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CYNTHIA GILES

Next Generation Compliance:

Environmental Regulation for the Modern Era

Part 2: Noncompliance with Environmental Rules Is Worse Than You Think

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Serious noncompliance with environmental rules is common. It is common across all programs and industry types. Significant violations occur at 25% or more of facilities in nearly all programs for which there is compliance data. For many programs with the biggest impact on health, serious noncompliance is much worse than that. Significant violation rates of 50% to 70% are not unusual. These widespread violations have a direct effect on people's health.

What we want is less air and water pollution. We want people not to be at risk of dangerous exposures or catastrophic environmental accidents. We want safer chemicals in the market. We want kids to be able to drink water and to play outside without endangering their health.

Compliance is how we get there. Congress sets the lofty public health goals. Regulations translate those aspirations into concrete requirements. The rubber meets the road when firms do – or don't do – what those rules require. That's compliance: Are companies taking the necessary action to protect public health or not? Laws and rules are a fine start, but what we truly care about is whether they produce action in the real world.

The introduction to this Next Gen series explains why rule design is the most important determinant of compliance. If a rule makes compliance the path of least resistance, compliance will be good. Otherwise, we can expect widespread serious violations. Part 1 of this series, Rules with Compliance Built In, provides detailed examples of successful and unsuccessful rules and explains how their structure determined the compliance outcome. You could be excused for thinking, as most environmental regulators do, that the bad examples are outliers, and that most rules have fairly good compliance performance. You could be excused, but you would still be wrong. Are the examples of rules with widespread violations anomalies in an otherwise great compliance record? Unfortunately, no. The poor outcomes discussed in Part 1 are regrettably just the tip of the iceberg. The broader compliance record is the subject of this article, Part 2 in the series.

Environmental compliance evidence is of four main types: 1) Statistically valid compliance "rates," of which there are very few, 2) Programs where the compliance status of a very large percentage of the sources is known, so something meaningful can be said about the compliance performance of the entire regulated community, 3) Rules where we don't know what the compliance performance is, but there is compelling evidence suggesting it is probably bad, and 4) Programs for which we have no idea about compliance, of which there are many. After reviewing evidence in these four categories, I describe two

important regulatory programs for which the publicly stated evidence about compliance is flawed and serious violations are much more common than public reports claim.

My review of the noncompliance evidence could have presented a couple illustrations in each category and moved on. Instead, I give multiple examples – nearly all very brief – because the number and diversity of the examples underscore the central point: serious noncompliance occurs everywhere. It's in all types of programs and all kinds and sizes of companies. It cannot be dismissed as a problem confined to a few industry sectors or a small number of atypical regulations. The sheer number of examples is part of the rebuttal to the skeptics, who may acknowledge that there are some rules with poor outcomes but who still cling to the belief that overall compliance is the norm.

A well-established paradigm is not easily knocked off its perch. The dual assumptions, that compliance overall is good and assuring compliance is the job of enforcers, have a tight grip on environmental policy.[1] That's not going to change until the paradigm's adherents accept that our current system isn't getting us there. The evidence presented here makes that case.

What kinds of violations matter?

For most people, the idea of pollution conjures up an image of smoke rising from a tall stack or dirty water flowing from a pipe. Everyone understands why illegal discharges from those sources is a problem. And they realize that higher amounts of violating pollution are generally more troubling. But there are also significant health threats regulated by EPA that don't fit that model.

Much of the most serious pollution does not come from clearly defined sources like a stack or a pipe. For air pollution, significant amounts of dangerous air emissions come from much more dispersed sources, like the leaks from valves, pipes, and tanks at industrial facilities; releases from oil and gas well sites across the country; and the emissions from millions of trucks, ships, and cars. And although discharge from wastewater pipes is still a serious problem, we face a growing threat from stormwater – rain that washes bacteria, nutrients, and chemical contamination from industrial facilities, pavement, and farms into the nation's waters.[2] Widespread violations of rules for these more diffuse types of pollution have a huge collective impact.

Many EPA rules are intended to prevent pollution from happening at all, not just allow it in limited

1 There are some scholars who have acknowledged the pervasiveness of serious environmental violations, but they expressly or implicitly assume that deficiencies in enforcement are the principal reason. *See e.g.*, David L. Markell & Robert L. Glicksman, *Dynamic Governance in Theory and Application, Part I*, 58 Ariz. L. Rev. 563, 590-591 (2016); Victor B. Flatt & Paul M. Collins Jr., *Environmental Enforcement in Dire Straits: There is No Protection for Nothing and No Data for Free*, 41 Envtl. L. Rep. News & Analysis 10679 (2011); Daniel A. Farber, Taking Slippage Seriously: Noncompliance and Creative Compliance in Environmental Law, 23 Harv. Envtl. L. Rev. 297 (1999).

2 Toxic algal blooms are increasing in the US, caused by nutrients from multiple sources including stormwater runoff. *See How Human Activities Increase the Occurrence of Cyanobacterial Blooms*, EPA, https://www.epa.gov/cyanohabs/causes-cyanohabs (last visited Feb. 13, 2020). Harmful Algal Blooms, EPA, https://www.epa.gov/nutrientpollution/harmful-algal-blooms (last visited Feb. 13, 2020).

amounts. For example, requiring that hazardous waste can only be sent to a licensed facility for treatment or disposal assures the public that dangerous wastes are handled by companies with the expertise and resources to prevent leaks. It's not that all violations of prevention rules lead directly to harm. It's that the more times regulated parties engage in unsafe practices the more likely it is that dangerous incidents will happen. That's why compliance with prevention rules is important. You never know when a violation will combine with unpredictable events to cause serious damage: The unlicensed pesticide applicator dowses a condo with a chemical not approved for indoor use and causes severe and permanent damage to an entire family; the inadequately inspected tank explodes, exposing workers and neighbors to dangerous chemicals; or the cracked containment wall leaks, sending toxic chemicals into the drinking water supply. When these terrible incidents occur, government investigations usually reveal that the company failed to take the required preventive measures. In other words, there was a violation. By insisting on compliance with prevention requirements we avoid creating the circumstances for these catastrophes to occur.[3]

Monitoring and reporting are also key compliance obligations. That's how companies and government know if the standards have been met. When companies don't monitor or don't report their activities, serious pollution problems can be happening unobserved. If waste manifests are not completed, no one knows that dangerous hazardous waste has gone missing. If a company skips monitoring, they are unaware that they have a serious leak spewing toxic chemicals into neighboring communities. These failures are not unimportant "paperwork" violations. If a drinking water provider doesn't sample the water to make sure it is safe before sending it out to consumers, no one who drinks the water would consider that a minor problem. Because the accuracy and timeliness of self-monitoring and reporting is central both to compliance and to program integrity, government rightfully considers violations of these requirements as very serious.

Compliance with rules is not all or nothing. Companies often comply with some rules but not others. They might violate rarely or frequently. Their emissions could barely exceed the limit or surpass it by a factor of twenty. Some firms do completely ignore environmental requirements, but it is more common that some actions are taken to comply, but they fall far short. The firm installs pollution controls but operates them intermittently or incorrectly. It has a program to inspect for corrosion, but the people implementing it miss obvious defects – with sometimes catastrophic consequences. Samples are taken, but not in the right places or at the right times, so the key pollution is missed. For these and many other reasons, noncompliance isn't a simple yes/no proposition.

3 Many regulations are intended to prevent contamination from reaching the environment or threatening people. Here are just few illustrations: oil spill prevention and counter measures (SPCC), pesticide labeling that includes use restrictions, corrosion control in drinking water systems to inhibit lead contamination, liner requirements for landfills to avert leaks, lead paint removal work practices, safe disposal requirements for PCBs, financial assurance obligations proving that companies have the resources to address the problems they cause, work practices for asbestos removal, and checking for corrosion in tanks and pipes holding dangerous chemicals.

We care about compliance overall, but we care most about the violations with the greatest potential impact. That's why I will focus on serious noncompliance in these articles. The question of greatest interest isn't whether a thorough examination can find any violation of any standard – although if many companies routinely have violations something is amiss – but how common it is to discover significant problems. In many programs, there is a well-established definition of what qualifies as significant, like the amount of violating pollution or the frequency of failure to monitor or report. When available, I will focus on data about these most serious kinds of violations.

It is worth noting that noncompliance and compliance are not always flip sides of the same coin. It is possible for inspectors to confirm some violations without knowing whether a company is complying with everything else. An inspector can see that the stack is belching smoke without checking that every required report was filed on time. It often takes intensive effort to say with certainty that a facility is 100% compliant, and usually that's not a very important question. That's why this series focuses on *noncompliance* and not compliance rates. Data about violations are more reliable than claims of full compliance, and the public health threat from serious violations is what we care most about.

Some people may wonder if the threats from widespread violations are less worrying than they appear because pollution measured at many ambient monitors has declined.[4] They hope that progress reducing some of the most troubling air and water pollution means we don't need to worry about pervasive, significant noncompliance. Unfortunately, ambient monitoring results don't give us that reassurance.

One reason is that despite progress, we still have very serious pollution problems. Over 130 million Americans live in areas that don't meet air quality standards.[5] Almost half of the nation's rivers and streams are in poor condition.[6] Some of these trends are now going in the wrong direction after years of

4 Ambient monitors measure air and water pollutants in the community and aggregate pollution from all sources. They are different from facility-specific monitors intended to measure the pollution from individual facilities.

5 *See Air Quality - National Summary*, EPA, https://www.epa.gov/air-trends/air-quality-national-summary (last visited Feb. 13, 2020); Nonattainment Areas for the Criteria Pollutants, EPA, https://epa.maps.arcgis.com/apps/MapSeries/index.html?appid=8fbf9bde204944eeb422eb3ae9fde765 (last visited Feb. 13, 2020) (displaying nonattainment areas for each of the criteria pollutants). Furthermore, ambient monitors may undercount actual pollution. A recent study using satellite data concluded that 24 million people lived in areas that should have been, but were not, classified as nonattainment for $PM_{2.5}$, doubling the number that EPA reported as living in $PM_{2.5}$ nonattainment areas nationally. Daniel M. Sullivan & Alan Krupnick, *Using Satellite Data to Fill the Gaps in the US Air Pollution Monitoring Network* at 2-3 (Resources for the Future, Working Paper RFF WP18-21, 2018).

6 EPA, EPA 841-R-16-011, National Water Quality Inventory Report to Congress, at 2 (Aug. 2017), https://www.epa.gov/sites/production/files/2017-12/documents/305brtc_finalowow_08302017.pdf. The national water quality assessment is based on statistical sampling. The 2017 survey report concludes that 46% of the river miles are in poor condition, but it can't identify where those poor-quality river miles are because the conclusion is based on a random sample. Fifty-five percent of the river miles assessed by the states were deemed impaired (unable to support one or more of the uses designated for them by the states, such as fishing or swimming). *Id*. at 8.

improvement.[7] Widespread violations contribute to these ongoing health threats.

But an even more important reason is that many of the serious violations occurring across the country today result in exposures, or the risk of exposures, that will never be spotted by ambient monitors. Ambient monitors look at long-term trends for some air and water pollutants[8] in some places[9] some of the time.[10] That's all they are intended to do. They tell us nothing about serious pollution that occurs far from any monitors, or toxic contaminants the monitors aren't looking for, or releases that happen when monitors aren't checking. And air and water monitors can't tell us how we are doing with programs to prevent exposure, such as lead paint, pesticides, drinking water contaminants, and dangerous chemicals in products.

Compliance is the first line of defense. And for many problems it's the only one. Some violations may eventually be observed in concerning results from long-term ambient monitoring. But most of the time they won't. People will be at risk, but ambient monitoring won't tell us that. Widespread serious violations of rules designed to protect public health are alarming, whether or not ambient monitors are raising a flag.

What do we know about noncompliance?

This series looks primarily at noncompliance on a national scale. That's because federal rules set the bar for delegated programs across the county. They are intended to meet the charge from Congress that everyone be protected, regardless of where they live.

7 *See e.g.*, Seth Borenstein & Nicky Forster, *US Air Quality Is Slipping After Years of Improvement*, AP News (June 18, 2019), https://www.apnews.com/d3515b79af1246d08f7978f026c9092b; *Water Quality Changes in the Nation's Streams and Rivers*, USGS, https://nawqatrends.wim.usgs.gov/swtrends/ (last visited Nov. 20, 2019) (an interactive map showing where water pollution is getting worse); Nadja Popovich, *America's Air Quality Worsens, Ending Years of Gains, Study Says*, New York Times (Oct. 24, 2019), https://www.nytimes.com/interactive/2019/10/24/climate/air-pollution-increase.html.

8 The air monitoring network focuses on the National Ambient Air Quality Standards (NAAQS) criteria pollutants: ozone (O_3) – formed in the atmosphere from the interaction of nitrogen oxides (NOx) and volatile organic compounds (VOCs) in sunlight, particulate matter (PM), nitrogen dioxide (NO_2), lead (Pb), sulfur dioxide (SO_2), and carbon monoxide (CO). There is some, but very limited, air toxic ambient monitoring: Currently there are only 27 ambient toxic monitoring sites nationwide, each only required to check for 19 compounds, although most check for more. *See Air Toxics – National Air Toxics Trends Stations*, EPA, https://www3.epa.gov/ttnamti1/natts.html (last visited Feb. 13, 2020). Note that there are 188 listed air toxics under the Clean Air Act. For the contaminants included in water quality monitoring, *see Water Quality in the Nation's Streams and Rivers – Current Conditions and Long-Term Trends*, the United States Geological Survey, https://www.usgs.gov/mission-areas/water-resources/science/water-quality-nation-s-streams-and-rivers-current-conditions (last visited Feb. 13, 2020); EPA, *National Water Quality Report, supra* note 6.

9 The majority of US counties don't have ambient air pollution monitors. Sullivan & Krupnik, *supra* note 5, at 2. *See also, Interactive Map of Air Quality Monitors*, EPA, https://www.epa.gov/outdoor-air-quality-data/interactive-map-air-quality-monitors (last visited Feb. 13, 2020) (map showing where all the ambient air quality monitors are located). Less than a third of the nation's river miles are monitored over a multiple year period for EPA's national water quality survey. EPA, *National Water Quality Report*, *supra* note 6, at 8.

10 Most ambient air monitors operate every three, six, or 12 days, depending on the pollutant. *See Ambient Monitoring Technology Information Center, Sampling Schedule Calendar*, EPA, https://www3.epa.gov/ttn/amtic/calendar.html (last visited Feb. 13, 2020) (displaying annual monitoring schedules). The national statistical sample of US waterways occurs on a five-year cycle. *See* EPA, *National Water Quality Report, supra* note 6, at 4.

Individual states might have much better or worse results, but we can only know if we are achieving the national goals of our federal laws by looking at the national picture. What does the evidence say?

1. Violations are common in the few programs with true noncompliance rates.

For decades, a noncompliance rate has been the holy grail for compliance work: What percentage of the regulated firms have violations? If we reliably know that and have information on the types and seriousness of the violations, we would know if we are doing a generally good or terrible job protecting the public.

There are two ways to identify a noncompliance rate with confidence. One is through statistically valid sampling; if we examine compliance at a randomly selected representative sample of regulated firms, the data on that sample can tell us what the rate is for the population as a whole. The other approach is to look at the compliance status of 100% (or very close to it) of the regulated facilities. This approach doesn't require randomized sampling because it looks at the entire universe.

There is surprisingly little information that could realistically be called a noncompliance rate. Because there has never been and will never be enough inspectors to inspect all or even a significant fraction of regulated facilities, figuring out a meaningful "rate" of noncompliance has been challenging.[11] State and federal inspectors are, for good reason, focused on the facilities that regulators have reason to believe might be in violation. Very few enforcement offices have the resources to inspect enough randomly selected facilities to be able to say anything with confidence about the rate of noncompliance. If there are 1,000 facilities in a state covered by a rule, and if in any year the state selectively inspects 100 of them and finds 25 are in violation, that is not a 25% noncompliance rate. Under this scenario the state doesn't know what's happening at 900 facilities. The true noncompliance rate could be anywhere between 5% and 90%; it can't be determined from 100 targeted inspections.[12]

In the early 2000s, EPA attempted to get a statistically valid noncompliance rate for some programs. This was EPA's response to continual pressure to say something conclusive about noncompliance rates. EPA worked with statisticians to develop reliable information about the rate of noncompliance for some sectors. So that the

11 For many programs, boots-on-the-ground inspections have been the most reliable way to determine compliance, as is discussed elsewhere in this Next Gen series. That isn't always the case; sometimes violations can be determined off-site from document reviews or facility-run monitoring, and sometimes inspectors miss some of the most serious violations because it isn't possible to identify those violations through on-site inspections alone. "Inspections" is used here to mean whatever investigatory method is best for determining noncompliance.

12 For many years, probably decades, some states have argued for calling the rate of violations discovered during inspections a noncompliance rate for the whole sector. The percentage of inspected facilities with violations – often called a "hit rate" – may tell you how common violations are at the inspected facilities, but it tells you nothing about compliance at facilities not inspected; pick a different group of facilities to inspect and you get a different rate. A true noncompliance rate can only be determined through data about the entire universe or a statistically representative sample. *See* EPA, Expanding the Use of Outcome Measurement for EPA's Office of Enforcement and Compliance Assurance Report to OMB, at 12 (2006), https://archive.epa.gov/compliance/resources/reports/compliance/research/web/pdf/outcome-measurement.pdf.

inspections could be largely random – and thus representative of the whole sector – EPA and the states had to forgo inspections that they would otherwise have done at facilities where there was reason to believe there were violations.

For each of three major environmental laws – clean water, clean air, and hazardous waste – EPA looked at one sector's compliance with one regulation. EPA learned two things: Noncompliance was common and figuring out noncompliance rates this way is prohibitively expensive.[13]

Here's what EPA found out about noncompliance rates:

13 *Id*. at 14-15. The project had both direct costs (additional costs to conduct the inspections and analyze the results – over $300,000 in 2018 dollars) and unquantified opportunity costs (the pollution or risk reductions EPA could have achieved by doing the same number of targeted – rather than random – inspections).

Sector and regulation	Number of random inspections required	Noncompliance rate[14]
Organic Chemical Manufacturing small quantity generator hazardous waste requirements under RCRA[15]	112	34.3% (+/- 8.1%)
Ethylene Oxide Manufacturers Clean Air Act toxic air pollution requirements[16]	67	49.2% (+/- 5%)
Municipal Combined Sewer requirements under Clean Water Act[17]	214	61.4% (+/- 5%)

14 The noncompliance rates cited here include all noncompliance, not just significant noncompliance, because that's the only information provided in the report.

15 Wastes from organic chemical manufacturing are defined as hazardous under the Resource Conservation and Recovery Act (RCRA). *Defining Hazardous Waste: Listed, Characteristic and Mixed Radiological Wastes, the F and K lists*, EPA https://www.epa.gov/hw/defining-hazardous-waste-listed-characteristic-and-mixed-radiological-wastes#FandK (last visited Feb. 13, 2020). The small quantity generator rules define how those wastes should be stored, transported, and disposed to prevent releases of those hazardous wastes into the environment.

16 Ethylene oxide is identified as a hazardous air pollutant under the Clean Air Act. It can cause harm to the brain and central nervous system, in addition to irritating eyes, skin, nose, throat, and lungs. *See Background Information on Ethylene Oxide*, EPA, https://www.epa.gov/hazardous-air-pollutants-ethylene-oxide/background-information-ethylene-oxide#why (last visited Feb. 13, 2020). Ethylene oxide is also a carcinogen. *Id.* Ethylene oxide has recently been in the news because of exposure concerns that started with a facility in Illinois. *See* Press Release, Illinois EPA, Illinois EPA Director Seals Portions of Sterigenics Due to Public Health Hazards from Ethylene Oxide Emissions (Feb.15, 2019), https://www2.illinois.gov/Pages/news-item.aspx?ReleaseID=19717. In November 2019, EPA proposed new regulations concerning emissions of ethylene oxide, pursuant to a court order requiring those regulations. *See* Press Release, EPA, EPA Moves Forward on Suite of Actions to Address Ethylene Oxide (Nov. 6, 2019), https://www.epa.gov/newsreleases/epa-moves-forward-suite-actions-address-ethylene-oxide.

17 The term "combined sewers" refers to the situation where human sewage, stormwater runoff, and indirect discharges of industrial waste are funneled into the same pipes. When rainfall leads to high volumes of stormwater, treatment authorities often discharge this untreated or partially treated waste into surface waters. Regulations governing discharges from combined sewers are designed to protect the public from the serious health threats posed by pathogens and industrial contaminants in the nation's waters.

The noncompliance rates EPA found during this exercise range from bad to dismal. Thirty-four percent of the studied RCRA hazardous waste generators were in violation; 49% of the ethylene oxide manufacturers were violating rules about air toxics; and a whopping 61% of municipalities were violating the rules about discharge of raw sewage and contaminated stormwater.

In addition, EPA learned that figuring out noncompliance rates this way isn't practical. It costs too much money, takes too much time, and it reduces the inspections EPA and states can do at facilities likely to be violating. Statistical sampling cannot possibly be done for even a small number of the sectors that EPA regulates, most of which have so many regulated facilities that the number needed for a statistically representative sample is unaffordably large. And it fails on another score too: Because taking a representative sample is designed to figure out the rate of noncompliance, it only tells EPA what the percentage of violators is, not who they are. It may show that 50% of facilities are violating, but it doesn't tell regulators which ones, so isn't useful for taking direct action.

An alternative way to figure out noncompliance rates is by looking at the compliance status of the entire universe of regulated facilities. No sampling is required. This kind of nearly complete universe information – so-called near-census data – is a better way to figure out noncompliance rates if the data are available as part of regular government operations because it gives useful rate information without all the costs and other downsides of sampling.

EPA has data on almost the entire universe of large, individually permitted discharges under the Clean Water Act (the National Pollution Discharge Elimination System, or NPDES, program). Under NPDES, individually permitted facilities are required to submit usually monthly reports about their discharges and self-disclose any violations. These are self-reported compliance levels, not verified by government, but because the requirement to report is universal, it is possible to find out from these reports what the self-reported rate of noncompliance is without the need to divert resources to investigating a representative sample.

There are about 7,000 major NPDES water dischargers each year. "Major" dischargers include the largest facilities discharging pollutants into the nation's waters. These include large industrial facilities like refineries and chemical manufacturing plants as well as cities that run sewage treatment plants. The percentage of NPDES majors that have self-reported violations over the last nine years has been between 37% and 56% a year.[18] The self-reported rate of more serious violations, labeled as significant noncompliance (SNC), has for many years been between 20% and 25%.[19]

Under a recent regulation, non-major water pollution dischargers are also required to submit their

18 *See Enforcement and Compliance History Online (ECHO), EPA,* https://echo.epa.gov/ (last visited Nov. 18, 2019) (Select topic Analyze Trends: State Water Dashboard, and select settings National Summary, Performance Dashboard, Box 3 (select Facilities in Non-Compliance (Majors, %)).

19 *Id.* at Box 4 (Major Facilities in Significant Non-Compliance (%)). SNC is a defined term that includes violations that are more frequent, higher volume, or more serious.

discharge reports to EPA and states electronically.[20] Non-majors are usually smaller industrial facilities and cities, and their discharges include nutrients, sediments, and a host of chemical contaminants. The new requirement will give EPA compliance data on close to the entire universe of approximately 40,000 facilities that are significant enough to require individual permits but for which compliance information has often been largely inaccessible to EPA and the public. Prior to the new universal requirement, about 36 states and territories did have 75% or more of their non-major (sometimes called "minor") water dischargers report electronically to EPA.[21] That's not enough for a completely reliable rate of noncompliance, but it is pretty close.[22] The rate of *serious* noncompliance for facilities in these states in 2008 was 60%.[23] With a sustained EPA effort to call attention to these astonishingly high rates of noncompliance – aided by a prominent article in The New York Times[24] – the rate has steadily declined; in 2015 the self-reported serious violation rate for the verified dischargers was an improved but still poor 32%.[25]

In contrast to the above discouraging outcomes, rules employing Next Gen strategies had excellent compliance results. Two of those rules are highlighted in Part 1 of this series: the Acid Rain Program and Greenhouse Gas Reporting Program. As a result of strong compliance design, both rules had noncompliance rates less than 2%.[26] Not coincidently, these rules have near-census data as part of the program design, so it is possible to be confident about noncompliance rates. The same

20 National Pollutant Discharge Elimination System (NPDES) Electronic Reporting Rule, 80 Fed. Reg. 64063 (Oct. 22, 2015) https://www.federalregister.gov/documents/2015/10/22/2015-24954/national-pollutant-discharge-elimination-system-npdes-electronic-reporting-rule. The NPDES e-reporting rule requires electronic submission by non-major individually permitted sources starting in December of 2016, so more reliable rates for this universe of water pollution dischargers will become available, although the rule has still not been fully implemented. *See NPDES eRule Readiness and Data Completeness Dashboard*, EPA, https://echo.epa.gov/trends/npdes-erule-dashboard-public (last visited Feb. 13, 2020) (presenting state-specific data on rule implementation).

21 *See* EPA Office of Enforcement and Compliance Assurance, U.S. EPA Annual Noncompliance Report (ANCR) Calendar Year 2015, at 9 (2016), https://echo.epa.gov/system/files/2015_ANCR.pdf. The most recent ANCR was for 2015; the dashboard using NPDES e-reporting rule data will eventually take the place of the ANCR. The states for which EPA had actual discharge data are labeled in the ANCR as "verified" states. States that only provided summary information were labeled "non-verified." *See id*. at 6.

22 Note that because 36 states and territories provided this universe data for facilities in their states, it cannot be directly translated into a *national* noncompliance rate. The facilities in states where electronic reporting was not required may have a noncompliance record that is better or worse than the reporting states.

23 EPA, 2015 ANCR, *supra* note 21, at 6.

24 Charles Duhigg, *Clean Water Laws Are Neglected, at a Cost in Suffering*, New York Times (Sept. 12, 2009).

25 EPA, 2015 ANCR, *supra* note 21, at 6. States that did not require facility electronic reporting or provide that information to EPA gave EPA only summary information. That summary data provided no facility-specific information, just conclusions, like "10% of our non-majors had serious violations." For years, that summary data have suggested that these nonverified states had noncompliance rates that were dramatically lower than verified states, a conclusion that is not supportable and that EPA rejected in its ANCR in 2015. *Id*. For example, in 2008, states with verified data reported a serious noncompliance rate for non-majors of 60%, while the states with non-verified summary data claimed a serious noncompliance rate of only 18%. *Id*.

26 *See* Cynthia Giles, *Part 1: Rules with Compliance Built In*, Next Generation Compliance: Environmental Regulation for the Modern Era, at 4 to 7 (acid rain) and 12 to 13 (greenhouse gas reporting) (Jan. 27, 2020), https://eelp.law.harvard.edu/2020/01/next-generation-compliance-environmental-regulation-for-the-modern-era/.

impressive results occurred for the Mercury and Air Toxics Standards (MATS), which employed Next Gen strategies akin to the Acid Rain Program.[27] Note that the same regulated sector – coal-fired power – had two impressive compliance outcomes (acid rain, MATS) and one compliance disaster (NSR),[28] further evidence that it is rule design, not the sector being regulated, that drives compliance results.

2. Overwhelming data in many programs show that serious violations are widespread.

EPA usually doesn't have statistically valid sampling or near-census data about compliance. So, most of the time there is nothing that can credibly be called a noncompliance rate.[29] However, for some individual rules or programs, EPA has reliable compliance data on 70% or more of the universe. That's enough to estimate how common it is that large facilities in that sector have serious violations.

Here are some examples:

Coal-fired power plants. Coal-fired power plants have produced by far the largest volume of dangerous air pollution of any industrial sector in the US.[30] Of the largest 25 coal-fired power companies, responsible for about 70% of the US coal-fired power production in 2005,[31] 18 were sued for violating the Clean Air

27 *See* US Energy Information Administration, *Coal Plants Installed Mercury Controls to Meet Compliance Deadlines*, Today in Energy (Sept. 18, 2017), https://www.eia.gov/todayinenergy/detail.php?id=32952# (compliance record). For example, the MATS rule required continuous monitoring for mercury 40 C.F.R. §63.10000(c)(1)(vi). Compliance with MATS was also aided by external developments, like the reduced price of gas and technological innovation in mercury removal, which significantly reduced the costs of compliance. *See* Calpine Corporation, Exelon Corporation, and Public Service Enterprise Group, Comment Letter on Proposed Supplemental Finding that it is Appropriate and Necessary to Regulate Hazardous Air Pollutants from Coal- and Oil-Fired Electric Utility Steam Generating Units, Docket ID No. EPA-HQ-OAR-2009-0234, at 3 (Jan. 15, 2016), https://www.regulations.gov/document?D=EPA-HQ-OAR-2009-0234-20549 (finding that the actual cost of complying with MATS was less than 25% of costs EPA estimated in the final rule). *See also, id*. at 4, (citing companies finding cheaper ways to meet the standard and the reduced price of natural gas as significant contributors to reduced costs of the rule). *See also*, Andrew Carter, *Alchemical Rulemaking and Ideological Framing: Lessons from the 40-Year Battle to Regulate Mercury Emissions from Electric Power Plants*, 58 Nat. Resources J. 125 (2018) (describing history of the struggles to reduce mercury emissions from power plants, and industry's actions to prevent regulation). MATS has been under assault from the Trump EPA, despite the utility industry's objection to rolling it back. *See Mercury and Air Toxics Standards*, Harvard Environmental and Energy Law Program Regulatory RollBack Tracker, https://eelp.law.harvard.edu/2017/09/mercury-and-air-toxics-standards/ (last updated Jan. 29, 2020).

28 *See* the discussion of NSR in Section 2 below and in Giles, *supra* note 26, at 24-30. *See also* Cynthia Giles, *Introduction*, Next Generation Compliance: Environmental Regulation for the Modern Era, https://eelp.law.harvard.edu/2020/01/next-generation-compliance-environmental-regulation-for-the-modern-era/ (comparing Acid Rain and NSR).

29 Environmental policy practitioners may be wondering why Section 1 above (noncompliance rates) doesn't include a discussion of noncompliance rates for public drinking water systems and major stationary sources of air pollution. Doesn't EPA routinely claim to have noncompliance rates for these two important categories of regulated sources? It does. But those claimed rates are demonstrably unreliable, as is discussed in Section 5 below.

30 *See* Emanuele Massetti et al., Oak Ridge National Laboratory, Environmental Quality and the U.S. Power Sector: Air Quality, Water Quality, Land Use and Environmental, at vii (Jan. 4, 2017), https://www.energy.gov/sites/prod/files/2017/01/f34/Environment%20Baseline%20Vol.%202--Environmental%20Quality%20and%20the%20U.S.%20Power%20Sector--Air%20Quality%2C%20Water%20Quality%2C%20Land%20Use%2C%20and%20Environmental%20Justice.pdf. *See also*, GAO, Wider Use of Advanced Technologies Can Improve Emissions Monitoring, at 19 (June 2001); American Lung Association, *Toxic Air: The Case for Cleaning Up Coal-fired Power Plants*, at 1 (March 2011) https://www.lung.org/assets/documents/healthy-air/toxic-air-report.pdf.

31 *See Ownership of Existing U.S. Coal-fired Generating Stations*,

Act's requirement to upgrade pollution controls when upgrading the plant.[32] That means at least 70% of the largest 25 coal-fired power companies were in serious violation of the Clean Air Act.[33]

"At least 70% of the largest 25 coal-fired power companies were in serious violation of the Clean Air Act."

Petroleum refineries. Emissions from petroleum refineries include some of the same pollutants found at power plants, along with smog-causing volatile organic compounds and air toxics including benzene, a known carcinogen. EPA has entered into 37 Clean Air Act settlements with US companies that refine over 95% of the nation's petroleum refining capacity. In other words, the companies responsible for virtually all of the nation's total production were in serious violation.[34]

Cement manufacturing plants. Cement manufacturing plants are the third largest industrial source of air pollution. All of the top five, and nine of the top 10 cement manufacturers in the US – responsible for 82% of the total US production – entered into enforcement agreements with EPA for serious Clean Air Act violations.[35]

Center for Media and Democracy, https://www.gem.wiki/Existing_U.S._Coal_Plants, (last visited Nov. 20, 2019; site was moved to a new web address in Jan. 2020) (listing top 25 coal fired utilities in 2005).

32 Sixteen were sued by EPA, and two by Sierra Club. Coal-Fired Power Plant Enforcement, EPA, https://www.epa.gov/enforcement/coal-fired-power-plant-enforcement (last visited Feb. 13, 2020) (partial list of EPA coal-fired power plant cases). Some of the EPA enforcement cases are still pending in the courts so are not on the settlement list, e.g., DTE Energy, Ameren, and Luminant. Sierra Club sued MidAmerican Energy and Entergy. There are many other coal-fired power plant settlements with companies not on the top 25 list. The coal-fired power plant cases were all large and complex and resulted in huge pollution reductions. Collectively these cases will lead to over two million tons of harmful pollution prevented each year. *See Duke Energy Corporation Clean Air Act (CAA) Settlement, The Power Plant Enforcement Effort,* EPA, https://www.epa.gov/enforcement/duke-energy-corporation-clean-air-act-caa-settlement (last visited Feb. 13, 2020) (total tons of pollution reduced from this work as of 2015).

33 *See* Giles, *supra* note 26, at 24-30 (discussion of coal-fired power plants' compliance with these New Source Review requirements and the design features of that rule that led to such widespread violations).

34 These settlements cover 112 refineries in 32 states and territories. On full implementation those cases will result in annual emissions reductions of more than 95,000 tons of nitrogen oxides and more than 260,000 tons of sulfur dioxide. *See Petroleum Refinery National Case Results*, EPA, https://www.epa.gov/enforcement/petroleum-refinery-national-case-results (last visited Feb. 13, 2020). The defendants in these cases include BP, Chevron, CITGO, Conoco, ExxonMobil, Hess, Koch, Sunoco, Tesoro, Total, and Valero, among many others. *Id*.

35 *See Air Enforcement, Stationary Sources*, EPA https://www.epa.gov/enforcement/air-enforcement#nsr (last visited Nov. 20, 2019). The top 10 US cement manufacturers in 2010 were, in declining order: CEMEX, Inc.; Holcim (US) Inc.; Lafarge North America Inc.; Lehigh Cement Co.; Buzzi Unicem USA Inc. (including Alamo Cement Co.); Ash Grove Cement Co.; Essroc Cement Corp.; Texas Industries, Inc. (TXI); Eagle Materials, Inc.; and St. Marys Cement Group. In 2010, the top five companies produced nearly 60% of total US portland cement, and the top 10 accounted for 82% of total production. *See* USGS, 2010 Minerals Yearbook, CEMENT, USGS, at 16.3, https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/atoms/files/myb1-2010-cemen.pdf. The companies underlined in the above list entered into enforcement agreements with EPA. *See Cement Manufacturing Enforcement Initiative*, EPA, https://www.epa.gov/enforcement/cement-manufacturing-enforcement-initiative#settlements (last visited Nov. 20, 2019); Press Release, EPA, EPA Reaches Agreement with Lehigh Cement on Clean Air Violations (June 18, 2008), https://archive.epa.gov/epapages/newsroom_archive/newsreleases/68bb6c787b74b7968525746c004d4b66.html; Press Release, EPA, Nevada Cement Co. Facility in Fernley, Nev., to Reduce

Combined sewer overflows. Just about every large city was in consistent and serious violation of the Clean Water Act and was eventually sued by EPA to fix the public health threat posed by discharges of raw sewage and contaminated stormwater into the nation's rivers. EPA and states have taken actions at 97% of large combined sewer systems, 92% of large sanitary sewer systems, and 79% of Phase 1 municipal separate stormwater systems.[36]

Mineral processing. Mineral processing facilities generate more toxic and hazardous waste than any other industrial sector. EPA's national enforcement initiative to reduce risk from this sector initially focused on compliance in the phosphoric acid industry.[37] Of the 20 facilities in this industry nationally,[38] 13 were covered by enforcement agreements as of 2016,[39] a serious violation rate of over 60%.

Sulfuric and nitric acid manufacturers. These acids are used in fertilizer, chemical, and explosive production. Acid production plants emit many thousands of tons of nitrogen oxides, sulfur dioxide, and sulfuric acid mist each year.[40] Complete data on noncompliance isn't publicly available, but EPA says this about violations in this sector, "EPA investigations have found a high rate of noncompliance with NSR/PSD in connection with plant expansions and process changes."[41]

Emissions, Upgrade Pollution Controls (May 12, 2017), https://www.epa.gov/newsreleases/nevada-cement-co-facility-fernley-nev-reduce-emissions-upgrade-pollution-controls. Nevada Cement is owned by Eagle Materials. *See* Eagle Materials Cement, Eagle Materials, http://www.eaglematerials.com/products/cement.html (last visited Nov. 20, 2019).

36 *National Compliance Initiative: Keeping Raw Sewage and Contaminated Stormwater Out of Our Nation's Waters*, EPA, https://www.epa.gov/enforcement/national-compliance-initiative-keeping-raw-sewage-and-contaminated-stormwater-out-our (last visited Nov. 20, 2019). Large means serves a population of over 50,000 or has more than 10 million gallons a day wastewater discharge. Here are just some of the biggest cities whose sewer systems were sued by EPA for sewage and/or stormwater contamination violations: Atlanta, Baltimore, Boston, Chicago, Cincinnati, Cleveland, Dallas, District of Columbia, Houston, Indianapolis, Kansas City, Los Angeles, Miami, Nashville, New York, Philadelphia, Pittsburgh, San Diego, Seattle, and St. Louis. Note that CSO and stormwater requirements discussed here are different from the secondary treatment regulation discussed in Part 1 of this series: Rules with Compliance Built In. *See* Giles, *supra* note 26.

37 *See National Enforcement Initiative: Reducing Pollution from Mineral Processing Operations*, EPA, https://19january2017snapshot.epa.gov/enforcement/national-enforcement-initiative-reducing-pollution-mineral-processing-operations_.html (last visited Nov. 20, 2019). Phosphoric acid facilities have a high risk of releases of acidic wastewaters, which also contain metals, and can cause serious water contamination and fish kills. For example, a 2007 incident at the Agrifos phosphoric acid facility in Houston released 50 million gallons of acidic hazardous wastewater into the Houston Ship Channel. A 2009 sinkhole at the PCS White Springs phosphoric acid facility in north Florida released over 90 million gallons of hazardous wastewaters into the Floridian aquifer, the drinking water source for Florida and south Georgia. *See Mosaic Fertilizer, LLC Settlement, Health Effects and Environmental Benefits*, EPA, https://www.epa.gov/enforcement/mosaic-fertilizer-llc-settlement (last visited Nov. 20, 2019).

38 EPA, National Enforcement Initiative Mineral Processing, *supra* note 37.

39 Innophos, Mosaic, PCS Geismar, Agrifos, and CF Industries settlements are all described on EPA's civil settlements web page. *Civil Cases and Settlements by Statute*, EPA, https://cfpub.epa.gov/enforcement/cases/index.cfm?templatePage=12&ID=7&sortby=&stat=Resource%20Conservation%20and%20Recovery%20Act (last visited Nov. 20, 2019) (search for each case by company name). Some companies had more than one facility. *Id.*

40 *See Acid Plant New Source Review Enforcement Initiative*, EPA, https://www.epa.gov/enforcement/acid-plant-new-source-review-enforcement-initiative (last visited Feb. 13, 2020).

41 *Air Enforcement, Stationary Sources*, EPA, https://www.epa.gov/enforcement/air-enforcement (last visited Feb. 13, 2020).

Underground storage tanks (UST). There are over 550,000 regulated underground storage tanks at about 200,000 facilities in the US.[42] These tanks store gasoline, oil, and chemicals. A leak from an underground tank, especially one that goes undetected for an extended period of time, can release dangerous substances into soil and groundwater that can be both a threat to drinking water and expensive to clean up. State reports reveal that the rate of significant violations by USTs averages about 28%.[43]

3. In many programs compliance evidence is spotty, but the signs aren't good.

There are a much larger number of rules, sectors, and programs for which there isn't enough information to even approximate a noncompliance rate. Nevertheless, for many such programs there are troubling signs that serious noncompliance is widespread. Some examples:

Oil and gas wells. Oil and gas wells and the storage tanks located near the wellheads frequently emit volatile organic compounds (VOCs) and benzene that directly pose a threat to health and collectively contribute to the formation of ground-level ozone, a known serious health issue. There are about 1 million active wells in the United States.[44] Even Trump's EPA admits that there have been significant excess emissions and Clean Air Act noncompliance at these wells, although the full extent of the problem is not known.[45]

42 *See* EPA, Semiannual Report Of UST Performance Measures End Of Fiscal Year 2018 (October 1, 2017 – September 30, 2018), https://www.epa.gov/sites/production/files/2018-11/documents/ca-18-34.pdf. Federal UST regulations do not apply to septic tanks, smaller tanks, or residential or farm tanks. *See Learn About Underground Storage Tanks (USTs), Do all tanks have to meet federal EPA regulations?,* EPA, https://www.epa.gov/ust/learn-about-underground-storage-tanks-usts#regs (last visited Nov. 20, 2019).

43 EPA has national regulations designed both to prevent such leaks and to detect them quickly if a leak does occur. States inspect about 45% of the facilities with USTs per year. *See UST Performance Measures*, EPA, https://www.epa.gov/ust/ust-performance-measures (last visited Nov. 20, 2019) (posting EPA annual reports). States submit summary information to EPA about the percentage of inspected facilities in "significant operational compliance." *See* Significant Operational Compliance (SOC) Performance Measures, EPA, https://www.epa.gov/ust/significant-operational-compliance-soc-performance-measures (last visited Nov. 20, 2019). State compliance reports focus on the two most serious kinds of violations: failure to comply with the requirements designed to prevent releases from underground tanks, and failure to comply with the obligation to have systems to quickly detect releases should they occur. The rate of significant operational compliance in the state reports has hovered around 72%. In other words, the percentage of inspected facilities with significant violations averages about 28%. These are not randomly selected inspections, so technically this is not a serious noncompliance rate, but the quite consistent performance over the years is nevertheless indicative of overall performance.

44 U.S. Energy Information Administration, U.S. Oil and Natural Gas Wells By Production Rate (Dec. 2019), https://www.eia.gov/petroleum/wells/.

45 *See* EPA, *New Owner Clean Air Act Audit Program for Upstream Oil and Natural Gas Exploration and Production Facilities, Questions and Answers*, at 1, https://www.epa.gov/sites/production/files/2018-06/documents/qaoilandnaturalgasnewowner auditprogram.pdf. For example, in an enforcement case with Noble Energy, EPA found that emissions controls were not properly designed or sized to control VOC emissions. *See Noble Energy, Inc. Settlement*, EPA, https://www.epa.gov/enforcement/noble-energy-inc-settlement (last visited Nov. 20, 2019). EPA issued a compliance alert in 2015 to address the widespread air violations states and EPA were observing in the field. EPA, Compliance Alert: EPA Observes Air Emissions from Controlled Storage Vessels at Onshore Oil and Natural Gas Production Facilities (Sept. 2015), https://www.epa.gov/sites/production/files/2015-09/documents/oilgascompliancealert.pdf. Some states have inspection programs for some wells, but neither the inspection methods nor the number of inspections is sufficient to determine how common serious violations

Animal agriculture. EPA estimates that there are about 20,000 large animal agricultural operations in the US; confined animal operations produce more than *three times* the sewage produced by the entire US human population.[46] EPA does not have reliable data about exactly how many of these sources there are, or whether they are complying with the regulatory limits on pollution.[47] We know the problems are significant though, because water quality studies routinely cite industrial animal agriculture as a major contributor to serious water quality degradation.[48]

Stormwater. Stormwater is runoff from rain falling on city streets, industrial plants, and construction sites, which adds chemicals, nutrients, pathogens, and other contaminants to the nation's waters.[49] People can be exposed to all of these contaminants when they drink water, eat fish, or swim or boat in rivers, lakes, and beaches, as millions do. Hundreds of thousands of sources are regulated by stormwater rules.[50] Compliance with federal stormwater requirements is unknown, but the huge number of river miles impaired by stormwater suggest that compliance is poor.[51] One study in North Carolina found that only 36% of regulated locations fully complied with stormwater standards.[52]

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are. Serious emission problems in natural gas gathering operations are also common, as evidenced by EPA's recent Enforcement Alert about violations during pigging operations: EPA, *EPA Observes Air Emissions from Natural Gas Gathering Operations in Violation of the Clean Air Act*, at 1-2 (Sept. 2019), https://www.epa.gov/sites/production/files/2019-09/documents/naturalgasgatheringoperationinviolationcaa-enforcementalert0919.pdf.

46 *See* EPA, NPDES CAFO Rule Implementation Status - National Summary, Endyear 2018 (Dec. 2018), https://www.epa.gov/npdes/npdes-cafo-regulations-implementation-status-reports (number of CAFOs); National Pollutant Discharge Elimination System Permit Regulation and Effluent Limitation Guidelines and Standards for Concentrated Animal Feeding Operations (CAFOs) Final Rule, 68 Fed. Reg. 7176, 7180 (Feb. 12, 2003) (amount of waste). Manure in such large quantities carries excess nutrients, chemicals, and microorganisms that find their way into waterways, lakes, groundwater, soils, and airways. *See* Pew Commission on Industrial Farm Animal Production in America, Putting Meat on the Table: Industrial Farm Animal Production in America, at 9 (Apr. 2008), http://www.pewtrusts.org/~/media/assets/2008/pcifap_exec-summary.pdf; Congressional Research Service, RL31851, Animal Waste and Water Quality: EPA Regulation of Concentrated Animal Feeding Operations (CAFOs), at 4 (Feb. 16, 2010), https://nationalaglawcenter.org/wp-content/uploads/assets/crs/RL31851.pdf.

47 *See The EPA's Failure to Track Factory Farms*, Food and Water Watch, at 4-5 (Aug. 2013), https://www.foodandwaterwatch.org/sites/default/files/EPA%20Factory%20Farms%20IB%20Aug%202013_0.pdf.

48 *See id.* at 2; EPA, Water Quality Report, *supra* note 6, at 8 (citing crop production and animal agriculture as leading causes of water quality problems).

49 EPA's water quality reports document the strong link between stormwater and water quality impairment. These wet weather discharges contain sediments, oil and grease, chemicals, nutrients, metals, and pathogens, all of which are among the biggest contributors to degraded water quality and some of which can endanger human health. EPA, NPDES E-Reporting Rule, *supra* note 20, at 64068.

50 There are about 95,000 industrial facilities covered by stormwater regulations. Another about 250,000 construction sites per year are required to control stormwater runoff. About 5,000 non-major municipal systems collect stormwater and are required to meet the federal standards. *Id.* at 64081.

51 *See* EPA OIG, Limited Knowledge of the Universe of Regulated Entities Impedes EPA's Ability to Demonstrate Changes in Regulatory Compliance, at 16, 18 (Sept. 2005): "According to EPA staff, there is a high level of noncompliance with stormwater regulations." As a result of the NPDES e-reporting rule finalized by EPA in 2015, nationwide data on stormwater sources are scheduled to become available in 2021. EPA, NPDES E-Reporting Rule, *supra* note 20, at 64087.

52 The 1993 study attempted to measure compliance with construction stormwater runoff controls in the state of North Carolina. *See* Raymond J. Burby & Robert G. Paterson, *Improving Compliance with State Environmental Regulations*, J. Policy Anal. Manag., Vol. 12. No. 4 (Autumn 1993). Unlike many Clean Water Act evaluations that rely primarily on self-reported data, this study did field investigations to make an independent determination of compliance. The report was dismal:

Worker Protection Standard (WPS). EPA Worker Protection Standard regulations are designed to protect agricultural workers and pesticide handlers by requiring owners to provide workers with information about pesticide safety, to limit their potential exposure to pesticides, and to quickly address any exposures that do occur.[53] EPA reports that only 3,309 of the 346,000 regulated entities were inspected in 2016, which is less than 1%. From these inspections, 1,142 violations were reported.[54]

Small quantity hazardous waste generators. The purpose of rules governing the roughly 25,000 firms generating large quantities of hazardous waste is to prevent releases of hazardous waste into the environment.[55] The rules are less strict for the about 375,000 small and very small quantity generators.[56] EPA does not know the number or compliance status of smaller quantity generators and a significant percentage of small quantity generators have never been inspected.[57] However, EPA has frequently found examples of firms inaccurately claiming to be small – and thus less regulated – and one statistically valid sample found a 34% noncompliance rate by one type of small quantity generators.[58]

Developers failed to install 27% of the control measures specified, and 51% of the installed measures were not properly maintained. The study found that more than 20% of the plans were deficient, so even full compliance would not have achieved the pollution reduction standard. In total, only 36% of the sites fully complied with the standard to retain all sediment on site. *Id.* at 759.

53 *See Agricultural Worker Protection Standard (WPS)*, EPA, https://www.epa.gov/pesticide-worker-safety/agricultural-worker-protection-standard-wps (last visited Nov. 20, 2019). Among other things, these rules require keeping workers out of areas being treated with pesticides. Exposure to pesticides can be a very serious matter. In one case resolved recently, EPA found that a company failed to notify workers to avoid fields recently treated with pesticides, resulting in exposure and hospitalization of workers. *See* Press Release, EPA, EPA Reaches Agreement with Syngenta for Farmworker Safety Violations on Kauai (Feb. 12, 2018), https://www.epa.gov/newsreleases/epa-reaches-agreement-syngenta-farmworker-safety-violations-kauai.

54 *See* EPA Enforcement and Compliance History Online (ECHO), https://echo.epa.gov/ (Select topic Analyze Trends: Pesticide Dashboard, WPS Dashboard, Box 3 (Inspections of WPS Regulated Facilities and Box 4: Violations by WPS Regulated Facilities), https://echo.epa.gov/trends/comparative-maps-dashboards/state-pest-dashboard?state=National (last visited Nov. 19, 2019). 2016 is the most recent year for which WPS data are presented in ECHO. For all the reasons previously discussed, the percent of violations found at such a limited and targeted number of inspections does not indicate a rate of noncompliance. Nevertheless, the data from these limited inspections are not encouraging.

55 The rules mandate storage, labeling, and transportation requirements, and require that hazardous waste only be sent to appropriately licensed facilities for treatment or disposal. *See Biennial Report Summary*, EPA, https://rcrapublic.epa.gov/rcrainfoweb/action/modules/br/summary/view (select Report Cycle: 2017, Location: National) (number of large quantity generators) (last visited Nov. 20, 2019).

56 *See Guide to Regulated Facilities in ECHO*, EPA, https://echo.epa.gov/resources/guidance-policy/guide-to-regulated-facilities (last visited Nov. 20, 2019) (showing number of RCRA regulated facilities under heading "Resource Conservation and Recovery Act (RCRA) Designations"). Although the small quantity and "conditionally exempt" (even smaller quantity) generators generate less waste, there are a lot more of them, so the collective impact of the smaller generators can still be large. Under RCRA there are no federally mandated state inspection requirements for small quantity generators, although states are supposed to have a program for periodically inspecting these facilities. *See* EPA, *Compliance Monitoring Strategy for the Resource Conservation and Recovery Act Subtitle C Core Program*, at 21 (Sept. 2015) https://www.epa.gov/compliance/compliance-monitoring-strategy-resource-conservation-and-recovery-act.

57 *See* EPA OIG, *Limited Knowledge*, *supra* note 51, at 18-19.

58 *See* Timothy A. Wilkins, *EPA's 'Next Generation' Enforcement Hitting Region 6 Facilities Now*, Bracewell blog (June 15, 2012) (note that the blog discusses events in 2015 so is likely incorrectly dated), https://bracewell.com/insights/epas-next-generation-enforcement-hitting-region-6-facilities-now (describing EPA enforcement concerning the "common problem" of generators underreporting their hazardous waste volumes).

Vehicle emissions. Cars and trucks are a major source of some of our most serious air pollution problems.[59] Mobile sources are responsible for more than half of the total nitrogen oxides (NOx) emissions in the US.[60] Even if cars and trucks meet emission standards when manufactured, which we know is not universally the case (see Volkswagen), emission controls can deteriorate over time, resulting in vehicles that unlawfully emit many times the allowable amount of pollution.[61] Owners of some vehicles also illegally tamper with emissions controls, significantly contributing to pollution in communities across the country.[62] Although the rate of these serious violations is not known, the evidence so far shows that the problem is widespread.

4. For many programs, compliance is unknown.

In 2005, EPA's Office of Inspector General (OIG) did a review of universe size and compliance across the programs EPA is charged with implementing.[63] That report included EPA's best estimate that there were 41.1 million entities regulated through the programs established under federal environmental laws.[64]

The OIG found that the Office of Enforcement and Compliance Assurance (OECA) concentrates most of its compliance monitoring and enforcement activities on large facilities and knows little about the identities or cumulative pollution effects of smaller

For the statistically valid rate of noncompliance, *see* EPA, Expanding the Use of Outcome Measurement, *supra* note 12, at 14, and discussion accompanying *supra* note 17.

59 *See generally*, EPA, Our Nation's Air (2018), https://gispub.epa.gov/air/trendsreport/2018/#sources. See also, Phillip Brooks, Air Enforcement Director, EPA, Presentation at the Association of Air Pollution Control Agencies: Tampering and Aftermarket Defeat Devices, at 2-4 (Aug. 27, 2019) https://www.cleanairact.org/events/documents/TamperingandAftermarketDefeatDevices-PhilBrooks.pdf.

60 Brooks, Tampering and Aftermarket Defeat Devices, *supra* note 59, at 2. Among other things, NOx pollution contributes to the formation of ozone (smog), a serious health threat.

61 Shaohua Hu et. al., Presentation at Air Sensors International Conference: Development and Establishment of a Monitoring Network using Portable Emissions AcQuisition System to Quantify Heavy-Duty In-Use Vehicles Emissions in California, at 11 (Sept. 12-14, 2018) https://asic.aqrc.ucdavis.edu/sites/g/files/dgvnsk3466/files/inline-files/Shaohua%20Hu%20-%20UPDATED%20-2018%20ASIC%20Conference_PEAQS_Hu%20S_Final_0.pdf, (1.4% of trucks emitted 50% of the soot, and 3.9% of trucks emitted 50% of NOx from trucks at one location in California). *See also* Chelsea V. Preble, Troy E. Cados, Robert A. Harley, and Thomas W. Kirchstetter, *In-Use Performance and Durability of Particle Filters on Heavy-Duty Diesel Trucks,* 52 Environ. Sci. Technol., 11913-11921 (2018) https://pubs.acs.org/doi/10.1021/acs.est.8b02977.

62 *See National Compliance Initiative: Stopping Aftermarket Defeat Devices for Vehicles and Engines*, EPA, https://www.epa.gov/enforcement/national-compliance-initiative-stopping-aftermarket-defeat-devices-vehicles-and-engines (last visited Nov. 20, 2019). Software and hardware intended to change emissions control performance from its condition when new are referred to as "aftermarket defeat devices" (as contrasted with defeat devices that are built into the vehicles as originally sold, as happened with Volkswagen). *See also*, Brooks, Tampering and Aftermarket Defeat Devices, *supra* note 59, at 8-10 (noting that heavy duty trucks with deleted emissions controls emit NOx at over 300 times the allowable amount, and that 10% or more of trucks may have had emission controls deleted). EPA enforcement has also found large-scale sales of passenger vehicle aftermarket defeat devices. *Id*. at 19.

63 EPA OIG, Limited Knowledge, *supra* note 51.

64 *Id*. at 3, 10. There are 45 programs under nine statutes listed in the appendix of the OIG report. Note that I include here fewer than the total claimed in the report because some categories are self-evidently inappropriately listed as statutes. *See id.* at 22. The number of regulated entities is likely higher today. For example, of the six areas that the OIG focused on for detailed analysis in its report, the OIG found that between 2001 and 2005 the size of the regulated universe increased by 35%. *Id*. at 6.

entities.[65] This series has already mentioned a long list of industrial sectors and rules that EPA is charged with administering, but there are many more. In every case, Congress directed EPA to adopt regulations to address risks to health and the environment. What follows is a partial list of additional EPA programs and the number of firms regulated under each. It isn't important to grasp the full list or understand each example and why it's important. Instead, the purpose is to show how extensive the total number of programs – and the number of regulated firms – for which EPA does not have reliable compliance information is.

Examples not already touched on elsewhere in this series include:[66]

- Over 110,000 minor and "synthetic minor" stationary sources of air pollution,[67]
- 580,000 firms regulated under the Emergency Planning and Community Right-to-Know Act (EPCRA), which requires industry to report on the storage, use, and releases of hazardous substances,[68]
- Over 3 million chemical facilities regulated under the so-called "core" Toxic Substances Control Act (TSCA), which regulates the manufacture, distribution, and use of chemicals,[69]
- More than 6 million establishments that have PCBs, which are regulated under TSCA to prevent the release of PCBs (compounds with both cancer and non-cancer health effects) into the environment,[70]
- Over 460,000 oil storage facilities regulated under the Spill Prevention, Control, and Countermeasure regulations (SPCC), which helps prevent discharge of oil into surface waters or shorelines,[71]
- More than 700,000 federal government, private non-residential, and residential apartment buildings that contain friable asbestos and are subject to regulations under the Clean Air Act that protect against release of asbestos (a carcinogen) during demolition and renovation activities,[72] and

65 *Id*. at 6, 14.

66 Superfund – the shorthand name for the law and program that cleans up contaminated sites in the United States – is the largest program that is not included in this Next Gen series. That's not because Superfund isn't important, but because it is not a regulatory compliance program. Superfund is a clean-up program for contaminated properties, with liability provisions designed to ensure that clean ups are funded by the companies that created the problem, not the taxpayer. The regulatory program that governs how hazardous waste is treated today, with a goal of preventing the kind of contamination seen at Superfund sites, is the Resource Conservation and Recovery Act (RCRA). That's why RCRA is discussed in this series, but Superfund is not.

67 *Id*. at 23 (size of regulated universe) and 17 (lack of compliance information). "Synthetic minor source" means a source that has the potential to emit regulated pollutants in amounts that are at or above the thresholds for major sources but has agreed to an enforceable restriction so that its potential to emit is less than major source levels.

68 *Id*. at 24.

69 *Id*. (size of regulated universe) and *id*. at 18 (lack of compliance information).

70 *Id*. at 24. PCBs are found in transformers, capacitors, and other electrical equipment, as well as oil used in motors and hydraulic systems, fluorescent light ballasts, and caulk. *See Learn about Polychlorinated Biphenyls (PCBs)*, EPA, https://www.epa.gov/pcbs/learn-about-polychlorinated-biphenyls-pcbs (last visited Feb. 13, 2020).

71 OIG, Limited Knowledge, *supra* note 51, at 25.

72 *See* EPA Office of Public Affairs (A-107), Asbestos Fact Book, at 4 (Feb. 1985).

- About 320,000 renovators who do 18 million renovation projects a year in homes with lead paint that are subject to the Lead Renovation, Repair and Painting (RRP) Rule (designed to prevent exposure to dangerous lead contamination, particularly for children). EPA conducts about 1,130 targeted RRP inspections a year.[73]

Most of the examples in this Next Gen series are programs for which the evidence strongly suggests serious violations are widespread, but the exact percentage of noncompliance isn't definitively known; in the fraction that represents the noncompliance "rate," EPA doesn't have the numerator. The above abbreviated list reminds us that for many programs EPA also doesn't know the denominator.[74]

5. For some important programs, EPA's understanding of noncompliance is wrong.

In addition to the many areas where EPA doesn't know how bad the noncompliance picture is, there is good reason to believe that some of what EPA thinks it knows is incorrect. Here are two examples:

Drinking water. Most people understand that compliance with standards to protect the safety of drinking water is vitally important. Exposure to contamination in drinking water can cause serious health problems, like acute health distress for infants from nitrates and water-borne disease outbreaks that affect millions in the US each year.[75] Contaminants in drinking water such as arsenic, lead, and disinfection byproducts can also contribute to long-term chronic health problems, especially for children.[76]

"In addition to the many areas where EPA doesn't know how bad the noncompliance picture is, there is good reason to believe that some of what EPA thinks it knows is incorrect."

There are about 150,000 regulated public drinking water systems in the US. Approximately 50,000 of these are community water systems, responsible for providing safe drinking water to roughly 94% of the people living in the US.[77]

73 *See* EPA OIG, EPA Not Effectively Implementing the Lead-Based Paint Renovation, Repair and Painting Rule, Report No. 19-P-0302, at 2 (2019) (number of renovators and projects subject to the rule); *See also, id.* at 11 (average number of inspections per year, noting that inspections are at less than one-half percent of the estimated universe of renovators).

74 EPA OIG, Limited Knowledge, *supra* note 51, *passim*.

75 A 2006 study estimated there were between 4.3 million to 11.7 million annual cases of acute gastrointestinal illnesses in the United States attributable to drinking water from community drinking water systems. Colford Jr., John M., Sharon Roy, Michael J. Beach, Allen Hightower, Susan E. Shaw, & Timothy J. Wade, *A Review of Household Drinking Water Intervention Trials and an Approach to the Estimation of Endemic Waterborne Gastroenteritis in the United States*, 4 J. Water Health, Suppl 2: 71 (2006), cited in GAO, Unreliable State Data Limit EPA's Ability to Target Enforcement Priorities and Communicate Water Systems' Performance, GAO-11-381, at 5 (June 2011).

76 GAO, Unreliable State Data, *supra* note 75, at 5-6.

77 *See Population Served by Community Water Systems with No Reported Violations of Health-Based Standards, Exhibit 1,* EPA, https://cfpub.epa.gov/roe/indicator.cfm?i=45 (last visited Feb. 13, 2020) (percent of population served by community water systems). *See also, Background on Drinking Water Standards in the Safe Drinking Water*

EPA's knowledge about systems' compliance with the drinking water standards is entirely dependent upon information from states. Drinking water systems are required to treat drinking water, test for signs of contamination, and provide that information to states. States are required to tell EPA about violations.[78] Using the state-reported data, EPA issues annual reports on the noncompliance record of the nation's drinking water systems. Based on information provided by the states, in 2016 EPA reported that 34% of public water systems had at least one violation, 8% violated health-based standards, and 26% violated monitoring requirements.[79]

Those numbers are troubling, but the actual number of violations is unfortunately much worse. Among other things, there are loopholes in the monitoring requirements, incentives to avoid admitting serious health-based violations, and huge gaps in the information the states provide to EPA.[80] The impact of loopholes and misaligned incentives is hard to quantify, but overwhelming evidence documents one thing: States are not telling EPA about all violations. Multiple assessments over many years have found the same thing. In audits of 38 states between 2002 and 2004, EPA found that states didn't report 38% of public systems' health-based violations and 71% of their monitoring and reporting violations.[81] A 2011 Government Accountability Office (GAO) review of community water system data from 14 states found that those states did not report 26% of health-based violations, and 84% of the monitoring violations.[82] Other reports by EPA and the EPA OIG had similar findings.[83] A recent National Academy of Sciences study concluded that an estimated 26% to 38% of health-based and 77% to 91% of monitoring and reporting violations were either not reported or

Act (SDWA), EPA, (number of PWS and CWS in the US), https://www.epa.gov/dwstandardsregulations/background-drinking-water-standards-safe-drinking-water-act-sdwa (last visited Feb. 13, 2020). Note that the EPA Report on the Environment contains more current data than the EPA Background document. The remaining about 6% of the population are supplied by private drinking water wells, which are not regulated at the federal level. A word about nomenclature. EPA regulates public water systems. There are three types of public water systems: about 50,000 community water systems (serving the same population year-round), about 85,000 transient non-community water systems (supplying water in transient locations like gas stations or campgrounds where people don't stay for long periods), and about 18,000 non-transient, non-community systems (supplying water to the same people at least six months a year but not all year, like schools or factories that have their own drinking water systems). *Id*.

78 40 CFR § 142.15(a)(1) (2011).

79 *See Providing Safe Drinking Water in America: National Public Water Systems Compliance Report*, EPA, https://www.epa.gov/compliance/providing-safe-drinking-water-america-national-public-water-systems-compliance-report (2016 National Snapshot) (last visited Nov. 20, 2019).

80 *See* Giles, *Next Generation Compliance, Part 1, supra* note 26, at 16-24 (discussion about these problems for two particularly concerning drinking water contaminants: pathogens and lead). The structure of those rules contributes both to the violations and the failure to accurately report them.

81 *See* EPA, 2006 Drinking Water Data Reliability Analysis and Action Plan, EPA 816-R-010, at 18 (2008). Community water systems – the ones that supply drinking water to people's homes – had an even worse record in EPA's 2006 analysis; 49% of health-based violations by community systems were not reported. GAO, *Unreliable State Data, supra* note 75, at 14.

82 GAO, *Unreliable State Data, supra* note 75, at Highlights Summary.

83 *See e.g., id*. at 22-24 (describing prior EPA analyses of data reliability); EPA OIG, EPA Claims to Meet Drinking Water Goals Despite Persistent Data Quality Shortcomings, at 4-6 (March 5, 2004).

inaccurately reported.[84]

Violations of health standards are of course deeply concerning but monitoring violations can be just as serious. When a drinking water system doesn't monitor or monitors incorrectly, it can very easily miss contamination that causes health problems. A GAO review confirmed that conclusion, finding that monitoring violations were a strong and statistically significant predictor of health-based violations.[85] The real violation numbers revealed in repeated audits are therefore even more alarming than they appear; large numbers of additional violations with a direct impact on health are hiding in the extensive (and unreported) monitoring noncompliance.[86]

The net effect of these giant holes in reporting by states is that EPA's official record about drinking water system compliance dramatically undercounts violations. Somewhere between 25% and 50% of the health-based violations, and up to 90% of monitoring violations, are not counted in EPA's reports.[87] This dismal performance doesn't even include the additional violations obscured by monitoring loopholes and incentives to avoid discovering problems. The actual number of systems violating drinking water standards isn't known, but it is likely twice, or more, what is stated in EPA's public reports.[88]

"Violations of health standards are of course deeply concerning but monitoring violations can be just as serious."

Stationary sources of air pollution. Most of EPA's knowledge about violations at stationary sources of

84 Maura Allaire, Haowei Wu, & Upmanu Lal, *National Trends in Drinking Water Violations*, 115 Proc. Natl. Acad. Sci. No. 9, 2078, 2083 (Feb. 27, 2018) (health based), at 2079 (monitoring and reporting). The PNAS study focused on Total Coliform Rule (TCR) violations because it described those as "more accurately reported than other types of violations." *Id*. That is an understatement. In a thorough 2000 data quality review, EPA found that TCR violations were reported to EPA 68% of the time (i.e., 32% were not reported). *Id*. at 19, citing EPA, Data Reliability Analysis of the EPA Safe Drinking Water Information System, Federal Version (SDWIS/Fed), EPA 816-R-00-020 (Oct. 2000). For the other health-based standards underreporting was much worse: 85% of other Maximum Contaminant Level violations and 93% of Surface Water Treatment Technique violations were not reported. EPA, Data Reliability Analysis, *supra* note 84, at 6.

85 GAO, Unreliable State Data, *supra* note 75, at 16.

86 *Id*. at 17. GAO also examined the effect of this inaccurate state reporting on EPA's enforcement prioritization system, which is designed to identify the most serious violators and ensure quick enforcement action to return violators to compliance. That prioritization system, called the EPA Drinking Water Enforcement Targeting Tool, looks at the state reported violation data for systems serving more than 10,000 people and gives each system a score based on the violations reported to EPA; if that score is above the cutoff level, it triggers an obligation for an enforcement response by the state or EPA. The GAO found that 73% of drinking water systems would have received a different score if EPA had known about the unreported violation data. *Id*. at 23-24.

87 More recent data about state failure to report violations to EPA aren't presented here because there aren't any. EPA stopped doing data verification reports for the drinking water program in 2010. *See* GAO, Unreliable State Data, *supra* now 75, at 29. *See also* GAO, *Drinking Water; Additional Data and Statistical Analysis May Enhance EPA's Oversight of the Lead and Copper Rule*, GAO-17-424, at 37 (Sept. 2017) (EPA reports that it has not conducted another data verification audit since they were discontinued in 2011).

88 *See* EPA OIG, EPA Claims, *supra* note 83, at 8: "EPA has reported to Congress and the public that it met an important annual performance goal when available evidence indicates it did not."

air pollution comes from states.[89] States do most of the inspections, and states receive the reports from facilities about their performance. States are supposed to identify high priority violations (HPVs) and enter that information into a database maintained by EPA. EPA then uses this information to confer with states about how to address serious violations within the time frames set out in national guidance.[90] The national average state-reported rate of significant violations for major air sources has been between 3% and 6% in recent years.[91] That seems like a fairly good performance record – certainly much better than the on average 20% to 25% significant violation rate self-reported by major Clean Water Act facilities. But is it correct?

An OIG investigation into significant air violators in the late 1990s found that states failed to report the vast majority of serious violations to EPA. In Pennsylvania, where the investigation started, the state reported that only six of its about 2,000 major stationary sources were in significant violation – an incredible rate of less than one third of 1%. When the OIG looked at just 270 state files – a small fraction of the total – it found another 64 facilities that should have been reported as having significant violations: a rate of 24%.[92] The OIG then expanded its investigation to five additional states and found that the same failure to report was widespread. The actual rate of significant violation was about 25% for those states too.[93] Other states not included in the OIG investigation showed similar worrying data. Ohio reported that over two years only four of its 1,700 major sources were significant violators. New York, with 2,300 major sources, reported zero significant violations.[94] All 10 EPA regions told the OIG that states were underreporting significant violators.[95] One state candidly admitted to the OIG that it didn't list significant violators because it did not want EPA involved in the resolution of a violation, saying that EPA's involvement "delayed the process."[96]

Twenty years have passed since the EPA OIG documented that over 85% of significant violations went unreported,[97] but the problem persists. For

89 Stationary are distinguished from mobile sources of air pollution, such as cars and trucks, which are also regulated under the Clean Air Act.

90 The more serious air violations used to be called "significant violations" or SV, but a 2014 change in policy now identifies them has high priority violations or HPV. The guidance about addressing serious violators is typically called "timely and appropriate" guidance because it sets standards for the speed and manner in which serious violations are addressed. *See* US EPA, Revised Timely and Appropriate (T and A) Enforcement Response to High Priority Violations (HPVs) Policy (Aug. 25, 2014), https://www.epa.gov/enforcement/revised-timely-and-appropriate-t-and-enforcement-response-high-priority-violations-hpvs.

91 *See* EPA Enforcement and Compliance History Online (ECHO), https://echo.epa.gov/ (Select topic Analyze Trends: State Air Dashboard, select view Performance Dashboard, Box 4 (High Priority Violations, Major Facilities with an HPV)) (data for 2010 through 2014; EPA's website says that the data on percentage of high priority violators have not been updated since 2014) (last visited Nov. 20, 2019).

92 *See* EPA OIG Region 3, Validation of Air Enforcement Data Reported to EPA by Pennsylvania, at 11-12 (Feb. 14, 1997).

93 *See* EPA OIG, Consolidated Report on OECA's Oversight of Regional and State Air Enforcement Programs, at 7-10 (Sept. 25, 1998).

94 *Id.*

95 *Id.* at 3, 8-10.

96 *Id.* at 10-11.

97 *See* OIG Consolidated Report, *supra* note 93, at 8 (the percentage unreported is the total number of unreported violations the IG discovered

2014, the last year that EPA's public violation rate data was updated, 14 states reported zero high priority violators[98] and an additional four states reported high priority violation rates for major sources of less than 1%.[99] In 2014, these 18 states together reported only six HPVs for their collective 2,484 major air sources.[100] That's a serious violation rate for large air pollution emitters in those 18 states of just 0.24%.[101] EPA's data says that nationwide in 2014 for the roughly 14,000 largest air pollution sources in the country, the state-reported high priority violator rate was an incredible 3%.[102]

To judge how suspiciously low this state-reported serious air violator information is, compare it to what water dischargers reported for the same year. Major water pollution dischargers, unlike most major air emitters, report their actual pollution levels directly to both EPA and states, so there is data to evaluate claims of compliance. The self-reported rate of significant violation by the largest water pollution dischargers in 2014 was 22%.[103] The comparison between air and water polluters buttresses the OIG's prior conclusion and shows how improbable it is that major air pollution sources – under regulations that are much more complex than those that apply to water dischargers – had the low rates of serious violation that states report.

The underreporting found by the OIG was a result of states not notifying EPA of the significant violators that the states had identified. An additional problem is that often states themselves don't know about serious violations. Of the state files reviewed by the OIG, 35% either failed to conduct the required tests or failed to document the inspection sufficiently for the OIG to determine if the proper inspection was conducted.[104] So not only were states failing to tell EPA about detected violations, some were failing to conduct inspections of sufficient rigor to find out which facilities were violating. Adding to this problem is the fact that some kinds of serious violations cannot be discovered through the kinds of inspections that states normally do, even if they are properly done.[105]

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as a percentage of all violations).

98 The designation for the more serious violations that EPA is tracking was revised in 2014 and these are now called high priority violations. HPVs are a subset of all violations and intended to focus attention on the most important problems.

99 *See* EPA Enforcement and Compliance History Online (ECHO), https://echo.epa.gov/ (Select topic Analyze Trends: State Air Dashboard, select view Performance Dashboard, Box 4 (High Priority Violations, Major Facilities with an HPV)) FY 2014 (The number of reported HPVs is calculated using the reported percentage of major facility HPVs times the total number of majors in each state)(last visited Nov. 20, 2019).

100 *Id*. A spreadsheet compiling EPA's public data showing each state's reported rate of major source high priority violators is on file with the author.

101 Twelve additional states reported HPV rates below 2%; the 30 states with claimed HPV rates between 0% and 2% reported just 51 majors as HPVs, a collective HPV rate of just 0.9%. *Id*.

102 *See* EPA ECHO, *supra* note 99.

103 *See* EPA Enforcement and Compliance History Online (ECHO), https://echo.epa.gov/ (Select topic Analyze Trends: State Water Dashboard, select view Performance Dashboard, Box 4 (High Priority Violations, Major Facilities in Significant Non-Compliance (%)), FY 2014 (last visited Nov. 20, 2019). Only two states – Nevada and Delaware – reported zero large water dischargers in significant noncompliance that year.

104 EPA OIG, Consolidated Report, *supra* note 93, at 14 (faulty inspections as a percentage of total inspection files reviewed).

105 GAO, EPA Should Improve Oversight of Emissions Reporting by Large

Not only are states underreporting what they know are serious air violators, facilities are not accurately reporting their emissions to states, so facilities are not flagged as violators in the first place. Part of the reason is companies' use of "emission factors" to estimate their air pollution releases.[106] Emission factors are long-term, industry-wide averages of air pollution from a source or process.[107] They were never intended to predict actual emissions at an individual location.[108] By definition, even if the emission factors were perfect, as many as half of the facilities would emit more.[109] And they are far from perfect. EPA itself identifies 62% of its emission factors as "below average" or "poor."[110]

Not surprisingly, field investigations frequently uncover actual emissions that are substantially higher than emission estimates. Time and again, monitoring data have revealed that estimated pollution levels significantly underreport actual pollution amounts, sometimes by an order of magnitude or more.[111] At refineries, for example, actual emissions have been discovered to be four times, 25 times, 132 times, and even 448 times the estimated amount.[112]

Facilities, GAO-01-46, at 10 (April 2001).

106 *See AP-42: Compilation of Air Emissions Factors*, EPA, https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors (last visited Nov. 20, 2019).

107 *See Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors* EPA, Technology Transfer Network Clearinghouse for Inventories & Emissions Factors, https://www.nrc.gov/docs/ML1607/ML16075A216.pdf. "In most cases, these factors are simply averages of all available data of acceptable quality and are generally *assumed* to be representative of long-term averages for all facilities in the source category (i.e., a population average)." *Id*. (emphasis added). *See also, Basic Information of Air Emissions Factors and Quantification,* EPA, https://www.epa.gov/air-emissions-factors-and-quantification/basic-information-air-emissions-factors-and-quantification (last visited Nov. 20, 2019).

108 *See* Rachel Leven, Most of EPA's Pollution Estimates are Unreliable. So Why is Everyone Still Using Them? Center for Public Integrity (Jan. 29, 2018) https://publicintegrity.org/environment/most-of-the-epas-pollution-estimates-are-unreliable-so-why-is-everyone-still-using-them/. *See also, AP-42: Compilation of Air Emissions Factors*, EPA, *supra* note 106, Introduction at 2: "Use of these factors as source specific permit limits and/or as emission regulation compliance determinations is not recommended by EPA."

109 *Id*.: "Because emission factors essentially represent an average of a range of emission rates, approximately half of the subject sources will have emission rates greater than the emission factor…."

110 *See* Leven, *Pollution Estimates are Unreliable, supra* note 108; Associated Press, *Emissions Often Underestimated, EPA Standards Old*, Cleveland.com (April 22, 2010). https://www.cleveland.com/business/index.ssf/2010/04/emissions_often_underestimated.html. *See also*, EPA OIG, EPA Can Improve Emissions Factor Development and Management, at 8 (March 22, 2006).

111 *See e.g.,* Daniel Hoyt & Loren H. Raun, *Measured and Estimated Benzene and Volatile Organic Carbon (VOC) Emissions at a Major U.S. Refinery/Chemical Plant: Comparison and Prioritization*, 65 J. Air & Waste Manage. No. 8, 1020 (2015) https://doi.org/10.1080/10962247.2015.1058304; GAO, EPA Should, *supra* note 105, at 12. *See also*, Leven, *Pollution Estimates are Unreliable, supra* note 108 (examples cited); Ann E. Carlson, *The Clean Air Act's Blind Spot: Microclimates and Hotspot Pollution*, 65 UCLA L. Rev. 1036, 1041, 1059 (2018).

112 *See* GAO, EPA Should, *supra* note 105, at 12 (fugitive emission leaks were four times estimates); David Hindin, Office of Enforcement and Compliance Assurance, EPA, Presentation at National Environmental Monitoring Conference: *The Future of Environmental Monitoring: Making the Invisible Visible*, at 14 (Aug. 2014) (flare emissions at Marathon 25 times estimate) https://nemc.us/docs/2014/Presentations/Wed-Plenary-26.1-Hindin.pdf; Loren Raun & Dan W. Hoyt, 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), Bureau of Pollution Control & Prevention, City of Houston, at 1, 92 (2011) http://www.greenhoustontx.gov/reports/dial20110720.pdf (true emissions underestimated by a factor of as much as 93 for benzene and 132 for

Underreporting emissions by estimating is a big issue; EPA projected in 2001 that about 80% of facilities used emission factors for their emissions reporting.[113] The title of one 2018 investigative report says it all: "Most of the EPA's Pollution Estimates are Unreliable, so Why is Everyone Still Using Them?"[114]

Some kinds of direct monitoring aren't necessarily much more reliable. A recent EPA OIG report found errors in over half of the stack test reports it reviewed in one state.[115] In addition, over 80% of stack test reports lacked key data necessary to evaluate the reliability of the results.[116] EPA admits that the problems the OIG found were not limited to one state or region.[117] Because stack tests can be as infrequent as once every five years, a mistake means that unlawful pollution can go unnoticed for years.[118]

"The title of one 2018 investigative report says it all: 'Most of the EPA's Pollution Estimates are Unreliable, so Why is Everyone Still Using Them?'"

When you put all this data together, it is obvious that the official national report substantially understates the extent of serious air violations. The last thorough look concluded that states were informing EPA about less than 15% of the significant violations – and that's just for violations the states knew about. Incorrect emissions reporting accounts for untold additional violations. Reporting practices have not appreciably changed. Nor have the political dynamics, which discourage states from revealing violators to EPA. It would be nice if the program with the biggest public health impacts, and also the most

VOCs); Hoyt, Measured and Estimated Benzene, *supra* note 111 (floating tank emissions 448 times estimate). Note that EPA has updated some refinery emissions estimates. *See Emissions Estimation Protocol for Petroleum Refineries*, EPA, https://www3.epa.gov/ttn/chief/efpac/protocol/Protocol%20Report%202015.pdf (April 2015).

113 GAO, EPA Should, *supra* note 105, at 14, (citing EPA as saying that in 2001 only 4% of reporting facilities used direct measurement, and about 80% used emission factors). *See also*, EPA OIG, *EPA Can Improve, supra* note 110, at 4, 8, and 10 (three industries under-controlled as a result of emission estimates understating actual emissions); Environmental Integrity Project, Toxic Shell Game, at 6 (March 26, 2018) (reasons why emission factors understate actual emissions), https://www.environmentalintegrity.org/wp-content/uploads/2017/02/Toxic-Shell-Game.pdf.

114 Leven, *Pollution Estimates are Unreliable, supra* note 108. *See also*, David Hasemyer, *EPA Agrees Its Emission Estimates from Flaring May be Flawed*, Inside Climate News (Oct. 13, 2016), https://insideclimatenews.org/news/12102016/epa-natural-gas-oil-drilling-flaring-emissions-estimates-flawed-fracking.

115 EPA OIG, More Effective EPA Oversight Is Needed for Particulate Matter Emissions Compliance Testing, Report No. 19-P-0251, at 11 (July 2019). Stack tests are measurements of air pollution done at the stack – the chimneys or smokestacks located at industrial facilities. The tests are done by companies selected and paid by the polluting facility and can take days to complete.

116 *Id*. at 15; 25 of 30 stack test reports reviewed were missing at least one element of calibration information; EPA's training says that without calibration, stack test results are meaningless. *Id*.

117 *Id*. at 12.

118 *Id*. at 11. Continuous emission monitoring systems (CEMS), on the other hand, have a quite good record for reliability. *See* EPA OIG, EPA Effectively Screens Air Emissions Data from Continuous Monitoring Systems but Could Enhance Verification of System Performance, EPA Report No. 19-P-0207, passim (June 2019).

complex regulatory requirements, had by far the best compliance record. Unfortunately, the evidence shows that isn't credible.

The challenges of federalism. In the above examples of unreliable data – drinking water and large stationary air sources – there is a common theme: States not informing EPA about violations. For all the reasons discussed above, states frequently don't know when there is a violation. But repeated audits show that states are often not informing EPA of known violations, despite the obligation to do so. Why? A central factor is that states don't want the scrutiny – from EPA or the public – that comes with raising their hands. If EPA knows about serious violators, it might insist that the matter be addressed more quickly or more aggressively. If the public knows how extensive the violations really are, they are likely to be upset and put even more pressure on the over-burdened and under-resourced states. There are many other factors too, like antiquated IT systems and too-confusing rules. Fortunately, Next Gen offers the opportunity to bypass this historic gulf, which I will explain later in this series.

What's the bottom line?

The evidence presented here shows that violations are common. When we narrow the focus to just the most serious violations, we find noncompliance rates of 25% or more. That's true even in programs that have had persistent and focused attention for decades. Rates of serious violation that are much higher – up to 70% or more – occur far too frequently.

We have created rules intended to improve our air and water and to reduce our risk from hazardous pollutants. But all these serious violations reveal the large gap between the goals of those rules and the situation on the ground.

As I mentioned in the introduction to this Next Gen series, observing that many companies do not comply is not a moral statement. Trying to make it one distracts from the central point. There certainly are companies that are reckless or criminal, and our rules need to make that irresponsible conduct harder to commit and easier to detect. But many companies don't decide to violate, they just don't make compliance a priority and so fall short. The people who bear the brunt of the violations don't care about the reasons. They just want it to stop.

That's the goal of Next Gen too. The point isn't to pass judgment. It's to make the rules work. Once we accept that violations happen all the time under the traditional model, we can put our effort into designing rules to make that far less likely.

Next Gen is a paradigm shift. It presents a way to dramatically improve compliance, and thereby reduce risks to health, but it requires letting go of the fiction that most companies comply. Policy makers' guesstimate that only about 5% to 10% of facilities violate is wrong. Serious violations are widespread and happen in companies of all sizes and all sectors and all programs.

Dislodging the belief that most companies comply is not easy. It has been the accepted wisdom for so long that people who have that view are not aware that the evidence doesn't support it. Summary statements of the facts meet skepticism. That's why extensive recitation of the evidence is presented in

this article.

Enforcement will continue to play an essential role in boosting compliance. Many of our nation's most important environmental advances have depended on enforcement and that will continue to be the case. Some of the alarming noncompliance problems discussed in this Next Gen series have been the focus of consistent enforcement effort that has helped to turn the tide, however expensive and time-consuming – and avoidable – that may have been.

But even the most committed and smart enforcers cannot achieve the impossible. A handful of enforcers at EPA and the states can't force compliance on millions of regulated entities. We will always need civil and criminal enforcement. Enforcement will always be central to the environmental protection mission. But the most important thing we can do to get better compliance is write rules with compliance built in. Give the enforcers a fighting chance by improving compliance out of the gate. Here's what we would all like: rules for which compliance is pretty good even if enforcement never comes knocking.

Environmental laws in the US have brought us a long way. The traditional paradigm was the basis for significant progress, but that paradigm is getting in the way now. The belief that most companies comply, and that enforcement can take care of the rest, cannot be squared with the facts. Continuing to believe that will make it impossible to deliver on the promises that Congress made 50 years ago. When we look the facts in the eye and acknowledge that we need a change, it opens the door to solutions that will work. That's what the rest of this Next Gen series is about.

For the rest of this series, click here.

AUTHOR BIO

Cynthia Giles is a Guest Fellow at Harvard Law School's Environmental and Energy Law Program. The author served as the Assistant Administrator for the US EPA's Office of Enforcement and Compliance Assurance for the entire Obama presidency.

AUTHOR NOTES

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