

U.S. House Committee on Energy and Commerce
Subcommittee on Environment, Manufacturing, and Critical Materials
Fiscal Year 2024 Environmental Protection Agency Budget Request
[May 10, 2023]

Documents for the record

At the conclusion of the hearing, the Chair asked and was given unanimous consent to include the following documents into the record:

1. FDA Statement of Concern with Medical Device Availability Due to Certain Sterilization Facility Closures, submitted by the Majority
2. WSJ Opinion Piece Entitled: “S.O.S. for the U.S. Electric Grid,” Submitted by Chair Johnson
3. A Report entitled “Energy Transition in PJM: Resource Retirements, Replacements & Risks”;
4. List of Active Regulatory Proposals taken from the website of the Office Of Management and Budget’s Unified Regulatory Agenda, specific to the Environmental Protection Agency, submitted by the Majority
5. A report from the Association of Air Pollution Control Agencies, entitled: “State Air Trends & Successes,” submitted by the Majority
6. A Heartland Policy Brief on Ethylene Oxide, submitted by the Majority
7. A One-Pager from the Medical Device Manufacturers Association, submitted by the Majority
8. Letter to Administrator Regan from Chair Rodgers, Chair Johnson, and Chair Griffith, March 21, 2023, submitted by the Majority
9. EPA Response to March 21, 2023 letter to Chair Rodgers, submitted by the Majority

FDA STATEMENT**Statement on concerns with medical device availability due to certain sterilization facility closures****For Immediate Release:**

October 25, 2019

Statement From:

Norman E. "Ned" Sharpless, MD

Acting Commissioner of Food and Drugs - Food and Drug Administration

As the agency responsible for ensuring the safety and effectiveness of all medical devices, the U.S. Food and Drug Administration has been closely monitoring the supply chain effects of closures and potential closures of certain large-scale sterilization facilities that use a gas called ethylene oxide (</medical-devices/general-hospital-devices-and-supplies/sterilization-medical-devices>) to sterilize medical devices prior to their use. The recent closure of a Sterigenics ethylene oxide sterilization facility in Illinois, the temporary closure of another Sterigenics facility in Georgia, and the potential closure of a large Becton Dickinson sterilization facility in Georgia could affect the availability of some sterile medical devices used by health care delivery organizations and patients. We have been working diligently with impacted device manufacturers and health care delivery organizations to ensure that they are aware of these developments and preparing to minimize adverse effects on patients whose care could be negatively affected if medical devices sterilized at these large facilities were not accessible. Medical devices that are sterilized to remove potentially harmful germs and other microorganisms prior to use are critical to our health care system and a shortage—especially of life-saving, life-sustaining, or other critical devices—can be a detriment to public health. In light of the possibility of continued ethylene oxide sterilization facility closures, we are again alerting the public to growing concerns about the future availability of sterile medical devices and impending medical device shortages.

Although medical devices can be sterilized by several methods, ethylene oxide is the most common method of sterilization of medical devices in the U.S. and is a well-established and scientifically-proven method of preventing harmful microorganisms from reproducing and causing infections. More than 20 billion devices sold in the U.S. every year are sterilized with ethylene oxide, accounting for approximately 50 percent of devices that require sterilization.

Medical devices made from certain polymers (such as plastic or resin), metals, or glass—or devices that have multiple layers of packaging or hard-to-reach crevices—are likely to be sterilized with ethylene oxide to avoid product damage during the process. These include surgical kits used in emergency procedures such as emergency Caesarean sections (“C-sections”) and in routine procedures such as cardiac surgery and hip or knee replacement surgeries. Without adequate availability of ethylene oxide sterilization, we anticipate a national shortage of these devices and other critical devices including feeding tube devices used in neonatal intensive care units, drug-eluting cardiac stents, catheters, shunts and other implantable devices. It’s important to note at this time there are no readily available processes or facilities that can serve as viable alternatives to those that use ethylene oxide to sterilize these devices. In short: this method is critical to our health care system and to the continued availability of safe, effective and high-quality medical devices.

The FDA recognizes that there are concerns associated with release of ethylene oxide into the environment if emissions were to occur at unsafe levels. Concerns about ethylene oxide emissions have resulted in certain state actions against sterilization facilities that are currently impacting manufacturers’ ability to use the ethylene oxide process to sterilize their medical devices. In February, the FDA became aware that the Illinois Environmental Protection Agency (EPA) issued a state EPA Order (<https://www2.illinois.gov/Pages/news-item.aspx?ReleaseID=19717>) to stop Sterigenics from sterilizing medical products and other products with ethylene oxide at their Willowbrook, Illinois, facility. The state EPA order was due to the presence of levels of ethylene oxide higher than the EPA found to be acceptable in the air around the facility. This closure caused a temporary shortage (</news-events/press-announcements/statement-jeff-shuren-md-director-center-devices-and-radiological-health-agency-efforts-mitigate>) of pediatric breathing tubes.

Another Sterigenics contract sterilization facility, in Atlanta, Georgia, has been closed since August while it undergoes construction to reduce ethylene oxide emissions. In October, the Sterigenics Willowbrook, Illinois, facility announced they would not reopen. As a consequence of these two large sterilization facilities being unavailable, the FDA continues to coordinate with multiple stakeholders on any impacts to medical device availability and to communicate with Sterigenics and medical device companies that may be affected. Because the number of ethylene oxide contract sterilization facilities in the U.S. is limited, we are very concerned that additional facility closures could severely impact the supply of sterile medical devices to health care delivery organizations that depend on those devices to take care of patients. The impact resulting from closure of these and perhaps more facilities will be difficult to reverse, and ultimately could result in years of spot or nationwide shortages of critical medical devices, which could compromise patient care.

This is why today we are urging medical device manufacturers that use ethylene oxide facilities to assess their inventory for any potential downstream impacts of sterilization facility closures on their product distribution. We are committed to working with manufacturers to look for alternative sterilization options. When manufacturers keep the FDA apprised of progress and obstacles encountered, it helps ensure that everyone's best efforts are being made to mitigate any shortages and prevent potential shortages. When U.S. manufacturers are not able to resolve a shortage and it involves a critical device needed for U.S. patients, the FDA may look for a firm that is willing and able to redirect safe and effective product into the U.S. market to address a shortage.

We also encourage health care facilities to perform similar inventory assessments of critical medical supplies that undergo contract terminal sterilization via ethylene oxide prior to shipping and reach out to the FDA so we can assist in any way we can to help identify sources of potential substitute devices. Hospitals and other health care delivery organizations should also work with their purchasing departments, group purchasing organizations and distributors, as appropriate, to help obtain product needed for patient care. So as to not exacerbate anticipated product availability concerns, we urge facilities to work together and not hoard product or attempt to purchase larger quantities of devices beyond their normal purchase volume.

We also encourage device manufacturers and health care providers to [provide \(/vaccines-blood-biologics/safety-availability-biologics/how-report-product-shortage-or-supply-issue-fda\)](#) us with information on potential supply issues. We have a [device shortages mailbox \(mailto:deviceshortages@fda.hhs.gov\)](#) so that any user, patient, manufacturer, or organization within the supply chain that is aware of a delay in distribution of new product, and/or anticipates a shortage, can notify us. It's never too early to contact us – the sooner we are aware of a potential shortage, the better we can assist in proactively developing a plan to mitigate its effects on patient care.

Since we first became aware of this issue earlier this year, we have continued to focus intently on addressing the immediate impacts of these closures and potential closures to help ensure patients can have access to the safe, effective, and high-quality medical devices they need today. We continue to communicate directly with manufacturers and monitor the supply of devices sterilized in facilities that have closed or that may close, paying special attention to life-saving, life-sustaining, and other critical devices. For instance, in the case of Smiths Medical's Bivona tracheostomy breathing tubes that were processed at the now-closed Sterigenics facility in Illinois, we helped mitigate that shortage by helping the manufacturer get a timely site change that kept supply interruptions to a minimum.

We share the public's objective to reduce over-reliance on ethylene oxide for medical device sterilization. And therefore, in addition to our shortage mitigation efforts, we have also been addressing the broader need for innovation and improvements to medical device sterilization techniques in general. For example, earlier this year we announced [two new innovation](#)

[challenges \(/news-events/fda-voices/preventing-medical-device-shortages-ensuring-safe-and-effective-sterilization-manufacturing\)](/news-events/fda-voices/preventing-medical-device-shortages-ensuring-safe-and-effective-sterilization-manufacturing) to encourage ideas from stakeholders, academics, industry and others about novel solutions for improving sterilization processes. This includes a call to identify new or alternative sterilization methods and technologies that are alternatives to those that use ethylene oxide, and another to develop new strategies to reduce ethylene oxide emissions.

In addition, we've previously announced we're holding a [public advisory committee meeting \(/advisory-committees/advisory-committee-calendar/november-6-7-2019-general-hospital-and-personal-use-devices-panel-medical-devices-advisory-committee\)](/advisory-committees/advisory-committee-calendar/november-6-7-2019-general-hospital-and-personal-use-devices-panel-medical-devices-advisory-committee) on November 6 and 7, 2019, dedicated to discussing how best to encourage innovation in medical device sterilization. We also continue to collaborate with the U.S. EPA, the entity responsible for reviewing and enforcing Clean Air Act regulations for sterilization facilities that emit ethylene oxide to ensure that facilities protect the public from significant risks, providing the U.S. EPA with updates on FDA activities in this area. And we'll continue to update stakeholders and the public as new information becomes available.

We want to be clear that we understand that there are very real consequences that medical device shortages have on patients, and we're committed to doing everything in our authority to help mitigate the adverse patient impact these sterilization facility closures are expected to have. We're also calling on all stakeholders—manufacturers, contract sterilizers, government agencies and other public health advocates—to join us and do your part to avert new device shortages and ensure patients have access to important and life-saving medical devices.

The FDA, an agency within the U.S. Department of Health and Human Services, protects the public health by assuring the safety, effectiveness, and security of human and veterinary drugs, vaccines and other biological products for human use, and medical devices. The agency also is responsible for the safety and security of our nation's food supply, cosmetics, dietary supplements, products that give off electronic radiation, and for regulating tobacco products.

Related Information

- FDA: [Ethylene Oxide Sterilization for Medical Devices \(/medical-devices/general-hospital-devices-and-supplies/sterilization-medical-devices\)](/medical-devices/general-hospital-devices-and-supplies/sterilization-medical-devices)
- FDA: [Ethylene Oxide Sterilization Facility Updates \(/medical-devices/general-hospital-devices-and-supplies/ethylene-oxide-sterilization-facility-updates\)](/medical-devices/general-hospital-devices-and-supplies/ethylene-oxide-sterilization-facility-updates)

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OPINIONREVIEW & OUTLOOK

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S.O.S for the U.S. Electric Grid

PJM Interconnection sounds the latest alarm that fossil-fuel plants are shutting down without adequate replacement power. The political class yawns.

By The Editorial Board

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Feb. 26, 2023 4:47 pm ET



People pass electrical power lines in Arlington, Va. PHOTO: ANDREW CABALLERO-REYNOLDS/AGENCE FRANCE-PRESSE/GETTY IMAGES

The warnings keep coming that the force-fed energy transition to renewable fuels is destabilizing the U.S. electric grid, but is anyone in government paying attention? Another S.O.S. came Friday in an ominous report from PJM Interconnection, one of the nation's largest grid operators.

The PJM report forecasts power supply and demand through 2030 across the 13 eastern states in its territory covering 65 million people. Its top-line conclusion: Fossil-fuel power plants are retiring much faster than renewable sources are getting developed, which could lead to energy “imbalances.” That’s a delicate way of saying that you can expect shortages and blackouts.

PJM typically generates a surplus of power owing to its large fossil-fuel fleet, which it exports to neighboring grids in the Midwest and Northeast. When wind power plunged in the Midwest and central states late last week, PJM helped fill the gap between supply and demand and kept the lights on.

That’s why it’s especially worrisome that PJM is predicting a large decline in its power reserves as coal and natural-gas plants retire. The report forecasts that 40,000 megawatts (MW) of power generation—enough to light up 30 million households—are at risk of retiring by 2030, representing about 21% of PJM’s current generation capacity.

Most projected power-plant retirements are “policy-driven,” the report says. For example, the steep costs of complying with Environmental Protection Agency regulations, including a proposed “good neighbor rule” that is expected to be finalized next month, will force about 10,500 MW of fossil-fuel generation to shut down.

At the same time, utility-company ESG (environmental, social and governance) commitments are driving coal plants to close, the report notes. Illinois and New Jersey climate policies could reduce generation by 8,900 MW. Do these states plan to rely on their good neighbors for power?

Many states have established ambitious renewable goals, and the Inflation Reduction Act lavishes enormous subsidies on wind, solar and batteries. But the report says the “historical rate of completion for renewable projects has been approximately 5%,” in part because of permitting challenges. In an optimistic case, the report estimates 21,000 MW of wind, solar and battery

storage capacity will be added to the grid by 2030—about half as much as the expected fossil-fuel retirements.

There's another problem: Demand for electric power will increase amid the growth in data centers and the government's push for the electrification of vehicles, heating and everything else. Loudoun County, Va., boasts "the largest concentration of data centers in the world," the report notes.

The report doesn't say this, no doubt owing to political reticence, but the conclusion is clear. The left's green-energy transition is incompatible with a growing economy and improving living standards. Renewables don't provide reliable power 24 hours a day, 365 days a year, and the progressive campaign to shut down coal and gas plants that do will invariably result in outages.

During an arctic air blast this past December, PJM ordered some businesses to curtail power usage and urged households to do the same. PJM narrowly avoided rolling blackouts as some generators switched to burning oil. But what will happen when those power plants shut down? A power shortage at PJM has the potential to cascade across much of the U.S.

Government officials have been raising alarms about the risks of cyber and physical attacks on the grid. But what about the accelerating danger from climate policy?

Appeared in the February 27, 2023, print edition as 'S.O.S for the U.S. Electric Grid'.



Energy Transition in PJM:

Resource Retirements, Replacements & Risks

Feb. 24, 2023

For Public Use

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Executive Summary

Driven by industry trends and their associated challenges, PJM developed the following strategic pillars to ensure an efficient and reliable energy transition: facilitating decarbonization policies reliably and cost-effectively; planning/operating the grid of the future; and fostering innovation.

PJM is committed to these strategic pillars, and has undertaken multiple initiatives in coordination with our stakeholders and state and federal governments to further this strategy, including interconnection queue reform, deployment of the State Agreement Approach to facilitate 7,500 MW offshore wind in New Jersey, and coordination with state and federal governments on maintaining system reliability while developing and implementing their specific energy policies.

In light of these trends and in support of these strategic objectives, PJM is continuing a multiphase effort to study the potential impacts of the energy transition. The first two phases of the study focused on energy and ancillary services and resource adequacy in 2035 and beyond. This third phase focuses on resource adequacy in the near term through 2030.¹

Maintaining an adequate level of generation resources, with the right operational and physical characteristics², is essential for PJM's ability to serve electrical demand through the energy transition.

Our research highlights four trends below that we believe, in combination, present increasing reliability risks during the transition, due to a potential timing mismatch between resource retirements, load growth and the pace of new generation entry under a possible “low new entry” scenario:

- The growth rate of electricity demand is likely to continue to increase from electrification coupled with the proliferation of high-demand data centers in the region.
- Thermal generators are retiring at a rapid pace due to government and private sector policies as well as economics.
- Retirements are at risk of outpacing the construction of new resources, due to a combination of industry forces, including siting and supply chain, whose long-term impacts are not fully known.
- PJM's interconnection queue is composed primarily of intermittent and limited-duration resources. Given the operating characteristics of these resources, we need multiple megawatts of these resources to replace 1 MW of thermal generation.

¹ See [Energy Transition in PJM: Frameworks for Analysis | Addendum](#) (2021), and [Energy Transition in PJM: Emerging Characteristics of a Decarbonizing Grid | Addendum](#) (2022).

² See previous work on Reliability Products and Services, including [PJM's Evolving Resource Mix and System Reliability](#) (2017), [Reliability in PJM: Today and Tomorrow](#) (2021), [Energy Transition in PJM: Frameworks for Analysis | Addendum](#) (2021), and work completed through the RASTF and PJM Operating Committee (2022).

The analysis also considers a “high new entry” scenario, where this timing mismatch is avoided. While this is certainly a potential outcome, given the significant policy support for new renewable resources, our analysis of these long-term trends reinforces the importance of PJM’s ongoing stakeholder initiatives, including capacity market modifications, interconnection process reform and clean capacity procurement, and the urgency for continued, combined actions to de-risk the future of resource adequacy while striving to facilitate the energy policies in the PJM footprint.

The first two phases of the energy transition study assumed that PJM had adequate resources to meet load.

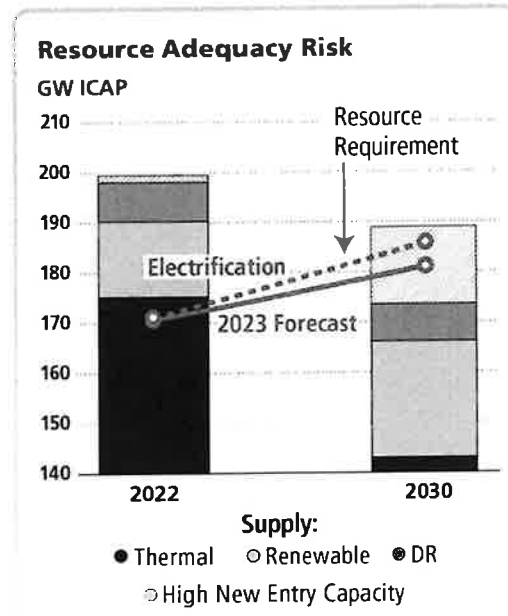
In this third phase of this living study, we explore a range of plausible scenarios up to the year 2030, focusing on the resource mix “balance sheet” as defined by generation retirements, demand growth and entry of new generation.

The analysis shows that 40 GW of existing generation are at risk of retirement by 2030. This figure is composed of: 6 GW of 2022 deactivations, 6 GW of announced retirements, 25 GW of potential policy-driven retirements and 3 GW of potential economic retirements. Combined, this represents 21% of PJM’s current installed capacity³.

In addition to the retirements, PJM’s long-term load forecast shows demand growth of 1.4% per year for the PJM footprint over the next 10 years. Due to the expansion of highly concentrated clusters of data centers, combined with overall electrification, certain individual zones exhibit more significant demand growth – as high as 7% annually.⁴

On the other side of the balance sheet, PJM’s New Services Queue consists primarily of renewables (94%) and gas (6%). Despite the sizable nameplate capacity of renewables in the interconnection queue (290 GW), the historical rate of completion for renewable projects has been approximately 5%. The projections in this study indicate that the current pace of new entry would be insufficient to keep up with expected retirements and demand growth by 2030. The completion rate (from queue to steel in the ground) would have to increase significantly to maintain required reserve margins.

In the study, we also consider generation entry beyond the queue using projections from S&P Global. Those projections indicate that, despite eroding reserve margins, resource adequacy would be maintained if the influx of renewables materializes at a rapid rate and gas remains the transition fuel, adding 9 GW of capacity. The analysis performed at the Clean Attribute Procurement Senior Task Force (CAPSTF) also suggests that further gas expansion is economic and competitive.⁵



The projections in this study indicate that it is possible that the current pace of new entry would be insufficient to keep up with expected retirements and demand growth by 2030.

³ Unless otherwise noted, thermal capacity values are expressed in ICAP, without adjustment for EFORD.

⁴ PJM Load Forecast Report, January 2023.

⁵ CAPSTF Analysis, Initial Results; Emmanuele Bobbio, Sr. Lead Economist – Advanced Analytics, PJM, Dec. 16, 2022.

Balance Sheet Summary (2022–2030)				
Retirements	New Entry Wind/Solar ⁶	New Entry Standalone Storage	New Entry Thermal	Load Growth
40 GW 60% Coal 30% Natural Gas 10% Other	Low = 48 GW-nameplate / 8 GW-capacity High = 94 GW-nameplate / 17 GW-capacity	Low = 3 GW High = 4 GW	Low = 4 GW High = 9 GW	2023 Forecast = 11 GW Electrification Forecast = 13 GW
				
Unless otherwise noted, thermal capacity values are expressed in ICAP, without adjustment for EFORD.				

For the first time in recent history, PJM could face decreasing reserve margins should these trends continue. The amount of generation retirements appears to be more certain than the timely arrival of replacement generation resources and demand response, given that the quantity of retirements is codified in various policy objectives, while the impacts to the pace of new entry of the Inflation Reduction Act, post-pandemic supply chain issues, and other externalities are still not fully understood.

The findings of this study highlight the importance of PJM's ongoing stakeholder initiatives (Resource Adequacy Senior Task Force, Clean Attribute Procurement Senior Task Force, Interconnection Process Subcommittee), continued efforts between PJM and state and federal agencies to manage reliability impacts of policies and regulations, and the urgency for coordinated actions to shape the future of resource adequacy. The potential for an asymmetrical pace in the energy transition, in which resource retirements and load growth exceed the pace of new entry, underscores the need to enhance the accreditation, qualification and performance requirements of capacity resources.

The composition and performance characteristics of the resource mix will ultimately determine PJM's ability to maintain reliability. It is critical that all PJM markets effectively correct imbalances brought on by retirements or load growth by incentivizing investment in new or expanded resources.

⁶ Includes hybrid projects with battery storage

Background

Resource adequacy is the ability of the electric system to supply the aggregate energy requirements of electricity to consumers at all times, taking into account scheduled and reasonably expected unscheduled outages of generation and transmission facilities. To achieve the goal of resource adequacy, PJM maintains an Installed Reserve Margin in excess of the forecast peak load that achieves a loss-of-load expectation (LOLE) of one day in 10 years. This LOLE standard is consistent with that prescribed in the ReliabilityFirst Corporation standard for planning resource adequacy.⁷

Long-term reliability and resource adequacy are addressed through the combined operation of PJM's electricity markets, and in particular the capacity market, called the Reliability Pricing Model (RPM). Each PJM member that provides electricity to consumers must acquire enough power supply to meet demand, not only for today and tomorrow, but for the future. Members secure these capacity resources for future energy needs through a series of base and incremental capacity auctions, as well as Fixed Resource Requirement plans.

The capacity market ensures long-term grid reliability by procuring the appropriate amount of power supply resources needed to meet predicted energy demand up to three years in the future. These capacity resources have an obligation to perform during system emergencies, and are subject to penalties if they underperform. By matching generation with future demand, the capacity market creates long-term price signals to attract needed investments to ensure adequate power supplies. This exchange provides consumers with an assurance of reliable power in the future, while capacity resources receive a dependable flow of income to help maintain their existing capability, attract investment in new resources, and encourage companies to develop new technologies and sources of electric power.

Methodology

The size, composition and performance characteristics of the resource mix will determine PJM's ability to maintain reliability. This study explores a range of scenarios in the context of resource adequacy, focusing on the resource mix "balance sheet" as defined by demand growth, generation retirements and new entry of generation. Using the methodology described in this section, PJM evaluates the future of resource adequacy by estimating the amount of capacity required to cover load expectations versus expected capacity for the years 2023 through 2030.

The study's initial supply levels are 192.3 GW of installed capacity from generation resources and 7.8 GW of installed capacity from demand response capacity resources. The generation mix is approximately 178.9 GW of thermal resources and 13.3 GW of renewables and storage.⁸

⁷ RFC Standard BAL-502-RF-03: Planning Resource Adequacy Analysis, Assessment and Documentation

⁸ This value includes the capacity value of run-of-river hydro, pumped storage hydro, solar, onshore wind, offshore wind and battery energy storage.

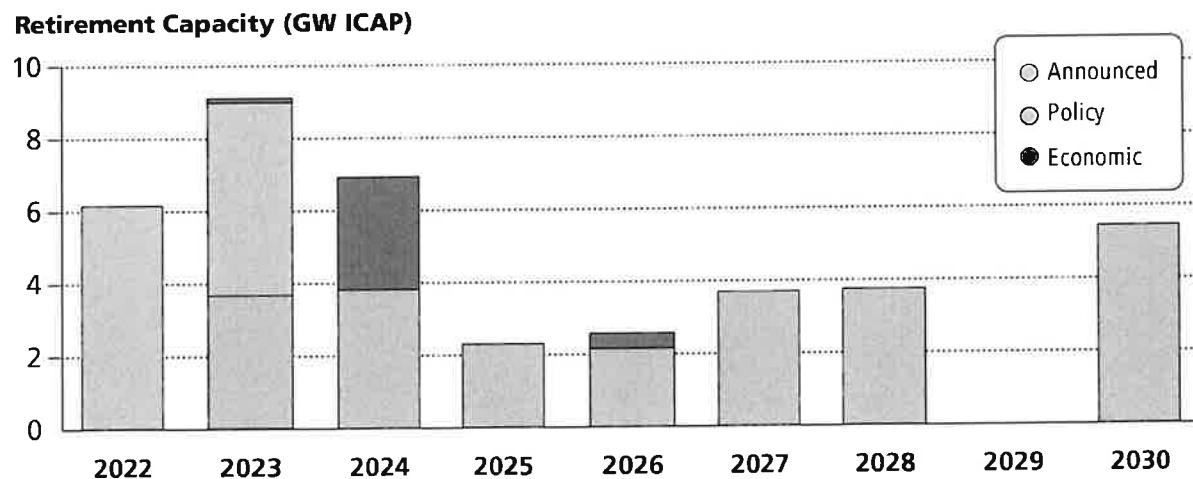
Supply Exits

PJM is undergoing a major transition in the resources needed to maintain bulk power grid reliability.

Historically, thermal resources have provided the majority of the reliability services in PJM. Today, a confluence of conditions, including state and federal policy requirements, industry and corporate goals requiring clean energy, reduced costs and/or subsidies for clean resources, stringent environmental standards, age-related maintenance costs, and diminished energy revenues are hastening the decline in thermal resources.

This study estimates anticipated retirements through 2030 by adding announced retirements with retirements likely as a result of various state and federal policies, and then with those at risk for retirement due to deteriorating unit economics. Potential policy-driven retirements, in this context, reflect resources that are subject to current and proposed federal and state environmental policies, in which it is conservatively assumed that the costs of mitigation and compliance could economically disadvantage these resources to the point of retirement. **Figure 1** highlights the 40 GW of projected generation retirements by 2030, which is composed of: 12 GW of announced retirements⁹, 25 GW of potential policy-driven retirements¹⁰ and 3 GW of potential economic retirements. Combined, this represents 21% of PJM's current installed capacity.¹¹ This section describes each category of potential retirements in more detail.

Figure 1. Total Forecast Retirement by Year (2022–2030)



⁹ Includes 6 GW of 2022 retirements.

¹⁰ Note that 7 GW of the 25 GW of supply with policy risk was also identified to have more immediate economic risk. The year that these 7 GW of potential policy retirements shown in **Figure 2** is based on timing identified in the economic analysis. In **Figure 4**, these 7 GW are shown in terms of the regulatory compliance timeline alone. The timeline of these potential quantities of resource retirements does not factor in any reliability "off-ramps" that may be included in established policies.

¹¹ In this study, PJM assumes that a resource that exits would not return to service in a future delivery year, even if operational conditions improve. Historically, a small percentage of retiring units would instead enter a "mothball" or standby state, in which the unit is put into a state where it may not operate for one or more years; however, in order to obtain an operating permit renewal, the mothballed unit would have to comply with the most recent environmental standards, likely requiring costly upgrades, making investing in newer, cleaner technologies more inviting.

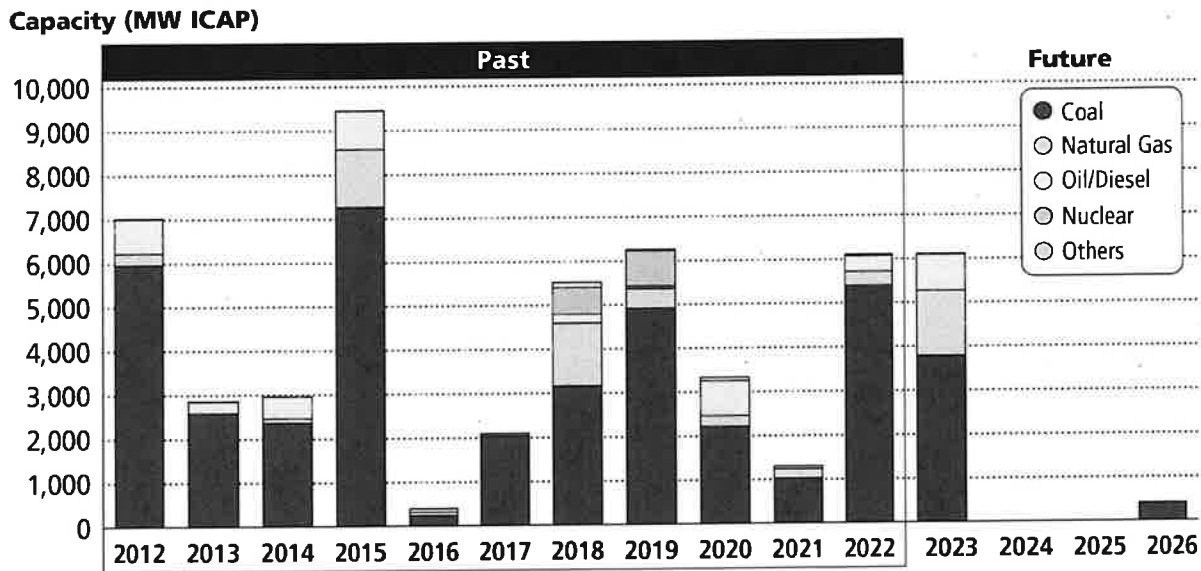
Announced Retirements

One of PJM's responsibilities is to ensure the continued reliability of the high-voltage electric transmission system when a generation owner requests deactivation. Through its Generation Deactivation process,¹² PJM identifies transmission solutions that allow owners to retire generating plants as requested without threatening reliable power supplies to customers. PJM may order transmission upgrades or additions built by transmission owners to accommodate the generation loss. PJM has no authority to order plants to continue operating. However, in some instances, to maintain reliability, PJM may formally request that a plant owner continue operating, subject to rates authorized by the Federal Energy Regulatory Commission (FERC), while transmission upgrades are completed.

Plant owners considering retirement must notify PJM at least two quarters before the proposed deactivation date. PJM and the transmission owners complete a reliability analysis in the subsequent quarter after notification to PJM. Generator retirements and any required system upgrades to keep the grid running smoothly are included in the PJM [Regional Transmission Expansion Planning](#) process and are reviewed with PJM members and stakeholders at the PJM [Transmission Expansion Advisory Committee](#).

Between 2012 and 2022, 47.2 GW of generation retired in PJM, as detailed by fuel type in **Figure 2**. In 2022, approximately 6 GW of generation deactivated and an additional 5.8 GW announced ("future") deactivations over the 2023–2026 time frame. The deactivations are slightly above the 10-year average of 4.3 GW, but well under the historical annual peak of 9.5 GW in 2015. Coal-fired resources account for approximately 89% of retired capacity in 2022.

Figure 2. Past and Announced Future Retirements



¹² See process details in PJM Manual 14-D, Section 9, and tracking of deactivation requests at <https://www.pjm.com/planning/services-requests/gen-deactivations>.

Potential Policy Retirements

An analysis of federal and state policies and regulations with direct impacts on generation in the PJM region yielded the largest group of potential future retirements in this study.¹³ As highlighted in **Figure 3**, the combined requirements of these regulations and their coincident compliance periods have the potential to result in a significant amount of generation retirements within a condensed time frame. These impacts will be reevaluated as these policies and regulations evolve. PJM will continue to work with both federal and state agencies on the development and implementation of environmental regulations and policies in order to address any reliability concerns.

Below are the policies and regulations included in the study:



EPA Coal Combustion Residuals (CCR): The U.S. Environmental Protection Agency (EPA) promulgated national minimum criteria for existing and new coal combustion residuals (CCR) landfills and existing and new CCR surface impoundments. This led to a number of facilities, approximately 2,700 MW in capacity, indicating their intent to comply with the rule by ceasing coal-firing operations, which is reflected in this study.



EPA Effluent Limitation Guidelines (ELG): The EPA updated these guidelines in 2020, which triggered the announcement by Keystone and Conemaugh facilities (about 3,400 MW) to retire their coal units by the end of 2028.¹⁴ Importantly, but not included in this study, the EPA is planning to propose a rule to strengthen and possibly broaden the guidelines applicable to waste (in particular water) discharges from steam electric generating units. The EPA is expecting this to impact coal units by potentially requiring investments when plants renew their discharge permits, and extending the time that plants can operate if they agree to a retirement date.



EPA Good Neighbor Rule (GNR): This proposal requires units in certain states to meet stringent limits on emissions of nitrogen oxides (NOx), which, for certain units, will require investment in selective catalytic reduction to reduce NOx. For purposes of this study, it is assumed that unit owners will not make that investment and will retire approximately 4,400 MW of units instead. Please note that the EPA plans on finalizing the GNR in March, which may necessitate reevaluation of this assumption.



Illinois Climate & Equitable Jobs Act (CEJA): CEJA mandates the scheduled phase-out of coal and natural gas generation by specified target dates: January 2030, 2035, 2040 and 2045. To understand CEJA criteria impacts and establish the timing of affected generation units' expected deactivation, PJM analyzed each generating unit's publically available emissions data, published heat rate, and proximity to Illinois environmental justice communities and Restore, Reinvest, Renew (R3) zones. For this study, PJM focuses on the approximately 5,800 MW expected to retire in 2030.

¹³ Policies impacting forward energy prices, such as the Regional Greenhouse Gas Initiative and Renewable Energy Credits, are implicitly included in economic analysis but are not explicitly included in analysis of policy-related retirements.

¹⁴ See State Impact PA, Nov. 22, 2021. These facilities have not filed formal Deactivation Notices with PJM.



New Jersey Department of Environmental Protection CO₂ Rule: New Jersey's CO₂ rule seeks to reduce carbon dioxide (CO₂) emissions of fossil fuel-fired electric generating units (EGUs) through the application of emissions limits for existing and new facilities greater than 25 MW. Units must meet a CO₂ output-based limit by tiered start dates. The dates and CO₂ limits are:

- June 1, 2024 – 1,700 lb/MWh
- June 1, 2027 – 1,300 lb/MWh
- June 1, 2035 – 1,000 lb/MWh

PJM used emissions data found in [EPA Clean Air Markets Program Data](#) to evaluate unit compliance. Where a unit's average annual emissions rate was greater than the CO₂ limit on the compliance date, the unit was assumed to be retiring. In this study PJM, estimated retirements at approximately 400 MW in 2024 and approximately 2,700 MW in 2027.

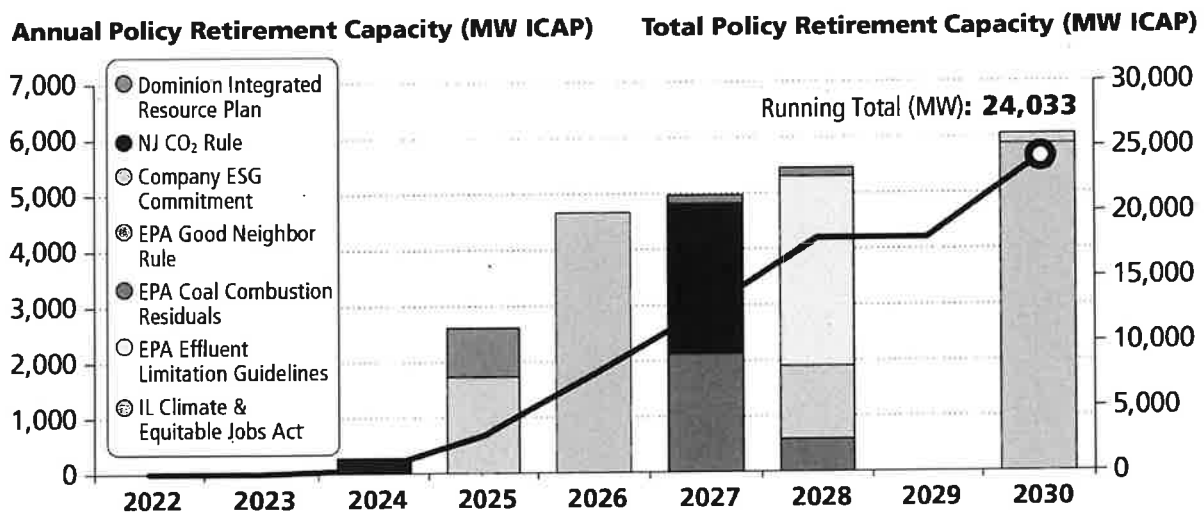


Dominion Integrated Resource Plan (IRP) commits to net zero carbon in its Virginia and North Carolina territory by 2050. PJM studied Dominion's Alternative Plan B retirement schedule, approximately 1,533 MW, for this analysis. Alternative Plan B proposes "significant development of solar, wind and energy storage resource envisioned by the VCEA," (Virginia Clean Economy Act of 2020), while maintaining natural gas generation for reliability, which is reflected in our analysis.



Company ESG (Environmental, Social, Governance) commitments are included where there is a commitment to retire resources per legal consent decree or other public statement. This includes the elimination of coal use and the retirement of the Brandon Shores, 1,273 MW, and Wagner, 305 MW, facilities in Maryland and the retirement of Rockport, 1,318 MW, in Indiana.

Figure 3. Potential Policy Retirements



Potential Economic Retirements

The third category of retirements in this study, beyond those formally announced and made likely by policy implementation, were identified through an analysis of revenue adequacy, the ability to economically cover going-forward costs from the wholesale markets. A net profit value was calculated for each existing generation resource using an estimate of future revenues and historical costs.

$$\text{Net Profit} = (\text{Gross Energy \& Ancillary Service Revenue} - \text{Production Costs}) \\ + (\text{Capacity Revenue}) - (\text{Fixed Avoidable Costs})$$

The results reveal that a portion of the thermal fleet is at risk of becoming unprofitable in the coming years.

The capacity market's Variable Resource Requirement (VRR) represents the set of prices for which load is willing to procure additional supply beyond the minimum reliability requirement. There are three points in the sloped demand curve, the first of which is anchored at a price 1.5 times the Net Cost of New Entry (Net CONE). Should the auction clear at this price level, the auction result signals that demand is willing to pay for the construction of new supply, minus the expected energy revenues the resource should expect to earn in the energy markets. As such, it is important to align the revenue expectations for the marginal resources with forward revenues, especially under PJM's continually changing landscape of business rules.

Energy & Ancillary Services Revenue and Production Cost

This study used a scaling approach to estimate forward unit-specific energy and ancillary services (E&AS) revenues from historical energy and ancillary service revenues by applying the following:

$$\text{Fwd Unit E\&AS Revenue} = \text{Hist Unit E\&AS Revenue} * \frac{\text{Fwd Reference E\&AS Revenue}^{15}}{\text{Hist Reference E\&AS Revenue}} * \frac{\text{Reference Avg Heat Rate}}{\text{Unit Avg Heat Rate}}$$

For a given reference resource type, unit dispatch was simulated using both historical and forward energy hub-adjusted energy prices. For the equivalent production cost model, the relative ratio of revenues and heat rates indicate the net effects of both rising fuel costs and energy price revenue. A unit on the margin in the energy markets, typically a natural gas unit, would set a locational price near its short-run marginal costs. Infra-marginal units, potentially coal units, would receive higher revenues as price-taking resources, and thus may see increased profitability. This is reflected in the analysis, in which a reference coal unit's forward revenues increased an average of 139% over previous revenue estimates.

¹⁵ The forward energy and ancillary services revenue calculation used in this study is the method that was developed for use in the Forward Net Energy & Ancillary Services Offset calculation originally developed in 2020, and filed as part of the most recent Quadrennial Review.

Capacity Revenues and Fixed Avoidable Costs

Unit-specific capacity revenues were calculated from prices and cleared quantities in the 2023/2024 Base Residual Auction (BRA). The study used the published 2023/2024 BRA Default Gross Avoidable Cost Rate (ACR) values as representative total fixed costs (\$/MW-day) required to keep the generating plant available to produce energy. In other words, these are projected costs that could be avoided by the retirement of the plant. Avoidable costs represent operational factors like operations and maintenance labor, fuel storage costs, taxes and fees, carrying charges, and other costs not directly related to the production of energy. When available, unit-specific ACR values from the 2023/2024 BRA supply offer mitigation process were used, otherwise the class average Gross ACR was used.

Results and Estimated Impact

This study assumes that a simulated economic loss would result in a retirement of the resource at the next available delivery year in which the unit is not committed for capacity. As such, a unit with a revenue loss that did not clear in the 2023/2024 BRA would exit in 2023, while a unit with a revenue loss that cleared in the 2023/2024 BRA would exit in 2024. While units that do not clear a single BRA may remain energy-only resources, this conservative assumption was used to provide awareness.

The economic analysis identified approximately 10 GW of supply in immediate economic risk, of which 7 GW of supply is also affected by policy risk, and 3 GW of supply is economic risk only. In aggregate, 6 GW are steam resources, and 4 GW represent combustion turbines and internal combustion resources. Several of the units identified were older steam boilers that had once converted from coal-fired to natural gas fuel; these resources are less efficient than a modern heat-recovery steam generator in a combined cycle unit. Fifty-three percent of the resources identified for economic risk did not have a PJM capacity obligation in Delivery Year 2023/2024, either through the FRR process or market clearing.

Supply Entry

The composition of the PJM Interconnection Queue has evolved significantly in recent years, primarily increasing in the amount of renewables, storage, and hybrid resources and decreasing in the amount of natural gas-fired resources entering the queue. The PJM New Services Queue stands at approximately 290 ICAP GW of generation interconnection requests, of which almost 94% (271 ICAP GW) is composed of renewable and storage-hybrid resources.

Natural Gas Headwinds

In the last decade, resources in the PJM region have benefitted from the proximity to the Marcellus Shale, an area that extends along the Appalachian Mountains from southern West Virginia to central New York. Beginning around 2010, gas extraction from hydraulic fracturing transformed this region into the largest source of recoverable natural gas in the United States. This local fuel supply decreased the prices for spot market natural gas in much of the PJM region, and prices in the PJM region often trade at negative basis to the Henry Hub spot price.

The entry of natural gas resources in the PJM region peaked in 2018, with 11.1 GW of generation commercializing that single year. From 2019 to 2022, a total of 8.1 GW of natural gas generation began service, or about a third of the 23 GW observed from 2015–2018. Queue proposals have also declined; over the last three years, only 4.1 GW of new natural gas projects entered the queue, while 15.1 GW of existing queue projects withdrew.¹⁶

Recent movement in the natural gas spot markets across the U.S. and Europe add another degree of uncertainty to future operations. In 2022, European natural gas supply faced many challenges resulting from the war in Ukraine and subsequent sanctions against Russia. Liquefied natural gas (LNG) imports into the EU and the U.K. in the first half of 2022 increased 66% over the 2021 annual average,¹⁷ primarily from U.S. exporters with operational flexibility. This international natural gas demand is a new competitor for domestic spot-market consumers, resulting in significantly higher fuel costs for PJM's natural gas fleet.

This study assumes that, of the approximately 17.6 GW of natural gas generation in the queue, only those that are proposed uprates of existing generation, or currently under construction, will complete.¹⁸ This results in 3.8 GW of entry from under-construction natural gas resources to be completed for the 2023/2024 Delivery Year. While 12 GW of natural gas have reached a signed Interconnection Service Agreement (ISA) stage, it is unclear what percentage of this capacity may move forward. If significantly more natural gas capacity achieved commercial operation, it could help avoid reliability issues.

Renewable Transition

PJM's projected resource mix continues to evolve toward lower-carbon intermittent resources. Entry into the queue from renewable and storage resources has been growing at an annualized rate of 72% per year since 2018, or 199 GW of capacity entry versus 2.8 GW commercializing and 42.1 GW withdrawn. This influx of renewable projects has led to a joint effort between PJM and its stakeholders to enact queue reforms intended to clear the backlog of projects, improve procedures around permitting and site control, simplify analysis by clustering projects, and accelerate projects that don't require network upgrades. FERC approved the proposed package in November 2022, with expected implementation in 2023.

Commercial Probability and Expanding Beyond the Queue

PJM staff developed several forecasts of the rate by which projects successfully exit the queue (the "commercial probability" of reaching an *In-Service* state). Since 1997, the PJM New Services Queue has tracked proposed generation interconnection projects from their submittal and study stages to completion of an ISA and Wholesale Market Participation Agreement (WMPA) and construction. At any point in the process, a resource may withdraw from the queue, effectively ending its commercial viability.

¹⁶ This capacity represents natural gas projects that were submitted prior to 2020 and withdrawn in the 2020–2022 time frame.

¹⁷ [Europe imported record amounts of liquefied natural gas in 2022](#), U.S. Energy Information Administration, June 14, 2022.

¹⁸ Under construction includes the New Service Queue *Partially in Service* – *Under Construction* and *Under Construction* statuses.

The study utilized a logistical regression classification algorithm to predict the probability of a project reaching an *In-Service* entry (or *Withdrawn* exit) based on several properties of the project. A logistical regression searches for patterns within training datasets, resulting in a model that can forecast a probability of a result. After applying the logistical regression model for 10 years of historical project completion (Y-queue to present) without project stage, approximately 15.3 GW-nameplate/8.7 GW-capacity were deemed commercially probable out of 178 GW of projects examined.

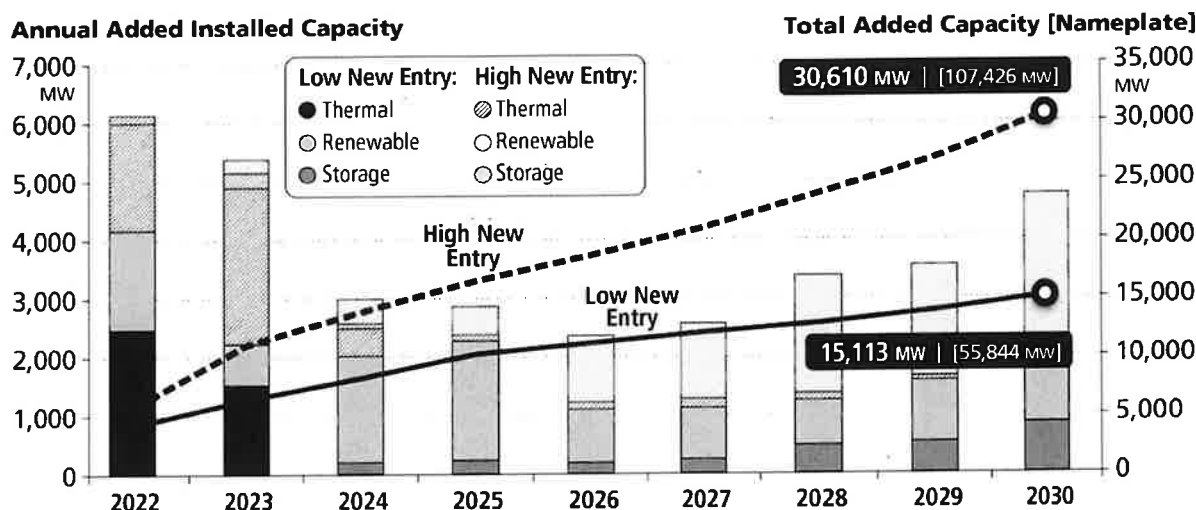
The model results for thermal resources were reasonably in line with expectations. However, the model produced extremely low entry from onshore wind, offshore wind, solar, solar-hybrid and storage resources. The uncertainty of completion rates of newer resource types, like offshore wind, likely plays a role in these model outcomes. After adjusting the new renewable capacity by Effective Load Carrying Capability (ELCC) derations, this commercial probability analysis estimates net 13.2 GW-nameplate / 6.7 GW-capacity to the system by 2030, as shown in **Figure 4**.

Given that this process may not capture recent policy changes and fiscal incentives toward renewable and storage development, and that the existing queue has fewer resources entered after 2026, PJM staff utilized two S&P Global Power Market Outlook analyses' generation expansion models. As estimates of future entry beyond the queue, these models are used to provide additional insight for the two scenarios: "Low New Entry" utilizes the "Planning Model,"¹⁹ and "High New Entry" utilizes the "Fast Transition" model.²⁰ Based on these models, PJM added additional capacity to its commercial probability data in each scenario.

These forecasts of generation expansion are economic resource planning solutions, which take state RPS requirements and capacity margins into account to ensure new renewable builds. Over the study period, the Low New Entry scenario adds 42.6 GW-nameplate/8.4 GW-capacity to supply expectations, resulting in total entry of 55.8 GW-nameplate/15.1 GW-capacity. The High New Entry scenario adds 107 GW-nameplate/30.6 GW-capacity after ELCC derations. Net natural gas entry was approximately 5 GW, and renewables was 48.5 GW-nameplate/10.4 GW-capacity, as shown in **Figure 4**.

¹⁹ S&P Global, North American Power Market Outlook, June 2022, planning model. This planning case incorporated effects from the 2021 Infrastructure Investment and Jobs Act, but not the 2022 Inflation Reduction Act.

²⁰ S&P Global, North American Power Market Outlook, Sept. 2022, Fast Transition model. This planning case assumes carbon net neutrality by 2050 through the IRA and additional policies, such as state clean energy policies, and as such assumes adjustments for increased electrification of heating, tax credits for renewable generation and higher levels of fossil retirements.

Figure 4. Forecast Added Capacity

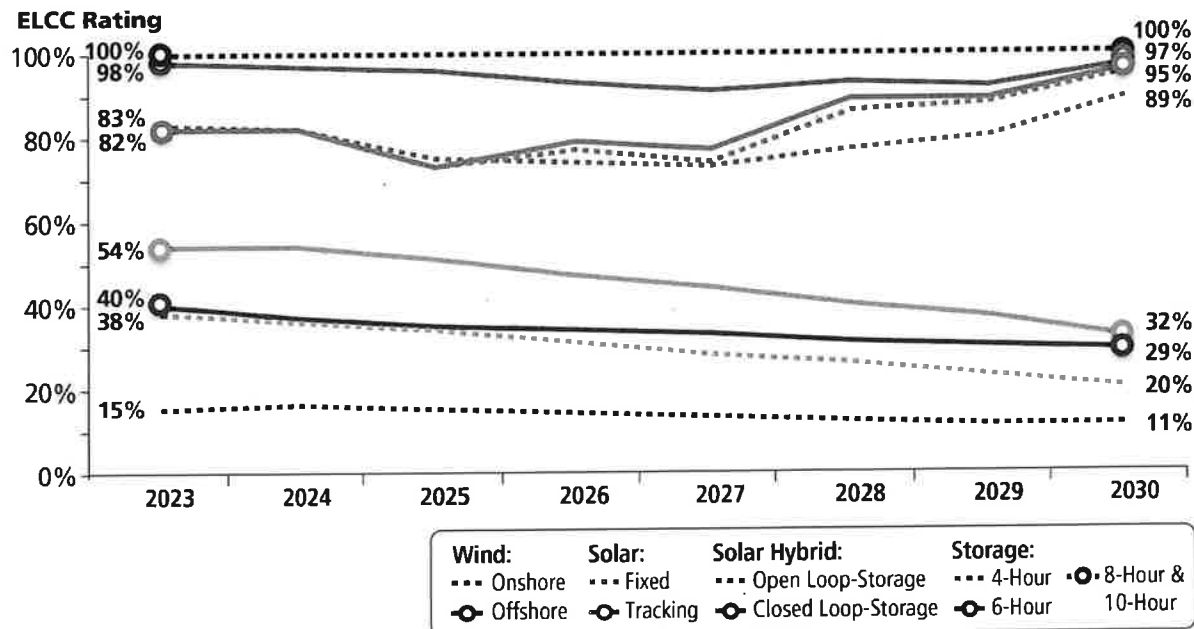
Impact of Capacity Accreditation on Existing Renewables and Storage

In July 2021, FERC accepted PJM's ELCC methodology for calculating unforced capacity values for intermittent and energy storage capacity resource classes. The ELCC analysis²¹ examines load and resource performance uncertainty, and calculates an hourly loss-of-load probability (LOLP) to meet a one-in-10 year loss of load expectation (LOLE) adequacy criteria. The ELCC method examines the alignment of a given resource type's capacity to high risk hours, as well as the change in risk hours proportional to the changes in portfolio size. The adjustments to accredited capacity went into effect in the 2023/2024 BRA executed in June 2022.

This study examined the current renewable generation fleet for the impact of future changes in capacity accreditation. Today, there are approximately 3.5 GW of onshore wind and solar capacity resources participating in the RPM capacity market as intermittent resources. From 2022 to 2030, this accredited capacity is expected to decline by 1.2 GW to 2.3 GW due to portfolio effects resulting in the increase of entry from other intermittent renewable resources.²² This adjustment is consistent with the renewable expectations presented in the [December 2021 Effective Load Carrying Capability \(ELCC\) Report](#).

²¹ [Manual 20, Section 5: PJM Effective Load Carrying Capability Analysis](#)

²² Approximate nameplate needed to replace 1 MW of thermal generation: Solar – 5.2 MW; Onshore Wind – 14.0 MW; Offshore Wind – 3.9 MW. These are average values.

Figure 5. Effective Load Carrying Capability (ELCC) Rating by Resource Type

Demand Expectations

Load forecasting is an important part of maintaining the reliability of the bulk electric system. Forecasting helps PJM make decisions about how to plan and operate the bulk electric system in a reliable manner, and how to effectively administer competitive power markets. PJM's Resource Adequacy Planning Department publishes an annual [Load Forecast Report](#), which outlines "long-term load forecasts of peak-loads, net energy, load management, distributed solar generation, plug-in electric vehicles and battery storage."

Along with the energy transition, PJM is witnessing a large growth in data center activity. Importantly, the PJM footprint is home to Data Center Alley in Loudoun County, Virginia, the largest concentration of data centers in the world.²³ PJM uses the [Load Analysis Subcommittee](#) (LAS) to perform technical analysis to coordinate information related to the forecast of electrical peak demand. In 2022, the LAS began a review of data center load growth and identified growth rates over 300% in some instances.²⁴ The 2023 PJM Load Forecast Report incorporates adjustments to specific zones for data center load growth, as shown in **Figure 5**.

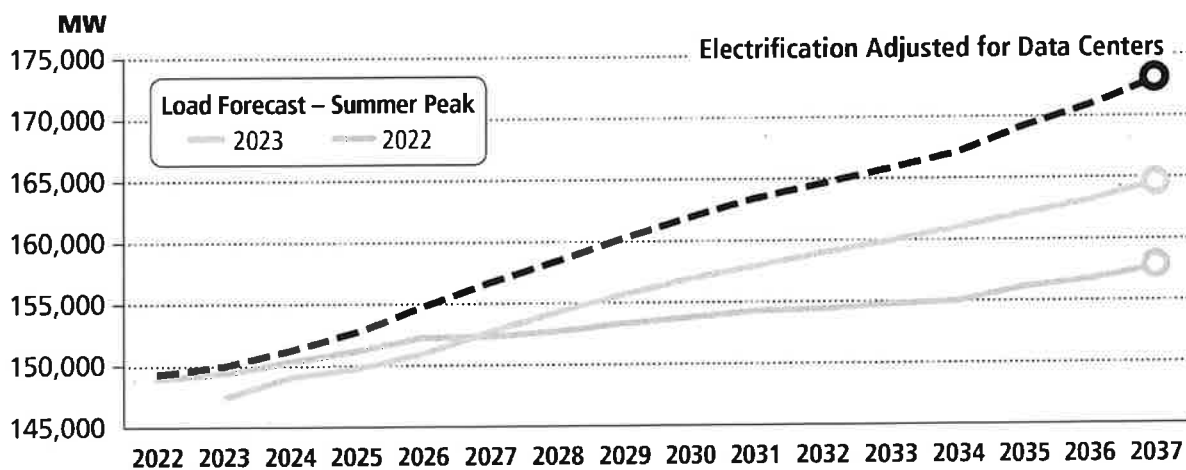
²³ See [Loudoun County Department of Economic Development](#), 2023.

²⁴ [Load Analysis Subcommittee: Load Forecast Adjustment Requests](#), Andrew Gledhill, Resource Adequacy Planning, Oct. 27, 2022

Additionally, PJM is expecting an increase in electrification resulting from state and federal policies and regulations. The study therefore incorporates an electrification scenario in the load forecast to provide insight on capacity need should accelerated electrification drive demand increases.²⁵ This accelerated demand increase is consistent with the methodology used in the Emerging Characteristics of a Decarbonizing Grid paper.²⁶ That paper found electrification to have an asymmetrical impact on demand growth, with demand growth in the winter, mainly due to heating, more than doubling that in the summer. This would move the bulk of the resource adequacy risk from the summer to the winter.

Figure 6 highlights how updated electrification assumptions and accounting for new data center loads have impacted the summer peak between the 2022 and 2023 forecasts.²⁷

Figure 6. Impacts of Electrification and Data Center Load on Forecasts



What Does This Mean for Resource Adequacy in PJM?

PJM projects resource adequacy needs through the Reserve Requirement Study (RRS). The purpose of the RRS is to determine the required capacity or Forecast Pool Requirement for future years or delivery years based on load and supply uncertainty. The RRS also satisfies the North America Electric Reliability Corporation/ReliabilityFirst Adequacy Standard BAL-502-RFC-03, Planning Resource Adequacy Analysis, Assessment and Documentation, which requires that the Planning Coordinator performs and documents a resource adequacy analysis that applies a LOLE of one occurrence in 10 years. The RRS establishes the Installed Reserve Margin values for future delivery years. For this study PJM used the most recent 2022 RRS, as well as the 2021 RRS for comparison.

²⁵ Electrification assumptions are 17 million EVs, 11 million heat pumps, 20 million water heaters, 19 million cooktops in PJM by 2037, built on top of the 2022 Load Forecast.

²⁶ [Energy Transition in PJM: Emerging Characteristics of a Decarbonizing Grid](#), May 17, 2022.

²⁷ [2023 Load Forecast Supplement](#), PJM Resource Adequacy Planning Department, January 2023.

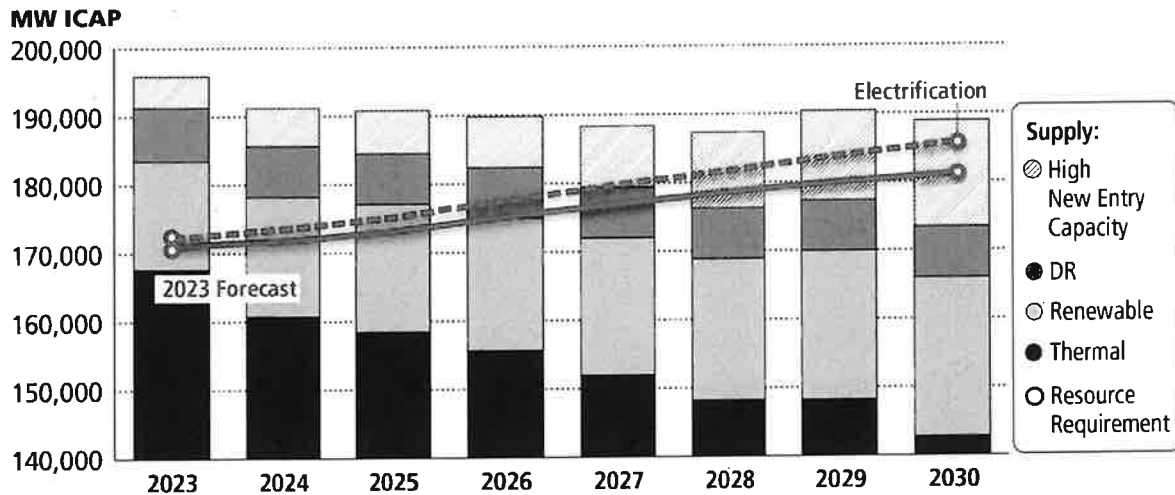
Combining the resource exit, entry and increases in demand, summarized in **Figure 7**, the study identified some areas of concern. Approximately 40 GW PJM's fossil fuel fleet resources may be pressured to retire as load grows into the 2026/2027 Delivery Year. At current low rates of renewable entry, the projected reserve margin would be 15%, as shown in **Table 1**. The projected total capacity from generating resources would not meet projected peak loads, thus requiring the deployment of demand response. By the 2028/2029 Delivery Year and beyond, at Low New Entry scenario levels, projected reserve margins would be 8%, as projected demand response may be insufficient to cover peak demand expectations, unless new entry progresses at a levels exhibited in the High New Entry scenario. This will require the ability to maintain needed existing resources, as well as quickly incentivize and integrate new entry

Table 1. Reserve Margin Projections Under Study Scenarios

Reserve Margin	2023	2024	2025	2026	2027	2028	2029	2030
Low New Entry								
2023 Load Forecast	23%	19%	17%	15%	11%	8%	8%	5%
Electrification	22%	18%	16%	13%	10%	7%	6%	3%
High New Entry								
2023 Load Forecast	26%	23%	21%	19%	17%	16%	17%	15%
Electrification	25%	22%	20%	18%	15%	14%	14%	12%

As witnessed during the rapid transition from coal resources to natural gas resources last decade, PJM markets provide incentives for capacity resources. The challenge will be integrating the level of additional resources envisioned to meet this demand, and therefore addressing issues such as resource capacity accreditation is critical in the near term. The low entry rates shown in our Low New Entry scenario are illustrative of recent completion history applied to the current queue. RTO capacity prices in recent auctions have been low for several delivery years, and capacity margins have historically reached around 28% of peak loads. As capacity reserve levels tighten, the markets will clear higher on the VRR curves, sending price signals to build new generation for reliability needs.

The 2024/2025 BRA, which executed in December 2022, highlighted another area of uncertainty. Queue capacity with approved ISAs/WMPAs is currently very high, approximately 35 GW-nameplate, but resources are not progressing into construction. There has only been about 10 GW-nameplate moving to in service in the past three years. There may still be risks to new entry, such as semiconductor supply chain disruptions or pipeline supply restrictions, which are preventing construction despite resources successfully navigating the queue process.

Figure 7. The Balance Sheet

For the first time in recent history, PJM could face decreasing reserve margins, as shown in **Table 1**, should these trends – high load growth, increasing rates of generator retirements, and slower entry of new resources – continue. The amount of generation retirements appears to be more certain than the timely arrival of replacement generation resources, given that the quantity of retirements is codified in various policy objectives, while the impacts to the pace of new entry of the Inflation Reduction Act, post-pandemic supply chain issues, and other externalities are still not fully understood.

The findings of this study highlight the importance of PJM's ongoing stakeholder initiatives (Resource Adequacy Senior Task Force, CAPSTF, Interconnection Process Subcommittee), continued efforts between PJM and state and federal agencies to manage reliability impacts of policies and regulations, and the urgency for coordinated actions to shape the future of resource adequacy.

The potential for an asymmetrical pace within the energy transition, where resource retirements and load growth exceed the pace of new entry, underscores the need for better accreditation, qualification and performance requirements for capacity resources.

The composition and performance characteristics of the resource mix will ultimately determine PJM's ability to maintain the reliability of the bulk electric system. Managing the energy transition through collaborative efforts of PJM stakeholders, state and federal agencies, and consumers will ensure PJM has the tools and resources to maintain reliability.

	<u>Agency</u>	<u>Agenda Stage of Rulemaking</u>	<u>Title</u>	<u>RIN</u>
1-1	EPA/RODALLA S	Proposed Rule Stage	Promulgation of Air Quality Implementation Plans; State of Texas; Regional Haze Federal Implementation Plan; Response to a Reconsideration of Provisions Governing Alternative to Source-Specific BART	2006- AA03
1-2	EPA/RODENV ER	Proposed Rule Stage	Federal Implementation Plan to Establish a Market for Ozone-Precursor Emissions Reduction Credits From Existing Sources on Indian Country Lands Within the Uinta Basin Ozone Nonattainment Area	2008- AA04
1-3	EPA/RODENV ER	Final Rule Stage	Federal Implementation Plan for Oil and Natural Gas Sources; Uintah and Ouray Indian Reservation in Utah	2008- AA03
1-4	EPA/ROSEATT LE	Proposed Rule Stage	Federal Implementation Plans Under the Clean Air Act for Indian Reservations in Idaho, Oregon and Washington	2012- AA02
2-1 (5)	EPA/OGC	Proposed Rule Stage	Environmental Protection Agency Freedom of Information Act Regulations Update, Phase II	2025- AA38
3-1 (6)	EPA/OMS	Proposed Rule Stage	Revisions to the EPA's Privacy Act Regulations for Systems of Records Notices	2025- AA43
4-1 (7)	EPA/OW	Proposed Rule Stage	Federal Baseline Water Quality Standards for Indian Reservations	2040- AF62
4-2 (8)	EPA/OW	Proposed Rule Stage	Human Health Criteria for Arsenic in Idaho	2040- AF82
4-3 (9)	EPA/OW	Proposed Rule Stage	Clean Water Act 404 Assumption Update Regulation	2040- AF83
4-4 (10)	EPA/OW	Proposed Rule Stage	Market-Based Approaches Under the National Pollutant Discharge Elimination System (NPDES) Program	2040- AG02
4-5 (11)	EPA/OW	Proposed Rule Stage	Federal Recreational Water Quality Criteria Applicable to Certain Waters in New York	2040- AG08
4-6 (12)	EPA/OW	Proposed Rule Stage	Revised Definition of "Waters of the United States"	2040- AG13
4-7 (13)	EPA/OW	Proposed Rule Stage	Water Quality Standards Regulatory Revisions to Protect Tribal Reserved Rights	2040- AG17

4-8 (14)	EPA/OW	Proposed Rule Stage	Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category	<u>2040-AG23</u>
4-9 (15)	EPA/OW	Proposed Rule Stage	Clean Water Act Methods Update Rule for the Analysis of Effluent	<u>2040-AG25</u>
4-10 (16)	EPA/OW	Proposed Rule Stage	National Pollutant Discharge Elimination System (NPDES) Small Municipal Separate Storm Sewer System (MS4) Urbanized Area Clarification	<u>2040-AG27</u>
4-11 (17)	EPA/OW	Proposed Rule Stage	Water System Restructuring Assessment Rule	<u>2040-AF96</u>
4-12 (18)	EPA/OW	Proposed Rule Stage	Consumer Confidence Report Rule Revisions	<u>2040-AG14</u>
4-13 (19)	EPA/OW	Proposed Rule Stage	National Primary Drinking Water Regulations for Lead and Copper: Improvements (LCRI)	<u>2040-AG16</u>
4-14 (20)	EPA/OW	Proposed Rule Stage	Per- and Polyfluoroalkyl Substances (PFAS) National Primary Drinking Water Regulation Rulemaking	<u>2040-AG18</u>
4-15 (21)	EPA/OW	Final Rule Stage	Federal Selenium Criteria for Aquatic Life and Aquatic-Dependent Wildlife Applicable to California	<u>2040-AF79</u>
4-16 (22)	EPA/OW	Final Rule Stage	Vessel Incidental Discharge National Standards of Performance	<u>2040-AF92</u>
4-17 (23)	EPA/OW	Final Rule Stage	Clean Water Act Section 401: Water Quality Certification	<u>2040-AG12</u>
4-18 (24)	EPA/OW	Final Rule Stage	Revised Definition of "Waters of the United States"	<u>2040-AG19</u>
4-19 (25)	EPA/OW	Final Rule Stage	Restoring Protective Human Health Criteria in Washington	<u>2040-AG21</u>
4-20 (26)	EPA/OW	Final Rule Stage	Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category--Initial Notification Date Extension	<u>2040-AG28</u>
5-1 (27)	EPA/OLEM	Prerule Stage	Drum Reconditioner Advance Notice of Proposed Rulemaking	<u>2050-AH29</u>
5-2 (28)	EPA/OLEM	Prerule Stage	PFAS-Related Designations as CERCLA Hazardous Substances	<u>2050-AH25</u>

5-3 (29)	EPA/OLEM	Proposed Rule Stage	Reporting Requirements for Emissions From Animal Waste Under the Emergency Planning and Community Right-to-Know Act	<u>2050-AH28</u>
5-4 (30)	EPA/OLEM	Proposed Rule Stage	Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; Legacy Surface Impoundments	<u>2050-AH14</u>
5-5 (31)	EPA/OLEM	Proposed Rule Stage	Technical Corrections to the Hazardous Waste Generator Improvements Rule, the Hazardous Waste Pharmaceuticals Rule, and the Definition of Solid Waste Rule	<u>2050-AH23</u>
5-6 (32)	EPA/OLEM	Proposed Rule Stage	Revisions to Standards for the Open Burning/Open Detonation of Waste Explosives	<u>2050-AH24</u>
5-7 (33)	EPA/OLEM	Proposed Rule Stage	Listing of PFOA, PFOS, PFBS, and GenX as Resource Conservation and Recovery Act (RCRA) Hazardous Constituents	<u>2050-AH26</u>
5-8 (34)	EPA/OLEM	Proposed Rule Stage	Definition of Hazardous Waste Applicable to Corrective Action for Solid Waste Management Units	<u>2050-AH27</u>
5-9 (35)	EPA/OLEM	Proposed Rule Stage	Updates to the RCRA Hazardous Waste Permitting Regulations and Other Technical Corrections	<u>2050-AH30</u>
5-10 (36)	EPA/OLEM	Final Rule Stage	Accidental Release Prevention Requirements: Risk Management Program Under the Clean Air Act; Safer Communities by Chemical Accident Prevention	<u>2050-AH22</u>
5-11 (37)	EPA/OLEM	Final Rule Stage	Alternate PCB Extraction Methods and Amendments to PCB Cleanup and Disposal Regulations	<u>2050-AH08</u>
5-12 (38)	EPA/OLEM	Final Rule Stage	Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; Federal CCR Permit Program	<u>2050-AH07</u>
5-13 (39)	EPA/OLEM	Final Rule Stage	Response to Petition to Revise the Non-Hazardous Secondary Material Standards Under Part 241	<u>2050-AH13</u>
5-14 (40)	EPA/OLEM	Final Rule Stage	Hazardous and Solid Waste Management System: Disposal of CCR; A Holistic Approach to Closure Part B: Implementation of Closure	<u>2050-AH18</u>

5-15 (41)	EPA/OLEM	Final Rule Stage	Designating PFOA and PFOS as CERCLA Hazardous Substances	<u>2050-AH09</u>
5-16 (42)	EPA/OLEM	Final Rule Stage	Revisions to the National Oil and Hazardous Substances Pollution Contingency Plan; Subpart J Product Schedule Listing and Authorization of Use Requirements	<u>2050-AE87</u>
6-1 (43)	EPA/OAR	Prerule Stage	Phasedown of Hydrofluorocarbons: Management of Certain Hydrofluorocarbons and Substitutes Under Subsection (h) of the American Innovation and Manufacturing Act of 2020	<u>2060-AV84</u>
6-2 (44)	EPA/OAR	Proposed Rule Stage	Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NNSR): Reconsideration of Fugitive Emissions Rule	<u>2060-AQ47</u>
6-3 (45)	EPA/OAR	Proposed Rule Stage	National Emissions Standards for Hazardous Air Pollutants From Secondary Lead Smelting	<u>2060-AS32</u>
6-4 (46)	EPA/OAR	Proposed Rule Stage	General Revisions to Part 75 Emissions Monitoring and Reporting, Acid Rain Program Administrative Provisions, and Mercury and Air Toxics Standards for Power Plants Electronic Reporting	<u>2060-AS74</u>
6-5 (47)	EPA/OAR	Proposed Rule Stage	Finding That Lead Emissions From Aircraft That Operate on Leaded Fuel Cause or Contribute to Air Pollution That May Reasonably Be Anticipated to Endanger Public Health and Welfare	<u>2060-AT10</u>
6-6 (48)	EPA/OAR	Proposed Rule Stage	Protection of Stratospheric Ozone: Updates to the Significant New Alternatives Policy Program	<u>2060-AU11</u>
6-7 (49)	EPA/OAR	Proposed Rule Stage	Revisions and Confidentiality Determinations for Data Elements Under the Greenhouse Gas Reporting Rule	<u>2060-AU35</u>
6-8 (50)	EPA/OAR	Proposed Rule Stage	National Emission Standards for Hazardous Air Pollutants: Ethylene Oxide Commercial Sterilization and Fumigation Operations	<u>2060-AU37</u>
6-9 (51)	EPA/OAR	Proposed Rule Stage	National Emission Standards for Hazardous Air Pollutants: Primary Magnesium Refining Residual Risk and Technology Review	<u>2060-AU65</u>

6-10 (52)	EPA/OAR	Proposed Rule Stage	Petition to Delist Stationary Combustion Turbines From the List of Categories of Major Sources of Hazardous Air Pollutants	<u>2060-AU78</u>
6-11 (53)	EPA/OAR	Proposed Rule Stage	National Emission Standards for Hazardous Air Pollutants From Portland Cement Manufacturing Amendments	<u>2060-AV00</u>
6-12 (54)	EPA/OAR	Proposed Rule Stage	Revised Response to Clean Air Act Section 126(b) Petition From New York	<u>2060-AV04</u>
6-13 (55)	EPA/OAR	Proposed Rule Stage	Revised Response to Clean Air Act Section 126(b) Petition From Maryland	<u>2060-AV05</u>
6-14 (56)	EPA/OAR	Proposed Rule Stage	Amendments to the NSPS for GHG Emissions From New, Modified, & Reconstructed Stationary Sources: EGUs	<u>2060-AV09</u>
6-15 (57)	EPA/OAR	Proposed Rule Stage	Emission Guidelines for Greenhouse Gas Emissions From Fossil Fuel-Fired Existing Electric Generating Units	<u>2060-AV10</u>
6-16 (58)	EPA/OAR	Proposed Rule Stage	Volume Requirements for 2023 and Beyond Under the Renewable Fuel Standard Program	<u>2060-AV14</u>
6-17 (59)	EPA/OAR	Proposed Rule Stage	New Source Performance Standards and Emission Guidelines for Crude Oil and Natural Gas Facilities: Climate Review	<u>2060-AV16</u>
6-18 (60)	EPA/OAR	Proposed Rule Stage	National Emission Standards for Hazardous Air Pollutants: Coke Ovens: Residual Risk and Technology Review for Pushing, Quenching, and Battery Stacks and Coke Oven Batteries	<u>2060-AV19</u>
6-19 (61)	EPA/OAR	Proposed Rule Stage	Review of Final Rule Reclassification of Major Sources as Area Sources Under Section 112 of the Clean Air Act	<u>2060-AV20</u>
6-20 (62)	EPA/OAR	Proposed Rule Stage	National Emission Standards for Hazardous Air Pollutants: Reciprocating Internal Combustion Engines and New Source Performance Standards: Internal Combustion Engines; Electronic Reporting Amendments	<u>2060-AV40</u>
6-21 (63)	EPA/OAR	Proposed Rule Stage	Revisions to the Air Emission Reporting Requirements (AERR)	<u>2060-AV41</u>
6-22 (64)	EPA/OAR	Proposed Rule Stage	Phasedown of Hydrofluorocarbons: Allowance Allocation Methodology for 2024 and Later Years	<u>2060-AV45</u>

6-23 (65)	EPA/OAR	Proposed Rule Stage	Restrictions on Certain Uses of Hydrofluorocarbons Under Subsection (i) of the American Innovation and Manufacturing Act	2060-AV46
6-24 (66)	EPA/OAR	Proposed Rule Stage	Regulatory Requirements for New HAP Additions to Part 63	2060-AV47
6-25 (67)	EPA/OAR	Proposed Rule Stage	Implementing Regulations Under 40 CFR Part 60 Subpart Ba Adoption and Submittal of State Plans for Designated Facilities	2060-AV48
6-26 (68)	EPA/OAR	Proposed Rule Stage	Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles	2060-AV49
6-27 (69)	EPA/OAR	Proposed Rule Stage	Greenhouse Gas Emissions Standards for Heavy-Duty Engines and Vehicles-Phase 3	2060-AV50
6-28 (70)	EPA/OAR	Proposed Rule Stage	Reconsideration of the National Ambient Air Quality Standards for Particulate Matter	2060-AV52
6-29 (71)	EPA/OAR	Proposed Rule Stage	NESHAP: Coal-and Oil-Fired Electric Utility Steam Generating Units-Review of the Residual Risk and Technology Review	2060-AV53
6-30 (72)	EPA/OAR	Proposed Rule Stage	National Emission Standards for Hazardous Air Pollutants: Plywood and Composite Wood Products Residual Risk and Technology Review Amendments	2060-AV56
6-31 (73)	EPA/OAR	Proposed Rule Stage	National Emission Standards for Hazardous Air Pollutants: Taconite Iron Ore Processing Residual Risk and Technology Review	2060-AV58
6-32 (74)	EPA/OAR	Proposed Rule Stage	National Emission Standards for Hazardous Air Pollutants: Lime Manufacturing Plants; Amendments	2060-AV59
6-33 (75)	EPA/OAR	Proposed Rule Stage	Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NNSR): Regulations Related to Project Emissions Accounting	2060-AV62
6-34 (76)	EPA/OAR	Proposed Rule Stage	Revision to 40 CFR Part 50, Appendix D, "Reference Measurement Principle and Calibration Procedure for the Measurement of Ozone in the Atmosphere (Chemiluminescence Method)"	2060-AV63
6-35 (77)	EPA/OAR	Proposed Rule Stage	Reconsideration of the National Ambient Air Quality Standards for Ozone	2060-AV64

6-36 (78)	EPA/OAR	Proposed Rule Stage	Protection of Stratospheric Ozone: Updates Related to the Use of Ozone-Depleting Substances as Process Agents	<u>2060-AV65</u>
6-37 (79)	EPA/OAR	Proposed Rule Stage	Revisions to Minor New Source Review (NSR) Program Requirements for State Implementation Plans	<u>2060-AV67</u>
6-38 (80)	EPA/OAR	Proposed Rule Stage	National Emission Standards for Hazardous Air Pollutants: Rubber Tire Manufacturing Residual Risk and Technology Review	<u>2060-AV70</u>
6-39 (81)	EPA/OAR	Proposed Rule Stage	National Emission Standards for Hazardous Air Pollutants and New Source Performance Standards for the Synthetic Organic Chemical Manufacturing Industry and Other Certain Equipment Leak Processes	<u>2060-AV71</u>
6-40 (82)	EPA/OAR	Proposed Rule Stage	Request from States for Removal of Gasoline Volatility Waiver	<u>2060-AV73</u>
6-41 (83)	EPA/OAR	Proposed Rule Stage	National Emission Standards for Hazardous Air Pollutants for the Group I and II Polymers and Resins Industries	<u>2060-AV74</u>
6-42 (84)	EPA/OAR	Proposed Rule Stage	Protection of Stratospheric Ozone: Listing of Substitutes Under the Significant New Alternatives Policy Program in Commercial and Industrial Refrigeration	<u>2060-AV77</u>
6-43 (85)	EPA/OAR	Proposed Rule Stage	New Source Performance Standards for Secondary Lead Smelting	<u>2060-AV78</u>
6-44 (86)	EPA/OAR	Proposed Rule Stage	State Implementation Plans: Restatement of SSM Policy; Findings of Inadequacy; and Amendment Provisions Applying to Excess Emissions During SSM Periods	<u>2060-AV79</u>
6-45 (87)	EPA/OAR	Proposed Rule Stage	Petroleum and Chemical Sector Reconsideration	<u>2060-AV80</u>
6-46 (88)	EPA/OAR	Proposed Rule Stage	Revisions to Method 320	<u>2060-AV81</u>
6-47 (89)	EPA/OAR	Proposed Rule Stage	National Emission Standard for Hazardous Air Pollutants: Integrated Iron and Steel Manufacturing Facilities Rule Amendments	<u>2060-AV82</u>
6-48 (90)	EPA/OAR	Proposed Rule Stage	Methane Emissions and Waste Reduction Incentive Program and Revisions to the Mandatory Greenhouse Gas Reporting Rule for Petroleum and Natural Gas Systems	<u>2060-AV83</u>

6-49 (91)	EPA/OAR	Final Rule Stage	National Emission Standards for Hazardous Air Pollutants: Site Remediation	<u>2060-AN36</u>
6-50 (92)	EPA/OAR	Final Rule Stage	Revision to Method 23--Determination of Polychlorinated Dibenzo-P-Dioxins and Polychlorinated Dibenzofurans From Stationary Sources	<u>2060-AT09</u>
6-51 (93)	EPA/OAR	Final Rule Stage	Protection of Stratospheric Ozone: Listing of Substitutes Under the Significant New Alternatives Policy Program in Refrigeration, Air Conditioning, and Fire Suppression	<u>2060-AT78</u>
6-52 (94)	EPA/OAR	Final Rule Stage	Control of Air Pollution From New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards	<u>2060-AU41</u>
6-53 (95)	EPA/OAR	Final Rule Stage	National Emission Standards for Hazardous Air Pollutants: Primary Copper Smelting Residual Risk and Technology Review and Primary Copper Smelting Area Source Technology Review	<u>2060-AU63</u>
6-54 (96)	EPA/OAR	Final Rule Stage	Control of Air Pollution From Aircraft Engines: Emission Standards and Test Procedures	<u>2060-AU69</u>
6-55 (97)	EPA/OAR	Final Rule Stage	National Volatile Organic Compound Emission Standards for Aerosol Coatings Amendments	<u>2060-AU94</u>
6-56 (98)	EPA/OAR	Final Rule Stage	Stds of Performance for Steel Plants:EAFs Constructed After 10/21/74 & on or Before 8/17/83;Stds of Performance for Steel Plants:EAFs & AOD Constructed After 8/17/83	<u>2060-AU96</u>
6-57 (99)	EPA/OAR	Final Rule Stage	NESHAP for the Gasoline Distribution Source Category (40 CFR Part 63, Subparts R and BBBB) and NSPS for Bulk Gasoline Terminals (40 CFR 60 Subpart XX) Review	<u>2060-AU97</u>
6-58 (100)	EPA/OAR	Final Rule Stage	NESHAP: Coal- and Oil-Fired Electric Utility Steam Generating Units-Revocation of the 2020 Reconsideration, and Affirmation of the Appropriate and Necessary Supplemental Finding	<u>2060-AV12</u>
6-59 (101)	EPA/OAR	Final Rule Stage	Rescinding the Rule on Increasing Consistency and Transparency in Considering Benefits and Costs in the Clean Air Act Rulemaking Process	<u>2060-AV18</u>

6-60 (102)	EPA/OAR	Final Rule Stage	New Source Performance Standards Review for Industrial Surface Coating of Plastic Parts for Business Machines	<u>2060-AV23</u>
6-61 (103)	EPA/OAR	Final Rule Stage	Air Quality: Revision to Definition of Volatile Organic Compounds--Exclusion of Hexafluoro-2-Butene (HFO-1336mzz-E)	<u>2060-AV24</u>
6-62 (104)	EPA/OAR	Final Rule Stage	National Emission Standards for Hazardous Air Pollutants: Wood Preserving Area Sources Technology Review	<u>2060-AV27</u>
6-63 (105)	EPA/OAR	Final Rule Stage	Automobiles and Light-Duty Trucks New Source Performance Standards Review	<u>2060-AV30</u>
6-64 (106)	EPA/OAR	Final Rule Stage	National Emission Standards for Hazardous Air Pollutants: Paint Stripping and Miscellaneous Surface Coating Operations at Area Sources	<u>2060-AV34</u>
6-65 (107)	EPA/OAR	Final Rule Stage	Testing Provisions for Air Emission Sources	<u>2060-AV35</u>
6-66 (108)	EPA/OAR	Final Rule Stage	National Emission Standards for Hazardous Air Pollutants: Miscellaneous Coating Manufacturing Residual Risk and Technology Review Amendments	<u>2060-AV38</u>
6-67 (109)	EPA/OAR	Final Rule Stage	Removal of Title V Emergency Affirmative Defense Provisions From State Operating Permit Programs and the Federal Operating Permit Program	<u>2060-AV39</u>
6-68 (110)	EPA/OAR	Final Rule Stage	Review of NSPS for Lead Acid Battery Manufacturing Plants and National Emission Standards for Hazardous Air Pollutants for Lead Acid Battery Manufacturing Area Sources Technology Review	<u>2060-AV43</u>
6-69 (111)	EPA/OAR	Final Rule Stage	National Perchloroethylene Air Emission Standards for Dry Cleaning Facilities	<u>2060-AV44</u>
6-70 (112)	EPA/OAR	Final Rule Stage	Federal Implementation Plan Addressing Regional Ozone Transport for the 2015 Ozone National Ambient Air Quality Standards	<u>2060-AV51</u>
6-71 (113)	EPA/OAR	Final Rule Stage	Reconsideration of the 2020 National Emission Standards for Hazardous Air Pollutants (NESHAP): Miscellaneous Organic Chemical Manufacturing Residual Risk and Technology Review	<u>2060-AV54</u>

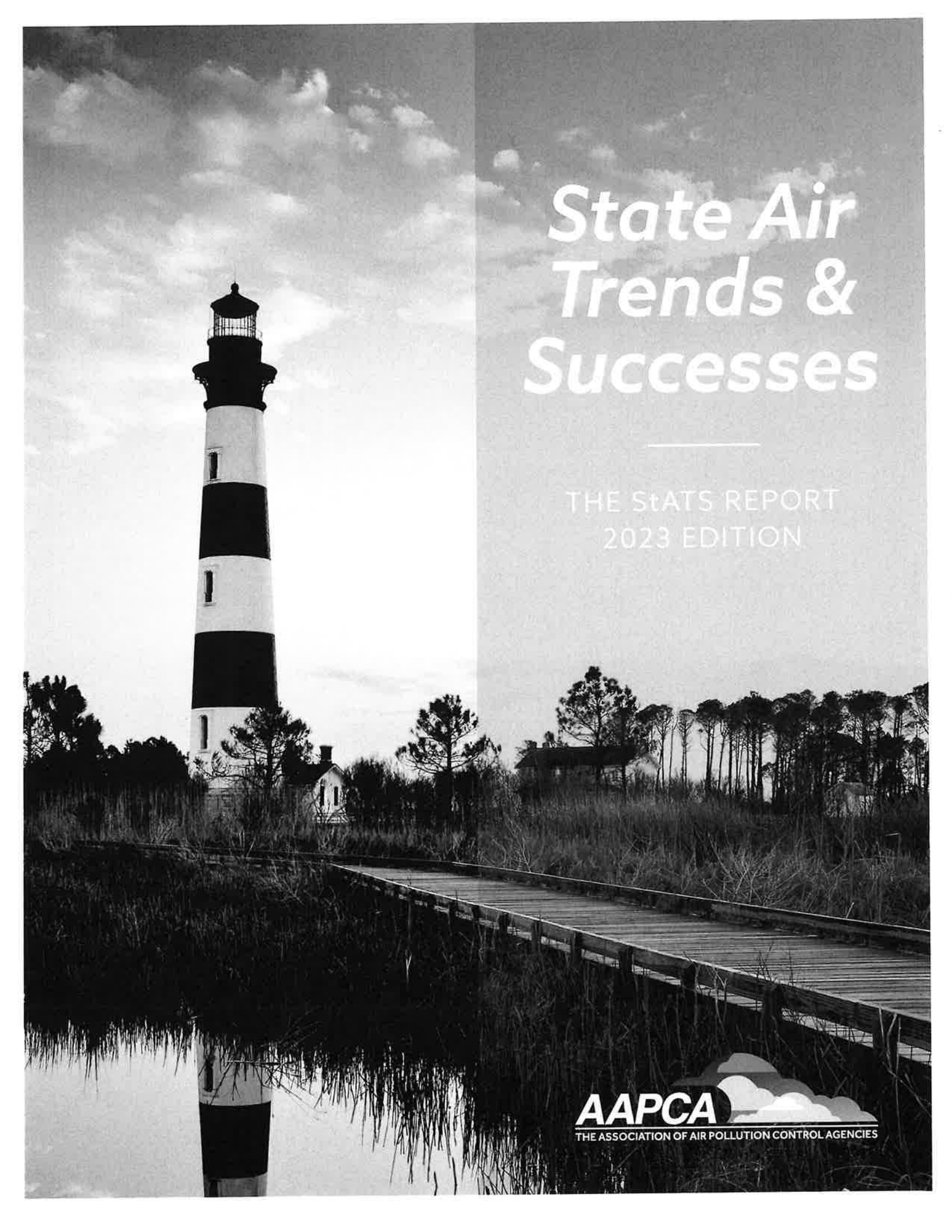
6-72 (114)	EPA/OAR	Final Rule Stage	Renewable Fuel Standard Program: Canola Oil Pathways to Renewable Diesel, Jet Fuel, Naphtha, Liquefied Petroleum Gas and Heating Oil	2060-AV55
6-73 (115)	EPA/OAR	Final Rule Stage	Redesignation of Stark County, Ohio for the 2008 Lead (Pb) National Ambient Air Quality Standards (NAAQS)	2060-AV66
6-74 (116)	EPA/OAR	Final Rule Stage	Revisions to the Lists of Reformulated Gasoline Covered Areas	2060-AV87
6-75 (117)	EPA/OAR	Final Rule Stage	Extension of Submittal Date for State Plans Required Under the Affordable Clean Energy Rule	2060-AV88
7-1 (118)	EPA/OCSPP	Proposed Rule Stage	Pesticides; Expansion of Crop Grouping Program	2070-AJ28
7-2 (119)	EPA/OCSPP	Proposed Rule Stage	Pesticides; Administrative Corrections and Removal of Obsolete Information	2070-AK13
7-3 (120)	EPA/OCSPP	Proposed Rule Stage	Restoration of Inadvertently-Removed Exemption From the Requirements of FIFRA	2070-AK25
7-4 (121)	EPA/OCSPP	Proposed Rule Stage	Pesticides; Modification to the Minimum Risk Pesticide Listing Program and Other Exemptions Under FIFRA Section 25(b)	2070-AK55
7-5 (122)	EPA/OCSPP	Proposed Rule Stage	Pesticides; Agricultural Worker Protection Standard; Reconsideration of Amendments to the Application Exclusion Zone Requirements	2070-AK92
7-6 (123)	EPA/OCSPP	Proposed Rule Stage	Pesticides; Required Electronic Submission of Foreign Purchaser Acknowledgement Statements	2070-AK96
7-7 (124)	EPA/OCSPP	Proposed Rule Stage	Fees for the Administration of the Toxic Substances Control Act (TSCA)	2070-AK64
7-8 (125)	EPA/OCSPP	Proposed Rule Stage	Updates to New Chemicals Regulations Under the Toxic Substances Control Act (TSCA)	2070-AK65
7-9 (126)	EPA/OCSPP	Proposed Rule Stage	Methylene Chloride; Rulemaking Under Section 6(a) of the Toxic Substances Control Act (TSCA)	2070-AK70
7-10 (127)	EPA/OCSPP	Proposed Rule Stage	1-Bromopropane; Rulemaking Under Section 6(a) of the Toxic Substances Control Act (TSCA)	2070-AK73

7-11 (128)	EPA/OCSPP	Proposed Rule Stage	Carbon Tetrachloride; Rulemaking Under Section 6(a) of the Toxic Substances Control Act (TSCA)	<u>2070-AK82</u>
7-12 (129)	EPA/OCSPP	Proposed Rule Stage	Trichloroethylene; Rulemaking Under Section 6(a) of the Toxic Substances Control Act (TSCA)	<u>2070-AK83</u>
7-13 (130)	EPA/OCSPP	Proposed Rule Stage	Perchloroethylene; Rulemaking Under Section 6(a) of the Toxic Substances Control Act (TSCA)	<u>2070-AK84</u>
7-14 (131)	EPA/OCSPP	Proposed Rule Stage	N-Methylpyrrolidone; Rulemaking Under Section 6(a) of the Toxic Substances Control Act (TSCA)	<u>2070-AK85</u>
7-15 (132)	EPA/OCSPP	Proposed Rule Stage	Procedures for Chemical Risk Evaluation Under the Toxic Substances Control Act (TSCA)	<u>2070-AK90</u>
7-16 (133)	EPA/OCSPP	Proposed Rule Stage	Reconsideration of the Dust-Lead Hazard Standards and Dust-Lead Post Abatement Clearance Levels	<u>2070-AK91</u>
7-17 (134)	EPA/OCSPP	Proposed Rule Stage	Revisions to Regulations on Persistent, Bioaccumulative, and Toxic Chemicals Subject to TSCA Section 6(h)	<u>2070-AL02</u>
7-18 (135)	EPA/OCSPP	Proposed Rule Stage	Other Chemical Substances Undergoing TSCA Section 6 Risk Evaluation; Significant New Use Rule for Certain Non-ongoing Uses	<u>2070-AL05</u>
7-19 (136)	EPA/OCSPP	Proposed Rule Stage	Phthalates; Significant New Use Rule for Certain Non-Ongoing Uses	<u>2070-AL06</u>
7-20 (137)	EPA/OCSPP	Proposed Rule Stage	Flame Retardants; Significant New Use Rule for Certain Non-ongoing Uses	<u>2070-AL07</u>
7-21 (138)	EPA/OCSPP	Proposed Rule Stage	Certain Solvents; Significant New Use Rule for Certain Non-ongoing Uses	<u>2070-AL08</u>
7-22 (139)	EPA/OCSPP	Proposed Rule Stage	Per- and Polyfluoro Alkyl Substances (PFAS) Designated as Inactive on the TSCA Inventory; Significant New Use Rule	<u>2070-AL10</u>
7-23 (140)	EPA/OCSPP	Proposed Rule Stage	Changes to Reporting Requirements for Per- and Polyfluoroalkyl Substances and to Supplier Notifications for Chemicals of Special Concern; Community Right-to-Know Toxic Chemical Release Reporting	<u>2070-AK97</u>

7-24 (141)	EPA/OCSP	Proposed Rule Stage	Addition of Certain Per- and Polyfluoroalkyl Substances (PFAS) to the Toxics Release Inventory (TRI)	<u>2070-AL03</u>
7-25 (142)	EPA/OCSP	Final Rule Stage	Pesticides; Exemptions of Certain Plant-Incorporated Protectants (PIPs) Derived From Newer Technologies	<u>2070-AK54</u>
7-26 (143)	EPA/OCSP	Final Rule Stage	Pesticides; Addition of Chitosan to the Active Ingredient Listing Eligible for Minimum Risk Pesticides	<u>2070-AK56</u>
7-27 (144)	EPA/OCSP	Final Rule Stage	TSCA Section 8(a)(7) Reporting and Recordkeeping Requirements for Perfluoroalkyl and Polyfluoroalkyl Substances	<u>2070-AK67</u>
7-28 (145)	EPA/OCSP	Final Rule Stage	Confidential Business Information Claims Under the Toxic Substances Control Act (TSCA)	<u>2070-AK68</u>
7-29 (146)	EPA/OCSP	Final Rule Stage	Asbestos Part 1: Chrysotile Asbestos; Regulation of Certain Conditions of Use Under Section 6(a) of the Toxic Substances Control Act (TSCA)	<u>2070-AK86</u>
7-30 (147)	EPA/OCSP	Final Rule Stage	Formaldehyde Emission Standards for Composite Wood Products; Voluntary Consensus Standards Update	<u>2070-AK94</u>
7-31 (148)	EPA/OCSP	Final Rule Stage	Asbestos; Reporting and Recordkeeping Requirements Under the Toxic Substances Control Act (TSCA)	<u>2070-AK99</u>
7-32 (149)	EPA/OCSP	Final Rule Stage	Addition of Diisononyl Phthalate Category; Community Right-to-Know Toxic Chemical Release Reporting	<u>2025-AA17</u>
7-33 (150)	EPA/OCSP	Final Rule Stage	Parent Company Definition for Toxics Release Inventory (TRI) Reporting	<u>2070-AK42</u>
7-34 (151)	EPA/OCSP	Final Rule Stage	Community Right-to-Know; Adopting 2022 North American Industry Classification System (NAICS) Codes for Toxics Release Inventory (TRI) Reporting	<u>2070-AL0</u>

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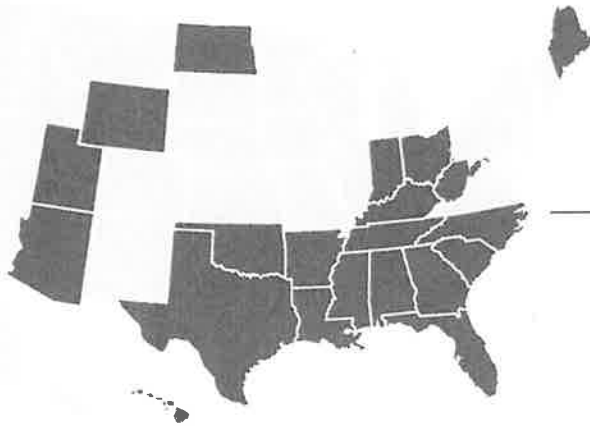
State Air Trends & Successes

THE STATS REPORT
2023 EDITION

AAPCA

THE ASSOCIATION OF AIR POLLUTION CONTROL AGENCIES

State Environmental Agencies Currently Represented on the AAPCA Board of Directors



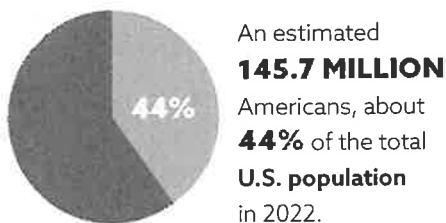
Alabama	North Carolina
Arizona	North Dakota
Arkansas	Ohio
Florida	Oklahoma
Georgia	South Carolina
Hawaii	Tennessee
Indiana	Texas
Kentucky	Utah
Louisiana	West Virginia
Maine	Wyoming
Mississippi	

Association of Air Pollution Control Agencies (AAPCA)

The Association of Air Pollution Control Agencies, or AAPCA, is a national, non-profit, consensus-driven organization focused on assisting state and local air quality agencies and personnel with implementation and technical issues associated with the federal Clean Air Act.

Created in 2012, AAPCA represents 48 state and local air pollution control agencies, and senior officials from 21 state environmental agencies currently sit on the AAPCA Board of Directors. AAPCA is housed in Lexington, Kentucky as an affiliate of The Council of State Governments. More information about AAPCA can be found on the Association's website: www.cleanairact.org.

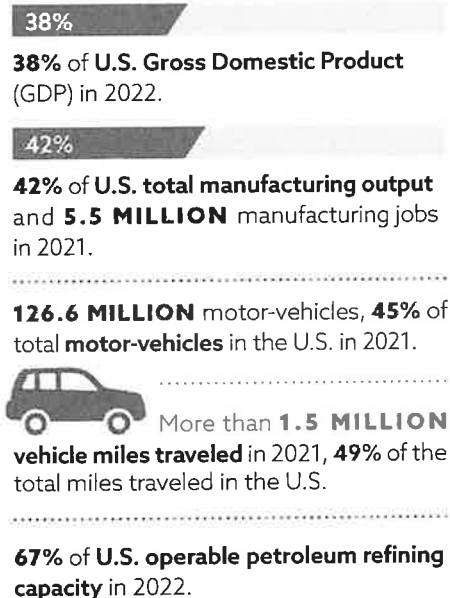
Footprint of AAPCA Member States



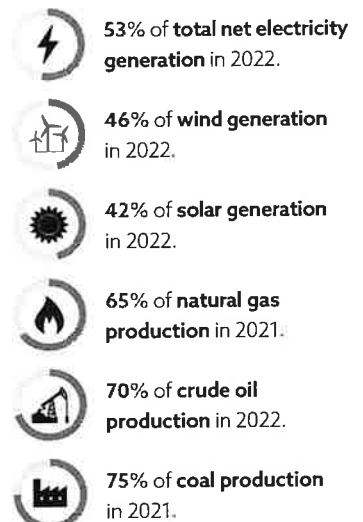
From **2012 to 2022**, a **population growth** of



State members of the AAPCA Board of Directors have primary responsibility for protecting air quality for a significant portion of the country, as reflected in the following statistics:



61% of total U.S. energy production in 2020, as well as:



Foreword

Dear Readers,

Today, we're enjoying the best air quality of our lifetimes. Right now, visibility at our greatest natural treasures — our National Parks and Wilderness Areas — is better than we've seen in decades. And we should all be proud of the significant public health benefits resulting from our work. How did we do it? Great federal, state, local and private partnerships and relationships were certainly critical to this success. In my home state of North Carolina, we can see 40 miles further (on the haziest days) than we could 20 years ago in our Class I areas. That's a remarkable improvement!

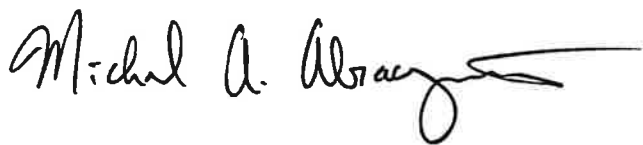
We continue to make progress in the nation's air quality. State, local, and tribal agencies, including the membership of the Association of Air Pollution Control Agencies (AAPCA), have dedicated significant time and resources to fulfilling this important mission. AAPCA is a consensus-driven organization of 48 state and local air agencies focused on assisting members with implementing technical issues associated with the federal Clean Air Act. Comprised of senior officials from 21 state environmental agencies, AAPCA's Board of Directors is geographically diverse, providing a unique forum of perspectives for us to engage as we work to improve air quality for the more than 145 million Americans we represent. AAPCA's Member States also guide the Association on a consensus basis, seeking to engage our federal co-regulator partners on common principles as we implement the Clean Air Act.

I'm pleased to present the Association's 2023 edition of its annual publication, *State Air Trends & Successes: The StATS Report*. Highlights from this year's report include:

- Since 2000, AAPCA Member States have achieved a 52 percent decrease in the combined emissions of the pollutants (or pollutant precursors) for which there are national ambient air quality standards, or NAAQS.
- The United States has reduced aggregate emissions of criteria air pollutants by 78 percent, from 1970 to 2021.
- From 2000 to 2022, AAPCA Member States reduced emissions of sulfur dioxide (SO₂) and oxides of nitrogen (NO_x) from the electricity sector by 92 percent and 84 percent, respectively.
- From 2000 to 2020, energy-related carbon dioxide (CO₂) emissions in AAPCA Member States declined 20 percent, while energy production increased 49 percent.
- Reported toxic air releases decreased nationally by 26 percent from 2012 to 2021. AAPCA Member States were responsible for roughly 66 percent of that reduction.
- From 2000 to 2020, visibility in 156 national parks and wilderness areas across the U.S. has improved by 33 percent on the clearest days and by 28 percent on the most impaired days.

The recipe that led to those successes will have to be repeated as we tackle major challenges ahead, including climate change and emerging contaminants. As the primary implementers of Clean Air Act programs, state, local, and tribal air agencies are well positioned to address those challenges by working directly with communities, regulated entities, and other stakeholders. Again, we have built the necessary relationships, credibility, and trust for interfacing with the public on environmental challenges. We look forward to continuing our important work as we engage federal partners and other stakeholders to improve air quality across the nation.

Thank you for reading.



MICHAEL ABRACZINSKAS

Director, Division of Air Quality

North Carolina Department of Environmental Quality

President, AAPCA

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Introduction

State Air Trends & Successes, or *The StATS Report*, examines the remarkable progress that the United States has achieved in air quality under the Clean Air Act, which places precedence on federal, state, and local cooperation. Through cooperative federalism, state and local governments coordinate with the U.S. Environmental Protection Agency (EPA) to implement national standards that protect public health and the environment. *The StATS Report*, published annually by the Association of Air Pollution Control Agencies (AAPCA), looks at the central role of state and local air agencies in improving the nation's air quality.

As primary implementers of Clean Air Act rules, state, local, and tribal air agencies work directly with communities, regulated industries, and other stakeholders in their jurisdiction. In this capacity, air agencies have built the necessary relationships, credibility, and trust for interfacing with the public on environmental challenges.

Polling the Public About the Environment

Gallup's annual Environment poll suggests that public perception about the nation's environmental and air quality may be contrary to readily available data. In 2023, only 44 percent of respondents were "Very satisfied" (11 percent) or "Somewhat satisfied" (33 percent) with the "quality of the environment in the nation," while 53 percent were "Somewhat dissatisfied" (30 percent) or "Very dissatisfied" (23 percent). Since 2001, respondents worrying a "Great deal" or "Fair

amount" about the environment has never been below 62 percent and often hovers near 70 percent. Over the same period, the percentage of respondents that think the environment is "Getting better" has never been above 42 percent and those that think it is "Getting worse" ranged from 48 to 68 percent.

Gallup has regularly queried the public on air pollution, with polling data on the topic going back to 1989. Consistently, the percentage of respondents worried a "Great deal" or "Fair amount" about air pollution breaches 70 percent. In fact, only in one year did polling data show public worry below 70 percent: 69 percent in 2004.

As *The StATS Report* details, national metrics for air pollution and overall air quality reveal a disconnect in the public's perception of environmental trends. From 1990 through 2021, a period that roughly aligns with Gallup's historical polling data on air pollution, emissions of all six criteria air pollutants – carbon monoxide (CO), particulate matter (PM₁₀ and PM_{2.5}), ground-level ozone (O₃), lead (Pb), nitrogen dioxide (NO₂), and sulfur dioxide (SO₂) – were down at least 33 percent, with ambient air concentrations of CO, O₃, Pb, NO₂, and SO₂ reduced at least 21 percent. Polling data is a limited window into public views, but this disconnect presents a unique challenge as air agencies continue to plan for tough-to-find emissions reductions while also responding to public concern about local and sometimes national and global issues.

Gallup Environment Poll Results, 1989-2022

Question: How much do you personally worry about air pollution?					
Date of Poll	Great deal	Fair amount	Only a little	Not at all	No opinion
2022 Mar 1-18	45%	30%	17%	8%	*
2021 Mar 1-15	41%	32%	20%	8%	*
2020 Mar 2-13	48%	28%	16%	9%	*
2019 Mar 1-10	43%	31%	16%	10%	*
2018 Mar 1-8	46%	30%	17%	7%	*
2017 Mar 1-5	47%	31%	15%	7%	*
2016 Mar 2-6	43%	31%	19%	7%	*
2015 Mar 5-8	38%	33%	19%	10%	*
2014 Mar 6-9	46%	27%	21%	7%	*
2013 Mar 7-10	40%	30%	20%	9%	*
2012 Mar 8-11	36%	35%	22%	7%	*
2011 Mar 3-6	36%	36%	20%	8%	*
2010 Mar 4-7	38%	32%	22%	8%	*
2009 Mar 5-8	45%	31%	18%	6%	*
2008 Mar 6-9	43%	35%	17%	6%	*
2007 Mar 11-14	46%	33%	15%	5%	*
2006 Mar 13-16	44%	34%	15%	7%	*
2004 Mar 8-11	39%	30%	23%	8%	*
2003 Mar 3-5	42%	32%	20%	6%	*
2002 Mar 4-7	45%	33%	18%	4%	*
2001 Mar 5-7	48%	34%	14%	4%	*
2000 Apr 3-9	59%	29%	9%	3%	*

Introduction (continued)

Question: How much do you personally worry about air pollution?					
Date of Poll	Great deal	Fair amount	Only a little	Not at all	No opinion
1999 Apr 13-14	52%	35%	10%	3%	*
1999 Mar 12-14	47%	33%	16%	4%	±
1997 Oct 27-28	42%	34%	18%	5%	1
1991 Apr 11-14	59%	28%	10%	4%	±
1990 Apr 5-8	58%	29%	9%	4%	±
1989 May 4-7	63%	24%	8%	4%	*

*Less than 0.5 percent

Source: Gallup Environment poll data available here.

Air Quality Data and Trends: A Good Story to Tell

By virtually any metric, the nation's air is cleaner and healthier than five decades ago, when the Clean Air Act was first passed. *The StATS Report* catalogues key trends and indicators using publicly available data from the U.S. EPA and other federal agencies, such as the U.S. Energy Information Administration that is housed in the U.S. Department of Energy (see page 7, "Types of Air Quality Data and Metrics"). These data are important for understanding how air pollution control and planning efforts have improved air quality, including under the national ambient air quality standards (NAAQS) and regional haze programs as well as for hazardous air pollutants and greenhouse gases. When relevant, this report also presents economic and social indicators, such as gross domestic product (GDP) and population growth, to provide context for some air quality metrics (For example: From 1970 through 2021, U.S. GDP rose nearly 300 percent while aggregate emissions of the six criteria air pollutants fell 78 percent).

State Air Trends & Successes: The StATS Report provides these metrics and trends in three sections:

- The first section, "AAPCA Member State Air Trends & Successes," focuses on the 21 AAPCA Member States, which are responsible for protecting air quality for nearly 146 million Americans, about 44 percent of the U.S. population. These states have seen above-average population growth, are home to more than 5.5 million manufacturing jobs, and produced 61 percent of the nation's total energy in 2020.
- The second section, "American Air Quality in an International Context," documents U.S. air quality improvement and economic indicators alongside other nations. The United States is the clear leader in air quality internationally while ranking first in GDP, second in energy production, and third in population.
- The final section, "Air Quality Trends in the United States," presents trends for ambient concentrations and emissions of pollutants under the NAAQS program, toxic air releases, visibility in national parks, and greenhouse gases – data show marked, prolonged improvement in every metric.

As a whole, *The StATS Report* underscores that environmental protection and economic development can both be achieved – indeed, already have been – through the collaborative efforts of state, local, tribal, and federal governments.

Meeting the Mission of State and Local Air Agencies

While air quality has improved substantially, air agencies continue to strive toward their missions of protecting air quality and public health. Core monitoring, modeling, and emissions inventory efforts have become more – not less – complex and technical, as has the development of state implementation plans (SIPs) to attain/maintain federal air quality standards. Located on the ground in their communities, state, local, and tribal air agencies deeply understand how national environmental efforts must intertwine with local priorities, economic strategies, and social needs.

As noted, the policy, technical, and jurisdictional expertise of air agencies is also critical in their role on the frontlines. Citizens and communities now increasingly look to social media and real-time technology like air sensors to become informed, requiring new and innovative outreach methods by agencies that build on their established credibility. Emerging environmental issues like wildfires, per- and polyfluoroalkyl substances (PFAS), and ethylene oxide (EtO) also continue to push the capacity of state and local air agencies.

In short, driving emissions reductions to better air quality has never been more challenging and resource intensive. The increasingly complex work of understanding air quality problems (and solutions) is now coupled with the need to respond to the public faster and more informed than ever. Despite these challenges and level (sometimes reduced) funding and staffing, air agencies have successfully continued to improve air quality because of dedicated public servants, developing best practices, and adopting technology to advance efficient, cost-effective solutions.

The positive air quality trends presented in *The StATS Report* are the result of sustained work and deep coordination among federal, state, tribal, and local agencies, all of which have a common goal of protecting public health. With increased efforts to improve public engagement and implement new federal regulations and legislation, cooperative federalism remains a proven and necessary framework for achieving successful environmental outcomes.

Types of Air Quality Data and Metrics

This report primarily relies on data from the U.S. Environmental Protection Agency (EPA) and other federal agencies, such as the U.S. Energy Information Administration (EIA), to evaluate air quality trends. These trends include metrics for criteria air pollutants, air toxics and hazardous air pollutants, visibility progress in National Parks and wilderness areas, and greenhouse gases, with sources provided below each chart or graph and in the source notes. Also included in this report are case studies and short excerpts from other relevant analyses, which include links to their source and data.

Criteria Air Pollutant Data

Trends and indicators of air quality can be measured in a variety of ways, but an important group of data to analyze is that of the air pollutants that are regulated under the federal Clean Air Act. Section 109 of the Clean Air Act requires U.S. EPA to establish both primary and secondary national ambient air quality standards, or NAAQS. Primary NAAQS are “standards the attainment and maintenance of which in the judgment of the Administrator, based on such criteria and allowing an adequate margin of safety, are requisite to protect the public health,” while secondary NAAQS “specify a level of air quality the attainment and maintenance of which... is requisite to protect the public welfare from any known or anticipated adverse effects associated with the presence of such air pollutant in the ambient air.”¹

NAAQS have been set for six “criteria” pollutants: carbon monoxide (CO), sulfur dioxide (SO₂), ground-level ozone (O₃), fine and coarse particulate matter (PM_{2.5} and PM₁₀), lead (Pb), and nitrogen dioxide (NO₂). Individual NAAQS may differ in form (for example, annual fourth highest daily maximum 8-hour concentration average over three years, for ozone), level² (often measured in parts per billion or micrograms per cubic meter), and averaging time (from one hour up to one year).³ U.S. EPA and the Clean Air Scientific Advisory Committee periodically review the adequacy of the NAAQS according to the statute.⁴

Nationally, ambient air pollution data from thousands of monitors across the United States are collected by U.S. EPA and state, local, and tribal air pollution control agencies and provided to the Air Quality System, or AQS. These data are used to “assess air quality, assist in attainment/non-attainment designations, evaluate State Implementation Plans [SIPs] for non-attainment areas, perform modeling for permit review analysis, and prepare reports for Congress as mandated by the Clean Air Act.”⁵

U.S. EPA reports on long-term air quality trends by preparing data analyses that show the overall trend lines for pollutant concentrations and emissions. Primary sources that inform this report include:

- Criteria air pollutant concentration data from U.S. EPA’s analysis of the AQS that looks at long-term trends in air quality.⁶
- Data showing emissions trends of the criteria pollutants from U.S. EPA’s Air Pollutant Emissions Trends Data,⁷ which relies on the National Emissions Inventory (NEI). The NEI is “a comprehensive and detailed estimate of air emissions of criteria pollutants, criteria precursors, and hazardous air pollutants from air emissions sources... released every three years based primarily upon data provided [to the Emissions Inventory System (EIS)] by State, Local, and Tribal air agencies for sources in their jurisdictions and supplemented by data developed by the U.S. EPA.”⁸
- Design values that are computed and published annually by U.S. EPA and defined as “a statistic that describes the air quality status of a given location relative to the level of the NAAQS... typically used to designate and classify nonattainment areas, as well as to assess progress towards meeting the NAAQS.”⁹

Other Air Quality Data

In addition to tracking criteria air pollutants, U.S. EPA also maintains data and develops analyses on multiple other federal air quality programs used to inform this report, including:

- The Toxic Release Inventory (TRI), which provides a consistent set of data over time for hazardous air pollutants (or air toxics) from source reporting.¹⁰
- Visibility progress tracked as part of the Regional Haze Program, with long-term trends available in U.S. EPA’s annual air quality trends report.¹¹
- In an annual progress report, the U.S. EPA publishes power sector emissions data for SO₂, nitrogen oxides (NO_x), and hazardous air pollutants, as well as carbon dioxide (CO₂).¹²

Additionally, greenhouse gas data in this report are primarily from U.S. EPA’s annual *Inventory of U.S. Greenhouse Gas Emissions and Sinks*¹³ and U.S. EIA reports, such as the *Annual Energy Outlook*, which includes CO₂ emissions data from energy sources.¹⁴

¹ 42 U.S.C. §7409(b).

² U.S. EPA states: “Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air (µg/m³).”

³ A chart of the primary and secondary NAAQS by pollutant, which includes averaging time, level, and form, can be found here.

⁴ 42 U.S.C. §7409(d).

⁵ U.S. EPA, Air Quality System. U.S. EPA notes that the AQS “also contains meteorological data, descriptive information about each monitoring station (including its geographic location and its operator), and data quality assurance/quality control information.”

⁶ Links to data summary files for national criteria pollutant trends can be found here.

⁷ Data can be found here. U.S. EPA notes: “The latest version of the 1970 – 2022 data show the trends for Tier 1 categories which distinguish pollutant emission contributions among major source types... As inventory methods are improved over time, for some emission sources an improved estimation method may be applied ‘backwards’ to previous year trend estimates.”

⁸ More information on the NEI can be found here. U.S. EPA states: “The NEI is built using the Emissions Inventory System (EIS) first to collect the data from State, Local, and Tribal air agencies and then to blend that data with other data sources.”

⁹ U.S. EPA, Air Quality Design Values.

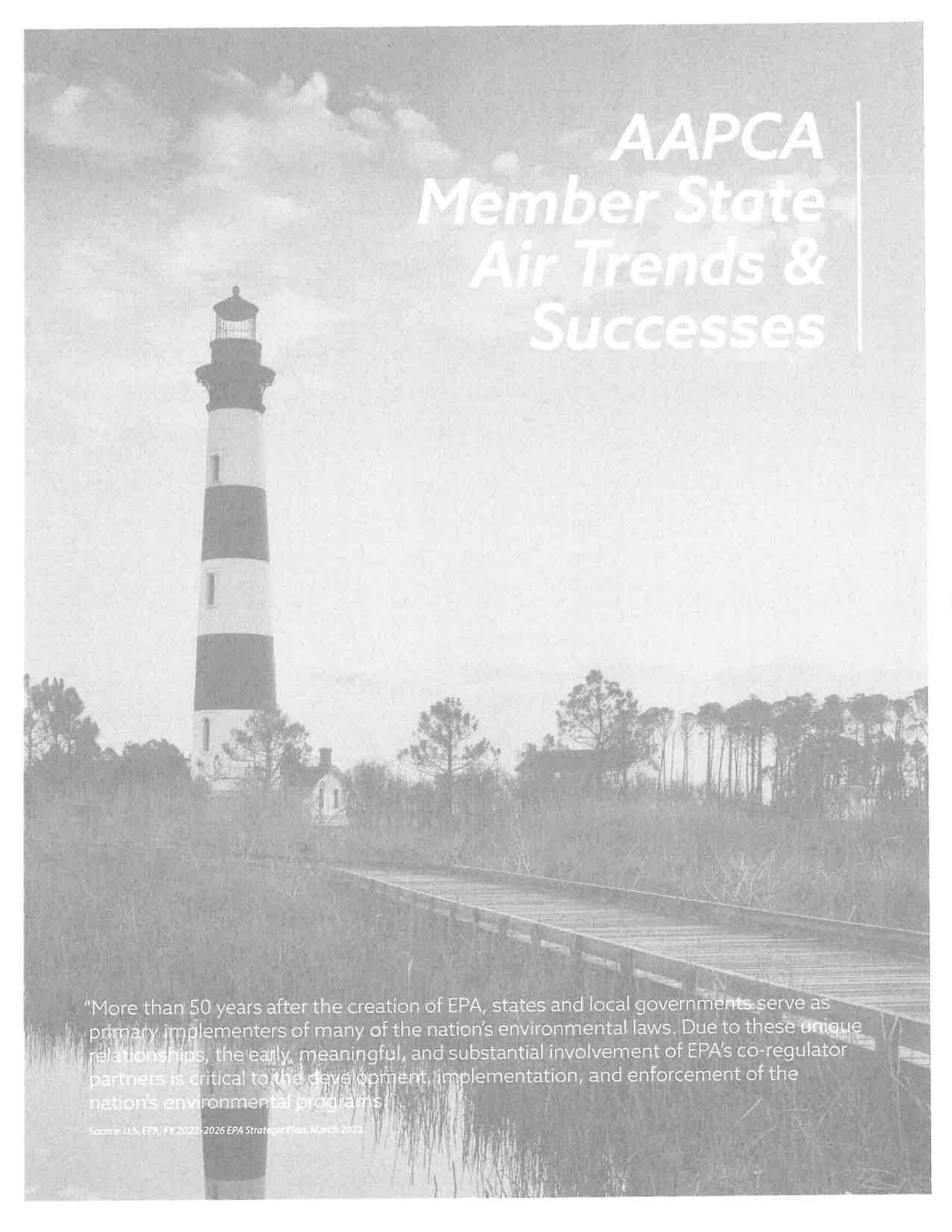
¹⁰ U.S. EPA, Toxics Release Inventory (TRI) Program. Annual TRI National Analysis here. U.S. EPA notes that the TRI “is a resource for learning about toxic chemical releases and pollution prevention activities reported by industrial and federal facilities. TRI data support informed decision-making by communities, government agencies, companies, and others. Section 313 of the *Emergency Planning and Community Right-to-Know Act* (EPCRA) created the TRI Program.”

¹¹ U.S. EPA, Air Quality – National Summary. See also: U.S. EPA, *Our Nation’s Air: Trends Through 2021*, June 2022 (Section: “Visibility Improves in Scenic Areas”).

¹² U.S. EPA, Power Sector Programs – Progress Report.

¹³ U.S. EPA releases the *Inventory of U.S. Greenhouse Gas Emissions and Sinks* each April. See also: U.S. EPA, Greenhouse Gas Inventory Data Explorer.

¹⁴ U.S. EIA, *Annual Energy Outlook 2023*, March 16, 2023.



AAPCA Member State Air Trends & Successes

"More than 50 years after the creation of EPA, states and local governments serve as primary implementers of many of the nation's environmental laws. Due to these unique relationships, the early, meaningful, and substantial involvement of EPA's co-regulator partners is critical to the development, implementation, and enforcement of the nation's environmental programs."

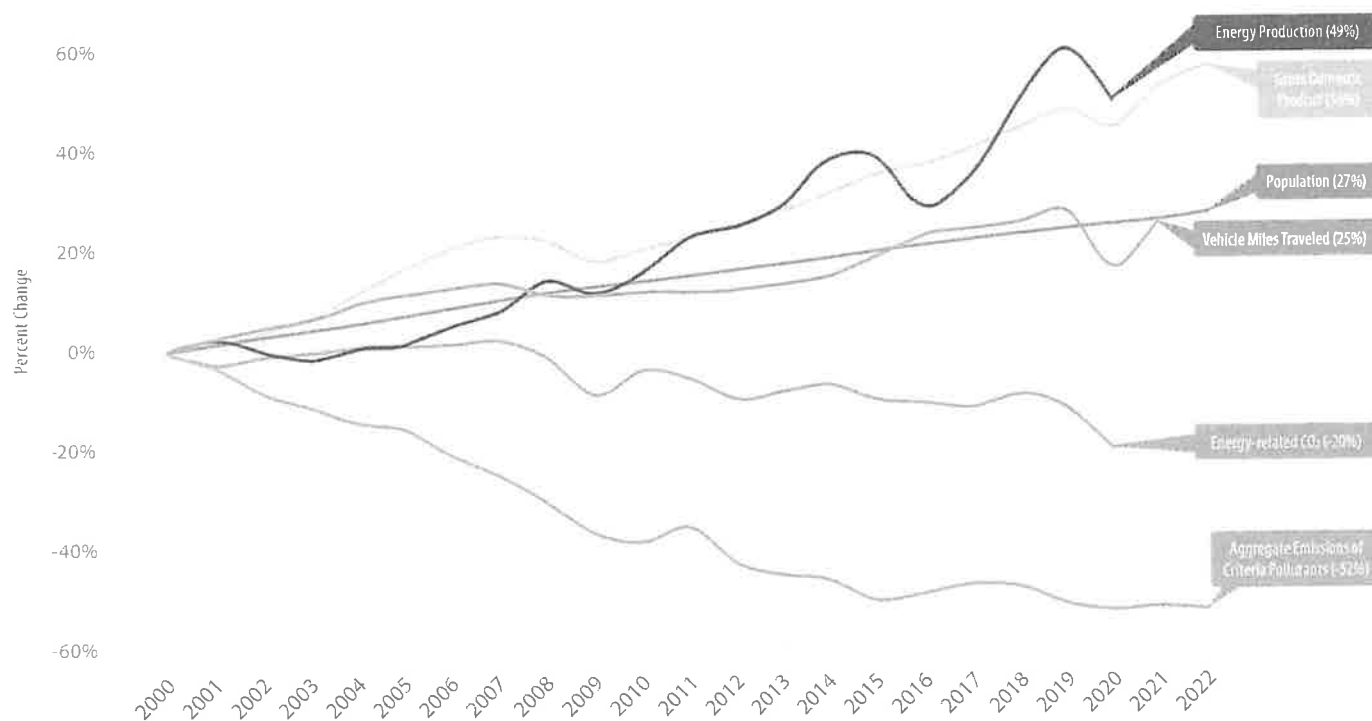
Source: U.S. EPA, FY 2022-2026 EPA Strategic Plan, March 2023

Economic Growth and Air Quality in AAPCA Member States

Since 2000, AAPCA Member States have overseen a 52 percent decrease in the combined emissions of the pollutants (or pollutant precursors) for which there are national ambient air quality standards, or NAAQS, while also experiencing significant economic and social growth over the last two decades¹⁵:

- AAPCA Member States saw a total increase in Gross Domestic Product (GDP) of 56 percent from 2000 to 2022, and contributed about 38 percent of the total U.S. GDP in 2022¹⁶;
- States in the Association reported a 25 percent increase in vehicle miles traveled from 2000 to 2021¹⁷;
- By 2022, AAPCA's membership represented more than 145 million people, or 44 percent of the total U.S. population, an increase in population of 27 percent from 2000¹⁸; and,
- From 2000 to 2020, the 21 states in AAPCA's membership were responsible for a 20 percent reduction in energy-related carbon dioxide (CO₂) emissions.¹⁹ In 2020, energy production in AAPCA Member States grew by 49 percent compared to production levels in 2000. AAPCA's Member States produced 61 percent of total U.S. energy in 2020.²⁰

AAPCA Member States | Comparison of Growth Indicators and Emissions Since 2000



Sources: U.S. Bureau of Economic Analysis, data available here; U.S. Energy Information Administration, State Energy Data System (SEDS): 1960–2020; U.S. Federal Highway Administration Office of Highway Policy Information, data available here; U.S. Census Bureau, data available here; U.S. EIA, Energy-Related CO₂ Emission Data Tables, Table 1. State energy-related carbon dioxide emissions by year (1970–2020); U.S. EPA, Air Pollutant Emissions Trends Data (Data file: “State Tier 1 CAPS Trends, Criteria pollutants State Tier 1 for 1990–2022”).

Air Quality | Fine Particulate Matter

U.S. EPA's online Green Book "provides detailed information about area National Ambient Air Quality Standards (NAAQS) designations, classifications, and nonattainment status."²¹ According to the database, a total of 39 areas were initially designated non-attainment for the 1997 fine particulate matter (PM_{2.5}) annual NAAQS of 15.0 micrograms per cubic meter (µg/m³), measured by the three-year average annual mean concentration.²²

U.S. EPA develops design values²³ based on monitoring data from the Agency's Air Quality System (AQS).²⁴ Of the designated areas, 23 are located partially or completely in AAPCA Member States, with the table below detailing the percent change in design values over two decades, a period in which AAPCA Member States averaged a 47 percent reduction in PM_{2.5} ambient air concentrations.²⁵ Furthermore, all of the designated areas within AAPCA Member States are now classified as in attainment or maintenance for the current 2012 PM_{2.5} NAAQS of 12.0 µg/m³.²⁶

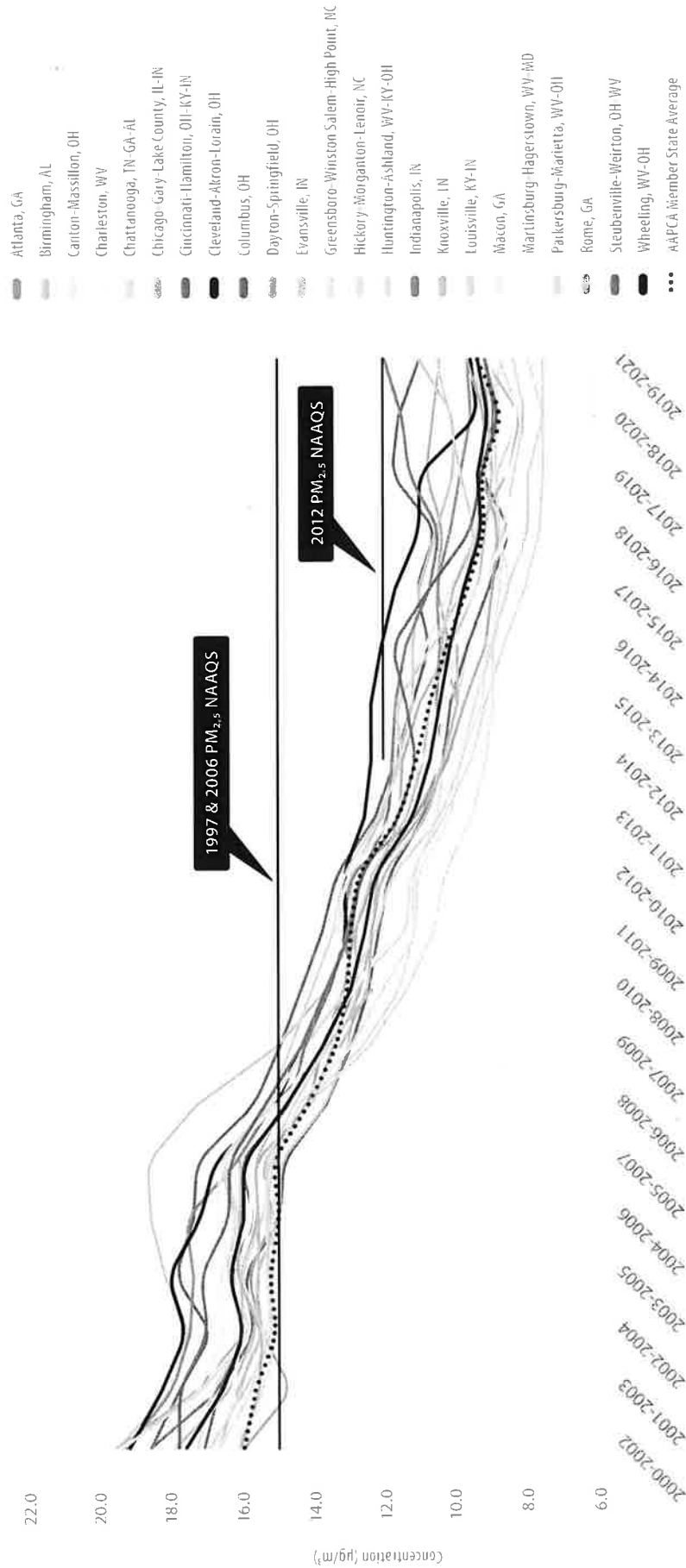
Designated Area	Percent Reduction in PM _{2.5} Concentrations (2000–2002 through 2019–2021 Design Values)
Atlanta, GA	-50.26%
Birmingham, AL	-43.88%
Canton-Massillon, OH	-46.93%
Charleston, WV	-57.87%
Chattanooga, TN-GA-AL	-48.52%
Chicago-Gary-Lake County, IL-IN	-46.94%
Cincinnati-Hamilton, OH-KY-IN	-40.86%
Cleveland-Akron-Lorain, OH	-50.52%
Columbus, OH	-46.78%
Dayton-Springfield, OH	-40.00%
Evansville, IN	-45.51%
Greensboro-Winston Salem-High Point, NC	-47.90%
Hickory-Morganton-Lenoir, NC	-48.77%
Huntington-Ashland, WV-KY-OH	-59.28%
Indianapolis, IN	-35.48%
Knoxville, TN	-49.16%
Louisville, KY-IN	-39.31%
Macon, GA	-45.12%
Martinsburg-Hagerstown, WV-MD	-48.15%
Parkersburg-Marietta, WV-OH	-55.88%
Rome, GA*	-38.51%
Steubenville-Weirton, OH-WV	-48.88%
Wheeling, WV-OH	-41.88%

*Data ends in designation year 2014–2016

Source: U.S. EPA, Air Quality Design Values (Data file: "PM_{2.5} Design Values, 2021").

Air Quality | Fine Particulate Matter

AAPCA Member States | Design Value History for Areas Previously Designated Nonattainment for the 1997 PM_{2.5} Annual NAAQS, 2002-2021



Source: U.S. EPA, Air Quality Design Values (Data file: "PM_{2.5} Design Values, 2021").

Air Quality | Ozone

According to U.S. EPA's online Green Book, 47 areas in the United States were previously designated as nonattainment for the 2008 ozone annual national ambient air quality standard (NAAQS) of 0.075 parts per million (ppm), determined using the annual fourth-highest daily maximum 8-hour concentration, averaged over three years.²⁷

The table below lists the percent change in design values over the last twenty years for the 13 previously designated nonattainment areas for the 2008 ozone NAAQS that are partially or fully within AAPCA Member States, which averaged over a 26 percent reduction in ambient concentrations of ozone.²⁸

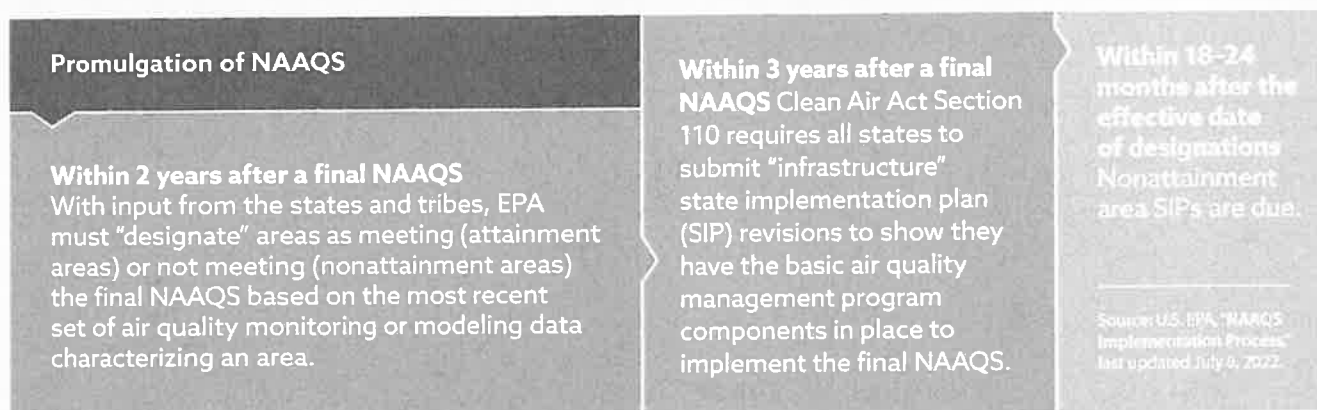
Designated Area	Percent Reduction in Ozone Concentrations (2000-2002 through 2019-2021 Design Values)
Atlanta, GA	-31.31%
Baton Rouge, LA	-19.77%
Charlotte-Rock Hill, NC-SC	-35.29%
Chicago-Naperville, IL-IN-WI	-25.00%
Cincinnati, OH-KY-IN	-27.08%
Cleveland-Akron-Lorain, OH	-27.27%
Columbus, OH	-26.67%
Dallas-Fort Worth, TX	-23.23%
Houston-Galveston-Brazoria, TX	-28.04%
Knoxville, TN	-36.73%
Memphis, TN-MS-AR	-27.66%
Phoenix-Mesa, AZ	-5.88%
Upper Green River Basin, WY*	2.78%

*Upper Green River Basin, WY is calculated from the first year that data was available, design value year 2005–2007. This area is excluded from average calculations.

Source: U.S. EPA, Air Quality Design Values (Data file: "Ozone Design Values, 2021").

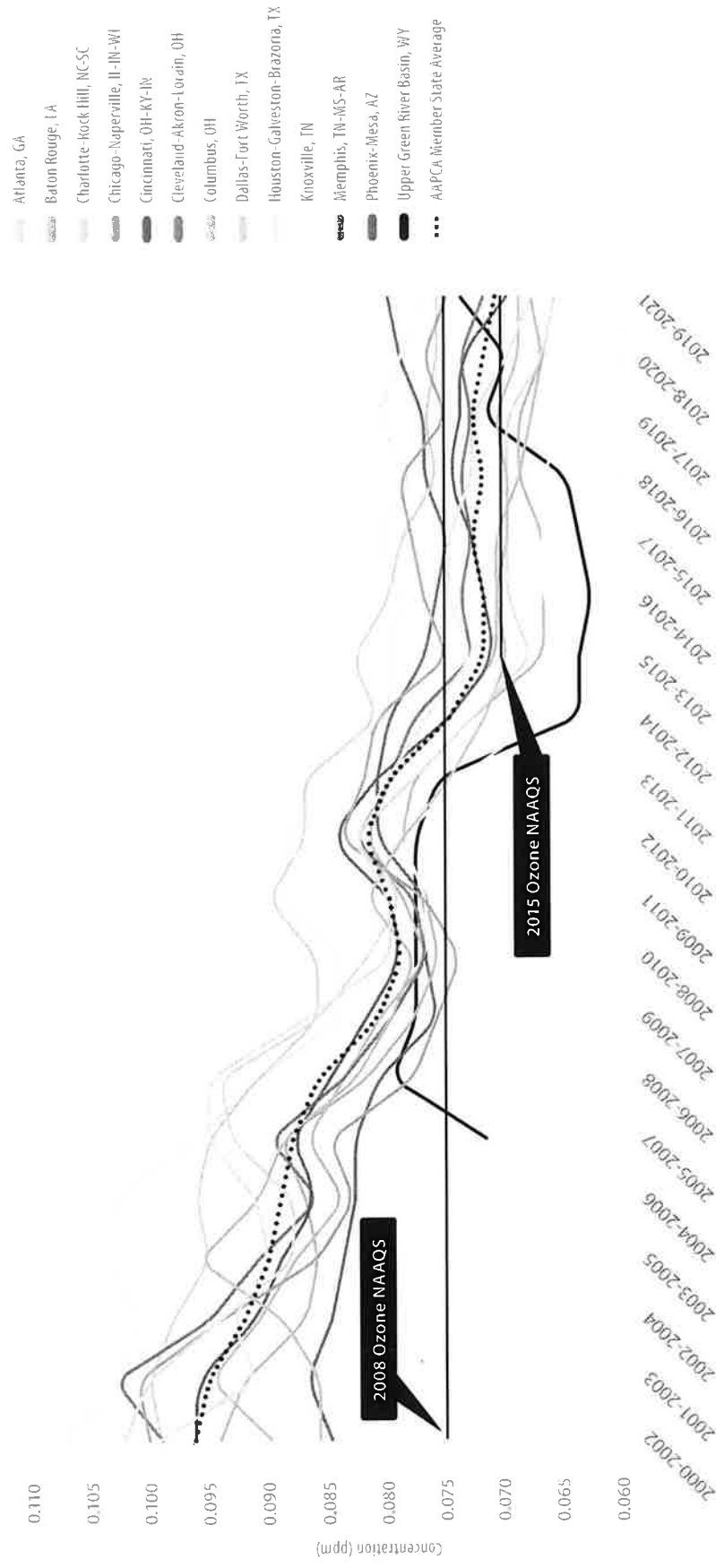
Implementing the National Ambient Air Quality Standards (NAAQS)

U.S. EPA and delegated programs at state, local, and tribal air agencies work together to implement the NAAQS, as directed by the federal Clean Air Act. U.S. EPA provides the below timeline for designations and implementation following a new or revised standard:



Air Quality | Ozone

AAPCA Member States | Design Value History for Areas Previously Designated Nonattainment for the 2008 Ozone Annual NAAQS, 2002-2021



*Upper Green River Basin, WY is calculated from the first year that data was available, design value year 2005-2007. This area is excluded from average calculations.

Source: U.S. EPA, Air Quality Design Values (Data file: "Ozone Design Values, 2021").

AAPCA **Best Practices** in Air Pollution Control

Each year, AAPCA designates Best Practices that identify ground-breaking technology, innovative approaches, and exemplary operations in the field of air pollution control, with particular focus on activities that are directly transferable to the operation of an air pollution control agency. Below are recipients of AAPCA's Best Practices in Air Pollution Control since 2018:

2022

Open Burn Permit Program
Arizona Department of Environmental Quality

2022 Air Quality Workshop
Oklahoma Department of Environmental Quality

Environmental Trainee Mentoring Program
Pennsylvania Department of Environmental Protection

Wyoming Environmental Audit Process
Wyoming Department of Environmental Quality

Air Quality Action Partners Program
Louisville Metro Air Pollution Control District (Local Government Best Practice)

Streamlined Communication and Collaboration for Air Monitoring Programs via Microsoft Teams
Mecklenburg County Air Quality (Local Government Best Practice)

Residential Woodsmoke Reduction Strategy
San Joaquin Valley Air Pollution Control District (Local Government Best Practice)

2021

COVID-19 Air Quality Inspection/Compliance Determinations
Arizona Department of Environmental Quality

Efficiencies in the Data Quality Review of Ambient Air Monitoring Data
Georgia Environmental Protection Division

NESHAP 6H Reg Nav Tool
North Carolina Division of Environmental Assistance & Customer Service

Shiny Dashboard for Remote Monitoring of Air Quality Data
Tennessee Department of Environment & Conservation

2020

Georgia PSD Emissions Inventory
Georgia Environmental Protection Division

2019

Data Verification Procedures
Georgia Environmental Protection Division

Ozone Design Value Predictor Tool
North Carolina Division of Air Quality

Louisville Community Workshop Series
Louisville Metro Air Pollution Control District (Local Government Best Practice)

2018

Georgia State Implementation Plan Processing Procedures
Georgia Environmental Protection Division

Toxicity Factors Database
Texas Commission on Environmental Quality

Inventory, Monitoring, Permitting, and Compliance Tracking (IMPACT) Web-based Data System
Wyoming Department of Environmental Quality

Presentations from all past recipients can be found on AAPCA's website: www.cleanairact.org

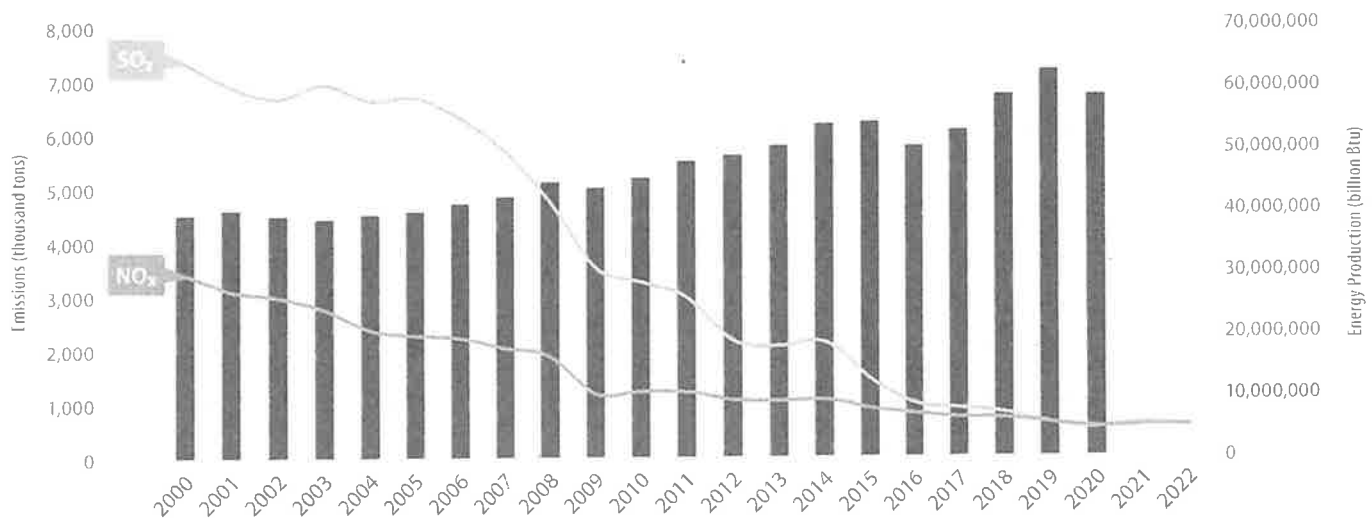


Emissions Reductions in the Electricity Sector

From 2000 to 2022, APCA Member States oversaw significant reductions in the emissions of sulfur dioxide (SO₂) and oxides of nitrogen (NO_x) from the electricity sector. Specifically, SO₂ emissions went from 7,322,232 tons in 2000 to 551,533 tons in 2022, a decline of 92 percent; NO_x emissions went from 3,405,187 tons in 2000 to 544,863 tons in 2022, a decline of 84 percent.²⁹

Meanwhile from 2000 to 2020, energy production in APCA Member States increased by 49 percent, to a total production in 2020 exceeding 58,500 trillion British thermal units (trillion Btu) of energy.³⁰

AAPCA Member States | Energy Production Compared to SO₂ and NO_x Emissions from the Electricity Sector, Since 2000



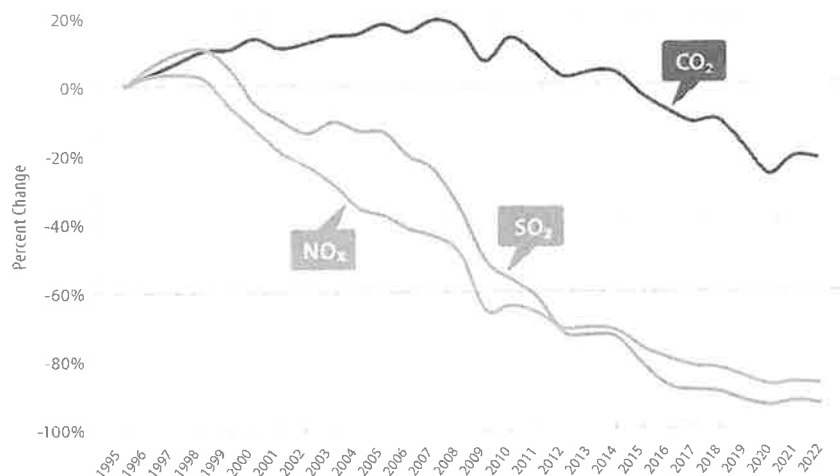
Source: U.S. Energy Information Administration, State Energy Data System (SEDS): 1960–2020; U.S. EPA, Air Pollutant Emissions Trends Data (Data file: “State Tier 1 CAPS Trends, Criteria pollutants State Tier 1 for 1990–2022”).

U.S. Power Plant Emissions Trends | Annual Percent Change of Emissions From Power Plants, 1995–2022

In February 2023, U.S. EPA released the 2022 annual emissions data for power plants across the United States, highlighting the following trends compared to 2021:

- A 10 percent decrease in sulfur dioxide (SO₂) emissions, a 93 percent reduction from 1995 levels;
- A 4 percent decrease in nitrogen oxides (NO_x) emissions, down 87 percent from 1995 levels; and,
- A 1 percent decrease in carbon dioxide (CO₂) emissions, 22 percent below 1995 levels.

Source: U.S. EPA, “EPA Releases 2022 Power Plant Emissions Data,” February 24, 2023. Data available [here](#).



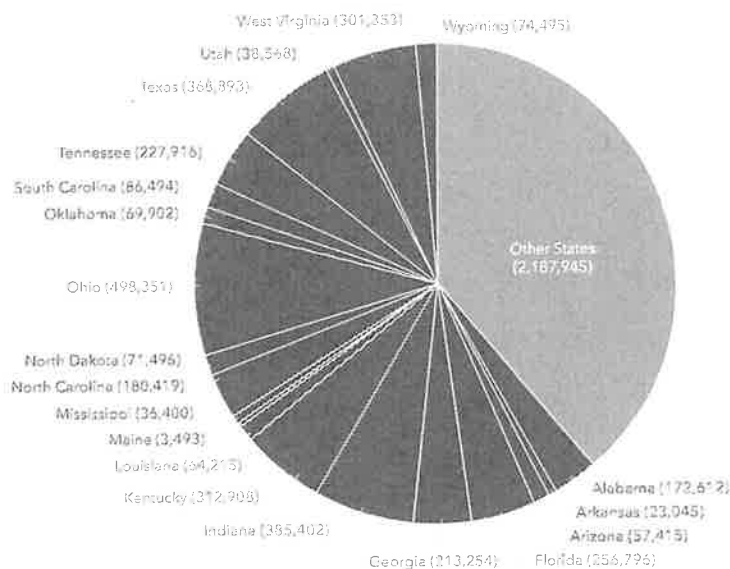
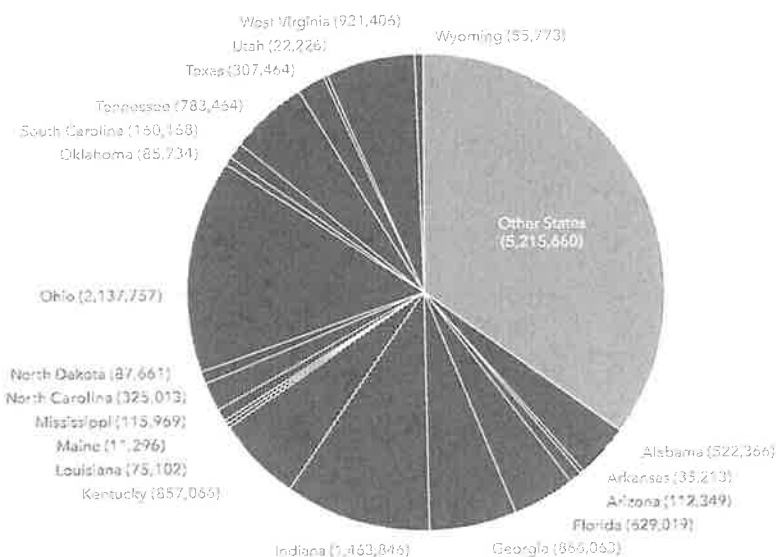
Emissions Reductions in the Electricity Sector

Data from U.S. EPA's Clean Air Markets Programs³¹ show that nationally from 1990 to 2021, the United States electricity sector reduced sulfur dioxide (SO₂) emissions by 94 percent — from 15,733,106 tons to 942,491 tons — and nitrogen oxides (NO_x) emissions by 88 percent — from 6,410,541 tons to 779,169 tons.

AAPCA Member States accounted for nearly 65 percent of the total 14,790,615-ton national reduction in SO₂ emissions, lowering SO₂ emissions from 10,152,009 tons in 1990 to 577,054 tons in 2021.³² Of the national 5,631,372-ton decrease in NO_x emissions, AAPCA Member States accounted for 61 percent, or 3,443,427 tons, reducing emissions from 3,938,966 tons in 1990 to 495,539 tons in 2021.³³

AAPCA Member States | Share of SO₂ Emissions Reductions in the Electricity Sector (tons of SO₂ reduced)

Source: U.S. EPA, "State-by-State SO₂ Emissions from CAIR and ARP Sources, 1990–2021," July 2022.



AAPCA Member States | Share of NO_x Emissions Reductions in the Electricity Sector (tons of NO_x reduced)

Source: U.S. EPA, "Annual NO_x Emissions from CSAPR and ARP Sources, 1990–2021," July 2022.

Regional Haze | Breton Wilderness Area

Established in 1904 through executive order of President Theodore Roosevelt, Breton National Wildlife Refuge (NWR) is the second oldest refuge in the National Wildlife Refuge System and the only refuge the president ever visited when he traveled to the islands in June 1915. As Louisiana's only Class I area, Breton NWR is comprised of a sixty-mile-long crescent of barrier islands, including Breton Island and the Chandeleur Islands. Breton NWR is located in the Gulf of Mexico, south of Gulfport, Mississippi and east of New Orleans and is accessible only by boat or seaplane.

The exposed islands are composed of open sand, shell beaches, and are partially covered with dune grasses and other shrubby vegetation. As nature takes its course, some parts of the islands are washed away while sand is deposited in other areas. Breton NWR also has some of the largest seabird colonies in the nation and has been identified as a Globally Important Bird Area by the American Bird Conservancy and The Nature Conservancy. Twenty-three species of seabirds and shorebirds frequently use the refuge, and thirteen species nest on the islands. The most abundant nesters are brown pelicans, laughing gulls, and royal, Caspian, and sandwich terns. Over 10,000 brown pelicans have been recorded nesting on the refuge. Waterfowl winter nearby and use the shallows, marshes, and sounds for feeding and shelter. Additionally in 2022, Kemp's ridley sea turtle nests have been observed on the islands for the first time in 75 years!

While the birds use the islands as a safe harbor, Louisiana must not become complacent with emissions reductions that push us firmly under the uniform rate of progress (glideslope). Through the collaborative efforts of state, local, and federal entities, visibility has improved and will continue to improve in Breton NWR under the Regional Haze Rule. The rule requires that each Class I area achieve natural conditions for visibility by the year 2064 by steadily improving the number of most impaired days and keeping the number of clearest days from decreasing. Point source sulfur dioxide (SO₂) and nitrogen oxides (NO_x) emissions were collectively reduced some 32 percent (134,965 tpy) from 2011 to 2017. These reductions have allowed Louisiana to exceed the uniform rate progress goals and remain below the glideslope established in the original state implementation plan (SIP) submittal.

More on the Louisiana Department of Environmental Quality can be found at www.deq.louisiana.gov/subhome/air.



Figure: Harvard College Library, Theodore Roosevelt Collection, Breton National Wildlife Refuge, photograph from www.fws.gov/media/president-teddy-roosevelt-breton-island-1915



Figure: U.S. Fish & Wildlife Service, Breton National Wildlife Refuge, photograph from www.fws.gov/refuge/breton.



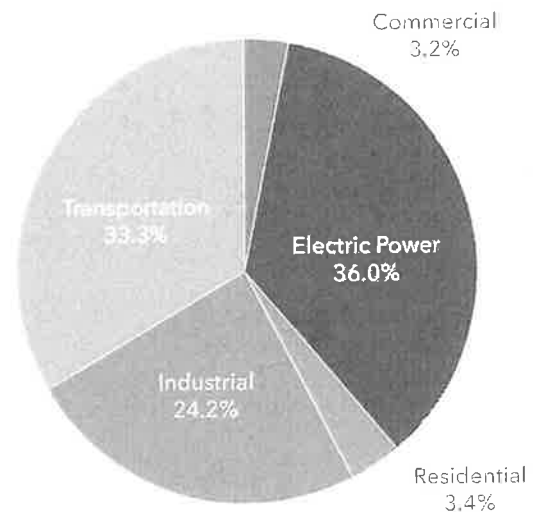
Greenhouse Gases and Energy

AAPCA Member States | Energy-Related Carbon Dioxide Emissions by Sector, 2020

The profile of energy-related carbon dioxide (CO₂) emissions from AAPCA Member States in 2020 was attributable to the following primary economic sectors³⁴:

- 36.0 percent from electricity generation;
- 33.3 percent from transportation;
- 24.2 percent from industry;
- 3.4 percent from residential; and,
- 3.2 percent from commercial.

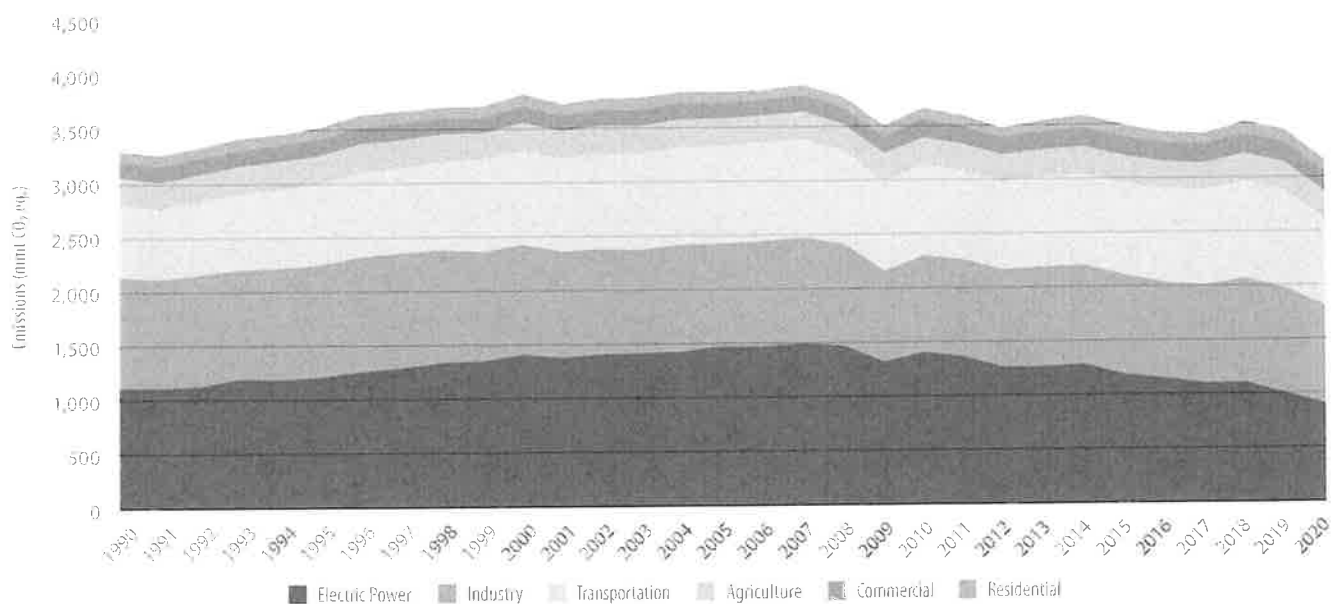
Source: U.S. Energy Information Administration, Energy-Related CO₂ Emission Data Tables, Table 3. State energy-related carbon dioxide emissions by sector.



U.S. EPA's *Inventory of U.S. Greenhouse Gas Emissions and Sinks by State* provides estimated greenhouse gas (GHG) data at the state level, consistent with the national *Inventory of U.S. Greenhouse Gas Emissions and Sinks*.³⁵ From 1990 to 2020, estimated GHG emissions in AAPCA Member States followed these trends:

- Electric power sector emissions decreased 19 percent;
- Industry sector emissions decreased 12 percent;
- Transportation sector emissions increased 20 percent;
- Agriculture sector emissions decreased 1 percent;
- Commercial sector emissions increased 21 percent; and,
- Residential sector emissions increased 15 percent.

AAPCA Member States | Greenhouse Gas Emissions by Economic Sector, 1990-2020

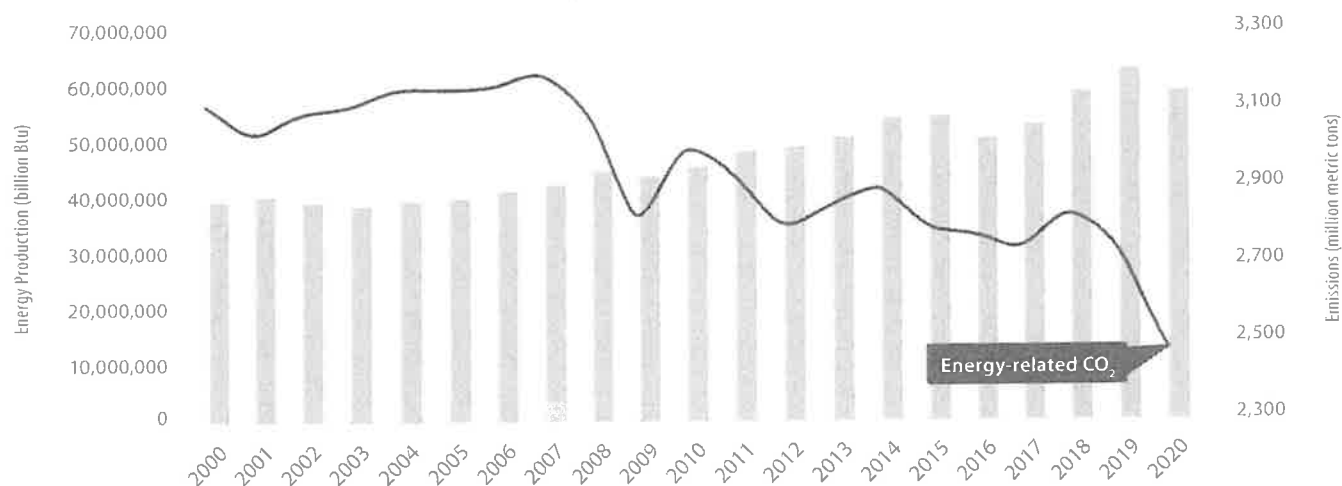


Source: U.S. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks by State: 1990-2021*, April 2023. See U.S. EPA's Greenhouse Gas Inventory Data Explorer.

Greenhouse Gases and Energy

From 2000 to 2020, energy-related carbon dioxide (CO₂) emissions in AAPCA Member States declined 20 percent, from 3,106 million metric tons in 2000 to 2,479 million metric tons in 2020, while energy production increased 49 percent.³⁶

AAPCA Member States | Total Energy Production Compared to Energy-Related Carbon Dioxide Emissions, 2000-2020



Source: U.S. Energy Information Administration (EIA), State Energy Data System (SEDS): 1960–2020; U.S. EIA, Energy-Related CO₂ Emission Data Tables, Table 1. State energy-related carbon dioxide emissions by year (1970–2020).

Furthermore from 2000 to 2020, states in AAPCA's membership oversaw an average reduction of nearly 40 percent in the carbon intensity of their economies.³⁷

AAPCA Member States | Percent Reduction in Carbon Intensity of the Economy, 2000-2020



Source: U.S. Energy Information Administration, Energy-Related CO₂ Emission Data Tables, Table 7. Carbon intensity of the economy by state (1997–2020).



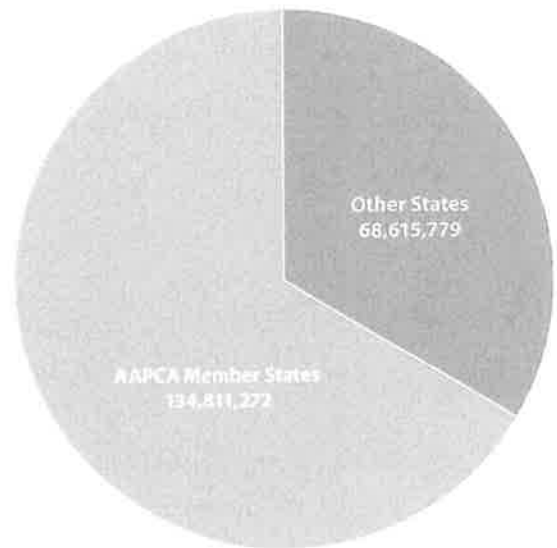
Air Toxics

AAPCA Member States | Share of Total Reduction of Reported Toxic Air Releases, 2012-2021 (pounds reduced)

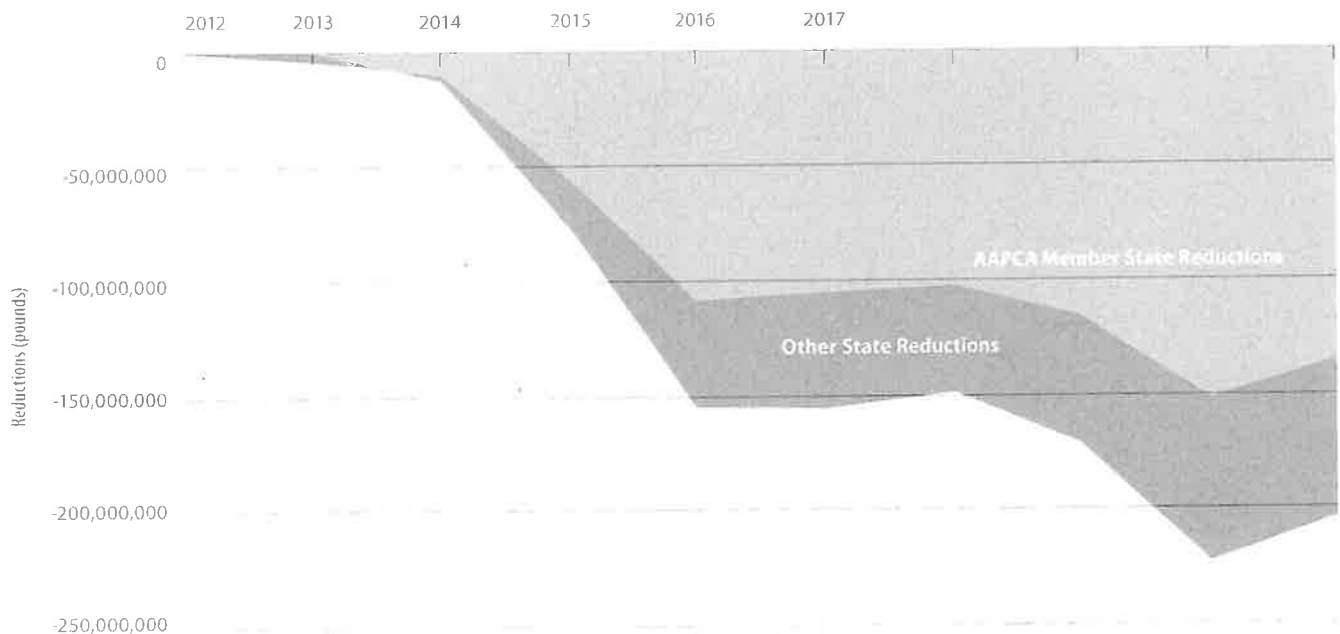
U.S. EPA's 2021 *Toxic Release Inventory (TRI) National Analysis* revealed a 26 percent reduction in reported toxic air releases compared to 10 years ago, from 774.6 million pounds in 2012 to 571.2 million pounds in 2021.³⁸

Of the 203.4-million-pound decrease in reported releases over the past decade, AAPCA Member States oversaw roughly 66 percent, or 134.8 million pounds.³⁹

Source: U.S. EPA Toxic Release Inventory Explorer, 2021 TRI Factsheets.



AAPCA Member States | Annual Share of National Reduction in Reported Toxic Air Releases, 2012-2021



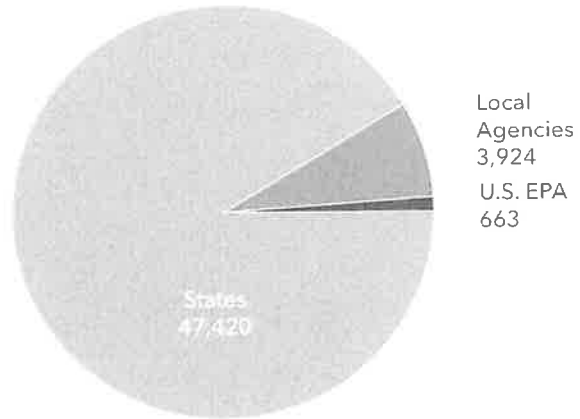
Source: U.S. EPA Toxic Release Inventory Explorer, 2021 TRI Factsheets.

State Compliance and Enforcement Activity

Number of Facilities Permitted Under Clean Air Act, 2022

U.S. EPA's Enforcement and Compliance History Online (ECHO) documents compliance monitoring activities that are undertaken by state and local air agencies and U.S. EPA, such as compliance evaluations, compliance determinations, and enforcement actions. U.S. EPA's ECHO Dashboard notes that "EPA delegates much of its [Clean Air Act] authority to state, local, and tribal agencies."⁴⁰

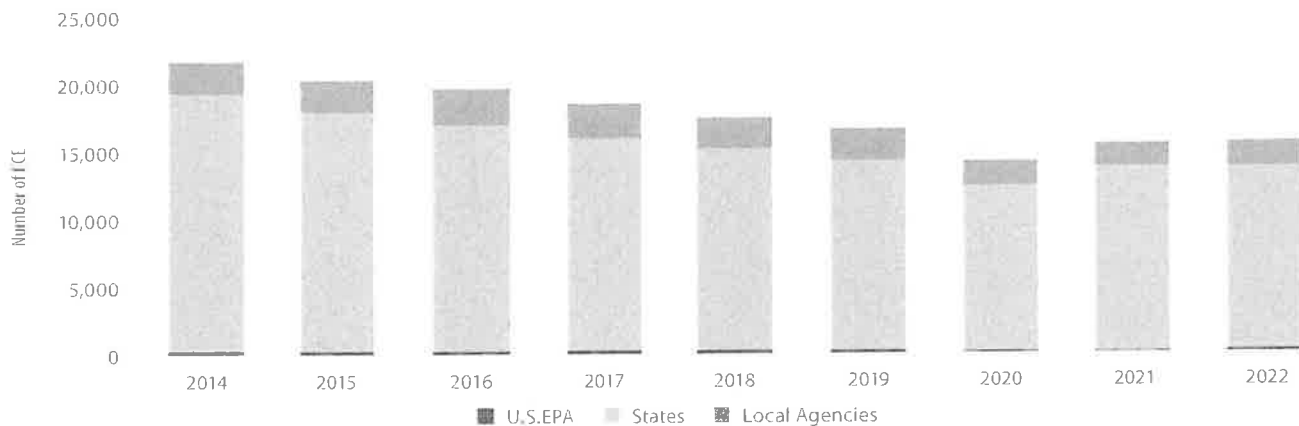
The ECHO Air Dashboard shows that of the 52,007 facilities permitted under the Clean Air Act in federal fiscal year (FY) 2022, states were the permitting agency on 47,420 facilities, local agencies on 3,924, and U.S. EPA for 663 facilities.⁴¹



The ECHO Air Dashboard also provides data on Full Compliance Evaluations (FCE) performed by U.S. EPA and state and local agencies. U.S. EPA defines an FCE as "a comprehensive evaluation of the compliance status of the facility. It looks for all regulated pollutants at all regulated emission units, and it addresses the compliance status of each unit, as well as the facility's continuing ability to maintain compliance at each emission unit."⁴² In federal FY 2022, ECHO details the following FCE lead agency distribution:

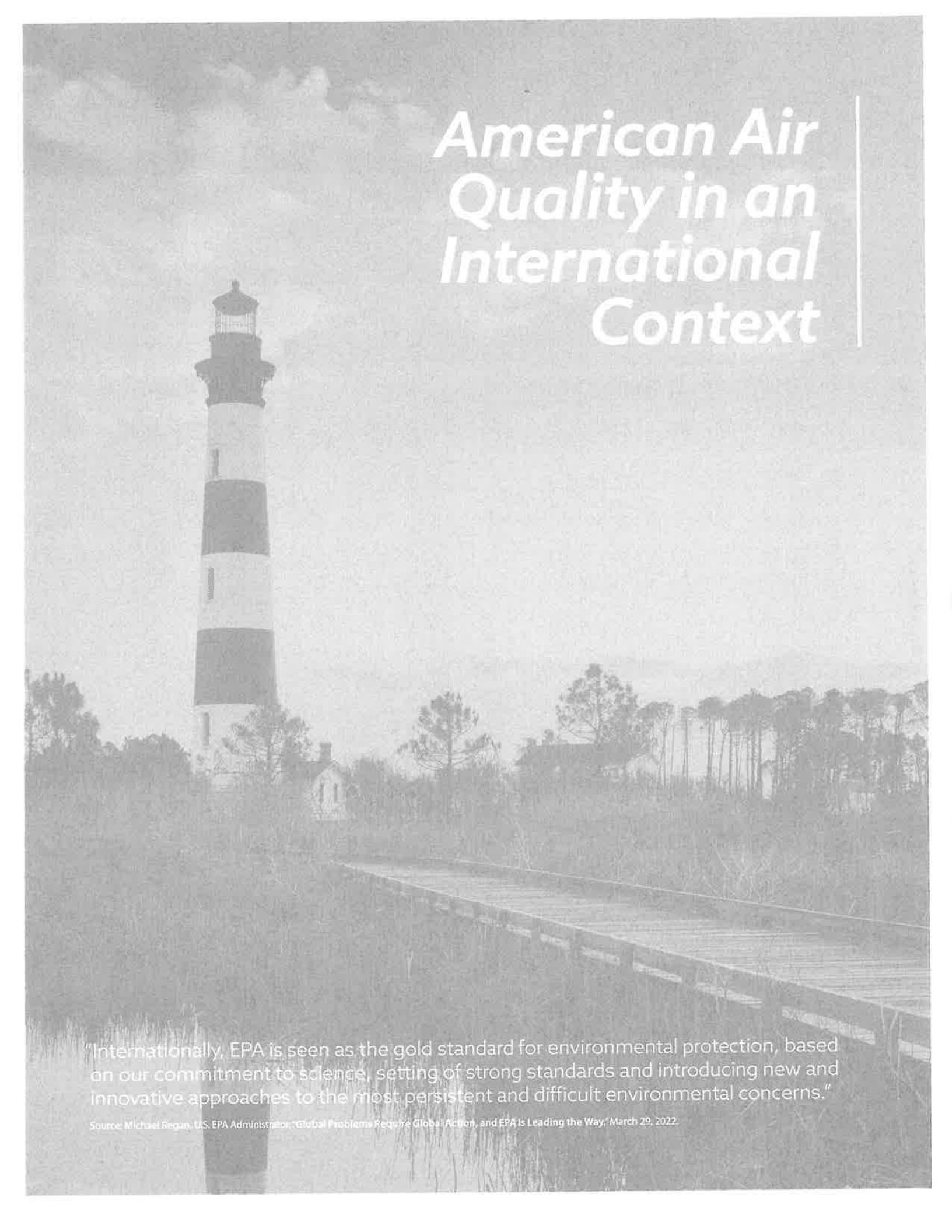
- States were the lead agency for 13,551 FCE, averaging more than 15,300 FCE annually from 2014 through 2022;
- Local programs were the lead agency for 1,872 FCE, averaging above 2,200 FCE annually from 2014 through 2022; and,
- U.S. EPA was the lead agency for 178 FCE, averaging about 200 FCE from 2014 through 2022.⁴³

Full Compliance Evaluations under Clean Air Act by Lead Agency, 2014-2022



Source: U.S. EPA, Analyze Trends: State Air Dashboard.

Additionally, U.S. EPA's ECHO Air Dashboard also shows that states averaged about 86,200 Clean Air Act compliance monitoring activities per year from 2014 through 2022, while local programs averaged above 22,500 per year from the same period. In 2022, AAPCA Member States were the lead agency for 44,997 out of the 75,678 state-led compliance monitoring activities, or 59 percent of the state lead agency total.⁴⁴



American Air Quality in an International Context

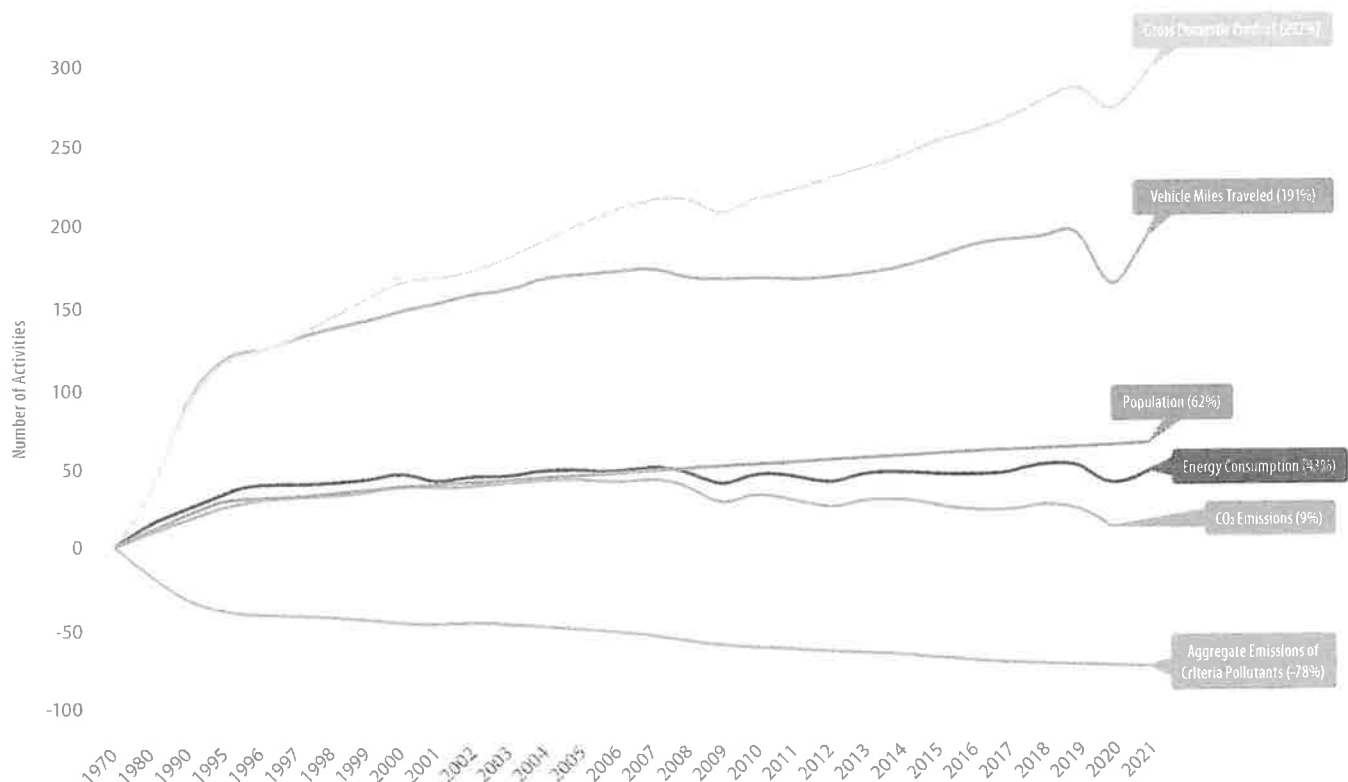
"Internationally, EPA is seen as the gold standard for environmental protection, based on our commitment to science, setting of strong standards and introducing new and innovative approaches to the most persistent and difficult environmental concerns."

Source: Michael Regan, U.S. EPA Administrator, "Global Problems Require Global Action, and EPA is Leading the Way," March 29, 2022.

Air Quality and Growth Indicator Trends in the United States

According to U.S. EPA's June 2022 report, *Our Nation's Air: Trends Through 2021*, the United States has reduced aggregate emissions of the six criteria air pollutants by 78 percent since 1970.⁴⁵ The substantial, sustained decline in emissions have led to improved air quality in the United States while Gross Domestic Product (GDP) rose 292 percent, Vehicle Miles Traveled increased 191 percent, population grew 62 percent, and energy consumption went up 43 percent.⁴⁶

Growth Indicators and Emissions Reductions in the United States, 1970–2021



Source: U.S. EPA, *Our Nation's Air: Trends Through 2021* (Section: "Economic Strength with Cleaner Air"), June 2022.

Internationally, the United States ranks:

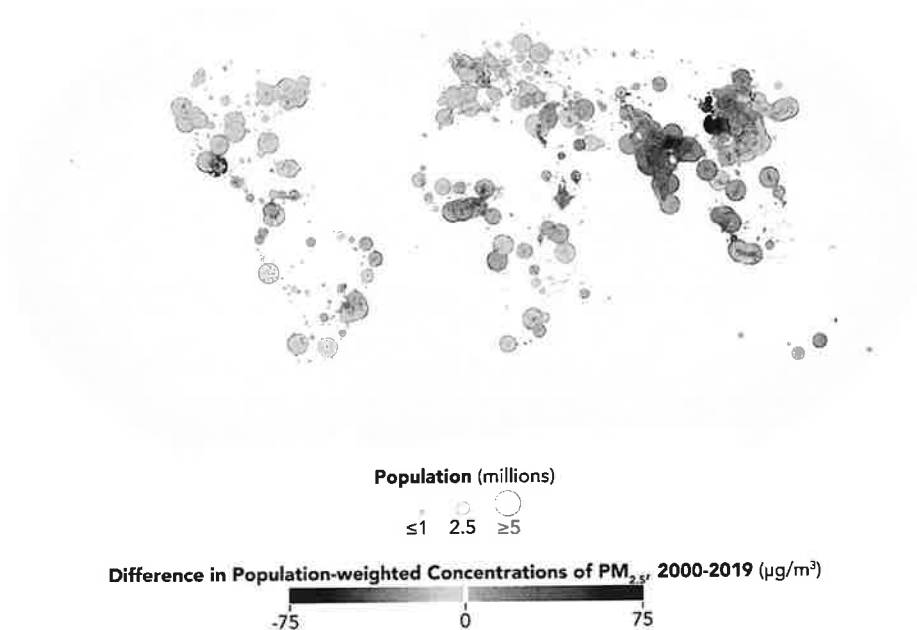
- First in GDP, at \$23.32 trillion in 2021, representing 24 percent of gross world product⁴⁷ and up by 127 percent from 2000 levels.⁴⁸
- Second in energy production, behind China, according to International Energy Agency (IEA) data.⁴⁹ From 1960 to 2020, United States energy production increased from approximately 42,591 trillion British thermal units (Btu) to 95,711 trillion Btu, or 125 percent.⁵⁰
- Third in total population, behind China and India,⁵¹ growing from approximately 203.4 million people in 1970 to 331.9 million people in 2021.⁵²

International Trends | Air Quality

Global Change in Population-Weighted Concentrations of $PM_{2.5}$, 2000-2019

Using satellite data,⁵³ the National Aeronautics and Space Administration's (NASA) Earth Observatory mapped the mean population-weighted ambient fine particulate matter ($PM_{2.5}$) concentration globally across all urban areas. The change in population-weighted $PM_{2.5}$ concentration trends from 2000 to 2019 varied widely between regions, with consistent decreases across North America, including the United States, and Europe while increasing across southeast Asia.⁵⁴

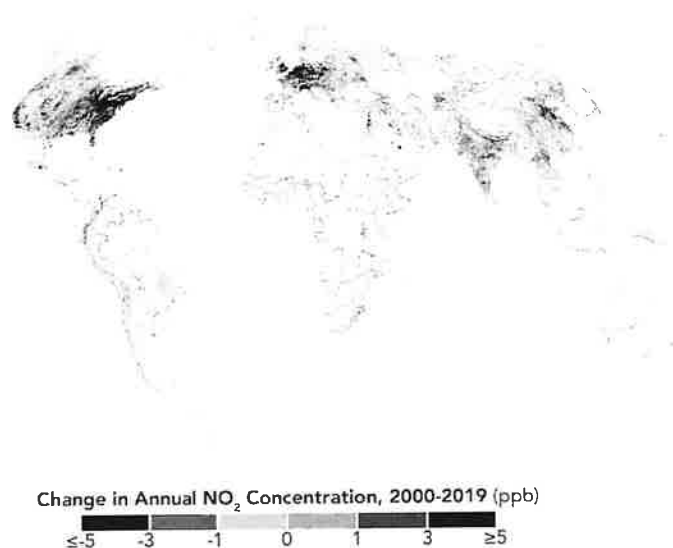
Source: NASA Earth Observatory, "No Breathing Easy for City Dwellers: Particulates," March 15, 2022.



Global Change in Concentrations of NO_2 , 2000-2019

Data from NASA's Ozone Monitoring Instrument on the Aura satellite shows a similar global pattern for the change in annual average nitrogen dioxide (NO_2) concentrations between 2000 and 2019.⁵⁵

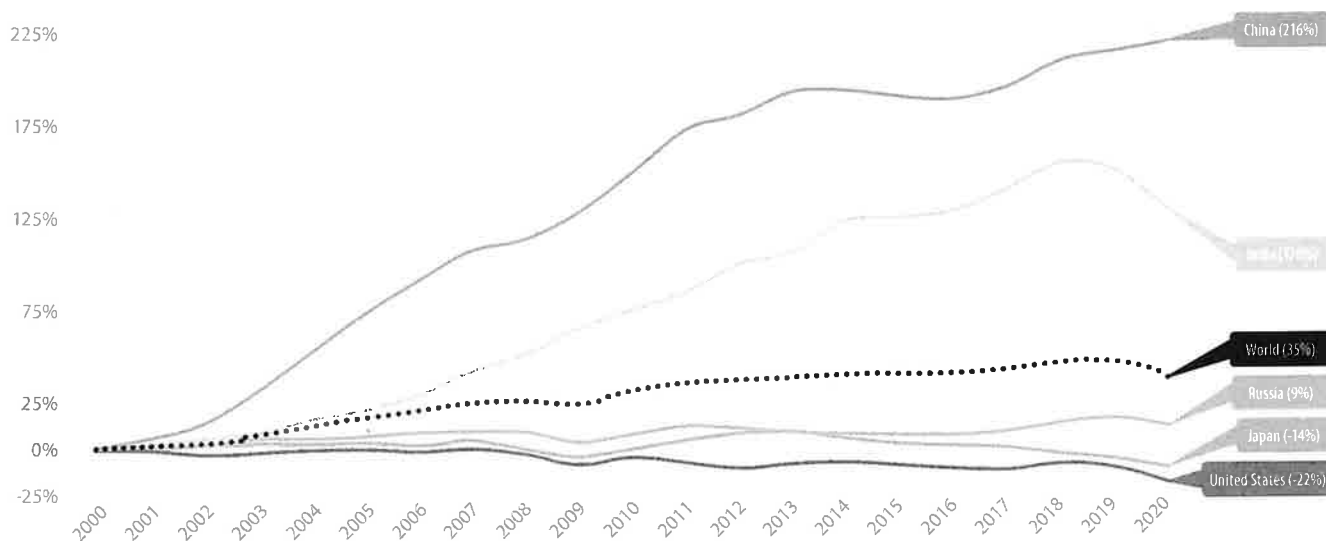
Source: NASA Earth Observatory, "No Breathing Easy for City Dwellers: Nitrogen Dioxide," March 14, 2022.



International Trends | Greenhouse Gas Emissions

The International Energy Agency's (IEA) database, *Greenhouse Gas Emissions from Energy*, includes annual estimates of total greenhouse gas (GHG) emissions from the energy sector for over 190 countries and regions.⁵⁶ From 2000 to 2020, the United States achieved the largest reductions among the five highest emitting nations, decreasing energy-related GHG emissions from 6,070 million tonnes of carbon dioxide equivalent (CO₂e) in 2000 to 4,744 million tonnes CO₂e in 2020. Data from IEA shows that GHG emissions from energy in the United States in 2021 were 18 percent lower than 2000 levels.⁵⁷

Annual Percent Change of Greenhouse Gas Emissions from Energy by Country, 2000-2020



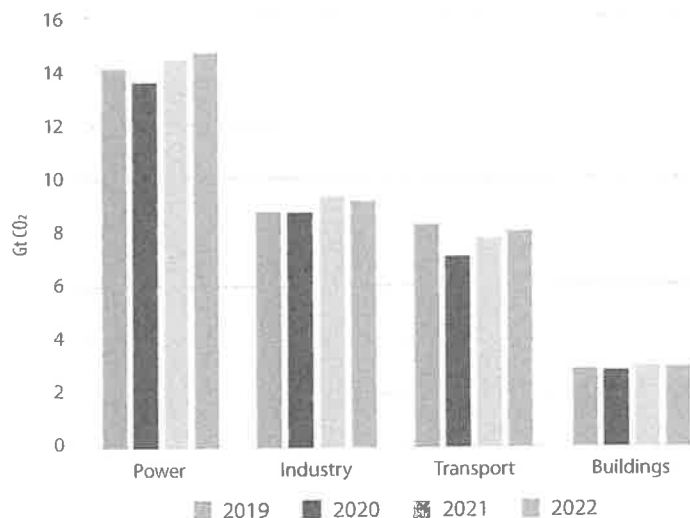
Source: International Energy Agency, *Greenhouse Gas Emissions from Energy Highlights*, September 16, 2022.

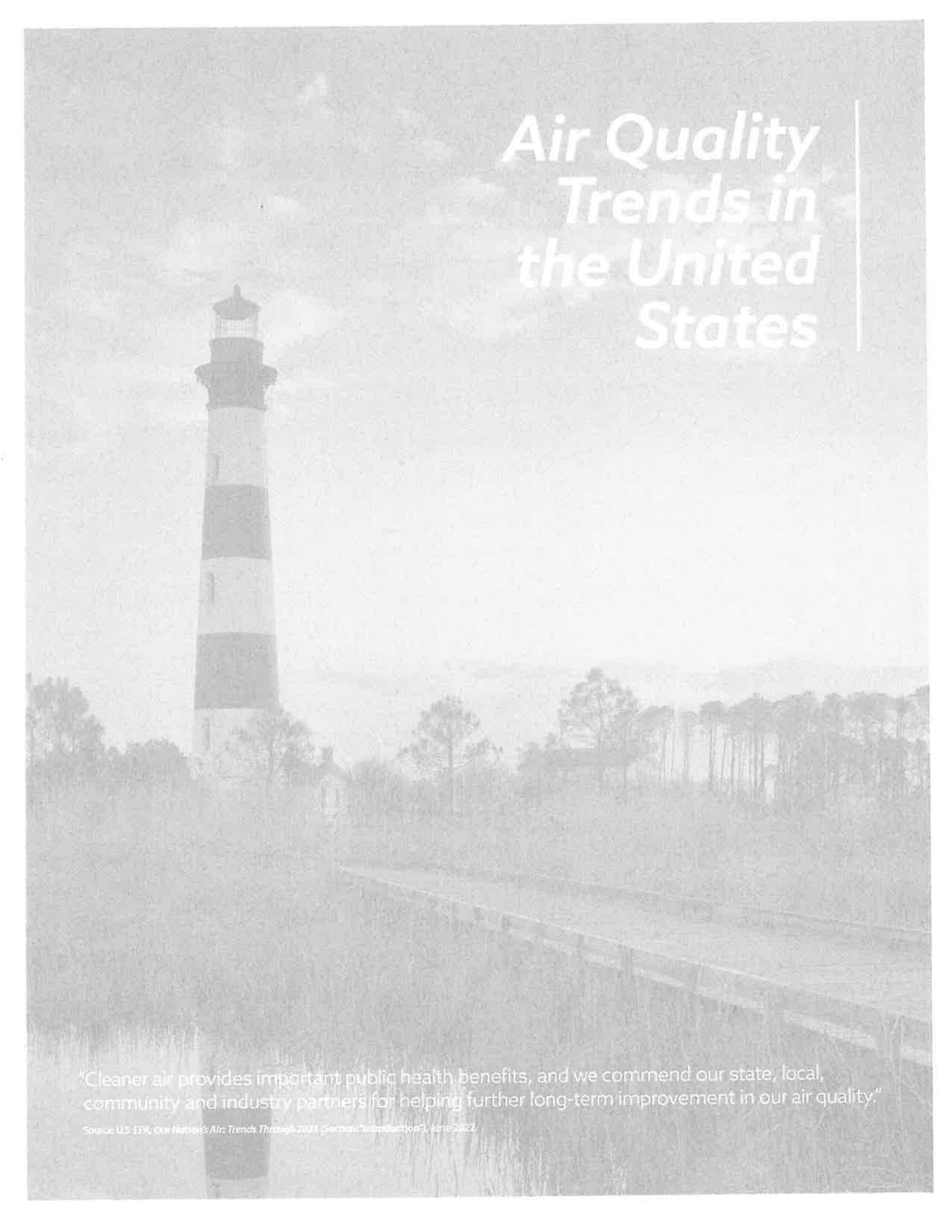
International Energy Agency | Global CO₂ Emissions by Sector, 2019-2022 (Gt CO₂)

In March 2023, IEA released the report, *CO₂ Emissions in 2022*, highlighting the following global carbon dioxide (CO₂) emissions trends:

- Global energy-related CO₂ emissions reached 36.8 gigatonnes (Gt) in 2022, a 0.9 percent increase from 2021;
- United States emissions grew by 0.8 percent (or 36 megatonnes) from 2021, to total 4.7 Gt in 2022;
- Total energy-related greenhouse gas emissions increased by 1.0 percent from 2021, to an all-time high of 41.3 Gt CO₂-equivalent; and,
- Global electricity demand increased by 2.7 percent, and overall carbon intensity of electricity generation declined by 2.0 percent.

Source: International Energy Agency, *CO₂ Emissions in 2022*, March 2023.



A black and white photograph of a lighthouse on a grassy hill. A wooden walkway leads from the bottom right towards the lighthouse. The lighthouse has a striped pattern. The sky is cloudy.

Air Quality Trends in the United States

"Cleaner air provides important public health benefits, and we commend our state, local, community and industry partners for helping further long-term improvement in our air quality."

Source: U.S. EPA, *Our Nation's Air: Trends Through 2021* (Section "Introduction"), June 2022.

Criteria Air Pollutants | Concentration Trends

U.S. EPA's national-level analysis of 2021 monitoring data show the substantial reductions in ambient concentrations of all criteria pollutants over the past several decades. As the below chart indicates, the United States has seen at least a 29 percent decline in the ambient levels of carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), ozone (O₃), and sulfur dioxide (SO₂) since 1980. Available data show that fine and coarse particulate matter (PM_{2.5} and PM₁₀) ambient concentrations have declined by at least a third of 2000 levels. And more recent data point to a sustained trend of meaningful improvements, with monitored concentrations of all criteria pollutants continuing to decline over the last ten years.⁵⁸

Ambient Concentrations	1980 vs 2021	1990 vs 2021	2000 vs 2021	2010 vs 2021
Carbon Monoxide	-87%	-79%	-65%	-26%
Lead	-98%	-98%	-93%	-85%
Nitrogen Dioxide (annual)	-67%	-61%	-53%	-29%
Nitrogen Dioxide (1-hour)	-64%	-54%	-40%	-22%
Ozone (8-hour)	-29%	-21%	-16%	-5%
PM ₁₀ (24-hour)	---	-32%	-36%	-5%
PM _{2.5} (annual)	---	---	-37%	-14%
PM _{2.5} (24-hour)	---	---	-33%	-2%
Sulfur Dioxide (1-hour)	-94%	-91%	-85%	-74%

Source: U.S. EPA, Air Quality—National Summary: Air Quality Trends (updated June 1, 2022).

Criteria Air Pollutants | Emissions Trends

In coordination with state and local air agencies, tribes, and industry, U.S. EPA develops annual nationwide emissions estimates, which are "based on actual monitored readings or engineering calculations of the amounts and types of pollutants emitted by vehicles, factories, and other sources."⁵⁹ U.S. EPA's most recently published estimates, show that the emissions of all criteria pollutants and precursors declined by at least a third (33 percent) from 1990 through 2021, and at least 21 percent since 2010.⁶⁰

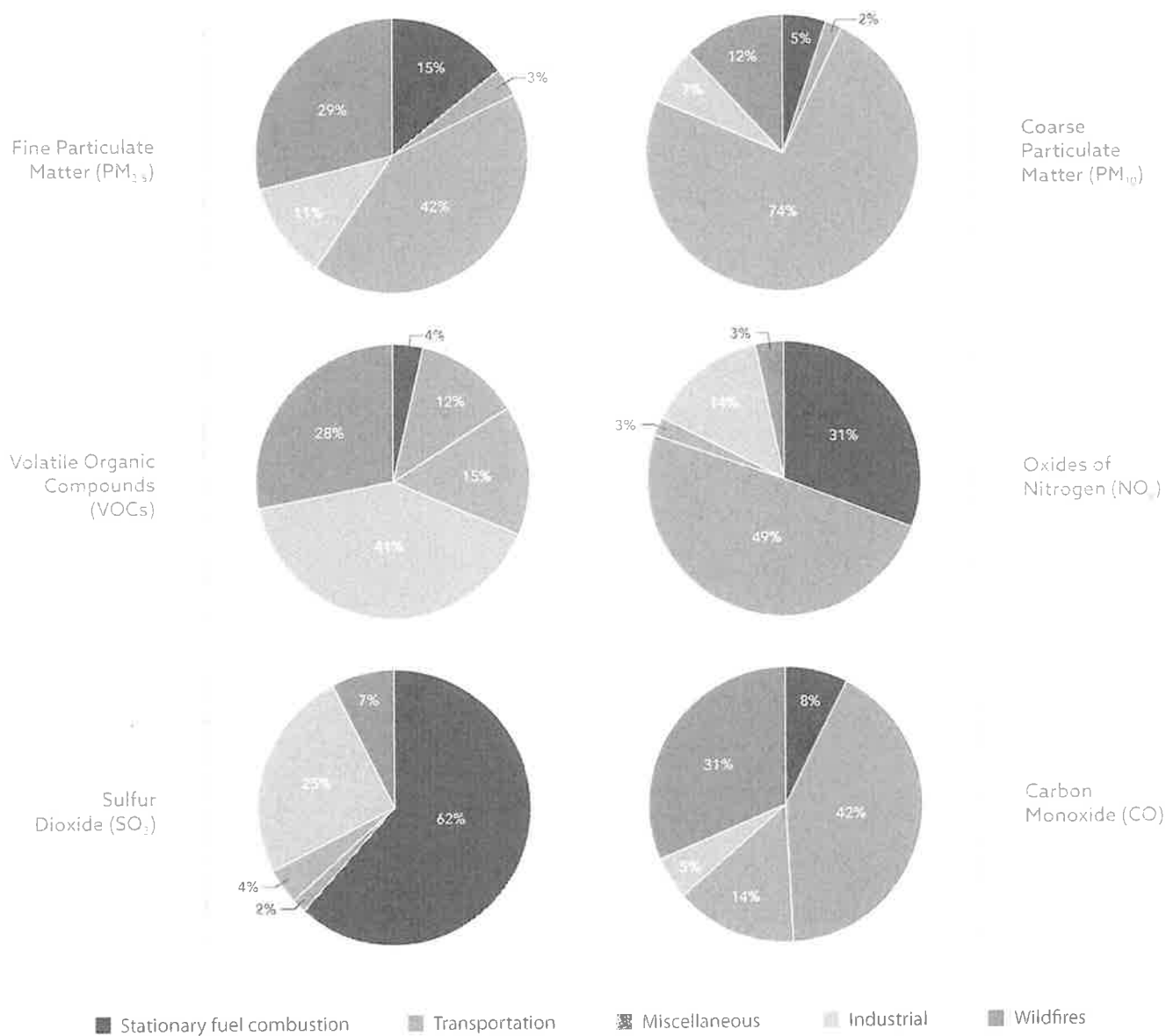
Emissions	1980 vs 2021	1990 vs 2021	2000 vs 2021	2010 vs 2021
Carbon Monoxide	-75%	-70%	-57%	-29%
Lead	-99%	-87%	-76%	-30%
Nitrogen Oxides	-72%	-70%	-66%	-48%
Volatile Organic Compounds	-61%	-49%	-30%	-21%
Direct PM ₁₀	-65%	-33%	-30%	-22%
Direct PM _{2.5}	---	-40%	-46%	-25%
Sulfur Dioxide	-93%	-92%	-89%	-76%

Source: U.S. EPA, U.S. EPA, Air Quality—National Summary: Emissions Trends (updated June 1, 2022).

Criteria Air Pollutants | Emissions Sources

U.S. EPA tracks emissions from the following source categories: Stationary Fuel Combustion, Industrial, Transportation, Wildfires, and Miscellaneous. Included below are the sources of criteria air pollutant and precursor emissions for the year 2022.⁶¹

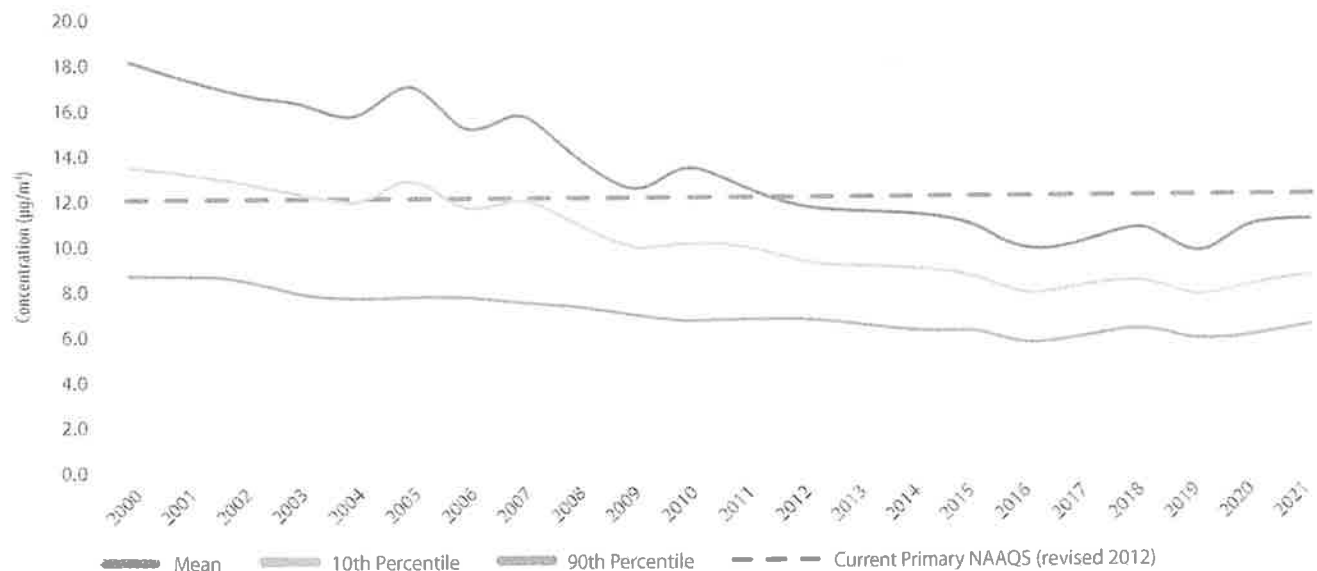
Criteria Air Pollutant Sources, 2022



Source: U.S. EPA, Air Pollutant Emissions Trends (Data file: "National Tier 1 CAPS Trends, Criteria pollutants National Tier 1 for 1970–2022").

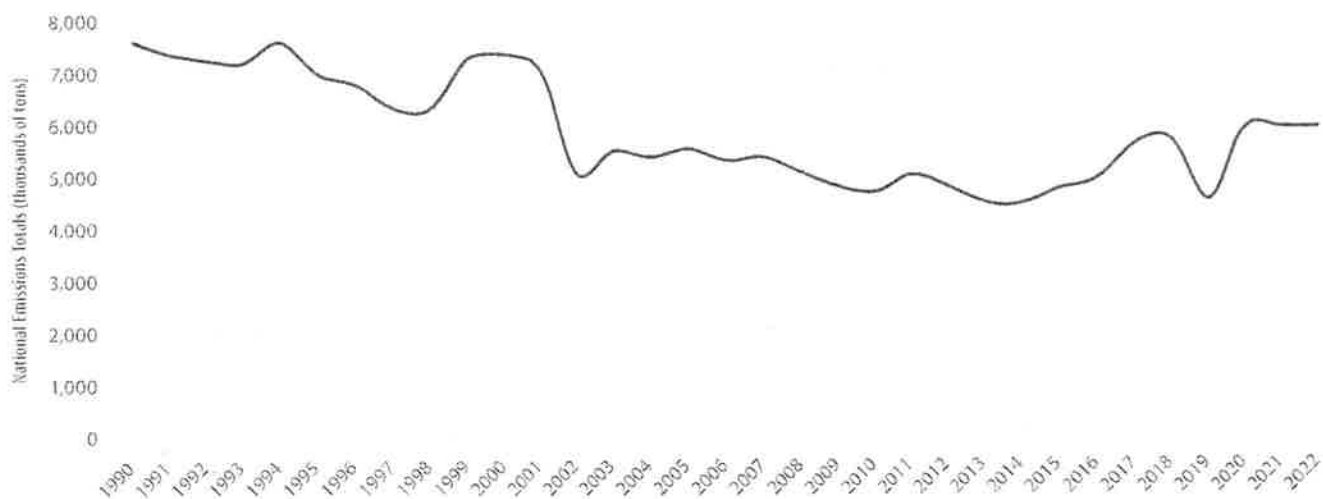
Criteria Air Pollutant Trends | Fine Particulate Matter

Fine Particulate Matter (PM_{2.5}) Air Quality 2000-2021
(Seasonally Weighted Annual Average) National Trend based on 375 Sites



Source: U.S. EPA, Particulate Matter (PM_{2.5}) Trends, August 2022.

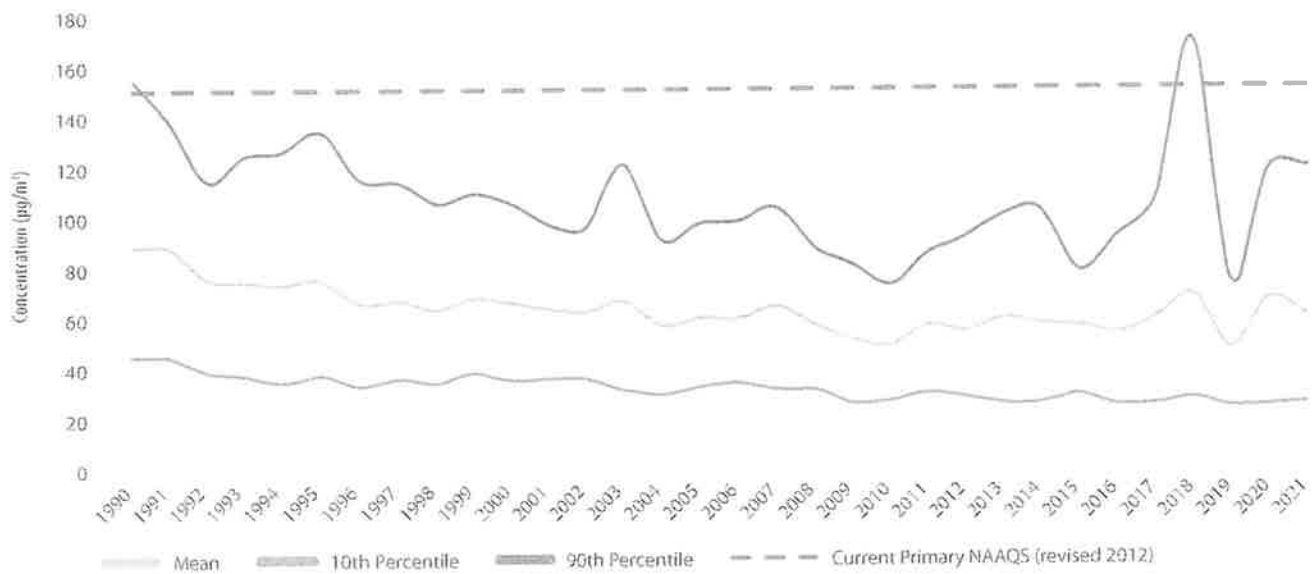
Fine Particulate Matter (PM_{2.5}) Emissions, 1990-2022



Source: U.S. EPA, Air Pollutant Emissions Trends (Data file: "National Tier 1 CAPS Trends, Criteria pollutants National Tier 1 for 1970-2022").

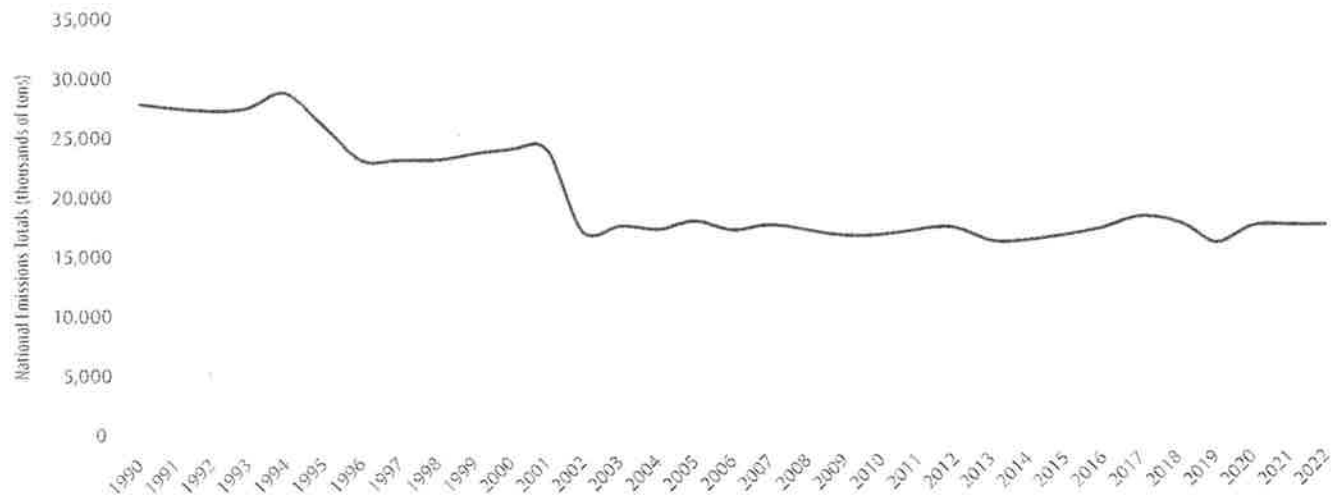
Criteria Air Pollutant Trends | Coarse Particulate Matter

Coarse Particulate Matter (PM₁₀) Air Quality 1990-2021
(Annual 2nd Maximum 24-Hour Average) Nation Trend Based on 90 Sites



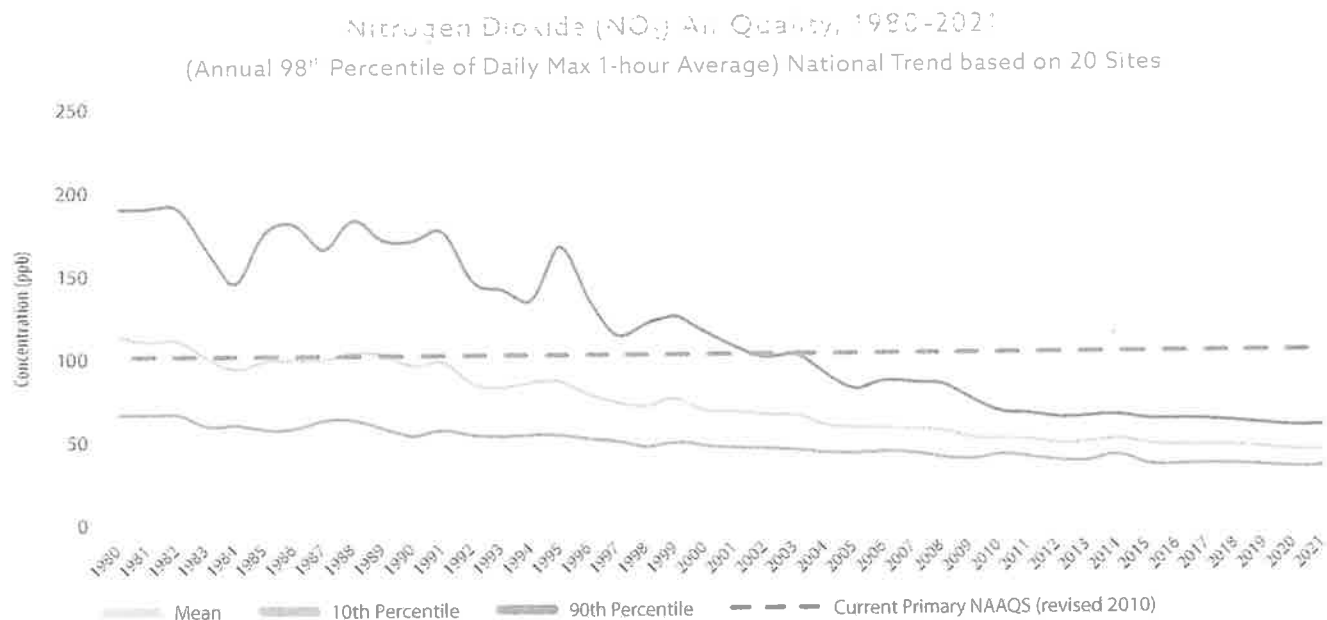
Source: U.S. EPA, Particulate Matter (PM₁₀) Trends, August 2022.

Coarse Particulate Matter (PM₁₀) Emissions 1990-2022



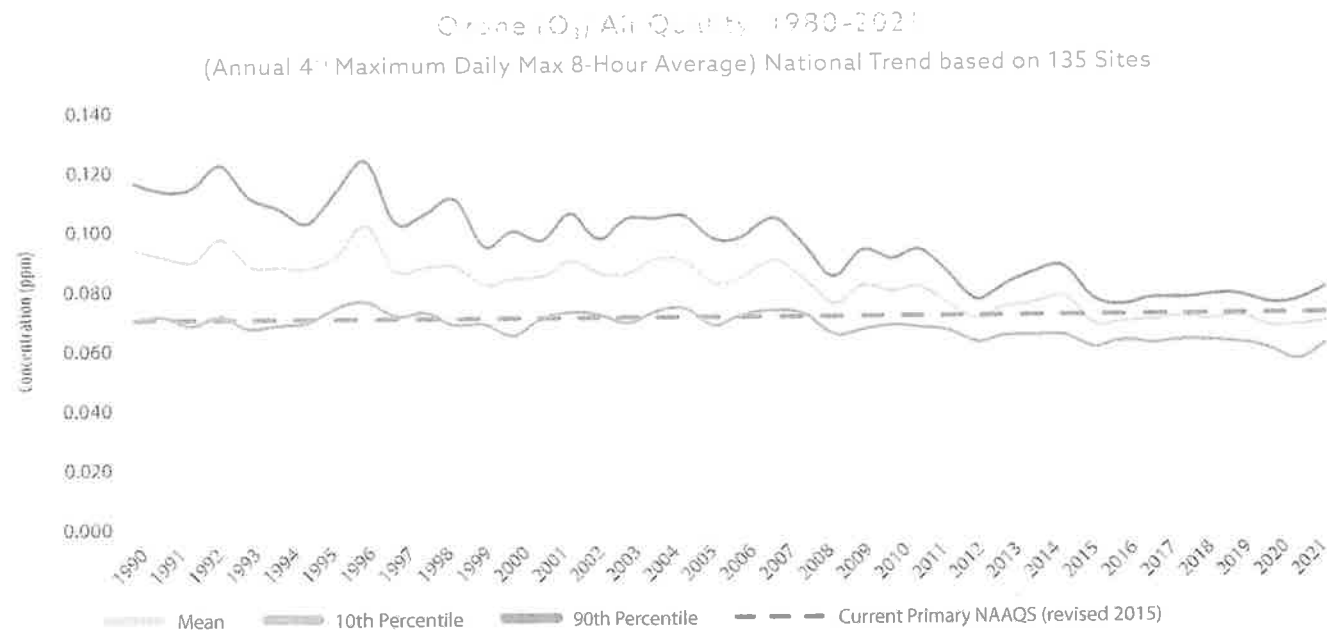
Source: U.S. EPA, Air Pollutant Emissions Trends (Data file: "National Tier 1 CAPS Trends, Criteria pollutants National Tier 1 for 1970-2022").

Criteria Air Pollutant Trends | Nitrogen Dioxide



Source: U.S. EPA, Nitrogen Dioxide Trends, August 2022.

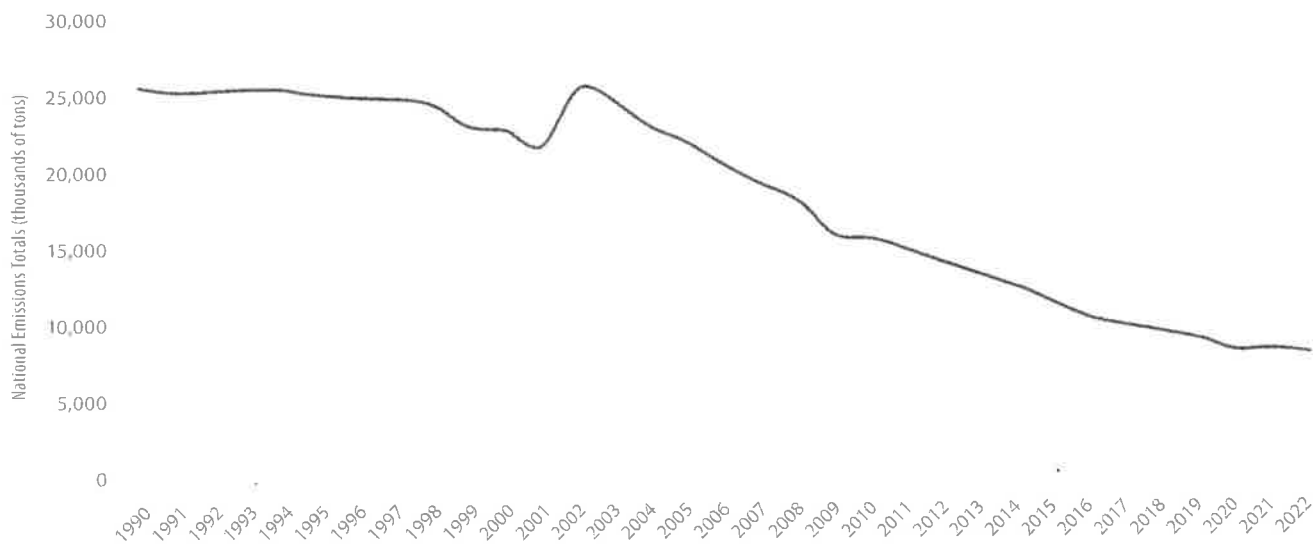
Criteria Air Pollutant Trends | Ozone



Source: U.S. EPA, Ozone Trends, August 2022.

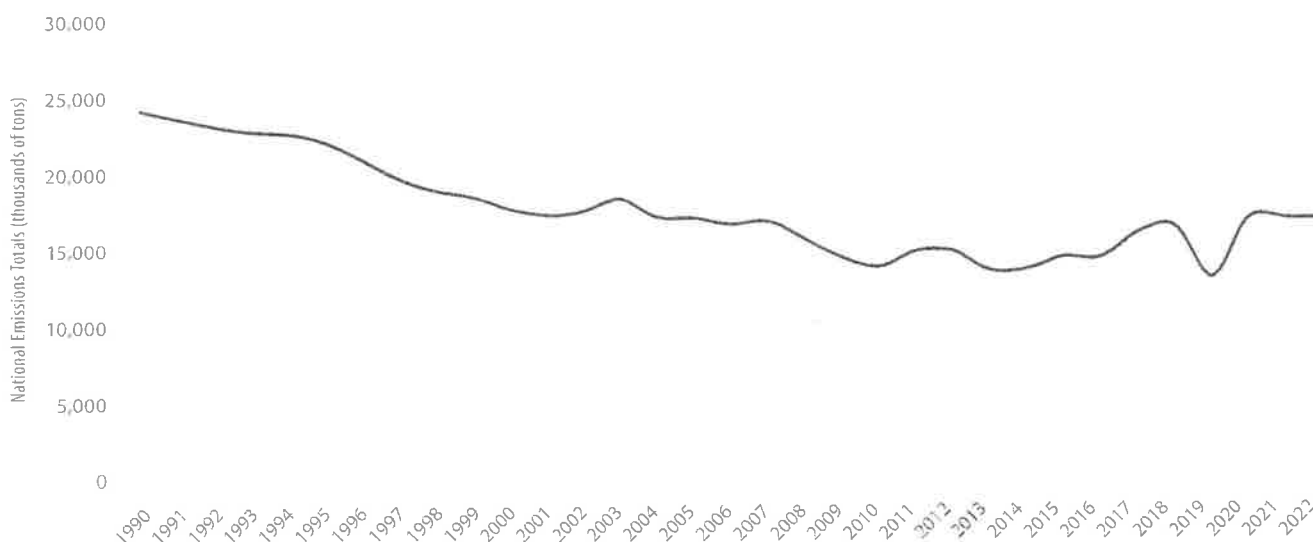
Criteria Air Pollutant Trends | Ozone Precursor Emissions

Oxides of Nitrogen (NO_x) Emissions, 1990-2022



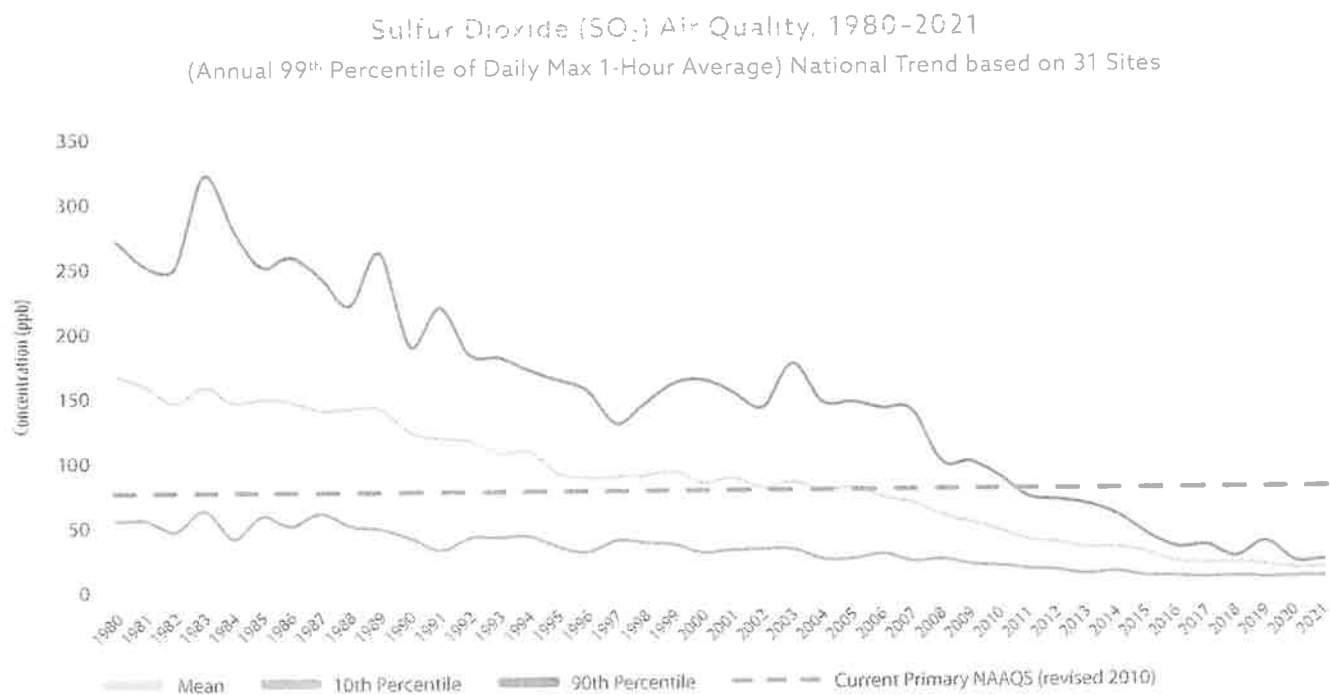
Source: U.S. EPA, Air Pollutant Emissions Trends (Data file: "National Tier 1 CAPS Trends, Criteria pollutants National Tier 1 for 1970-2022").

Volatile Organic Compounds (VOC) Emissions, 1990-2022

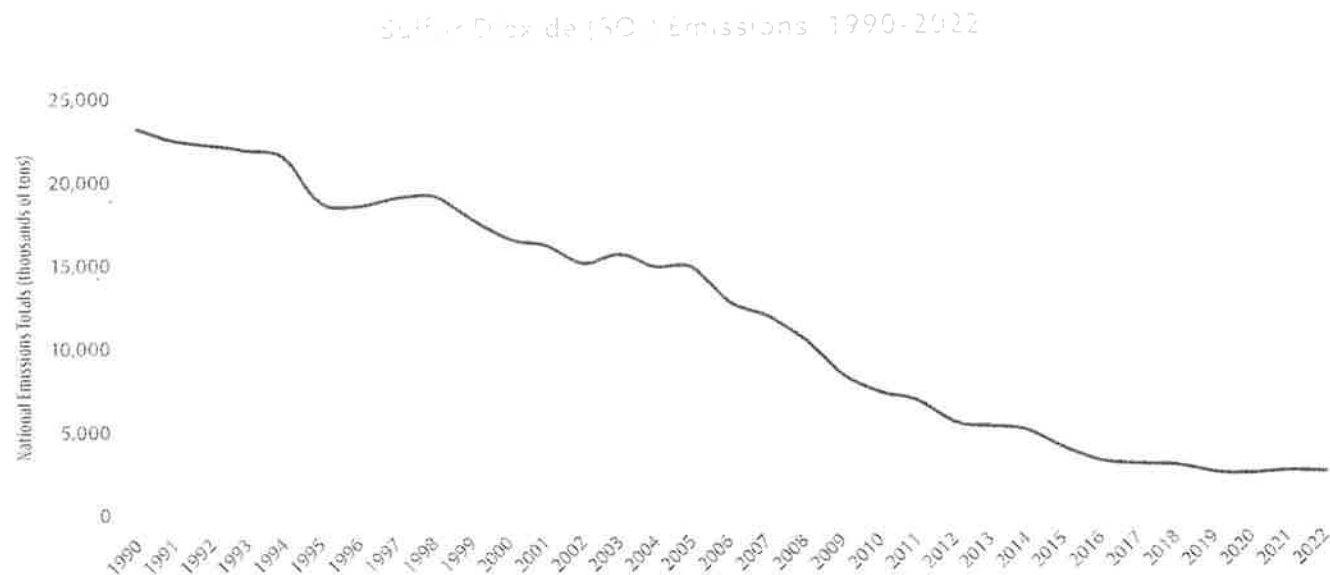


Source: U.S. EPA, Air Pollutant Emissions Trends (Data file: "National Tier 1 CAPS Trends, Criteria pollutants National Tier 1 for 1970-2022").

Criteria Air Pollutant Trends | Sulfur Dioxide



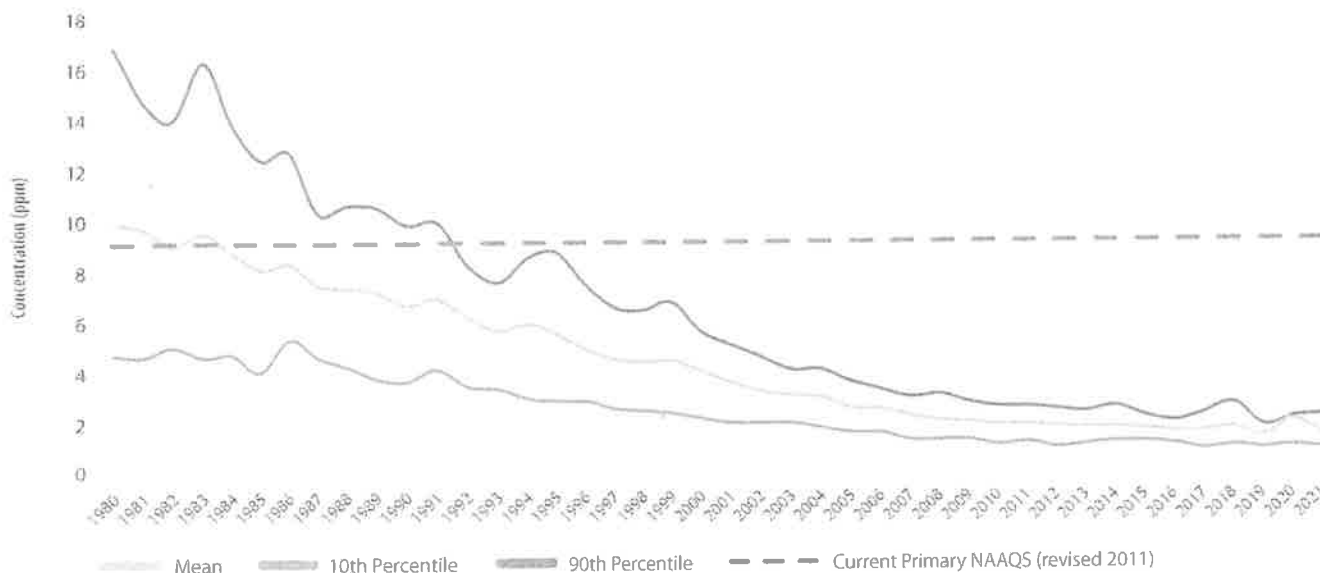
Source: U.S. EPA, Sulfur Dioxide Trends, August 2022.



Source: U.S. EPA, Air Pollutant Emissions Trends (Data file: "National Tier 1 CAPS Trends, Criteria pollutants National Tier 1 for 1970-2022").

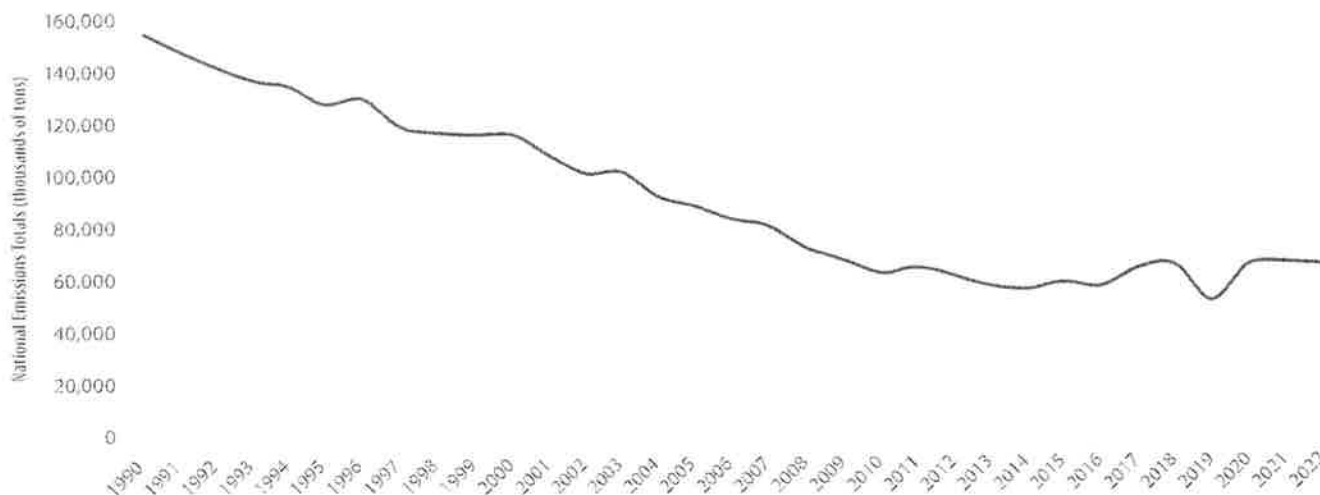
Criteria Air Pollutant Trends | Carbon Monoxide

Carbon Monoxide (CO) Air Quality 1980-2021
(Annual 2nd Maximum 8-hour Average) National Trend based on 33 Sites



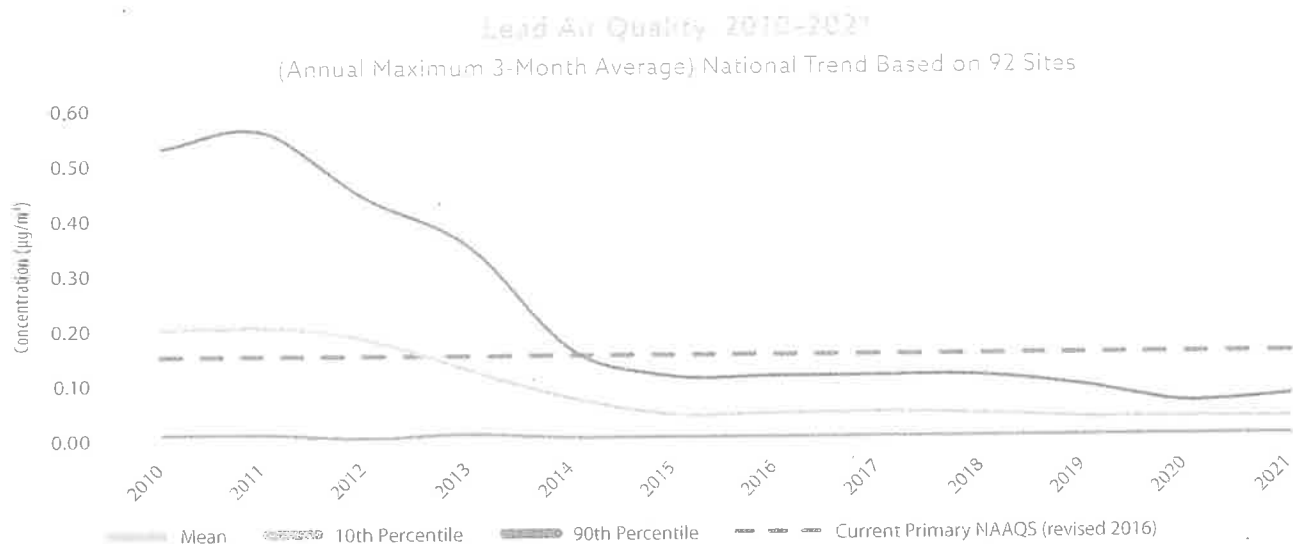
Source: U.S. EPA, Carbon Monoxide Trends, August 2022.

Carbon Monoxide (CO) Emissions 1990-2022



Source: U.S. EPA, Air Pollutant Emissions Trends (Data file: "National Tier 1 CAPS Trends, Criteria pollutants National Tier 1 for 1970-2022").

Criteria Air Pollutant Trends | Lead

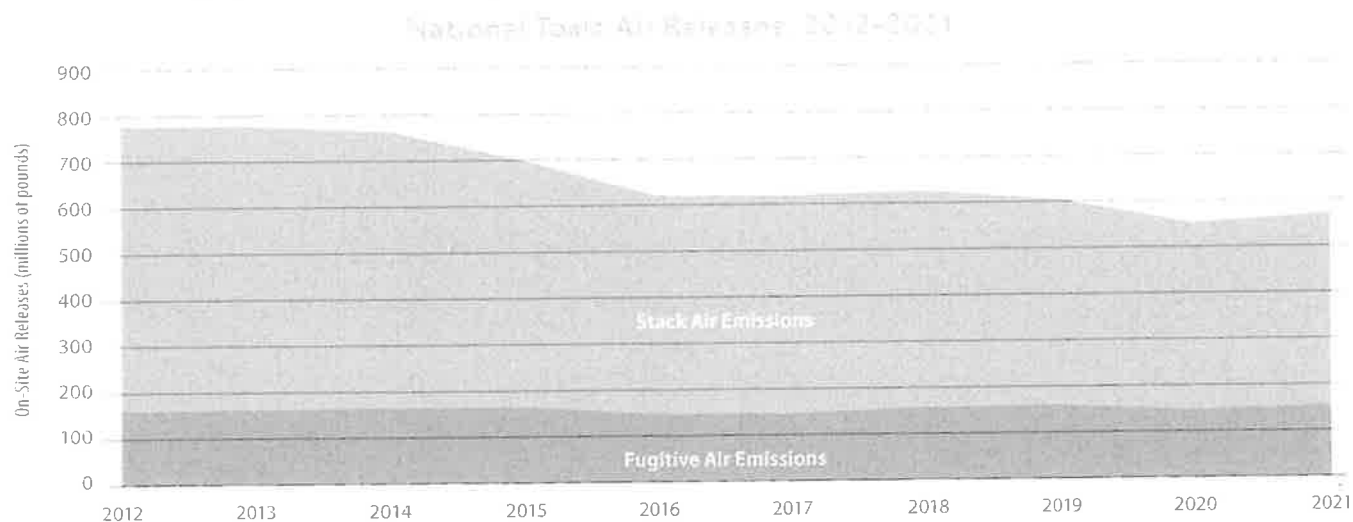


Source: U.S. EPA, Lead Trends, August 2022.

Hazardous Air Pollutants

As reported to U.S. EPA's *2021 Toxic Release Inventory National Analysis*, emissions of hazardous air pollutants, or air toxics, have continued to trend downward over the past decade. From 2012 to 2021, reported on-site toxic air releases decreased by 26 percent, from approximately 774.6 million pounds in 2012 to 571.2 million pounds in 2021, for a total reduction of about 203.4 million pounds.

Compared to 2020, national toxic air releases increased in 2021 by 3 percent. Sectors contributing the largest quantities of air releases during 2021 included chemical manufacturing (168.0 million pounds, or 29 percent), paper manufacturing (115.8 million pounds, or 20 percent), and electric utilities (64.5 million pounds, or 11 percent).⁶²

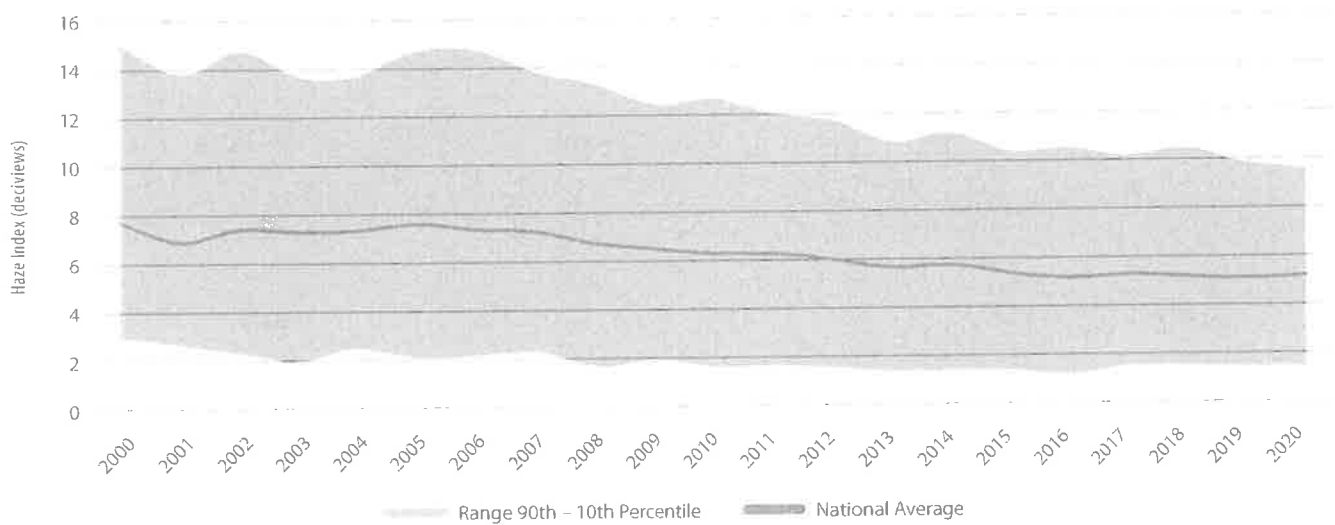


U.S. EPA, *2021 Toxic Release Inventory National Analysis*, March 16, 2023.

Visibility Improvements

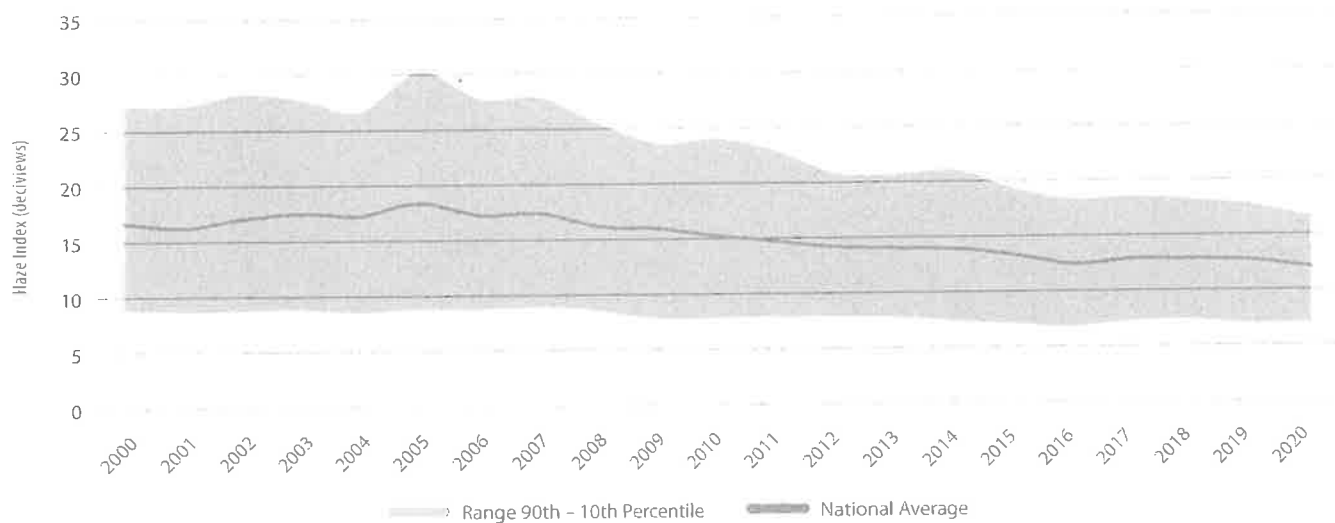
Under the Regional Haze Program, state and federal agencies monitor visibility in 156 national parks and wilderness areas, or Class I areas. U.S. EPA's 2021 report on air trends provides visibility data for Class I areas through 2020. Since 2000, visibility on the 20 percent clearest days has improved by nearly 33 percent, while there has been a 28 percent improvement in visibility during the 20 percent most impaired days.⁶³

National Visibility Trends on Clearest Days: 2000-2020



Source: U.S. EPA, *Our Nation's Air: Trends Through 2021* (Section: "Visibility Improves in Scenic Areas"), June 2022.

National Visibility Trends on Most Impaired Days: 2000-2020



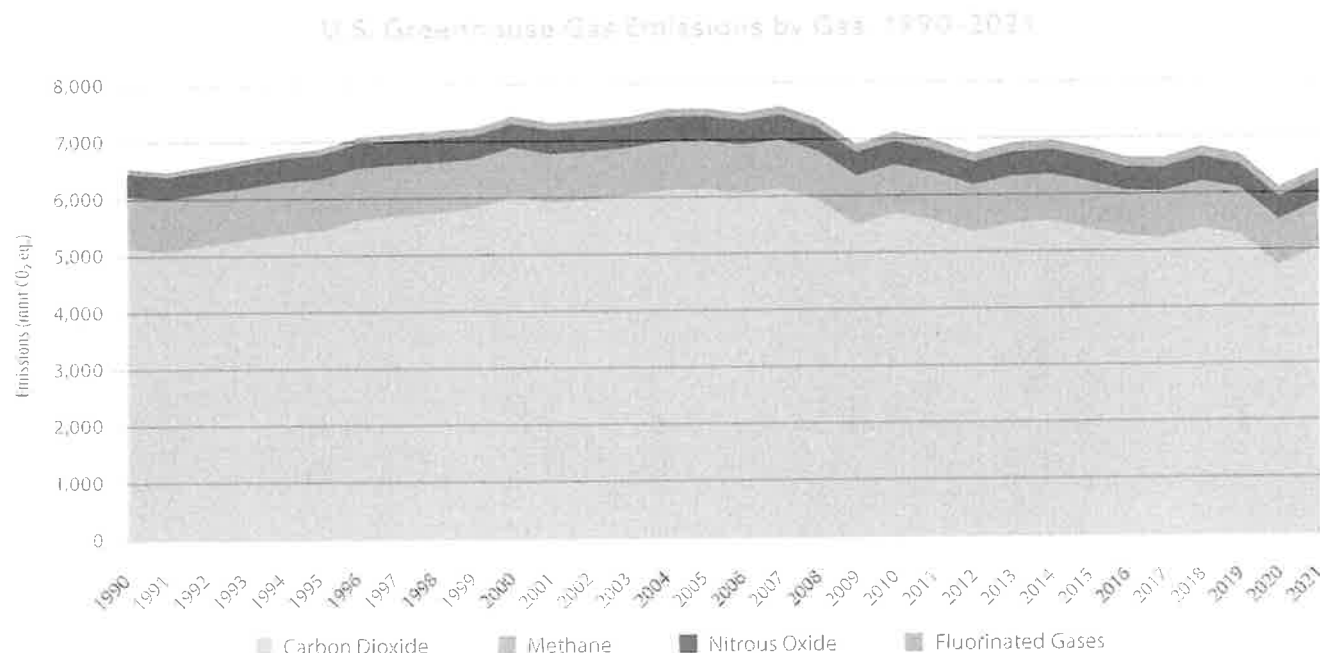
Source: U.S. EPA, *Our Nation's Air: Trends Through 2021* (Section: "Visibility Improves in Scenic Areas"), June 2022.



Greenhouse Gas Trends

Released in April 2023, U.S. EPA's *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021* documents that gross greenhouse gas emissions in the United States totaled 6,340.2 million metric tons of carbon dioxide equivalents (mmt CO₂ eq.) in 2021, a 2.3 percent decrease from 1990 levels.

In 2021, after accounting for sequestration from the land sector, U.S. EPA's *Inventory* finds that the nation's greenhouse gas emissions totaled 5,586.0 mmt CO₂ eq., an increase of 6 percent from the prior year and 17 percent below 2005 levels.⁶⁴



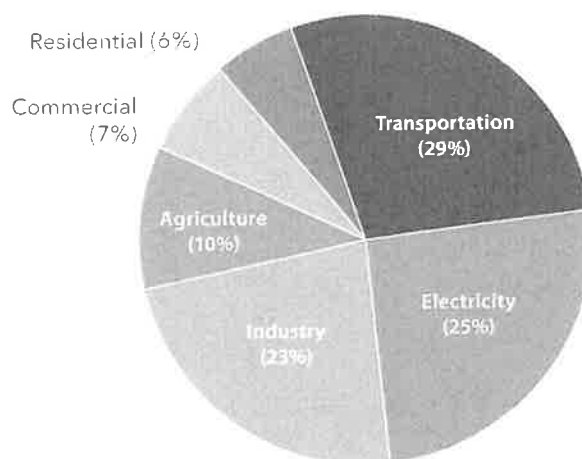
Source: U.S. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021*, April 2023. See U.S. EPA's Greenhouse Gas Inventory Data Explorer.

U.S. Greenhouse Gas Emissions by Economic Sector 2021

Greenhouse gas (GHG) emissions in 2021 were from the following primary economic sectors:

- 29 percent from transportation, up 18.6 percent from 1990;
- 25 percent from electricity generation, down 15.7 percent from 1990;
- 23 percent from industry, down 11.3 percent since 1990;
- 10 percent from agriculture, up 7.2 percent since 1990;
- 7 percent from commercial, down 1.8 percent from 1990; and,
- 6 percent from residential, up 5.8 percent from 1990.

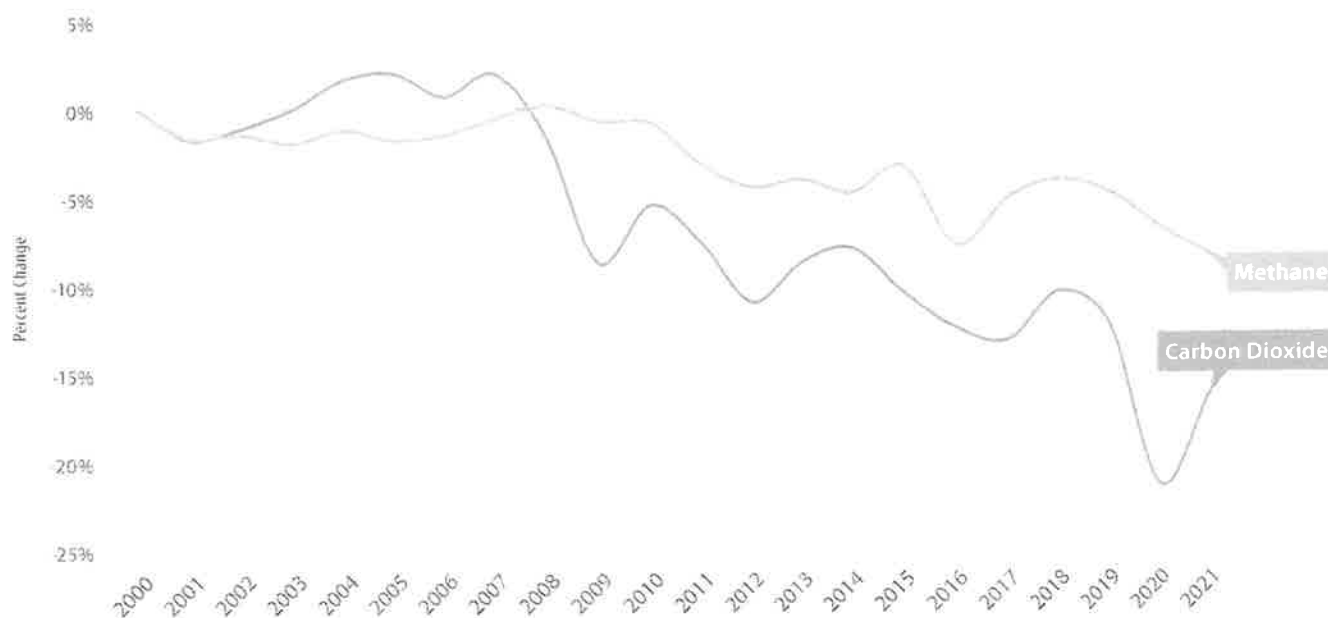
Source: U.S. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021*, April 2023. See U.S. EPA's Greenhouse Gas Inventory Data Explorer.



Greenhouse Gas Trends

U.S. EPA's *Inventory* also shows that, from 2000 to 2021, the United States reduced annual carbon dioxide emissions from 6,010.1 million metric tons of carbon dioxide equivalents (mmt CO₂ eq.) to 5,032.2 mmt CO₂ eq., a 16 percent decline.⁶⁵ Annual U.S. emissions of methane went from 867.8 mmt CO₂ eq. in 2000 down to 793.4 mmt CO₂ eq. in 2021, equivalent to a 9 percent decline.⁶⁶

Percent Change of U.S. Emissions of Carbon Dioxide and Methane, 2000-2021



Source: U.S. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021*, April 2023.

Recent Headlines from the U.S. Energy Information Administration (EIA)

U.S. coal shipments increased slightly in 2022 as power plants replenished stockpiles | April 26, 2023

U.S. natural gas production grew by 4% in 2022 | March 29, 2023

Renewable generation surpassed coal and nuclear in the U.S. electric power sector in 2022 | March 27, 2023

Coal was the largest source of electricity generation for 15 states in 2021 | December 7, 2022

Nearly a quarter of the operating U.S. coal-fired fleet scheduled to retire by 2029 | November 7, 2022

U.S. natural gas production set a new record in 2021 | October 12, 2022

Carbon intensity of U.S. power generation continues to fall but varies widely by state | September 13, 2022

In the first half of 2022, 24% of U.S. electricity generation came from renewable sources | September 9, 2022

Energy production declined by record amounts in several states in 2020 | August 8, 2022

Energy use fell during 2020 in all U.S. states except Alaska | July 21, 2022

Fossil fuel sources accounted for 79% of U.S. consumption of primary energy in 2021 | July 1, 2022

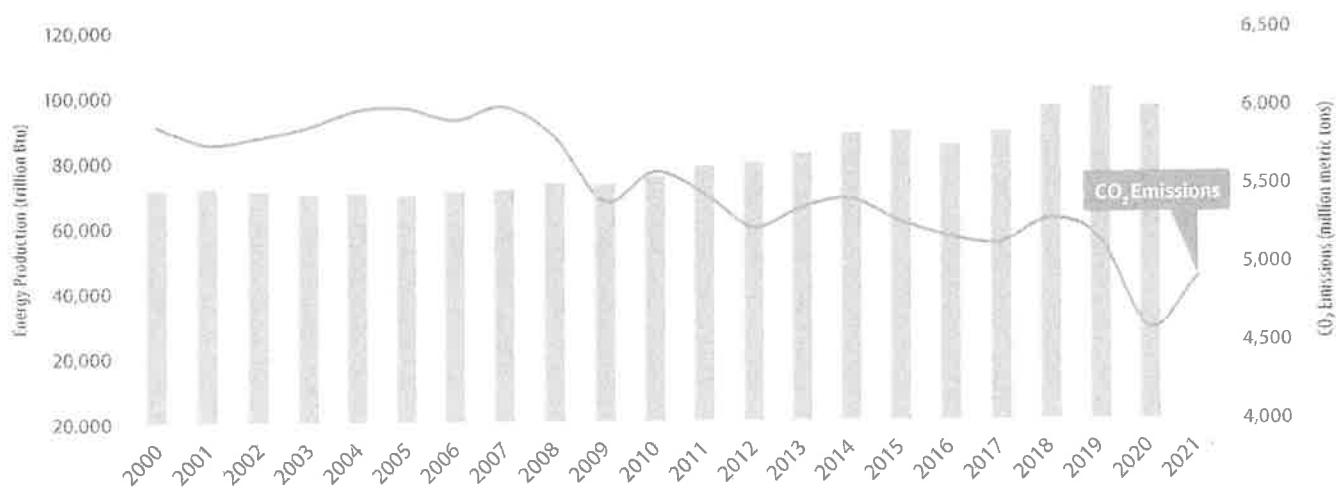
U.S. energy-related CO₂ emissions rose 6% in 2021 | May 13, 2022

Greenhouse Gas Trends | Energy-Related Carbon Dioxide Emissions

According to recent data from the U.S. Energy Information Administration, or EIA, United States energy-related carbon dioxide (CO₂) emissions fell by almost 17 percent from 2000 to 2021, from 5,888.6 million metric tons in 2000 to 4,902.5 million metric tons in 2021.⁶⁷

U.S. EIA data also shows that total U.S. energy production increased by 34 percent from 2000 to 2020, from 71,238 trillion British thermal units (Btu) in 2000 to 95,711 trillion Btu in 2020.⁶⁸

U.S. Total Energy Production Compared to Energy-Related CO₂ Emissions: 2000-2021

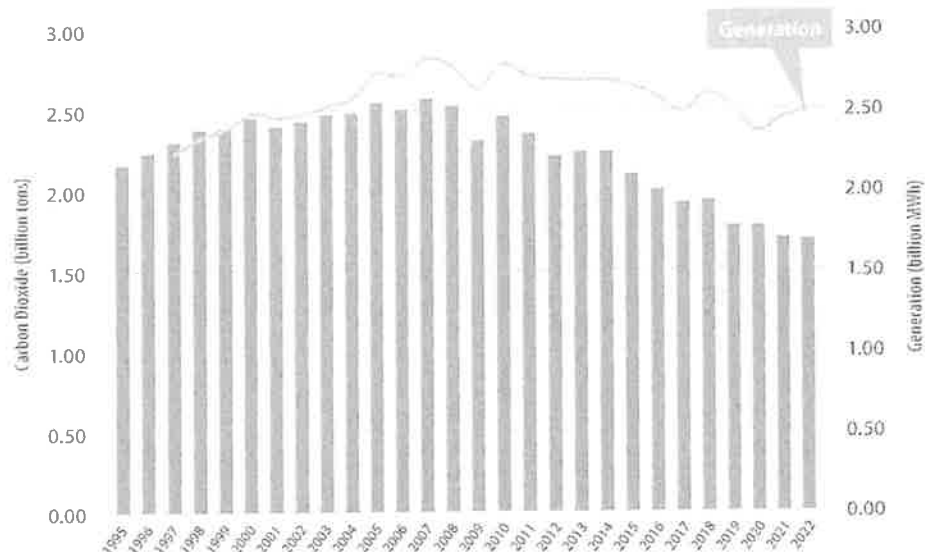


Source: U.S. EIA, Annual Energy Outlook 2023 (Section: "Emissions"), March 16, 2023; U.S. EIA, State Energy Data System (SEDS): 1960-2020.

U.S. Power Plant Emissions Trends | Annual CO₂ Emissions: 1995-2022

U.S. EPA's annual progress report on emissions from the power sector documents that CO₂ emissions from electricity generation declined by 21 percent from 1995 to 2021, during which time gross generation grew nearly 7 percent. From 2021 to 2022, U.S. CO₂ emissions decreased slightly by 1 percent, while generation rose by 2 percent.

Source: U.S. EPA, Power Plant Emission Trends, February 2023.



Sources

Types of Air Quality Data and Metrics

- ¹ 42 U.S.C. §7409(b).
- ² U.S. EPA states: "Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$)."
- ³ A chart of the primary and secondary NAAQS by pollutant, which includes averaging time, level, and form, can be found [here](#).
- ⁴ 42 U.S.C. §7409(d).
- ⁵ U.S. EPA, Air Quality System. U.S. EPA notes that the AQS "also contains meteorological data, descriptive information about each monitoring station (including its geographic location and its operator), and data quality assurance/quality control information."
- ⁶ Links to data summary files for national criteria pollutant trends can be found [here](#).
- ⁷ Data can be found [here](#). U.S. EPA notes: "The latest version of the 1970 – 2022 data show the trends for Tier 1 categories which distinguish pollutant emission contributions among major source types... As inventory methods are improved over time, for some emission sources an improved estimation method may be applied 'backwards' to previous year trend estimates."
- ⁸ More information on the NEI can be found [here](#). U.S. EPA states: "The NEI is built using the Emissions Inventory System (EIS) first to collect the data from State, Local, and Tribal air agencies and then to blend that data with other data sources."
- ⁹ U.S. EPA, Air Quality Design Values.
- ¹⁰ U.S. EPA, Toxics Release Inventory (TRI) Program. Annual TRI National Analysis [here](#). U.S. EPA notes that the TRI "is a resource for learning about toxic chemical releases and pollution prevention activities reported by industrial and federal facilities. TRI data support informed decision-making by communities, government agencies, companies, and others. Section 313 of the *Emergency Planning and Community Right-to-Know Act* (EPCRA) created the TRI Program."
- ¹¹ U.S. EPA, Air Quality – National Summary. See also: U.S. EPA, *Our Nation's Air: Trends Through 2021*, June 2022 (Section: "Visibility Improves in Scenic Areas").
- ¹² U.S. EPA, Power Sector Programs – Progress Report.
- ¹³ U.S. EPA releases the Inventory of U.S. Greenhouse Gas Emissions and Sinks each April. See also: U.S. EPA, Greenhouse Gas Inventory Data Explorer.
- ¹⁴ U.S. EIA, *Annual Energy Outlook 2023*, March 16, 2023.

AAPCA Member State Air Trends & Successes

- ¹⁵ U.S. EPA, Air Pollutant Emissions Trends Data (Data file: "State Tier 1 CAPS Trends," Criteria pollutants State Tier 1 for 1990–2022).
- ¹⁶ U.S. Bureau of Economic Analysis, "Gross Domestic Product by State, 4th Quarter 2022 and Year 2022 (Preliminary)," released March 31, 2023.
- ¹⁷ U.S. Office of Highway Policy Information, data available [here](#).
- ¹⁸ U.S. Census Bureau, data available [here](#).
- ¹⁹ U.S. EIA, Energy-Related CO₂ Emission Data Tables. Table 1. State energy-related carbon dioxide emissions by year.
- ²⁰ U.S. EIA, State Energy Data Systems (SEDS): 1960–2020.
- ²¹ U.S. EPA's Green Book can be found [here](#).
- ²² U.S. EPA's listing of areas designated nonattainment or maintenance for the 1997 annual PM_{2.5} NAAQS can be found [here](#). In 2012, the NAAQS for PM_{2.5} was lowered to 12.0 $\mu\text{g}/\text{m}^3$, based on an annual arithmetic mean averaged over three years (the 2006 review maintained the 1997 NAAQS). In 2020, U.S. EPA retained the 2012 standard of 12.0 $\mu\text{g}/\text{m}^3$. In June 2021, U.S. EPA announced the reconsideration of the 2020 decision to retain the 2012 PM_{2.5} standards. On January 6, 2023, U.S. EPA announced the proposed decision for the reconsideration of the NAAQS for PM.
- ²³ U.S. EPA defines a design value as "a statistic that describes the air quality status of a given location relative to the level of the [NAAQS]." More information is available [here](#).
- ²⁴ U.S. EPA's Air Quality System "contains ambient air pollution data collected by EPA, state, local, and tribal air pollution control agencies from over thousands of monitors."
- ²⁵ U.S. EPA, Air Quality Design Values (Data file: "PM_{2.5} Design Values, 2021"). Data for this chart is based on overlapping three-year averages beginning with 2000–2002 and ending with 2019–2021.
- ²⁶ U.S. EPA's listing of areas designated nonattainment or maintenance for the 2012 PM_{2.5} NAAQS can be found [here](#).
- ²⁷ U.S. EPA's listing of areas designated nonattainment or maintenance for the 2008 ozone NAAQS can be found [here](#). In 2015, U.S. EPA lowered the NAAQS for ozone to 0.070 parts per million (ppm), based on the annual fourth-highest daily maximum 8-hour average concentration, averaged over three years. In 2020, U.S. EPA retained the 2015 standard of 0.070 ppm. In October 2021, U.S. EPA announced the reconsideration of the 2020 decision to retain the 2015 ozone standards.
- ²⁸ U.S. EPA, Air Quality Design Values (Data file: "Ozone Design Values, 2021"). Data for this chart is based on overlapping three-year averages beginning with 2000–2002 and ending with 2019–2021.

Sources (continued)

- ²⁹ U.S. Energy Information Administration, State Energy Data System (SEDS): 1960–2020.
- ³⁰ U.S. EPA, Air Pollutant Emissions Trends Data (Data file: “State Tier 1 CAPS Trends,” Criteria pollutants State Tier 1 for 1990–2022).
- ³¹ More information on U.S. EPA Clean Air Markets Programs can be found here, and include the Acid Rain Program (ARP), the Cross-State Air Pollution Rule (CSAPR), and the CSAPR Update.
- ³² U.S. EPA, “State-by-State SO₂ Emissions from CSAPR and ARP Sources, 1990–2021,” July 2022.
- ³³ U.S. EPA, “State-by-State NO_x Emissions from CSAPR and ARP Sources, 1990–2021,” July 2022.
- ³⁴ U.S. Energy Information Administration, Energy-Related CO₂ Emission Data Tables. Table 3. State energy-related carbon dioxide emissions by sector.
- ³⁵ U.S. EPA recognizes that there will be differences between the EPA’s state-level GHG estimates and some inventory estimates developed independently by individual state governments. Inventory data presented here should not be viewed as official data of any state government. More information is available here, including official state greenhouse gas inventories here.
- ³⁶ U.S. Energy Information Administration (EIA), State Energy Data System (SEDS) 1960–2020; U.S. EIA, Energy-Related CO₂ Emission Data Tables. Table 1. State energy-related carbon dioxide emissions by year.
- ³⁷ U.S. Energy Information Administration, Energy-Related CO₂ Emission Data Tables. Table 7. Carbon intensity of the economy by state.
- ³⁸ U.S. EPA, 2021 Toxic Release Inventory (TRI) National Analysis, March 2023.
- ³⁹ U.S. EPA Toxic Release Inventory Explorer, 2021 TRI Factsheets.
- ⁴⁰ See U.S. EPA’s State Air Dashboard, part of Enforcement and Compliance History Online (ECHO).
- ⁴¹ See U.S. EPA’s State Air Dashboard, part of Enforcement and Compliance History Online (ECHO). Data accessed April 27, 2023.
- ⁴² U.S. EPA’s ECHO Air Dashboard reports the following as Clean Air Act compliance monitoring activities: Full Compliance Evaluation (FCE), Partial Compliance Evaluation (PCE), Stack Test, and Title V Annual Compliance Certification (TVACC) Reviews.
- ⁴³ See U.S. EPA’s State Air Dashboard, part of Enforcement and Compliance History Online (ECHO). Data accessed April 27, 2023.
- ⁴⁴ See U.S. EPA’s State Air Dashboard, part of Enforcement and Compliance History Online (ECHO). Data accessed April 27, 2023.
- American Air Quality in an International Context
- ⁴⁵ U.S. EPA, *Our Nation’s Air: Trends Through 2021*, June 2022.
- ⁴⁶ U.S. EPA, *Our Nation’s Air: Trends Through 2021*, June 2022.
- ⁴⁷ World Bank, GDP Listings by Country, March 30, 2023.
- ⁴⁸ World Bank, GDP Listings by Country, March 30, 2023.
- ⁴⁹ IEA maintains country profiles on key energy statistics, including energy production. More information on the United States can be found here, and China here.
- ⁵⁰ U.S. Energy Information Administration, State Energy Data System (SEDS): 1960–2020, June 24, 2022.
- ⁵¹ U.S. Census Bureau, Current Population.
- ⁵² U.S. Census Bureau, Population and Housing Estimates.
- ⁵³ Synthesized measurements of aerosol optical depth acquired by the National Aeronautics and Space Administration (NASA) Moderate Resolution Imaging Spectroradiometer (MODIS), Multi-angle Imaging SpectroRadiometer (MISR), and Sea-viewing Wide Field-of-view Sensor (SeaWiFS).
- ⁵⁴ Southerland, V. et al., “Global urban temporal trends in fine particulate matter (PM_{2.5}) and attributable health burdens: estimates from global datasets,” *The Lancet Planetary Health*, January 05, 2022. Available at: [https://doi.org/10.1016/S2542-5196\(21\)00350-8](https://doi.org/10.1016/S2542-5196(21)00350-8).
- ⁵⁵ Anenberg, S. et al., “Long-term trends in urban NO₂ concentrations and associated pediatric asthma incidence: estimates from global datasets,” *The Lancet Planetary Health*, January 2022. Available at: [https://doi.org/10.1016/S2542-5196\(21\)00255-2](https://doi.org/10.1016/S2542-5196(21)00255-2).
- ⁵⁶ More information on IEA’s *Greenhouse Gas Emissions from Energy* database and methodology can be found here.
- ⁵⁷ International Energy Agency, *Greenhouse Gas Emissions from Energy Highlights*, September 2022.

Air Quality Trends in the United States

- ⁵⁸ U.S. EPA, Air Quality—National Summary: Air Quality Trends (updated June 1, 2022).
- ⁵⁹ U.S. EPA, Air Quality—National Summary: Emissions Trends (updated June 1, 2022). Note: “EPA estimates nationwide emissions of ambient air pollutants and the pollutants they are formed from (their precursors). These estimates are based on actual monitored readings or engineering calculations of the amounts and types of pollutants emitted by vehicles, factories, and other sources. Emission estimates are based on many factors, including levels of industrial activity, technological developments, fuel consumption, vehicle miles traveled, and other activities that cause air pollution.”

Sources (continued)

⁶⁰ U.S. EPA, Air Quality—National Summary: Emissions Trends (updated June 1, 2022).

⁶¹ U.S. EPA, Air Pollutant Emissions Trends Data (Data file: "National Tier 1 CAPS Trends," Criteria pollutants National Tier 1 for 1970–2022).

⁶² U.S. EPA, 2021 Toxic Release Inventory National Analysis, March 2023.

⁶³ U.S. EPA, *Our Nation's Air: Trends Through 2021*, June 2022 (Section: "Visibility Improves in Scenic Areas"). A full listing of Class I Areas under U.S. EPA's Regional Haze program can be found here.

⁶⁴ U.S. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021*, April 2023. U.S. EPA's *Inventory* "provides a comprehensive accounting of total greenhouse gas emissions for all man-made sources in the United States."

⁶⁵ U.S. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021*, April 2023.

⁶⁶ U.S. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021*, April 2023.

⁶⁷ U.S. EIA, State Energy Data System (SEDS): 1960–2020, June 24, 2022.

⁶⁸ U.S. Energy Information Administration, *Annual Energy Outlook 2023*, March 16, 2023 (Section: "Emissions"). Includes the following sectors: transportation, industrial, electric power, residential, and commercial.

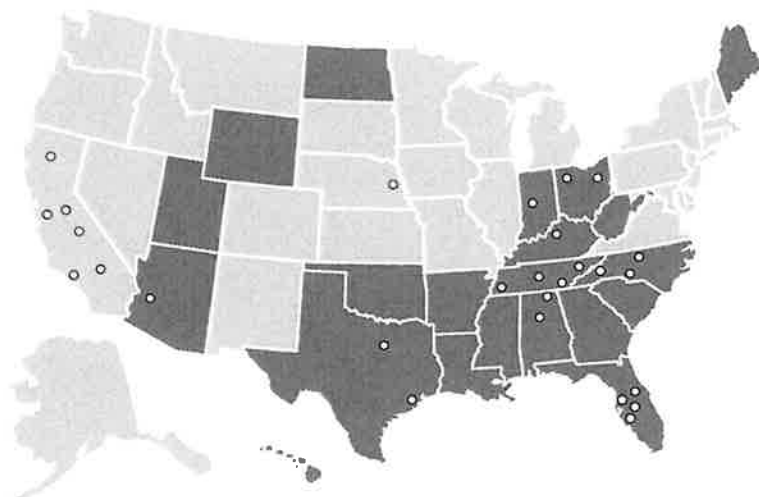
Air Quality Resources

AAPCA State Agencies

- Alabama Department of Environmental Management
- Arizona Department of Environmental Quality
- Arkansas Division of Environmental Quality
- Florida Department of Environmental Protection
- Georgia Environmental Protection Division
- Hawaii Department of Health
- Indiana Department of Environmental Management
- Kentucky Division for Air Quality
- Louisiana Department of Environmental Quality
- Maine Department of Environmental Protection
- Mississippi Department of Environmental Quality
- North Carolina Department of Environmental Quality
- North Dakota Department of Environmental Quality
- Ohio Environmental Protection Agency
- Oklahoma Department of Environmental Quality
- South Carolina Department of Health & Environmental Control
- Tennessee Department of Environment & Conservation
- Texas Commission on Environmental Quality
- Utah Department of Environmental Quality
- West Virginia Department of Environmental Protection
- Wyoming Department of Environmental Quality

AAPCA Local Agencies

- Asheville-Buncombe Air Quality Agency (NC)
- Butte County Air Quality Management District (CA)
- Canton City Health Department Air Pollution Control Division (OH)
- Chattanooga-Hamilton County Air Pollution Control Bureau (TN)
- City of Fort Worth Environmental Quality Division (TX)
- City of Huntsville Natural Resources Office (AL)
- City of Indianapolis (IN)
- El Dorado County Air Pollution Control District (CA)
- Environmental Protection Commission of Hillsborough County (FL)
- Forsyth County Office of Environmental Assistance & Protection (NC)
- Galveston County Health District, Air & Water Pollution Services (TX)
- Jefferson County Department of Health, Air & Radiation Protection Division (AL)
- Knox County Air Quality Management (TN)
- Louisville Metro Air Pollution Control District (KY)
- Manatee County Environmental Protection Division (FL)
- Maricopa County Air Quality Department (AZ)
- Mecklenburg County Air Quality (NC)



- Mojave Desert Air Quality Management District (CA)
- Nashville-Davidson Metro Public Health Department (TN)
- Omaha Air Quality Control Division (NE)
- Orange County Air Quality Management (FL)
- Pinellas County Air Quality Monitoring Program (FL)
- San Joaquin Valley Air Pollution Control District (CA)
- Shelby County Health Department (TN)
- Toledo Division of Environmental Services (OH)
- Ventura County Air Pollution Control District (CA)
- Yolo-Solano Air Quality Management District (CA)

Additional Air Quality Resources

- U.S. EPA Air Quality Trends Website
- U.S. EPA Nonattainment Areas for Criteria Pollutants (Green Book)
- U.S. EPA Report on the Environment (ROE)
- U.S. EPA Air Quality Index (AQI)
- U.S. EPA Power Plant Emissions Trends
- Environmental Council of the States ECOS Results
- Western Regional Air Partnership (WRAP) Regional Haze Storyboard

AAPCA Staff

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REGULATION ENVIRONMENT & ENERGY

Policy Brief: Managing Ethylene Oxide: An Air Quality Professional's Perspective



By **Richard J. Trzupek**

Published **October 23, 2020**



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The Myth: Ethylene oxide is a uniquely hazardous manmade compound. It is commonly found at dangerous concentrations in the air, near commercial and industrial facilities that use it, and it is virtually unregulated.

Reality: Ethylene oxide is produced at petrochemical facilities, but is also regularly found in natural, biological systems, such as the human body. It is also commonly found in ambient air throughout industrial, residential, and rural areas. It is one of hundreds of potentially hazardous chemicals that is meticulously regulated by a variety of federal, state, and local agencies, which enforce regulations that are carefully designed to protect human health and the environment.

The Exposure Question

In a world filled with thousands upon thousands of chemicals, natural and manmade, defining “safe” exposure levels to any one of them is an incredibly complex exercise. The risk associated with exposure depends on the state of a person’s health, other exposures and risk factors, the frequency of exposure, genetic predispositions, and many other factors.

One of the more valuable ways of looking at exposure is to compare how exposure to a particular compound near manmade sources differs from natural background exposure in areas far removed from a manmade source. People are generally comfortable accepting the idea that natural background concentrations of air, water, and soil contaminants can serve as a baseline when examining risks associated with exposure. If 10 parts per billion of a compound can be regularly found in the air in remote locations, far away from potential industrial sources, there is no reason to suspect that a similar exposure of 10 parts per billion near an industrial source should be cause for concern.

When examined from this perspective, monitoring efforts in the public and private sectors tell a compelling story about ethylene oxide (EtO). Numerous studies have examined ethylene-oxide concentrations in the ambient air near industrial facilities that use the chemical, such as sterilization operations and petrochemical plants utilizing it as a precursor. These concentrations have been compared to ethylene-oxide concentrations in the ambient air at locations far removed from facilities handling ethylene oxide, and what researchers have found is that there is no meaningful statistical difference between the datasets. The air near a plant handling ethylene oxide is about as likely to

contain a slightly higher concentration of the compound compared to Remote Area A as it is to contain a slightly lower concentration of the compound near Remote Area B.



Richard J. Trzupek

Richard J. Trzupek is a chemist who has been employed as an environmental consultant to industry for more than 25 years.



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EtO Sterilization of Medical Devices

EtO Sterilization Is Essential to Health Care Delivery

The highly regulated process of using Ethylene Oxide (EtO) gas to sterilize medical devices is crucial to the safety of thousands of medical treatments and procedures. Every year in the U.S., 20 billion medical devices representing half of all sterile, single use devices are sterilized with EtO. EtO sterilization, which protects patients from the risk of bacterial, fungal and viral infectious diseases, is the only FDA-validated industrial option to safely sterilize medical devices that contain polymers, electronics or multiple layers of packaging. Alternative modes of sterilization including steam, radiation, and heat would damage those devices, impacting the device's performance, safety or effectiveness. Additionally, there is no alternative that could meet the material compatibility or capacity needs to replace EtO sterilization.

EPA Regs Would Limit EtO, FDA Warns Closures Would be Catastrophic

The Environmental Protection Agency (EPA) recently published two proposals intended to limit EtO emissions from commercial sterilizers (NESHAP) and worker exposure to the chemical inside facilities (FIFRA). The EPA's actions are sweeping and there is broad concern that in addition to the costs to comply, several of the proposals would require changes that will lead to capacity reductions in existing facilities, as well as additional sterilizer closures. This is a scenario that FDA warned in 2019 would be "catastrophic" for health care providers and patients:

"We would be concerned if even one additional facility shut down. We will start to see spot shortages; there is no question about that. In terms of a more catastrophic national impact, with two facility shutdowns, it is almost a certainty." – Susan Schwartz, FDA's Office of Strategic Partnerships and Technology Innovation ([link](#))

MDMA's members share EPA's commitment to public health and support new rules that are achievable while not impacting sterilization capacity. The treatments and cures MDMA's members develop have led to profound advancements in clinical care and helped patients live longer and healthier lives. We are concerned, however, that the potential environmental benefits of EPA's actions, if implemented as proposed, would be relatively small compared to the dire consequences to patient care if EtO sterilization capacity is substantively limited.

CATHY McMORRIS RODGERS, WASHINGTON
CHAIR

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED EIGHTEENTH CONGRESS
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March 21, 2023

The Honorable Michael S. Regan
Administrator
U.S. Environmental Protection Agency
Mail Code 1101A
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Dear Administrator Regan,

On October 14, 2022, we wrote you to request that you ensure meaningful public engagement and opportunity for public comment concerning any proposal by the Environmental Protection Agency (EPA) to revise existing air quality standards for fine particulate matter, also known as PM_{2.5}.¹

We requested that you ensure the agency follows its own precedents as well as requirements under the Administrative Procedure Act to accept comment on retaining the existing standards.² We also asked that you ensure the public has at least 90 days to submit comments once any proposal is published. (See attached letter outlining our requests and concerns about the consequences of an inadequate review process.)

This past January 6, you proposed to revise the PM_{2.5} standards to significantly lower levels, and specifically asked for comment on a range below the current standard. Indeed, you failed to take comment on keeping the current standards, in that proposal. You also provided for only 60 days for public comment. Given the complexity and scope of regulatory impacts to comply with the potential new standards, it is disappointing that you would not provide for full opportunity for public comment on all aspects of the proposed decision.

¹ See October 14 Letter to EPA Administrator Michael Regan from Energy and Commerce Republican Leader Rodgers, Subcommittee on Oversight and Investigations Leader Griffith, and Subcommittee on Environment and Climate Change Leader McKinley.

² To satisfy the APA's notice and comment requirements, agencies must provide a "meaningful opportunity" for comment and "remain sufficiently open minded." See *Rural Cellular Ass'n. v. FCC*, 588 F.3d 1095, 1101 (D.C. Cir. 2009).

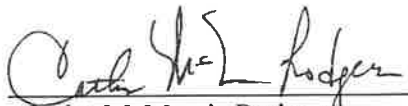
We write today to request you extend the comment period by 30 days and confirm to us as soon as practicable that you will accept full public comment, including for retaining the existing standards.

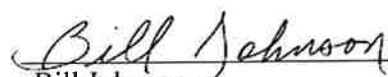
In addition, we request you supply a written response by April 4, 2023, in which you describe in detail:

- (a) The EPA's current assessment of the impacts of the proposed standards on small businesses, agriculture, municipalities, individual homeowners, and other small, nonpoint sources, which your data indicate make up some 80% of the sources that will be required to reduce PM2.5 emissions;
- (b) What outreach you have made to ensure these small businesses, agriculture, municipalities, individual homeowners, and other small, nonpoint sources understand the proposal, given the likelihood of increased controls and costs for these sources; and
- (c) The significance of the EPA's inability to identify sufficient emission controls in the Draft Regulatory Impact Analysis to attain the proposed alternative standards.

You may have your staff contact Peter Spencer or Mary Martin of the Majority Committee staff should you have questions.

Sincerely,


Cathy McMorris Rodgers
Chair
House Committee on Energy and
Commerce


Bill Johnson
Chair
Subcommittee on Environment,
Manufacturing, and Critical Materials


H. Morgan Griffith
Chair
Subcommittee on Oversight and
Investigations

Letter to The Honorable Michael S. Regan
Page 3

Attachment

CC: The Honorable Frank Pallone, Ranking Member
The Honorable Diana DeGette, Ranking Member, Subcommittee on Environment,
Manufacturing, and Critical Materials
The Honorable Kathy Castor, Ranking Member, Subcommittee on Oversight and
Investigations

FRANK PALLONE, JR., NEW JERSEY
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ONE HUNDRED SEVENTEENTH CONGRESS

Congress of the United States

House of Representatives

COMMITTEE ON ENERGY AND COMMERCE

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Minority (202) 225-3641

October 14, 2022

The Honorable Michael S. Regan
Administrator
U.S. Environmental Protection Agency
Mail Code 1101A
1200 Pennsylvania Avenue N.W.
Washington, DC 20460

Dear Administrator Regan,

We write to request that you ensure meaningful public engagement and opportunity for public comment concerning any proposal by the Environmental Protection Agency (EPA) to revise existing air quality standards for fine particulate matter, also known PM_{2.5}.

Less than two years ago, EPA, pursuant to Clean Air Act requirements, completed an exhaustive review of the PM_{2.5} standards, concluding that existing standards protect public health with an adequate margin of safety. However, just six months later, in June 2021, you directed the agency to review that decision. We understand EPA recently submitted the resulting reconsideration proposal to the White House for interagency review.

When EPA seeks public comment on that proposal, you should ensure the agency follows its own past precedents as well as requirements under the Administrative Procedure Act to accept comment on retaining the existing standards.¹ Furthermore, we believe you should ensure the public has at least 90 days to submit comments once any proposal is published.

We understand EPA has accepted comment on retaining the existing standards in proposals for each of the 2006, 2012, and 2020 reviews of the PM_{2.5} standards. For example, when proposing the current annual PM_{2.5} standards in 2012, EPA invited “general, specific, and

¹ To satisfy the APA’s notice and comment requirements, agencies must provide a “meaningful opportunity” for comment and “remain sufficiently open minded.” See *Rural Cellular Ass’n. v. FCC*, 588 F.3d 1095,1101 (D.C. Cir. 2009).

technical comments on all issues involved in this proposal.”² Going as far back as 1996, when EPA proposed the first PM_{2.5} standards, it solicited “broad public comment” not only on the then-proposed standard but also alternatives.³

EPA’s reconsideration of the 2020 PM_{2.5} standard comes at a time of ongoing improvements to air quality. EPA, states, and the regulated community have successfully worked together to slash PM_{2.5} emissions, resulting in a 37% improvement in related air quality since 2000. These emissions reductions will continue under existing programs without changes to the PM_{2.5} standard.

Lowering the standard will create a regulatory burden that undermines community business investment, reduces tax revenue that support local schools and first and frontline responders, and effectively hamstrings efforts to overcome tough economic times. These impacts reverberate to every part of the country already reeling from a recession.

For example, areas that do not meet new air standards face immediate, substantial, and long-lasting economic consequences. Existing facilities in these areas could be required to install new, expensive controls. New businesses seeking to build or upgrade operations must also install the most up-to-date emissions controls, without consideration of cost, and are subject to enhanced EPA oversight. In addition, businesses must offset new PM_{2.5} emissions by paying for emissions reductions at existing facilities. Absent affordable offsets, new projects cannot proceed. Federal funds for transportation projects may also be withheld unless those projects can be shown not to increase PM_{2.5} emissions. Restrictions do not end once these areas achieve PM_{2.5} standards. Instead, they must petition EPA to be re-designated to attainment by submitting a complex maintenance plan listing numerous mandatory and long-lasting measures.

Moreover, the consequences of lowering PM_{2.5} standards extend even to areas meeting those standards. New projects and major expansions in these areas require permits demonstrating that they will not exceed the standards. Manufacturing businesses trying to make such demonstrations are already pinched between PM_{2.5} standards set near levels of emissions that naturally occur or are transported from other countries, and EPA modeling designed to over predict PM_{2.5} concentrations. Lowering PM_{2.5} standards further would eliminate the small margin left for manufacturers and to obtain the necessary approvals for new, state-of-the-art projects. This could force companies operating in areas meeting PM_{2.5} standards to install controls even more costly than those required in areas that fail them – or to simply not build at all.

Changes to the PM_{2.5} standards should therefore clearly improve public health – especially with PM_{2.5} emissions already on a continuing, downward trajectory. It is critical, then, for EPA’s reconsideration to get the science and the rulemaking process right. That requires

² Fed. Reg. 38890, 38899 (June 29, 2012); *see also* 2006 Ozone NAAQS, 71 Fed. Reg. 2620, 2653 (Jan. 17, 2006) (“The Administrator solicits comment on all aspects of this proposed decision.”) *and* 2020 Ozone NAAQS, 85 Fed. Reg. 49830, 49874 (Aug. 14, 2020) (“[T]he Administrator solicits comment on the array of issues associated with review of this standard . . .”).

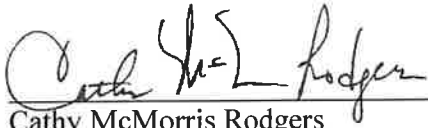
³ 61 Fed. Reg. 65638, 65661 (Dec. 13, 1996).

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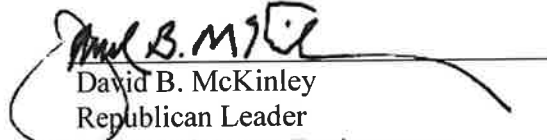
accepting comment on the full range of issues, including retaining existing standards, and providing stakeholders sufficient time, at least 90 days, to file comments.

We appreciate your attention to this matter.

Sincerely,



Cathy McMorris Rodgers
Republican Leader
Committee on Energy and Commerce


David B. McKinley
Republican Leader
Subcommittee on Environment
and Climate Change
H. Morgan Griffith
Republican Leader
Subcommittee on Oversight
and Investigations



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

May 9, 2023

OFFICE OF
AIR AND RADIATION

The Honorable Cathy McMorris Rodgers
Chair
House Committee on Energy and Commerce
U.S. House of Representatives
Washington, D.C. 20515

Dear Madam Chair:

Thank you for your letter dated March 21, 2023, to U.S. Environmental Protection Agency (EPA) Administrator Regan in which you express concerns regarding EPA's proposal on the current National Ambient Air Quality Standards (NAAQS) for particulate matter (PM). The Administrator has asked that I respond on his behalf.

As you know, EPA has proposed to revise the current primary (health-based) annual fine particle, or PM_{2.5}, standard from its current level of 12.0 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) to within the range of 9.0 to 10.0 $\mu\text{g}/\text{m}^3$, to provide increased public health protection, while also soliciting comment on the full range of recommended levels from the Clean Air Scientific Advisory Committee (CASAC) (i.e., as low as 8.0 $\mu\text{g}/\text{m}^3$ and as high as 11.0 $\mu\text{g}/\text{m}^3$). After carefully reviewing the available scientific and quantitative information, EPA has proposed to retain the current primary (health-based) 24-hour PM_{2.5} standard with its current level of 35 $\mu\text{g}/\text{m}^3$, while also soliciting comment on the full range of recommended levels from the CASAC (i.e., as low as 25 $\mu\text{g}/\text{m}^3$). As is typical in NAAQS reviews, EPA is proposing a range of options for consideration in revising the NAAQS, based on the available scientific and technical information, including their uncertainties, as well as the CASAC's advice. EPA proposes a range of options, as the available information can be interpreted in different ways, and in soliciting comment on these options, the public can provide their comments and rationales for how the available information could support retaining the current standards and any potential revisions to the standards. In reaching a final decision, the Administrator will select a single value for the level of the standard(s) that provides requisite protection for public health.

As a general matter, the proposal will not impose any specific requirements on any business, but rather, this proposed rule establishes national standards for allowable concentrations of PM in ambient air as required by section 109 of the Clean Air Act. Furthermore, as has been recognized by the courts, NAAQS themselves impose no regulations upon any entities,

including small entities.¹ Air quality management decisions and approaches to implement the PM NAAQS will be made in the first instance by state and local air agencies following EPA's air quality designations process. EPA's air quality designations process, as well as the subsequent state and local air agency planning processes, provide opportunities for public comment and engagement as they move forward.

In your letter, you request that the comment period be extended by 30 days. EPA has considered your request. The Agency considers the 60-day comment period to be appropriate. We also held a multi-day virtual public hearing on February 21 through 23, 2023, from 11am EST to 7 pm EST, which provided the public with an opportunity to provide oral testimony. EPA is denying the request to extend the 60-day public comment period, which closed on March 28, 2023.

I appreciate all your concerns and can assure you that your views and comments will be taken into consideration as we develop a final rule. Your comments and recommendations have been forwarded to the docket for this rulemaking (Docket ID No. EPA-HQ-OAR-2015-0072) and will be considered as EPA moves forward in its decision-making process. EPA intends to issue a final rule on the PM NAAQS by the end of 2023.

Again, thank you for your letter. If you have any further questions, please contact me or your staff may contact Ms. Kyle J. Zieba, Congressional Liaison Specialist in EPA's Office of Congressional and Intergovernmental Relations at ziebakyle@epa.gov or (202) 893-0018.

Sincerely,

Joseph Coffman
Principal Deputy Assistant Administrator

cc: The Honorable Frank Pallone, Ranking Member
Committee on Energy and Commerce

The Honorable Diana DeGette, Ranking Member
Subcommittee on Environment, Manufacturing, and Critical Materials

The Honorable Kathy Castor, Ranking Member
Subcommittee on Oversight and Investigations

¹ See also *American Trucking Associations v. EPA*, 175 F.3d 1027, 1044-45 (D.C. Cir. 1999) (NAAQS do not have significant impacts upon small entities because NAAQS themselves impose no regulations upon small entities), rev'd in part on other grounds, *Whitman v. American Trucking Associations*, 531 U.S. 457 (2001).