental Regulation from the Grassroots Up: Explaining and Expanding the Success of the Toxics Release Inventory*, Env. Man., Vol. 25(2), pp. 115–127 (2000), *available at* http://nature.berkeley.edu/orourke/PDF/tri.pdf.

form. The website also maintains links to the most commonly searched data to expedite searches of other databases.

It is also possible to simply post major documents online. A growing number of states, for example, post permits online. Other documents that could be posted include annual Title V compliance certifications and other reports that are filed with the permitting authority.

Transparency in practice

Applying transparency principles well requires skill. The information should be presented in a way and using terms that members of the public can easily understand, within a context understandable to the public. For example:

- Depending on the purpose and quality of the data, a live data feed or a near real-time posting of data may be useful. If a live online data feed is likely to be difficult to understand and interpret, then lead time may be necessary to allow for interpretive material to be included. Some examples below have specified that posting should be soon after sampling and reports are due; some specify a particular timeframe.
- Posted information is more accessible if it is as few clicks as possible from the regulated entity's home page.
- Web postings that use plain language terms to describe the information allow Internet search engines to easily find the information.
- The availability of the information should be publicized, such as through press releases.

Where information is made available for download, it should be in a data format that allows for easy data analysis (for example, in "CSV" format, which allows data to be moved from Excel to other similar applications, rather than PDF files).

Prior to posting information on a website, it is important to consider issues related to data control, preservation, privacy, and assertions of confidentiality (see, e.g., 40 C.F.R. Part 2 on Public Information for some of the factors that may go into this judgment).

When posting data online, consider including educational materials to help users interpret displayed data in the context of national standards and health benchmarks. Additionally, if the website allows users to easily report data errors to the appropriate EPA or state data stewards, the quality of the data will improve over time.

Examples

- Wisconsin state regulations on mining of sand used in hydraulic fracturing ("frac sand") require that large-scale industrial sand mines install fenceline particulate monitors to sample for 24 hours on the 6 day schedule established by EPA. The data is analyzed, quality assured, and clearly presented in a graphical manner and made available on the Wisconsin Department of Natural Resources (WDNR) webpage dedicated to industrial sand mining. Additionally, WDNR has dedicated a staff person to facilitate transparency between concerned citizens and frac sand

mining facilities. The facilities must submit air monitoring data quarterly basis. The industrial sand mining website, updated quarterly, is available at http://dnr.wi.gov/topic/mines/sand.html.

- Minnesota has included similar transparency requirements in permits it has issued for sand mining and processing operations, to measure ambient levels of silica. Fenceline monitoring has been established at four facilities, and the results are posted on a website maintained by the state Pollution Control Agency. Fenceline data is collected over a 24 hour period every six days, so that over time data is gathered for each day of the week. The website explains the relevant regulatory standards and how to compare the monitoring results to those standards. See https://www.pca.state.mn.us/air/air-monitoring-minnesota-silica-sand-facilities#winona-b9a765fc.

> ➢ Innovations from Other Environmental Programs:
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> During the Deepwater Horizon oil spill in 2010, BP placed cameras 5,000 feet underwater and streamed the live feeds over the Internet, allowing the public and the government to see the efforts to cap the leaking well.

- The PES refinery in Philadelphia (formerly owned by Sunoco) is required by a consent decree to measure and record hourly the levels of a number of pollutants and to make that data available on a monitoring data site in an accessible, clearly labeled, and clearly presented manner. The facility must also post the continuous emission monitor reports on a quarterly basis and maintain fenceline monitoring data for at least five years from the date of collection and review the data with a Community Advisory Panel member upon request. The website postings are available at http://pes-companies.com/social-responsibility/environment-safety/. See Appendix for more details.

- The BP Whiting refinery (Whiting, Indiana) consent decree requires BP to set up four monitoring stations around the refinery to continuously measure concentrations of pentane, hexane, sulfur dioxide, and hydrogen sulfur compounds. The equipment also measures wind speed and direction, temperature, humidity, and barometric pressure and are to be reported to the public on a weekly basis for five years following the execution of the consent decree. Additionally, BP must post quarterly CEMS emissions reports and must review all data posted on the website with community members upon request. The data collected is available at: http://raqis.radian.com/pls/raqis/bpw.whiting. See Appendix for more details.

- Shell Deer Park consent decree requires the refinery and chemical plant in Deer Park, Texas to construct a state-of-the-art system to monitor benzene levels at the fenceline of the refinery which borders a residential neighborhood with a school. The data will be available weekly to the public through a website that includes concurrent information for benzene, wind speed, and wind direction. Shell will also post the Semi-Annual Air Monitoring Field Investigation reports to the internet that include air emissions, meteorological data, calibration data, any other data measured, and steps Shell took to bring the sources into compliance. The monitoring system and website are currently in the planning and approval stage. See Appendix for more details.

- Noble Energy consent decree requires the company to do engineering studies of its tank systems to ensure its vapor control systems are properly designed to minimize emissions. As these studies will be potentially groundbreaking in the industry, Noble will also publicly post reports on its vapor control system engineering evaluations and modifications, intended to provide other companies with the opportunity to learn from Noble's findings and apply them to their own storage tanks, helping to reduce emissions. For more information see https://www.epa.gov/enforcement/noble-energy-inc-settlement. See Appendix for more details.

EPA hosts several websites that provide information to the public about permit and enforcement data and other aspects of facility environmental performance. For example, as discussed above the Clean Air Markets Division website provides a wide range of information about major sources. Other examples include:

- The Facility Level Information on Greenhouse Gases Tool (FLIGHT) provides extensive information on greenhouse gas emissions from large sources. Members of the public can search for large greenhouse gas emitters based on location, source type, date, as well as specific greenhouse gas types. Uses can view and export the data in map, list, or graphical format and the data is available on mobile devices. See https://ghgdata.epa.gov/ghgp/.

- The Enforcement Compliance History Online (ECHO) Website: ECHO provides integrated compliance and enforcement information for about 800,000 regulated facilities nationwide. Its features range from simple to advanced, catering to users who want to conduct broad analyses as well as those who need to perform complex searches. Specifically, ECHO allows you to find and download information on: (1) permit data; (2) inspection dates and findings; (3) violations; (4) enforcement actions; and (5) penalties assessed. See https://echo.epa.gov.

Many states also provide the public with searchable information about permits and air quality issues. Just a few are listed below.

- Alabama Department of Environmental Management's eFile system allows the public and other stakeholders to freely access documents that exist in electronic format in ADEM's document management system. The system has over one million documents available for the public to search, including permits, inspection reports, complaints, compliance reports, and enforcement actions. See http://app.adem.alabama.gov/eFile/.

- Texas Commission on Environmental Quality Air Emission Event Report Database allows the public to search for air emissions reports by facility, company, or region and can be narrowed by date. The information provided includes the type of chemical emitted and the estimated amount. See http://www.tceq.state.tx.us/field/eventreporting.

- Wisconsin Department of Natural Resources air permitting process search allows members of the public to search for air emissions permit applications as well as approved permits. The database allows for searches based on multiple limitations such as location, facility, permit status, permit date, etc. Each permit includes detailed information on each facility such as

facility contacts, Wisconsin DNR contacts, details on the stages of any permits, emissions information, and any other "industrial monitoring data." See http://dnr.wi.gov/cias/am/amexternal/AM_PermitTrackingSearch.aspx.

III. Electronic Reporting

The benefits of electronic reporting

Regulated facilities have many requirements to report information to regulators. Increasingly, this is being done electronically. Electronic reporting typically entails the use of electronic "smart" forms or web tools that guide the regulated entity through the reporting process (simply emailing reports is not true electronic reporting).

Electronic reporting creates many new opportunities beyond streamlining the transfer of information. Electronic reporting reduces costs associated with paper reporting and provides regulators with more complete and timely data, allowing more effective prioritization of monitoring and enforcement actions. The websites through which reporting is done can provide feedback to reporters (e.g., flagging data that appear to be erroneous), and can be used as a vehicle for providing compliance information or other assistance.

For these reasons, it is now EPA policy that "in developing new regulations ... we will start with the assumption that reporting will be electronic and not paper based. And we will use shared services to do this to the maximum extent possible. This Policy Statement is one important step forward in the Agency's larger E-Enterprise for the Environment Initiative."[5]

Currently, over four dozen EPA air program rules require electronic submission of reports directly to the EPA using the Compliance and Emissions Data Reporting Interface (CEDRI) within the Central Data Exchange (CDX). Over 4,100 electronic submittals have been successfully submitted to date. The Electronic Reporting Tool (ERT) creates electronic versions of stationary source sampling test plans and reports of test results that can be submitted to the EPA and air agencies. Using the CEDRI tool, sources can submit the ERT files, as well as pdf uploads and fillable forms that exist within CEDRI. CEDRI can also accept test reports that are not required under a federal rule, such as additional test reports required by states, and can accept additional information that may be required by states within reports.

In the greenhouse gas reporting program and the acid rain program, all reporting is done electronically. EPA is in the process of making electronic reporting mandatory for most New Source Performance

[5] "E-Reporting Policy Statement for EPA Regulations," Memorandum from Deputy Administrator Robert Perciasepe to Assistant Administrators et al., dated September 30, 2013, *available at* https://www.epa.gov/compliance/policy-statement-e-reporting-epa-regulations.

Standards (NSPS) under 40 CFR Part 60 and National Emissions Standards for Hazardous Air Pollutants (NESHAP) under 40 CFR Part 63. In March of 2015, EPA published a proposal that would expand the number of NSPS rules that require reports to be submitted electronically, as well as allow sources to retain electronic records in lieu of hardcopy records. If this rule is made final, we expect that most sources subject to an NSPS will be required to submit certain reports electronically. Future rules are planned to require electronic reporting under NESHAP. For more information on the proposed rule, see http://www.gpo.gov/fdsys/pkg/FR-2015-03-20/html/2015-05406.htm.

Reports filed electronically through CEDRI are available to EPA, and to state, local and tribal pollution control agencies as well as to the facility itself. The information is also available to the public through an EPA website called WebFIRE.

Electronic reporting in practice

While e-reporting reduces paper transaction costs associated with creating, mailing, entering, and error correction, it also necessitates new efforts to create the necessary tools to assist the regulated source in submitting quality reports and software to accept the electronic submittals.[6] In addition, as e-reporting becomes more common it will be necessary to avoid, where possible, requiring regulated sources to file reports to multiple systems. EPA has undertaken a project, aimed at integrating multiple electronic reports. This project is called Combined Air Emissions Reporting and is part of the E-Enterprise for the Environment initiative.[7]

If large amounts of data will be reported, systems and practices must be in place to collect, manage, analyze, and make the data accessible, such as:

- Specifying electronic reporting requirements for submitting results of regular monitoring requirements including analyses of emissions monitoring for identified parameters, and chosen elements of most concern, e.g., where certain issues have been problems in the past at this source.
- Using data standards jointly established by the states and EPA as part of the Exchange Network and avoiding creating new, unique file and data formats that are not already supported by the National Environmental Information Exchange Network. See http://www.exchangenetwork.net/communities-of-interest/air/.

In some instances, a regulated entity may not be able to report electronically because it does not have the means to do so. Temporary waivers may be provided to cover such cases, with the expectation that the reporting entity will obtain the equipment needed to report electronically within a reasonable time. In the meantime, the regulation, permit, or settlement typically requires the regulated entity to report the information on paper.

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[6] States that accept e-reporting in lieu of paper reports must have EPA approved systems. The current status of CROMERR applications received from states is found at the following web address https://www.epa.gov/cromerr/status-cromerr-applications-states.

[7] For more information about E-Enterprise, see https://www.epa.gov/e-enterprise.

Examples

- The Greenhouse Gas Reporting Program requires over 8,000 facilities across 40 industry types to monitor GHG data, including emissions, and report them to EPA on an annual basis. Facilities use an electronic system to calculate and submit their data to EPA, which runs real-time checks for common mistakes. If a potential mistake is detected, the facility is prompted to correct it before submission. The electronic system also runs thousands of post-submission verification checks on the reports to flag potential errors for EPA staff to further investigate as appropriate. If an error is suspected, EPA notifies the reporter with an electronic message to correct it within a 45-day verification period. Once the verification period is complete, all non-CBI data are published on EPA's Facility Level Information on Greenhouse gases Tool (FLIGHT). In 2014, EPA began publicly flagging FLIGHT facilities with unresolved errors or ones that did not provide a valid reason for an absent report, and their FLIGHT facility pages contained cautionary text about the errors. This improved data transparency and accountability. See https://ghgdata.epa.gov/ghgp/main.do.

- BP Exploration (North Slope, Alaska) consent decree requires BP to maintain a secure, web-based portal that includes progress reports regarding data collection, pipeline inspections, Risk Ranking Procedures, information on the Risk Prevention and Mitigation procedures, repair information, leak detection activities, any spill data, as well as access to BPXA's GIS data. BP may claim the data reported is confidential business information (CBI). See Appendix for more details.

- Electronic reporting for New Source Performance Standards (NSPS) and National Emissions Standards for Hazardous Air Pollutants (NESHAP). Some pollution control standards currently require owner/operators to submit air emissions data electronically and allow facilities to keep electronic records. New users register with the electronic system before uploading reports. The system focuses on reports that provide direct measures of air emissions data, such as excess emission reports, summary reports, performance test reports, etc. Some examples of rules that already contain electronic reporting are the NSPS and NESHAP for Portland cement facilities (part 60 subpart F and part 63 subpart LLL) and the NESHAP for major source boilers (part 63 subpart DDDDD). A list of all rules that contain electronic reporting can be found at: https://www.epa.gov/ttn/chief/ert/ert_rules.html. A proposed rule would extend electronic reporting to additional NSPS and NESHAP, as well as expand the type of reports covered by some regulations that already require some electronic reporting. The proposed rule covers most NSPS; see 80 Fed. Reg. 15099 (March 20, 2015), at https://federalregister.gov/a/2015-05406.

IV. Advanced Monitoring

The benefits of advanced monitoring

Monitoring technology is advancing rapidly, improving the ability of regulators, regulated parties, communities, and others to have a clear understanding of emissions and ambient conditions. The term "advanced monitoring" includes a broad range of sampling and analytic equipment, systems, techniques, practices, and technologies for better detecting and measuring pollution. Advanced monitoring technology generally fits into one or more of these categories:

- Monitors pollutants on a real-time or near real-time basis, often without lengthy lag times for laboratory analysis;
- Less expensive, easier to use, or more mobile than technologies currently in widespread use;
- Provides data of acceptable quality that is more complete or easier to interpret for a specific purpose;
- An existing technology used in a new way to provide better information on pollutants, pollution sources, or environmental conditions.

Advanced monitoring includes both monitors that measure emissions from a particular source and those that monitor pollutants in the ambient environment. Advanced monitoring often provides more complete and timely data without lengthy laboratory analysis compared to traditional monitoring. It can also be used to provide communities and individuals with real-time information about pollution that affects them.[8]

Advanced monitors can take a variety of forms. Some of these are:

Continuous emissions monitors (CEMs) provide more complete information about emissions, providing sources with real time data that can allow facilities to identify problems sooner and respond promptly. CEMs have been used in some air programs for many years, and in those contexts are not "Next Gen." However, CEMs are being developed for new types of pollutants, and their cost, while still high, is declining. As the CEMs technology drops in price, the scope of projects that are considered cost-effective broadens.

Optical imaging devices make it possible to observe pollutants from a distance and at night. This technology allows for the detection of leaks that are invisible to the naked eye, and allows for the accurate assessment of visible emissions. Although these devices do not provide quantitative measures of pollution, their ability to identify the existence or density of pollution can be valuable. For example, forward-looking infrared (FLIR) cameras can be used to find fugitive emissions, such as leaks of VOCs

[8] Recent advances in air pollution monitoring are described in Snyder, Emily G., et al., *The Changing Paradigm of Air Pollution Monitoring*, 47 Env. Sci. & Tech. 20, 11369-77 (2013), *available at* http://pubs.acs.org/doi/pdf/10.1021/es4022602.

from petroleum storage tanks, or methane leaks at natural gas facilities. Opacity monitors can be used to measure the opacity of a plume of smoke, and have been approved in some standards as an alternative to the traditional method of simple visual evaluation.

Fenceline monitoring involves placing air sensors around the perimeter of a facility's property. Although not new technology, its application in permitting or air rules is new. This is a complement to traditional monitoring done at emission points within the facility, which is directly linked to specific compliance requirements for those units. Fenceline monitoring assesses the actual downwind impact of all the emissions at a facility, capturing both emissions from point sources and fugitive emissions. It can be particularly useful at large, complex facilities, or industrial sites with multiple facilities, where complex emission mixtures are present making it difficult to ascertain the source of the emissions. The data can be used to assess the potential impact of facility releases on the surrounding environment and communities, especially when combined with ambient information such as meteorological data. Such data can identify potential exposure issues and inform the local community about the quality of the air they breathe.

In addition, new tools are being developed by both governmental and private entities to communicate, analyze, and display the data gathered by these technologies. These allow advances in monitoring technologies to be married with transparency strategies described above for maximum impact.

Advanced monitors are not just useful for regulators. When used by regulated entities, advanced monitoring can supplement traditional monitoring methods and more effectively prevent, reduce or—even better—call attention to potential problems before noncompliance occurs, often while making operations more efficient.[9] Regulated entities may find that voluntary use of monitors allows for detection and fixing of problems before they become enforcement concerns.

New technology (and new applications of existing technology) can also make it possible for the public to play an active role in assessing environmental conditions. In particular, small mobile sensors are increasingly being used by private citizens to measure air quality in their neighborhoods. Although no sensors of this type have been approved to date as Federal Reference Methods, devices that would not be appropriate for compliance purposes could, if sufficiently reliable and used properly, be useful for other purposes, such as screening of potential areas of concern. Monitoring by citizens has the potential to provide much more information than has historically been available from Agency-managed monitoring networks.

Advanced monitoring in practice

A number of technical and practical challenges and considerations associated with emerging monitoring technologies remain, especially with regard to low-cost mobile sensors that are often used by the public to measure air quality. Sensor technology is in rapid flux, and the reliability of such sensors varies and is

[9] Energy monitoring devices are being used in southern China to immediately identify and address high levels of pollution or energy waste. These devices enable the city of Hengqin to track emissions and energy consumption in real time. See http://www.deseretnews.com/article/865617771/One-solution-for-air-pollution-Big-data.html?pg=all.

often untested. Further work will be needed on the part of both regulators and potential users of sensors to realize their long term potential. A first step is the Air Quality Sensor Performance Evaluation Center at the South Coast Air Quality Management District in California (discussed below).

Other types of advanced monitors, used by agencies, raise fewer technical concerns. However, operators should still take care to ensure that they are being used properly. Developing familiarity with new monitoring tools is important for Agency staff working on rules, permits, or in enforcement.

Examples

- BP Whiting refinery (Whiting, Indiana) consent decree requires BP to install fenceline monitoring equipment to observe and record "reportable" gas flares. The equipment includes a vent gas flow monitoring system and average molecular weight analyzer, steam flow monitoring, gas chromatograph, meteorological station, and a video camera. See Appendix for more information.

- EPA's Geospatial Measurement of Air Pollutants (GMAP) program designs, develops, and utilizes state of the art mobile measurement systems to gain insight into source emissions, population impacts, and exposure risk management strategies. It mounts advanced monitoring equipment on a vehicle to map pollutants such as sulfur dioxide and methane, along with meteorological information. For example, the vehicle can drive through a neighborhood to look for indicators that help locate likely pollution sources. For detailed information, see https://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=309632

- EPA's "Methane Rule" (limiting methane emissions from oil and gas production and processing facilities requires facilities to check for leaks on a quarterly or semiannual basis (depending on the type of facility). The rule allows IR cameras to be used for leak detection, as an alternative to Method 21. See https://www.epa.gov/airquality/oilandgas/actions.html
For further information see the Appendix.

- EPA's Petroleum Refinery NESHAP requires fenceline monitoring to identify and control fugitive emissions. The fenceline monitors must be placed around the perimeter of the facility to ensure that emissions are properly managed and neighboring communities are not being exposed to unintended emissions. If specified trigger levels are exceeded, the facility must investigate possible sources of emissions and take action to correct them. Monitoring results will be reported electronically on a quarterly basis, and will be placed in a publicly available database. EPA will work with stakeholders to determine the best way to communicate the monitoring results to the public. See https://www.epa.gov/airtoxics/petref.html. See Appendix for more details.

- Wisconsin state regulations on frac sand (sand used in hydraulic fracturing) require large-scale mining facilities to install fenceline particulate monitors to sample for 24 hours on a 6-day schedule established by EPA. The data are analyzed, quality assured, and clearly presented in a

graphical manner. The facilities must submit air monitoring data on a monthly basis. As discussed under "Transparency," the results are reported on a public website. See http://dnr.wi.gov/topic/mines/sand.html. See Appendix for more details.

- Minnesota's permits for four sand processing facilities require fenceline monitoring for particulate matter. To ensure that particulates from the sand do not create a hazard to nearby properties, the permits require upwind and downwind monitors for two years after beginning operations, with samples collected every six days. See https://www.pca.state.mn.us/air/air-monitoring-minnesota-silica-sand-facilities#winona-b9a765fc. Permit language is provided in the Appendix.

- Pennsylvania's general permit for natural gas compression facilities requires facilities to monitor for leaks at least quarterly, using a forward-looking infrared (IR) camera. If a leak is detected, it must be corrected as soon as possible but in any case within 15 days. The general permit is available at http://www.bipc.com/files/Publication/bcd1f612-ac8c-4e97-b290-c4c9ae7dffd2/Presentation/PublicationAttachment/9948db7f-4a5c-4e45-a1a1-c50fc2fe7107/GP-5_2-1-2013.pdf.

- Ashtabula Tire Partners (Ashtabula, Ohio) construction permit requires the use of a baghouse leak detection system (BLDS) to automate and continuously monitor the baghouse, where typically only periodic manual pressure drop reading are required. Ashtabula Tire Partners will use the BLDS in addition to monitoring baghouse pressure drop to ensure continuous operation and compliance with PM requirements. The permittee must also submit its annual Permit Evaluation Report (PER) electronically through the Ohio EPA's e-Business Center: Air Services. http://wwwapp.epa.ohio.gov/dapc/permits_issued/1174959.pdf. Advanced monitoring (pp. 22-24); e-reporting (pg. 24). See Appendix for more details.

- The PES Refinery (Philadelphia, Pennsylvania) consent decree requires the facility to use fenceline monitors to measure and record hourly the levels of $PM_{2.5 \text{ and } 10}$, CO, VOCs, sulfur dioxide, NO_x, hydrogen sulfide, and reduced sulfur compounds. Sunoco will also install a meteorological station to measure and record wind speed, wind direction, ambient temperature, humidity, and barometric pressure for continuous reporting. As discussed under "Transparency," the results will be reported on a public website. See Appendix for more details.

- Shell Deer Park (Deer Park, Texas) consent decree requires Shell to construct a state-of-the-art system to monitor benzene levels at the fenceline of the refinery and chemical plant near a residential neighborhood and school. A meteorological station will be set up to collect wind speed and directional data. As discussed under "Transparency," the results will be reported on a public website. See Appendix for more details.

- Total Petrochemicals USA (Port Arthur, Texas) consent decree requires Total to complete a two-phase Supplemental Environmental Project (SEP) to conduct passive, infrared imaging to detect equipment leaks emitting pollutants that contribute to ground-level ozone and smog. The first SEP phase requires Total to image and monitor at least 1,000 components, including at least 500

components where leaks have been previously detected. The second SEP phase requires imaging of all components not imaged in phase one. See Appendix for more details.

- Noble Energy consent decree requires the company to address concerns about leaks from petroleum storage tanks by installing advanced pressure monitors with continuous data reporting on a cross-section of the tank system. This monitoring will verify that the tanks are not over-pressurized in a way that could cause VOC emissions. Electronic monitors will measure pressure in storage vessels and transmit data to a central location, triggering an alarm for high pressure to allow the operator to respond before a leak occurs. The consent decree also requires Noble to use IR cameras to verify that the vapor control system is preventing leaks. For more information see https://www.epa.gov/enforcement/noble-energy-inc-settlement. See Appendix for more details.

- As discussed above, very low-cost sensors are increasingly available which can be used by citizens and other private parties to test air quality for a number of pollutants including ozone and particulates. However, the quality and reliability of these sensors can vary greatly. To inform the public about the quality of these sensors, the South Coast Air Quality Management District (in California) has established the Air Quality Sensor Performance Evaluation Center (AQ-SPEC). The Center aims not only to help citizens identify the best monitors to use, but also to catalyze the successful development and use of high-quality sensors. See http://www.aqmd.gov/aq-spec/home.

V. Independent Third-Party Verification

The benefits of independent third-party verification

Properly structured independent third-party monitoring and verification in rules, permits, and settlements can enhance accountability, improve compliance, and produce more and better compliance data.[10] Third-party monitoring, when combined with public disclosure, informs the public of the regulated entity's compliance status and enables public responses to noncompliance. The best third-party verification approaches are structured to ensure that auditors are competent and independent and that audit or inspection criteria are objective and fact-based.[11] For example, draft data may be submitted concurrently to the government and the regulated entity, rather than being shared in draft first with the regulated entity. Third-party verification examples include:

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[10] See, e.g., Kunreuther, H., McNulty, P. & Kang, Y., *Improving Environmental Safety Through Third Party Inspection*, Wharton School - U. of Penn. (Oct. 2001); Lesley K. McAllister, *Regulation by Third-Party Verification*, 53 B.C. L. REV. 1, 22-23 (2012); and Esther Duflo et al., *Truth-Telling By Third-Party Auditors And The Response of Polluting Firms: Experimental Evidence From India*, 128 Q. J. of Econ. 4 at 1499-1545 (2013).

[11] See Short, J.L. & Toffel, M.W., *The Integrity of Private Third-Party Compliance Monitoring*, Kennedy School - Harvard, Working Paper RPP-2015-20 (Dec. 2015), available at https://www.hks.harvard.edu/content/download/78659/1765209/version/1/file/RPP_2015_20_Short_Toffel.pdf.

Examples

- Proposed amendments to the Accidental Release Prevention Requirements of Risk Management Programs (RMP) under the Clean Air Act, Section 112(r)(7). The proposed revisions aim to modernize EPA's chemical safety and security regulations, guidance, and policies as required under Executive Order (EO) 13650. EO 13650 directs the federal government to carry out a number of tasks intended to prevent chemical accidents, such as the explosion in West, Texas on April 17, 2013. The proposed revisions include several changes to the accident prevention program requirements, including by using expert third party reviewers to check on performance for those small number of facilities that have shown that mere self-audits are not sufficient because they have had serious accidents. Among other things, the independence criteria for auditors limit past, present, and future business relationships with owners/operators. The proposed rule's preamble discusses the root causes of the accidental releases, the academic literature on the importance of independence in designing an effective third party program, and federal, state, industry experience with third party verifiers. See https://www.epa.gov/rmp/proposed-changes-risk-management-program-rmp-rule.

- Mann Distribution LLC (Warwick, Rhode Island) was issued an administrative order requiring it to address a variety of safety and hazardous waste violations at a chemical distribution facility. Among other things, the order includes a requirement that the facility implement an independent third-party inspection program, hiring an auditor who will conduct four inspections over the course of at least one year, of which three must be unannounced. To ensure that the auditor is truly independent, the order requires that no member of the inspection team may have performed work for Mann in the past, and may not work for Mann for five years after the inspections are complete. In addition, inspection reports are to be submitted simultaneously to EPA and to Mann. For more information, see https://yosemite.epa.gov/oa/rhc/epaadmin.nsf/CAFOs%20and%20ESAs/B2D06F9F9027BF6485257F6D00213DAD/$File/FIFRA-01-2016-0017%20CAFO.pdf. See the Appendix for relevant text from the order.

VI. Innovative Enforcement

The benefits of innovative enforcement

Innovative enforcement combines the lessons learned in implementing Next Generation Compliance with new capabilities in analyzing larger data sets to better identify serious violators, ensure the integrity of electronic reporting, and more effectively and efficiently track compliance with settlements, while supporting new approaches to improve compliance.[12] It is important to understand that in this

[12] For a report exploring the use of compliance rate data to drive inspection and targeting decisions, *see* New Jersey Department of Environmental Protection, *Compliance & Enforcement Target and Measure Initiative Final Project Report* (Oct. 2006).

context "enforcement" includes a wide range of measures aimed at improving compliance, including tools to assist regulated parties in taking responsibility for their environmental impacts.

Examples

- The Olympic Regional Clean Air Agency's self-inspection guide provides laminated cards to gas stations with pictures of common defects, including those in the gaskets and seals, which assist stations with diagnosing problems with the dispenser. The card also provides a how-to guide for inspecting the various components of the tank and pump to prevent gas leaks. See https://www.orcaa.org/makeitgo/uploads/business-assistance-forms/gas-stations-self-inspection-guide.pdf.

- The Ohio EPA Division of Air Pollution Control has a data management system in place for both external application and reporting creation as well as internal review of those submissions and permit development. The data management system includes a web-based, CROMERR-compliant portal for the regulated community. This includes the ability for a facility to create and submit permit applications, annual emissions reports, and permit based reports. In addition, the facility maintains a detailed facility profile including air flow information from the process generating emissions, through the control equipment to the egress point. An internal data management system is used by Ohio EPA staff to receive submissions from the web portal. It tracks the progress of review of those reports, applications, etc. through the end of required processing. That may be in the form of permit issuance, submission to U.S. EPA tracking systems, or invoicing. Publicly available files are made available through Ohio EPA's e-Doc system, which provides online access to all public documents. See http://www.epa.ohio.gov/dapc/airservices.aspx.

Using tools in combination

As has already been seen in many of the examples above, the Next Gen tools presented in this Compendium can have their greatest impact when used in combination—for example, advanced monitoring can be combined with electronic reporting and public transparency. Using tools together can have a multiplier effect.

Examples

- Shell Deer Park (Deer Park, Texas) consent decree: As discussed under "Transparency" and "Advanced Monitoring," a 2013 consent decree with the Shell Deer Park (SDP) refinery and chemical plant requires SDP to construct a state-of-the-art system to monitor benzene levels at its fenceline, which is near a residential neighborhood and school. A meteorological station will be set up near the optical paths measured by the AMS to collect wind speed and direction. The results will be reported on a public website. Shell will also post Semi-Annual Air Monitoring Field Investigation reports to the internet that include air emissions, meteorological data, calibration data, any other data measured, and steps Shell took to bring the sources into compliance. The monitoring system and website are currently in the planning and approval stage. See Appendix for more details.

> ➢ Innovations from Other Environmental Programs:
>
> California State Water Control Board's "Creek Watch" is an iPhone application developed by IBM that enables members of the public to help regulators monitor thousands of miles of creeks and streams in their local watershed. Participants are encouraged to use the Creek Watch app to take and upload pictures of their local waterway and report how much water and trash they see. IBM's research lab aggregates the data and shares it with local water control boards to help them track pollution and manage water resources. All data are shown on a map and table on a publicly accessible website. For more information, see www.ibm.com/smarterplanet/us/en/water_management/article/creek_watch.html

- EPA's Village Green Project places cutting-edge air monitors, built into benches with solar panels to provide power, in public locations such as parks or libraries. Village Green monitors are currently located in Kansas City, Kansas; Durham, North Carolina; Washington, D.C.; Chicago, Illinois; and Philadelphia, Pennsylvania. The results can be seen by visitors at the site of the monitor, and are also uploaded to a public website. The data updates every minute and includes ozone, $PM_{2.5}$, temperature, humidity, and wind speed and direction. The website provides historical data for up to one month in both table and graphic forms and allows users to view the data on a smartphone when near the stations. See http://www.airnow.gov/index.cfm?action=airnow.villagegreen.

Additional Resources

For additional information about Next Generation Compliance, see the following documents:

- Cynthia Giles, *Next Generation Compliance*, The Envtl. Forum, Sept.-Oct. 2013, at 22, *available at* https://www.epa.gov/sites/production/files/2014-09/documents/giles-next-gen-article-forum-eli-sept-oct-2013.pdf.

- U.S. EPA, Office of Enforcement and Compliance Assurance, *Use of Next Generation Compliance Tools in Civil Enforcement Settlements* (January 2015), *available at* https://www.epa.gov/sites/production/files/2015-01/documents/memo-nextgen-useinenfsettlements.pdf.

- U.S. EPA, *NPDES, RCRA, and Cleanup Compendia of Next Generation Compliance Examples* (September 2016), available at https://www.epa.gov/compliance/next-generation-compliance.