JUST ENERGY PAPERS

An Equitable Transition to Clean and Renewable Energy Must Reduce Air Pollution Burdens in Environmental Justice Communities

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November 2021

This paper was prepared for the Climate and Clean Energy Equity Fund and Just Solutions Collective and was written for educational purposes, not to advocate for a position related to any specific legislation. The author would like to thank Arjun Makhijani, Parin Shah, Aiko Schaefer, Sonum Nerurkar, Jillian Du, Shana Lazerow, and Nina Robertson for their review and contributions to this paper. All errs are solely the author's.

The transition to clean and renewable energy is critical to protect communities from the most devastating impacts of the climate crisis. To be equitable, this transition must focus on reducing both greenhouse gas emissions and harmful air pollution, especially in already over-burdened environmental justice communities.

Historically, Black, Indigenous, People of Color (BIPOC) communities and communities with lower incomes have borne the brunt of our overreliance on fossil fuels with higher exposures to toxic air pollution. This increased exposure disproportionately impacts their health, longevity, and quality of life. Even in the transition to alternatives considered "renewable" or deemed "necessary" for a clean energy system, these communities—often called environmental justice or disadvantaged communities[1]—have unjustly faced and will continue to face increased air pollution. In Baltimore, Maryland, a highly impacted environmental justice community breaths a toxic and harmful pollution mix from a trash incinerator that the state classifies as renewable.[2] In Springfield, Massachusetts, an environmental justice community surrounded by power plants spent years fighting off a large biomass facility that would have made their already toxic air worse.[3] Across the country in the San Joaquin Valley of California, communities breath some of the worst air in the country, as a natural gas power plant starts and stops more than 400 times a year to provide energy when the sun goes down.[4] Each start of that power plant emits more pollution than if it steadily operated for many hours.[5]

Environmental justice communities like these have faced and will likely continue to face increased localized harmful air pollution and health risks from the transition to "renewable" and "clean" energy unless specific targeted measures, programs, and requirements are developed.

At a minimum, the development of a federal or state clean or renewable electricity standard or renewable portfolio standard should: a) be designed to reduce harmful air pollution with a priority for frontline and environmental justice communities;[6] b) not include polluting combustion resources such as biomass combustion in the definition of clean or renewable;[7] c) require energy planning and procurement to move past reliance on dirty combustion resources to clean resources that protect the health of environmental justice communities; and d)

ensure more accurate reporting and verification of emissions, updated pollution control requirements, and increased enforcement of existing and updated clean air requirements.

1. BACKGROUND

Environmental justice communities already face disproportionate and dangerous air pollution risks.

Many parts of the country breathe air that does not currently meet federal standards. More than 40 percent of the population lives in areas where pollution levels frequently make the air too dangerous to breathe.[8] This burden disproportionately falls on people of color, who are more than three times more likely than white people to be breathing the most polluted air.[9]

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Air pollution can cause many serious health effects. Inhaling small particles called particulate matter can lead to asthma attacks, hospitalization, and premature death.[10] These health impacts can exacerbate and worsen existing economic and social burdens caused by poverty, unemployment, existing health conditions, and racial injustice. Some consequences of pollution exposure can include lost days at school and work, increased healthcare costs, greater caregiving needs, and job loss. Any increase of particulate matter pollution increases health risks as there is no safe threshold for particulate matter pollution.[11]

Exposure to ground-level ozone, which is created by chemical reactions between nitrogen oxides and volatile organic compounds in sunlight, can reduce lung function and harm lung tissue.[12] Hazardous air pollutants such as mercury are harmful to human health and can lead to many serious health problems, including neuromuscular changes, respiratory failure, and premature death.[13]

Children, older adults, and people with asthma are at greater risk to health impacts from air pollution.[14]

The pollution burdens from combustion power plants are disproportionately located in environmental justice communities.

Power plants that burn any type of fuel emit air pollution and contribute to existing pollution burdens. The amount of pollution a power plant emits and its contribution to the air pollution burden depend on a number of factors including whether the power plant has pollution control equipment.[15] Pollution control equipment can significantly reduce pollutants,[16] but each type of control only reduces a subset of pollutants that a plant emits, and they only work under the right conditions. For example, pollution controls generally are not as effective when a power plant is starting, shutting down, or operating at partial load. Nevertheless, the installation and operation of the best available pollution controls are a crucial way to limit the pollution burdens from power plants. Indeed, smaller plants without pollution controls can emit more harmful pollution than larger plants with controls.[17]

The amount of pollution emitted also depends on the type and amount of fuel that is burned. Burning any type of fuel—whether it is coal, natural gas, biomass, biomethane, municipal waste, or even hydrogen[18]—emits harmful pollution. The type and amount of pollution emitted by burning these fuels depends on the fuel, the combustion temperature, and the amount of the fuel burned. Since all combustion can and does increase pollution, it is important to consider the potential impact of *all* fuels that are burned, not solely fossil fuels, when considering potential air pollution impacts from the transition to different energy resources. Indeed, even as coal emissions are declining, communities across the country are experiencing health impacts from combustion of biomass and gas.[19]

Power plants that burn fuels can and do increase the existing pollution burden faced by communities. The emissions from operating just one power plant can significantly impact local air quality. In an analysis of power plant emissions, the California Energy Commission found that emissions from one power plant alone would cause the background level of coarse particulate matter to exceed the

limiting California ambient air quality standard by more than 50 percent.[20] Power plants are also likely to contribute to days exceeding ambient air quality standards. For example, an analysis found that the majority of California "peaker" power plants generated more electricity on days when ozone standards were exceeded in the air basin.[21]

The burden of power plant pollution falls disproportionately on low-income communities and communities of color.[22] Study after study has established that polluting power plants are disproportionately located near communities of color and the most disadvantaged communities.[23]

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Disproportionate siting has occurred for fossil fuel plants, such as coal and natural gas plants, as well as for other types of harmful combustion power plants, such as biogas and biomethane facilities.[24] Municipal waste incinerators, which emit hazardous air pollution, are also disproportionaAtely located in communities of color.[25] Not only are environmental justice communities located closer to power plants, they are also breathing more pollution from power plants. A recent study found that communities of color face the highest risk of morbidity from power plants' fine particulate matter pollution.[26]

2. A POORLY DESIGNED CLEAN ELECTRICITY OR RENEWABLE PORTFOLIO STANDARD COULD INCREASE AIR POLLUTION.

There are three reasons why the implementation of a federal or state clean electricity or renewable portfolio standard could increase pollution in environmental justice communities: 1) the remaining fossil fuel plants could emit more pollution due to more frequent cycling; 2) polluting combustion facilities could be identified as "renewable" and increase pollution; and 3) false solutions could prolong the life of fossil fuel facilities. As a air quality research scientist recently summarized: "[Natural] gas, biomass, and wood are not clean or healthy

alternative energy sources. Swapping one polluting fuel source for another is not a pathway to a healthy energy system."[27]

The remaining fossil fuel plants could increase their air pollution.

Although some power plants will retire under a clean electricity or renewable portfolio standard, any remaining fossil fuel plants could increase emissions unless actions are taken to protect the impacted communities. The remaining fossil fuel power plants' impacts on air quality are especially likely to be acute moving forward due to the increased emissions from units starting, stopping, and operating at partial load more frequently. The remaining facilities are likely to cycle more because they may be used to back up solar and wind resources even though other clean resources—such as energy storage, demand response, and hydro resources—could meet this need.

Fossil fuel units that are starting, spinning, and operating at partial load emit more pollutants per megawatt hour (MWh) than units operating at full capacity. A study conducted in California found that natural gas facilities emit significantly more air pollution while starting than they do during full-load steady-state operation.[28] In fact, the pollution from one start can be more than if the natural gas power plant operated the entire day.[29]

The amount of pollution emitted in a start can vary significantly between facilities, from producing as many nitrogen oxide (NO_x) emissions as five hours of steady-state operation to producing emissions equal to 38 hours of steady-state operation. In particular, just one start of the Colusa natural gas facility in California can emit as many NO_x emissions as the facility would have emitted in 12 to 38 hours of steady-state operation. Although these estimates are based on permitted values, actual data shows that the emissions can be even higher. For example, during one start in May 2020, the Colusa facility emitted more than 90 times its regular rate of NO_x emissions during a start.[30]

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These values demonstrate how significant startup emissions can be and why consideration of increased cycling of fossil fuel power plants is important for protecting air quality. As states increase their reliance on wind and solar energy, there is a potential that natural gas facilities could be called upon to start and stop much more frequently, and this change in operation could have significant emission consequences.

In addition to increased emissions from cycling, fossil fuel facilities also emit more when operating at partial load.[31] It is likely that remaining natural gas facilities will be more frequently cycled and operated at partial load to back up renewables. As a joint report by the North American Electric Reliability Corporation and the California Independent System Operator summarized, "[t]he existing and planned generation fleet will likely need to operate for more hours at lower minimum operating levels and provide more frequent starts, stops, and cycling over the operating day."[32]

A clean electricity or renewable portfolio standard could increase reliance on polluting combustion resources some states identify as "renewable."

It is possible that a "renewable" or "clean" energy standard could include polluting resources such as biofuel or municipal waste combustion resources, even though those resources are not clean in any sense of the word.[33] If those resources are included within a standard, new facilities may be constructed, and these new facilities as well as existing facilities are likely to increase harmful air pollution, especially in environmental justice communities. Environmental justice communities breathing the toxic air emitted from incinerators and biogas facilities have already witnessed what happens when states allow polluting resources to qualify as "renewable" or "clean."[34]

Biomass is one harmful type of combustion resource that may be included within a clean electricity or renewable portfolio standard. Biomass facilities burn

materials such as plants and wood and emit enormous amounts of pollutants per megawatt hour of generation. Biomass facilities can emit more than 150 percent the nitrogen oxides, more than 600 percent the volatile organic compounds, more than 190 percent the particulate matter, and more than 125 percent the carbon monoxide of a coal plant per megawatt hour.[35] Emissions from a biomass plant can also exceed those from a natural-gas-fired power plant for every major pollutant.[36] This is in part because biomass plants tend to be much less efficient than gas- and coal-fired plants and in part because biomass fuels tend to have far more water content to burn off to produce "useful" energy.[37] In addition to criteria pollutants, biomass facilities emit hazardous pollutants, including dioxins, lead, arsenic, mercury, and even emerging contaminants like phthalates.[38] All of these substances are dangerous to human health.

Biogas electricity-generating facilities also produce harmful pollution.[39] Studies have found that biogas plants can emit three times the nitrogen oxide emissions of natural gas plants.[40] Biogas facilities can also emit high levels of sulfur dioxide[41] and volatile organic compounds, including formaldehyde.[42]

Biomass and biofuel plants are often smaller plants than fossil fuel facilities and may not have the best available control technologies installed to limit air pollution, meaning that these facilities could significantly increase air pollution and public health risks in communities.[43] Thus, these facilities have the potential to emit significant amounts of harmful pollution in local communities. These plants are often located in highly impacted environmental justice communities, especially when related to biomethane and concentrated animal-feed operations.[44]

Many states also classify the burning of municipal waste as "renewable" energy, despite the fact that it emits a toxic mix of hazardous air emissions.[45] Burning trash can emit a variety of harmful air pollutants, including particulate matter, mercury, lead, chromium, acid gases such as hydrogen fluoride and hydrogen bromide, and toxic organics.[46] These harmful incinerators are disproportionately located in BIPOC and lower-income communities.[47] Furthermore, municipal waste is not a renewable energy source because the term "renewable" by definition means the source is replenished by natural processes.

Allowing fossil fuel plants to continue operating could increase pollution.

Without adequate safeguards, the transition to clean and renewable electricity could also increase pollution in environmental justice communities by allowing continued reliance on fossil fuel plants through the use of carbon capture and sequestration (CCS) or injection of hydrogen or biofuels into combustion plants. Reliance on injecting hydrogen and biofuels will continue our reliance on expensive fossil fuel infrastructure and increase air pollution in communities located near these fossil fuel plants.[48]

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In particular, even if it successfully captures the carbon,[49] carbon capture and sequestration at fossil fuel power plants is expected to increase harmful particulate matter, ammonia, and nitrogen oxide.[50] Moreover, as related to hydrogen injection, the combustion of hydrogen-enriched natural gas produces significant quantities of criteria pollution, particularly much higher nitrogen oxide emissions,[51] up to six times that of burning methane.[52] Similarly, the injection of biomethane into fossil fuel infrastructure emits many different types of harmful pollutants.[53]

These examples demonstrate why, unless specific proactive policies and practices are put in place and made integral to the energy transition, air pollution could increase in certain environmental justice communities if the power plants are allowed to deploy CCS or inject hydrogen or biofuels under a clean electricity or renewable portfolio standard.

3. POTENTIAL SOLUTIONS TO MITIGATE AIR POLLUTION BURDENS

This paper recommends two different types of solutions to mitigate air pollution burdens for potential state or federal standards: 1) requirements within the energy standards and procurement frameworks to help ensure pollution does not increase in environmental justice communities; and 2) measures within air quality requirements to ensure targeted air pollution reductions. The goal should be to decrease air pollution and equitably prioritize reductions in environmental justice communities. Other types of solutions can and should be explored even beyond these ideas as the mitigation of air pollution burdens will require a multi-layered approach that involves and includes the input and expertise of disproportionately impacted communities.[54]

Requirements within the energy standards are needed to ensure air pollution does not increase in environmental justice communities.

Steps can be taken directly within the design of a federal or state clean electricity or renewable portfolio standard to limit the pollution burden in environmental justice communities. Three actions should be examined as ways to ensure that the pollution burden in these communities is decreased, including: A) only clean resources that do not create additional pollution burden should qualify; B) utilities should be required to plan and procure clean energy resources to ensure that their transition to clean electricity will reduce air pollution, with a priority for environmental justice communities; and C) the standard should include requirements that air pollution will be reduced, with a priority for environmental justice communities. These actions can take many different forms, as reflected in various state requirements and decisions.

A. Clean electricity and renewable portfolio standards should only include clean renewable electricity generation.

As an initial policy matter, a clean electricity and renewable portfolio standard should only include clean energy resources that do not emit air pollution. As

described above, the inclusion of harmful combustion resources such as biomass and trash facilities as "renewable" can lead to significant harmful local pollution. If these harmful combustion resources are defined as renewable, more polluting facilities are likely to be constructed since requirements are likely to spur development of new resources. Thus, it is crucial to ensure that new polluting resources are not built at the outset. Communities should not have to fight pollution sources being proposed as "renewable" in their neighborhood like the community in Springfield, Massachusetts.[55] These sources should not be allowed to meet the standard in the first place.

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In addition, false solutions—such as injecting biomethane into natural gas infrastructure—can also increase harmful pollution. To limit these polluting and false solutions in a tech-neutral way, the definition of "clean" or "renewable" energy can be limited to ensure that polluting combustion resources and false solutions do not qualify as renewable or clean electricity.

A potential definition for renewable and clean electricity that takes these considerations into account is as follows:

> Renewable energy is any form of energy from solar, geophysical, or biological sources that is replenished by natural processes at a rate that equals or exceeds its rate of use in one year or less.[56] Net soil carbon balance should be included in the assessment of the replenishment within one year. Clean electricity generation must be renewable and have zero criteria air pollutant emissions in the electricity generation process.[57]

Using this definition, the standard should only include electricity generation resources that are renewable *and* clean. For practical purposes, this definition excludes electricity production methods that rely on combustion of fuels and all nonrenewable sources such as trash and nuclear energy because neither are replenished by natural processes.

B. Utilities should develop equitable plans and procure clean resources that prioritize reductions in environmental justice communities.

To ensure that pollution is being reduced in the electricity sector, utilities should reduce and eliminate the disproportionate pollution burdens of environmental justice communities by integrating pollution considerations directly into their resource planning and eventual procurement. This integration can be implemented at the state and local level and incentivized through federal support.

Planning for and procuring resources must consider how to retire the existing polluting resources while ensuring that new polluting resources are not built. This objective can be accomplished through targeted long-term planning that directly involves the community through outreach and a meaningful public process. A concrete way to ensure that utilities and states proactively plan for retirement of polluting facilities is to include definitive retirement dates. Illinois recently passed legislation that does exactly that: it includes specific retirement dates for fossil fuel facilities, with a priority for those located in environmental justice communities.[58]

Utilities can also utilize evaluation criteria to inform procurement decisions, including scoring bonuses and other approaches, to ensure that air pollution is taken into account.[59] Concrete requirements for consideration of air pollution impacts within the procurement framework are an essential first step for ensuring that pollution is reduced overall. By planning in advance, procurement can effectively reduce pollution burdens experienced by disproportionately impacted communities.

For example, if thoughtfully planned, energy storage and renewable energy can be deployed to displace polluting peaker fossil fuel plants.[60] Direct replacement of peaker plants with storage and renewable resources can provide environmental and equity benefits by reducing pollution in the most-impacted communities.[61] This type of thoughtful siting of storage and renewables can also replace the potential high levels of pollution from the starting and stopping of the remaining plants. Given that peaker plants are disproportionately located within environmental justice communities,[62] planning and procurement for resources to

replace existing polluting plants can reduce pollution burdens in these communities.

These types of planning and procurement requirements are often implemented at the state and local levels and will require advocacy at those levels. At the federal level, grants and other types of programs could be designed to provide resources to support this type of thoughtful planning and procurement and provide technical assistance to communities to conduct this planning.

C. Clean electricity or renewable portfolio standards should include a requirement to reduce pollution with a priority for reductions in environmental justice communities.

In addition to planning and procurement requirements, standards should also include a requirement for utilities to reduce air pollution in addition to greenhouse gases. This requirement can be tied to how federal or state funding from either a clean electricity or renewable portfolio standard is used by a utility, or it can be a direct emissions reduction requirement. These requirements should, at a minimum, apply to both reducing emissions in the overall utility portfolio and in environmental justice communities, in particular. The more granular the requirement, the more protective it will be for communities. Monitoring and verification will be necessary to track whether increases occur.

This requirement to reduce pollution could be included in a federal clean electricity or renewable portfolio standard as a requirement to receive particular financial benefits related to meeting the standard, or this requirement to reduce pollution could be tied to how potential federal funding and resources related to the standard are targeted. The Spending Clause in the U.S. Constitution provides the federal government with authority to offer grant funds that are contingent on certain activities.[63] For example, additional federal or state resources could be directed to develop resources to replace polluting resources in environmental justice communities. Another idea could be to penalize a utility if it increases its emissions or a state could require that utilities reduce emissions as reflected in their long-term planning.[64] Regardless of how it is structured, a federal or state requirement to reduce air pollution should be clear and unambiguous to help

ensure compliance. States can also develop requirements to limit air emissions from utilities.

These and other ideas should be explored to reduce pollution within the framework of a clean electricity or renewable portfolio standard.

Actions to strengthen the Clean Air Act can protect environmental justice communities.

In addition to taking steps within the design of an renewable and clean energy standard, steps should be taken related to strengthening the Clean Air Act at the state and federal levels to ensure: A) transparent reporting and verification of emissions; B) updated pollution-control requirements to reflect new operational and climate requirements; and C) increased enforcement, with a priority for disadvantaged communities.

A) Increase reporting, transparency, and verification

To protect against air pollution increases, federal and state agencies need to increase monitoring and reporting requirements for all types of electricity-generating facilities. For example, at a federal level, the U.S. Environmental Protection Agency (EPA) could develop reporting requirements for all generation facilities over 1 megawatts (MW) that emit criteria or toxic air pollutants. Communities and regulators need to fully understand what pollution is being emitted as an initial step toward limiting these emissions.[65] The U.S. Energy Information Agency (EIA) already requires some limited pollution reporting for facilities over 1 MW,[66] but it lacks the authority and air pollution expertise to monitor the air emissions from these facilities.[67]

In particular, to improve air emission reporting, the EPA would need to take additional steps to: manage monitoring and reporting from electricity generation units under 25 MW; include additional pollutants such as hazardous air pollutants and greenhouse gas emissions; update the monitoring requirements for smaller generating units; develop an accessible and transparent database; and verify the emissions data. Electricity-generating units that are over 25 MW are currently monitored with continuous emissions monitors. These types of monitors provide

essential information about the changing emissions of facilities due to starts and stops and changing fuels. Real-time data is necessary to ensure communities know what types of pollution are being emitted in their communities.[68]

Problematically, many smaller facilities[69] currently only estimate emissions with emissions factors that do not accurately reflect what is being emitted into the air.[70] Notably, these emission factors often fail to fully account for the increases in cycling emissions from facilities starting and stopping more often. Additional targeted resources could help support the installation of continuous emissions monitors to facilities under 25 MW to provide additional and more-accurate emissions data.

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To better track emissions, the EPA should publish these emissions in a transparent and accessible format and verify these emission estimates. This tracking should include all relevant criteria air pollutants, hazardous air pollutants, and greenhouse gases. This tracking should also include consistent and accurate methodologies for inclusion of start-up and shut-down emissions.[71] Visualization tools—such as the California Power Map developed by Physicians, Scientists and Engineers for Healthy Energy[72]—are necessary to understand the emission impacts from the energy sector. Resources could also be used at both the federal and the state levels to develop accessible and transparent tools to view and understand emissions data.

The Clean Air Act already provides the EPA with the authority to require reporting, monitoring, and verification of emissions from electricity-generating facilities, and the agency has started to aggregate its data related to the electricity sector in its Emissions & Generation Resource Integrated Database (eGRID).[73] Specifically, Section 114 of the Clean Air Act provides the EPA with broad authority to request any information related to emissions from facilities regulated under the Clean Air Act.[74] Other Clean Air Act provisions, such as Section 401, provide monitoring and reporting requirements applicable to electricity-generating facilities.[75] The EPA's Clean Air Markets Division already tracks and monitors pollution from power plants under various Clean Air Act

programs, and this division has taken steps to better integrate pollution data from power plants.[76] Additional targeted resources for this new monitoring, tracking, and verification work—along with the supporting regulatory work conducted by the EPA's Office of Air and Radiation and Office of Air Quality Planning and Standards—would allow for the promulgation of the necessary rules and the critical oversight to ensure transparent reporting and verification of emissions from electricity-generating facilities. This increased focus on transparency and reporting is necessary to better ensure that potential emission increases do not adversely impact environmental justice communities.

Additional funding of at least $350 million over 10 years could provide the necessary resources to the EPA to conduct both tracking of emissions of units under 25 MW and provide the necessary oversight, requirements, and verification to ensure that these tracked emissions are as accurate as possible. In addition to this federal funding, states could and should take an increased role to ensure more-accurate and transparent reporting of emissions from power plants. To do this type of work, states could also use more resources and funding to develop monitoring requirements and ensure transparent and accessible reporting.

B) Develop updated pollution requirements

A just and equitable transition should also increase the resources and funding for the EPA and state air agencies to develop and update air pollution limitations and requirements for electricity-generating facilities, including all combustion facilities that generate electricity. New combustion facilities may be constructed and existing facilities may change how they operate by cycling and operating at partial load more often. The EPA and states should review existing requirements and ensure that new and modified resources are required to install the best pollution controls to limit emissions. These controls should necessarily include both traditional pollution-control devices, such as selective catalytic reduction, as well as requirements to install energy storage to limit the starts and stops of combustion facilities.

The EPA promulgates specific requirements that relate to different source categories, and it can promulgate guidance that describes how to apply other

pollution-control requirements to sources. These types of requirements include the New Source Performance Standards and the National Emission Standards for Hazardous Air Pollutants. For example, Section 111 of the Clean Air Act requires the EPA to promulgate standards for performance for new stationary sources.[77] The EPA is required to review and, if appropriate, revise such standards at least every eight years. The EPA is also required to regulate existing sources. Several categories related to electricity generation will need updates in the near future.[78] Section 112 of the Clean Air Act requires the EPA to promulgate emission standards requiring the maximum degree of reduction in emissions of hazardous air pollutants that are determined to be achievable.[79] The EPA is required to review and revise the emission standards under this section no less often than every 8 years. These rules can and should be reevaluated given the changes in operation experienced in utilities in order to ensure that these sources install the best controls to mitigate potential emission increases.

The EPA can also examine innovative ways to regulate air emissions, including potential caps on facility emissions like Hawaii,[80] alternative zero-emission resources as control technology, and requirements for consistency with climate and other relevant requirements. The State of New York, for example, rejected two natural gas facilities' applications for Clean Air Act permits on the basis that the operation of these facilities was not consistent with New York's climate requirements.[81]

A reasonable funding range to support the EPA taking a new, closer look at source categories and pollution-control requirements related to electricity generation and fossil fuels is at least $100 million over 10 years.

In addition to funding federal agency work to develop pollution-control requirements, states can and should reexamine and update their pollution-control requirements. If they reevaluate their rules, state and local air pollution agencies will likely need more resources to consider these requirements. Although the EPA set the floor for the standards at the federal level, states can develop more-stringent requirements for stationary sources under the Clean Air Act[82] and may be better suited to account for specific local issues and impacts.

C) Increase funding for enforcement, prioritizing environmental justice communities

Another way to protect against potential pollution increases is to provide more resources to improve enforcement of air limitations and requirements for electricity-generating facilities, with a priority for facilities located in environmental justice communities. It is important that this ask be combined with the other requests related to the Clean Air Act described above in order to ensure transparency regarding the amount of emissions and updated and strengthened pollution control requirements.

It should be noted that the EPA's current workforce is lower than it has been in 30 years.[83] Reductions in workforce and funding impact the ability of the EPA to enforce the laws meant to protect the public, leading to rampant violations of the laws meant to protect communities. Data suggests that noncompliance rates of 50 to 70 percent of protective environmental requirements are not unusual and that significant Clean Air Act violations occur at 25 percent of facilities or more.[84]

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Studies that have examined enforcement have also found that states have informed the EPA of less than 15 percent of the significant violations, and that's only for the violations that states know about, which is only a small fraction due to significant underreporting issues.[85]

Not surprisingly, given these significant enforcement issues, the EPA has recognized the need to strengthen enforcement in communities with environmental justice concerns.[86] To accomplish this objective, the EPA has committed to "[i]ncrease the number of facility inspections in overburdened communities," to "[s]trengthen enforcement in overburdened communities by resolving environmental noncompliance through remedies with tangible benefits for the community," and to "[i]ncrease engagement with communities about

enforcement cases that most directly impact them."[87] The EPA needs significant resources to achieve these goals.

Additional resources are also needed to increase state and tribal government enforcement. As the EPA recognizes, states and local authorities play an important role in achieving increased enforcement with benefits to overburdened communities.[88] Nevertheless, state and local air pollution authorities have been chronically underfunded, which prevents these agencies from carrying out and implementing critical activities.[89] This underfunding is due, in part, to the declining grants to state and local authorities from the federal government.[90]

The funding for Tribal Nations also has remained largely stagnant, while health concerns have increased. This stagnation of funding has impacted the ability of Tribal Nations to establish air programs and develop and implement the necessary requirements of the Clean Air Act.[91] This decrease in funding has also made it more difficult for tribal government air programs to address pollution and compliance.[92]

Furthermore, additional resources are needed to fund community engagement related to enforcement and planning, including grants to community groups to facilitate this outreach and engagement. Community engagement and outreach related to enforcement can help develop a consistent and reliable process for addressing community concerns and empower the community in actions impacting their health.

The Clean Air Act provides the relevant statutory authority to increase federal, state, and tribal enforcement resources with a priority for environmental justice communities. General EPA enforcement is conducted through the Office of Enforcement and Compliance Assurance, and sections 113 and 307 of the Clean Air Act provide the EPA with general authority for enforcement.[93] The enforcement should prioritize low-income communities and communities of color highly impacted by pollution. To ensure that environmental justice communities are prioritized, the EPA can take into account state designations of environmental justice communities[94] and information available to the EPA.[95]

As related to states, Section 105 of the Clean Air Act allows the EPA to provide grants to support air pollution planning and control programs for the prevention

and control of air pollution. Grants could be provided to local agencies for enforcement of air pollution requirements with a priority for low-income communities and communities of color disproportionately impacted by pollution. Programs like the Targeted Airshed Grant Program, which provides competitive grants to air agencies to reduce pollution in nonattainment areas, could be utilized to ensure that the resources are being directed to the most highly impacted communities.[96] These grants should also be conditioned on the reporting of and increased transparency related to discovered violations.[97] Sections 103 and 105 of the Clean Air Act provide the EPA with authority to provide Tribal Nations a grant or contract assistance to carry out functions required by the Act.[98] To ensure that enforcement related to the Clean Air Act is improved and that environmental justice communities are protected, at least $7 billion over 10 years is likely needed. This increase to the current budget is necessary to fill the significant need for increased enforcement at all levels.

4. CONCLUSION

The transition to clean and renewable energy is critical to protect communities from the most devastating impacts of the climate crisis. To be equitable and just, this transition must focus both on reducing greenhouse gas emissions and harmful air pollution, especially in already over-burdened and disproportionately impacted environmental justice communities.

Without appropriate safeguards, the implementation of a clean electricity or renewable portfolio standard could increase pollution in environmental justice communities because the remaining fossil fuel plants that may be used to back up renewables could emit more pollution due to cycling, thereby maintaining and increasing reliance on polluting combustion facilities labeled as "renewable"—false solutions that could prolong the life of fossil fuel facilities. Without a focus on reducing air pollution along with greenhouse gas emissions, and putting environmental justice front and center, more communities could face increased exposure to harmful, toxic pollution from electricity-generating resources like the communities in Baltimore, Maryland, and the San Joaquin Valley in California.

To mitigate this potential, measures that reduce pollution burdens should be an integral part of the design of any clean electricity or renewable portfolio standard. Any clean electricity or renewable portfolio standard should be designed to reduce harmful air pollution overall and specifically in frontline and environmental justice communities. These measures should include both increased resources to track and require reductions of emissions, as well as measures that require thoughtful planning for how to reduce the impacts of combustion resources.

In addition, the design of a clean electricity or renewable portfolio standard should not include polluting combustion resources as clean or renewable but should require utilities to reduce air emissions with a priority for environmental justice communities. In order to be environmentally just, a federal clean electricity or renewable portfolio standard must necessarily include specific additional funding to measure, verify, and reduce harmful air pollution, as well as ensure the inclusion of environmental justice communities in the planning and enforcement.

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[1] This paper generally refers to environmental justice communities, which are often defined as Black, Indigenous, People of Color (BIPOC) communities and communities with lower incomes that are highly impacted by pollution. There are a variety of ways to define environmental justice communities using criteria that estimate cumulative impacts by evaluating socioeconomic and pollution burdens, among other factors. For example, California has developed CalEnviroScreen, which defines environmental justice communities through a variety of socioeconomic and pollution criteria. https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30.

[2] See, e.g., *New Report: The Age of Incinerators in the U.S. Is Ending*, https://www.no-burn.org/failingincineratorsreport/ (describing the impacts of the incinerator in Baltimore and how approximately eight of the ten remaining incinerators are located in environmental justice communities); N. Seldman, Institute for Local Self-Reliance, Local Activists in Baltimore Pressure Mayor to Protect Clean Air (Aug. 20, 2020), https://ilsr.org/activists-baltimore-clean-air-act/.

[3] See, e.g., WBUR News, *Mass. Revokes Air Permit for Controversial Biomass Facility in Springfield*, https://www.wbur.org/earthwhile/2021/04/02/springfield-biomass-permit-revoked.

[4] See American Lung Association, *State of the Air 2021, Most Polluted Cities*, https://www.lung.org/research/sota/city-rankings/most-polluted-cities (showing Fresno–Madera–Hanford as one of the top most polluted cities for particulate matter and ground ozone pollution); PSE Healthy Energy, California Power Map, https://www.psehealthyenergy.org/california-power-map/ (showing Panoche Energy Center in Fresno starting 451 times in 2017 and 440 times in 2018).

[5] See U.S. EPA Clean Air Markets Database, Panoche Energy Center Emissions, https://ampd.epa.gov//ampd/ (hourly data shows that startup NO_x emissions are higher than the average steady-state rate of 0.007 lb/MWh and the hourly emission rate during startup can exceed 0.1 lb/MWh, which is more than 10 times the steady-state hourly rate).

[6] Clean energy is generally not the same as renewable energy. Renewable energy generally refers to sources that naturally replenish themselves, such as solar, while clean energy generally refers to zero-carbon resources, which may potentially harmful technologies, such as nuclear energy. See, e.g., Lee Beck and Jennifer Gordon, *The devil's in the details: Policy implications of 'clean' vs. 'renewable' energy*, UTILITY DIVE (March 14, 2019), https://www.utilitydive.com/news/the-devils-in-the-details-policy-implications-of-clean-vs-renewable/550441/.

[7] A recommended definition for the term "clean and renewable energy" is described further on in this paper.

[8] American Lung Association, *2021 State of the Air, Key Findings*, https://www.lung.org/research/sota/key-findings.

[9] Id.

[10] See, e.g., U.S. Environmental Protection Agency, *Health and Environmental Effects of Particulate Matter*, https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm.

[11] See, e.g., Bing Zhao, et al., Short-term exposure to ambient fine particulate matter and out-of-hospital cardiac arrest: A nationwide case-crossover study in Japan, THE LANCET 4, E15-E23 (Jan. 1, 2020). DOI:https://doi.org/10.1016/S2542-5196(19)30262-1.

[12] See, e.g., U.S. Environmental Protection Agency, *Ground-level Ozone Pollution,* https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics#effects.

[13] See, e.g., World Health Organization, *Mercury and Health*, https://www.who.int/news-room/fact-sheets/detail/mercury-and-health.

[14] See, e.g., U.S. Environmental Protection Agency, *Research on Health Effects from Air Pollution,* https://www.epa.gov/air-research/research-health-effects-air-pollution; U.S. Environmental

Protection Agency, Health Effects of Exposure to Mercury, https://www.epa.gov/mercury/health-effects-exposures-mercury.

[15] U.S. Energy Information Administration, *Energy and the Environment,* https://www.eia.gov/energyexplained/electricity/electricity-and-the-environment.php (general description of several types of pollution controls).

[16] Id.

[17] Pollution controls can reduce some pollutants by more than 95 percent. See, e.g., U.S. EPA, Mercury and Air Toxic Standards, Cleaner Power Plants, https://www.epa.gov/mats/cleaner-power-plants (last updated Oct. 23, 2020).

[18] Burning hydrogen produces nitrogen oxide emissions as a byproduct of combustion. Studies have shown that burning hydrogen can produce much more nitrogen oxide than methane. See, e.g., , Mehmet Salih Cellek and Ali Pınarbaşı, *Investigations on Performance and Emission Characteristics of an Industrial Low Swirl Burner While Burning Natural Gas, Methane, Hydrogen-Enriched Natural Gas and Hydrogen as Fuels*, INTERNATIONAL JOURNAL OF HYDROGEN ENERGY 43, no. 2 (January 11, 2018): 1194-1207, https://doi.org/10.1016/j.ijhydene.2017.05.107. This does not apply to the use of hydrogen in fuel cells, where the only product of the chemical reaction generating electricity is water. Hydrogen produced from natural gas results in additional air pollution and should be avoided.

[19]See Jonathan J. Buonocore et al., A decade of the U.S. energy mix transitioning away from coal: Historical reconstruction of the reductions in the public health burden of energy, 2021 ENVIRON. RES. LETT. 16 054030. "[T]here are still substantial and growing public health impacts from gas combustion…[and] there are still substantial health impacts from biomass."

[20] California Energy Commission, *Alamitos Final Decision, Air quality table, AFC Section 5.1* (2014), https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=13-AFC-01.

[21] Elena Krieger, et al., A Framework for Siting and Dispatch of Emerging Energy Resources to Realize Environmental and Health Benefits: Case Study on Peaker Power Plant Displacement, ENERGY POLICY 96 (2016), 302-313. "Peaker" plants are used for short periods when electricity demand is high, i.e., around the period of "peak" electricity demand. They typically have low capital cost and high fuel use.

[22] See, e.g., Manuel Pastor, et al., *Minding the Climate Gap: What's at Stake if California's Climate Law Isn't Done Right and Right Away*, p. 8–12 (2010), https://dornsife.usc.edu/pere/mindingclimategap/.

[23] NAACP, Little Village Environmental Justice Organization, and the Indigenous Environmental Network, *Coal-Blooded: Putting Profits Before People* (2013), https://naacp.org/resources/coal-blooded-putting-profits-people; PSE Healthy Energy, *California Environmental Justice Gas Plants* (2017), https://www.psehealthyenergy.org/wp-content/uploads/2017/04/CA.EJ_.Gas_.Plants.pdf; Earthjustice, *Communities of Color, Poverty Bear Burden of Air Pollution* (2011), https://earthjustice.org/news/press/2011/communities-of-color-poverty-bear-burden-of-air-pollution;

Climate Xchange, *The Racist Placement of Power Plants in Pennsylvania* (July 20, 2020), https://climate-xchange.org/2020/07/20/the-racist-placement-of-power-plants-in-pennsylvania/.

[24] See, e.g., Phoebe Gittelson, Danielle Diamond, Lynn Henning, Maria Payan, Lynn Utesch, and Nancy Utesch, *The False Promises of Biogas: Why Biogas Is an Environmental Justice Issue*, published online May 26, 2021, https://doi.org/10.1089/env.2021.0025.

[25] M. Donahue, Institute for Local Self-Reliance, *Waste Incineration: A Dirty Secret in How States Define Renewable Energy* (Dec. 2018), https://ilsr.org/wp-content/uploads/2018/12/ILSRIncinerationFInalDraft-6.pdf.

[26] Maninder P.S. Thind, Christopher W. Tessum, Inês L. Azevedo, and Julian D. Marshall, *Fine Particulate Air Pollution from Electricity Generation in the US: Health Impacts by Race, Income, and Geography*, ENVIRONMENTAL SCIENCE & TECHNOLOGY, 2019, *53* (23), 14010-1401, DOI: 10.1021/acs.est.9b02527.

[27] Harvard T.H. Chan School of Public Health, Negative impacts of burning natural gas and biomass have surpassed coal generation in many states (May 5, 2021), hsph.harvard.edu/c-change/news/gas-biomass/.

[28] Aspen Environmental Group, *Cal. Independent System Operator SB 350 Studies*, Volume 9, Table 4.4-3, p. 100 (2016), https://www.caiso.com/Documents/SB350Study-Volume9EnvironmentalStudy.pdf.

[29] Id. This information is based on permitted values. The EPA tracks actual hourly rates of emissions, but it does not track startup emissions. Nevertheless, review of that data demonstrates that the hourly rate of emissions during startup is higher than steady-state emissions. See, e.g., U.S. EPA Clean Air Markets Database, Panoche Energy Center Emissions, https://ampd.epa.gov//ampd/.

[30] See U.S. EPA Clean Air Markets Database, Colusa Power Plant, May 28, 2020 Data. According to the continuous emissions monitor data, the plant emitted 145, 393, and 404 pounds of NO_x during its first three hours of operation. After those first three hours, the next 11 hours were between 8 and 10.5 pounds of NOx per hour.

[31] Cal. Independent System Operator, Senate Bill 350 Studies, Volume 9, at p 99, https://www.caiso.com/Documents/SB350Study-Volume9EnvironmentalStudy.pdf (citing NREL finding that natural gas plants may emit around 30 percent more NO_x pollution at partial load).

[32] NERC, CAISO, 2013 Special Reliability Assessment, Maintaining Bulk Power System Reliability While Integrating Variable Resources – CAISO Approach (Nov. 2013), https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC-CAISO_VG_Assessment_Final.pdf.

[33] See *infra* discussing the definition of renewable energy.

[34] See *supra* Section I(2) (describing disproportionate siting and burdens that environmental justice communities face from incinerators and biogas facilities).

[35] Mary S. Booth, *Trees, Trash, and Toxics: How Biomass Energy Has Become the New Coal*, Partnership for Policy Integrity (Apr. 2, 2014), https://www.pfpi.net/trees-trash-and-toxics-how-biomass-energy-has-become-the-new-coal.

[36] Id.

[37] Id.

[38] Id. (describing how biomass plants emit these plants sometimes at higher rates than incinerators due to lax regulatory requirements).

[39] Although not covered here, it is important to note that combustion of gas and biogas in homes also increases harmful indoor air pollution.

[40] Valerio Paolini, Francesco Petracchini, Marco Segreto, Laura Tomassetti, Nour Naja, an Angelo Cecinato, *Environmental impact of biogas: A short review of current knowledge,* JOURNAL OF ENVIRONMENTAL SCIENCE AND HEALTH, Part A, 53:10, 899-906 (2018), https://doi.org/10.1080/10934529.2018.1459076. Although biogas facilities can be controlled with pollution controls, they are less likely to have protective pollution controls, in part due to their size.

[41] Id. citing Borjesson, P.; Berglund, M. Environmental Systems Analysis of Biogas Systems-Part I: Fuel-Cycle Emissions. BIOMASS BIOENERGY 2006, *30*, 469–485. DOI:10.1016/j.biombioe.2005.11.014.

[42] Id. citing Gallego, E.; Roca, F. J.; Perales, J. F.; Guardino, X.; Gadea, E.; Garrote, P., *Impact of Formaldehyde and VOCs from Waste Treatment Plants Upon the Ambient Air Nearby an Urban Area (Spain),* SCI. TOTAL ENVIRON. 2016, *568*, 369–380. https://doi.org/10.1016/j.scitotenv.2016.06.007.

[43] See, e.g., Partnership For Policy Integrity, *Air Pollution from Biomass Energy,* https://www.pfpi.net/air-pollution-2.

[44] See, e.g., Phoebe Gittelson, Danielle Diamond, Lynn Henning, Maria Payan, Lynn Utesch, and Nancy Utesch, *The False Promises of Biogas: Why Biogas Is an Environmental Justice Issue* (May 26, 2021), https://doi.org/10.1089/env.2021.0025.

[45] M. Donahue, Institute for Local Self-Reliance, *Waste Incineration: A Dirty Secret in How States Define Renewable Energy* (Dec. 2018), https://ilsr.org/wp-content/uploads/2018/12/ILSRIncinerationFInalDraft-6.pdf.

[46] See U.S. EPA, AP 42, *Municipal Waste Incineration Emissions Factors,* https://www3.epa.gov/ttn/chief/ap42/ch02/final/c02s01.pdf; see also M. Donahue, Institute for Local Self-Reliance, *Waste Incineration: A Dirty Secret in How States Define Renewable Energy* (Dec. 2018), https://ilsr.org/wp-content/uploads/2018/12/ILSRIncinerationFInalDraft-6.pdf.

[47] Id.

[48] In addition to increasing air pollution, carbon capture and sequestration and hydrogen injection into the fossil fuel system is costly, and many projects have been unsuccessful.

[49] There are significant questions about whether carbon capture can effectively work in practice. See, e.g,, Stephen Stapczynski, *Chevron's Carbon Capture Struggle Shows Big Oil's Climate Hurdle*, BLOOMBERG GREEN (July 18, 2021).

[50] See, M. Jacobson, *The Health and Climate Impacts of Carbon Capture and Direct Air Capture*, 12 ENERGY ENVIRON. SCI. 3567 (2019), https://web.stanford.edu/group/efmh/jacobson/Articles/Others/19-CCS-DAC.pdf; European Environment Agency, *Air Pollution Impacts from Carbon Capture and Storage (*Nov. 17, 2011), https://www.eea.europa.eu/publications/carbon-capture-and-storage; Food and Water Watch, *The Case Against Carbon Capture: False Claims and New Pollution (*March 2020), https://foodandwaterwatch.org/wp-content/uploads/2021/04/ib_2003_carboncapture-web.pdf (summarizing sources describing increases in air pollution from CCS).

[51] Dan Sadler, et al., *H21 Leeds CityGate Project Report.* City of Leeds, 2017, https://www.h21.green/wp-content/uploads/2019/01/H21-Leeds-City-Gate-Report.pdf, p. 163, Table 5.15. Flame combustion of hydrogen resulted in "relatively high NO_x," compared to natural gas flame combustion.

[52] Mehmet Salih Cellek and Ali Pınarbaşı, Investigations on Performance and Emission Characteristics of an Industrial Low Swirl Burner While Burning Natural Gas, Methane, Hydrogen-Enriched Natural Gas and Hydrogen as Fuels, INTERNATIONAL JOURNAL OF HYDROGEN ENERGY 43, no. 2 (January 11, 2018): 1194–1207. https://doi.org/10.1016/j.ijhydene.2017.05.107. "In the case of using hydrogen-enriched natural gas or pure hydrogen instead of natural gas as the fuel, the combustion emissions […] such as CO and CO_2 are remarkably decreased compared to the natural gas. However, the NO_x emissions are significantly increasing especially due to thermal NO."

[53] See *supra* (discussion of pollution from biomethane).

[54] See, e.g., Just Solutions Collective (formerly the 100% Network) Comprehensive Building Blocks for a Regenerative and Just 100% Policy, https://www.justsolutionscollective.org/blog-posts/regenerative-just-100-policy-building-blocks-released-by-experts-from-impacted-communities (discussing the building blocks of building policy from the ground up).

[55] WBUR News, *Mass. Revokes Air Permit for Controversial Biomass Facility in Springfield*, https://www.wbur.org/earthwhile/2021/04/02/springfield-biomass-permit-revoked.

[56] The first part of the definition applies to all primary energy sources that are renewable, like solar, wind, and geothermal. The distinction that makes a primary energy source renewable is that renewable primary energy sources are replenished by natural processes at a rate equal to or greater

than the rate of use, while nonrenewable ones are not. Secondary energy sources can be renewable if they are made only from primary renewable energy sources. Hydrogen from electrolysis of water using solar or wind electricity is renewable in this sense because the primary energy source is renewable.

[57] This definition of "renewable energy" starts with the 2014 IPCC definition; however, the IPCC definition does not specify the period of replenishment. In our definition, it is one year or less. This prevents clearly nonrenewable uses—such as burning old growth trees and replacing them by saplings—from being counted as renewable. The IPCC has not defined clean energy. It is obvious that to qualify as "clean," energy sources should not emit pollutants that harm health and the environment in the course of electricity production. Intergovernmental Panel on Climate Change. *Climate Change 2014: Mitigation of Climate Change. Working Group III Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* Edited by Ottmar Edenhofer, Ramón Pichs-Madruga, Youba Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel, and J.C. Minx. New York: Cambridge University Press, 2014, https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_full.pdf, p. 1261.

[58] Illinois Climate Equity and Jobs Act, Public Act 102-0662, https://www.ilga.gov/legislation/publicacts/102/PDF/102-0662.pdf.

[59] The California Public Utilities Commission requires that air pollution be taken into account during procurement. See Cal. Public Utility Commission, Decision 18-02-018, pp. 69-70 (December 2018).

[60] PSE Healthy Energy, Energy Storage Peaker Plant Replacement Project, https://www.psehealthyenergy.org/our-work/energy-storage-peaker-plant-replacement-project/.

[61] Id.

[62] See, e.g., Elena Krieger, et al., A Framework for Siting and Dispatch of Emerging Energy Resources to Realize Environmental and Health Benefits: Case Study on Peaker Power Plant Displacement, ENERGY POLICY 96 (2016), 302-313.

[63] See U.S. Constitution, Article I, Section 8, Clause 1. U.S. Supreme Court precedent requires that the conditions, among other things, must be unambiguous, germane to the federal interest, and not represent impermissible coercion. See *South Dakota v. Dole, 483 U.S. 203* (1987). See also Congressional Research Service, *The Federal Government's Authority to Impose Conditions on Grant Funds* (March 23, 2017), https://fas.org/sgp/crs/misc/R44797.pdf.

[64] See, e.g., Cal. Public Util. Code Section 454.52(a)(1)(H) (requiring utilities to minimize air pollution with a priority for disadvantaged communities).

[65] See, e.g., Cynthia Giles, *Next Generation Compliance*, THE ENVIRONMENTAL FORUM (2013), https://www.epa.gov/sites/default/files/2014-09/documents/giles-next-gen-article-forum-eli-sept-oct-2013.pdf (discussing the importance of transparency).

[66] The U.S. Energy Information Administration collects relevant data on Forms EIA-860 and EIA-923.

[67] The U.S. Energy Information Administration is tasked with collecting and analyzing data, not monitoring air pollution. See 42 U.S. Code Section 7135.

[68] Continuous emissions monitors are generally reliable. See U.S. EPA, Office of Inspector Generation, EPA Effectively Screens Air Emissions Data from Continuous Monitoring Systems but Could Enhance Verification of System Performance, EPA Report No. 19-P-0207 (June 2019).

[69] The United States Energy Information Agency estimated that there were approximately 10,346 electric power plants with a nameplate capacity of at least 1 MW. See U.S. EIA, https://www.eia.gov/tools/faqs/faq.php?id=65&t=2. Of these plants, the U.S. EPA collects information in its Clean Air Markets Database for approximately 4,113 units. See https://ampd.epa.gov/ampd/. This means that more than 6,000 facilities are between 1 and 25 MW.

[70] See Rachel Leven, *Most of EPA's Pollution Estimates Are Unreliable. So Why Is Everyone Still Using Them?,* Center for Public Integrity, https://publicintegrity.org/environment/most-of-the-epas-pollution-estimates-are-unreliable-so-why-is-everyone-still-using-them/. In this article, Leven states: "The agency itself admits most [of emission factors] are unreliable: it rates about 62 percent as 'below average' or 'poor.' Nearly 22 percent aren't rated at all." The EPA has estimated that approximately 80 percent of facilities rely on emissions factors. U.S. General Accounting Office, *EPA Should Improve Oversight of Emissions Reporting by Large Facilities*, GAO-01-46 (April 2001).

[71] States have developed inconsistent methodologies for measuring start-up and shut-down emissions. See J. Obaid, Comparing Non-Steady State Emissions under Start-Up and Shut-Down Operating Conditions with Steady State emissions for Several Industrial Sectors, Energies 2017, 10, 179: doi:10:3390/en10020179.

[72] Physicians, Scientists, and Engineers for Healthy Energy, California Power Map, https://www.psehealthyenergy.org/california-power-map/.

[73] See U.S. EPA, *eGRID Questions and Answers*, https://www.epa.gov/egrid/egrid-questions-and-answers#egrid5a.

[74] 42 U.S.C. Section 7414.

[75] 42 U.S.C. Section 7651k.

[76] U.S. EPA, Emissions & Generation Resource Integrated Database, https://www.epa.gov/egrid.

[77] 42 U.S.C. Section 7411.

[78] The last rule update for fossil-fuel-fired electric-utility steam-generating units was in 2013, and the last update for stationary combustion turbines was in 2012.

[79] 42 U.S.C. Section 7412.

[80] See Hawaii Administrative Rule Section 11-60.1-204(d)(6)(C), https://health.hawaii.gov/cab/files/2014/07/HAR_11-60_1-typed.pdf.

[81] See New York State Department of Environmental Conservation, Notice of Denial of Title V Air Permit, Astoria Gas Turbine Power (Oct. 27, 2021), https://www.dec.ny.gov/docs/permits_ej_operations_pdf/nrgastoriadecision102721.pdf.

[82] Section 116 of the Clean Air Act allows state and local air pollution control agencies to adopt a more-stringent program.

[83] U.S. EPA, EPA's Budget and Spending, https://www.epa.gov/planandbudget/budget.

[84] Cynthia Giles, Harvard Law School, Environmental & Energy Law Program, *Next Generation Compliance: Noncompliance with Environmental Rules Is Worse Than You Think* (April 14, 2020), http://eelp.law.harvard.edu/wp-content/uploads/Cynthia-Giles-Part-2-FINAL.pdf.

[85] Id.

[86] U.S. EPA, Memorandum from L. Starfield, Acting Assistant Administrator, *Strengthening Enforcement in Communities with Environmental Justice Concerns* (April 30, 2021), https://www.epa.gov/sites/default/files/2021-04/documents/strengtheningenforcementincommunitieswithejconcerns.pdf

[87] Id.

[88] Id.

[89] See, e.g., State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials, *The Critical Funding Shortfall of State and Local Air Quality Agencies* (Feb. 2004), https://www.4cleanair.org/wp-content/uploads/Documents/FundingNeedsOverview.pdf.

[90] See, e.g., U.S. Government Accountability Office, *Opportunities to Better Sustain and Modernize the National Air Quality Monitoring System*, https://www.gao.gov/assets/gao-21-38.pdf; State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials, *The Critical Funding Shortfall of State and Local Air Quality Agencies* (Feb. 2004), https://www.4cleanair.org/wp-content/uploads/Documents/FundingNeedsOverview.pdf.

[91] National Tribal Air Associations, *Budget Analysis* (May 2019), https://www.ntaatribalair.org/wp-content/uploads/2019/12/2019-NTAA-Budget-Analysis-1.pdf.

[92] Id.

[93] 42 U.S.C. Sections 7413 and 7607.

[94] For example, California has developed a tool called CalEnviroScreen to identify environmental justice communities: https://oehha.ca.gov/calenviroscreen.

[95] The U.S. EPA is currently considering relevant information in the development of an Environmental Justice Screening Tool called EJSCREEN. See U.S. EPA, EJSCREEN, https://www.epa.gov/ejscreen. President Biden has issued an executive order requiring consideration of environmental justice and spurring economic opportunity. See U.S. White House, Executive Order on Tackling the Climate Crisis at Home and Abroad, https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/.

[96] See, e.g., U.S. EPA, *2021 Targeted Airshed Grant Program,* https://www.epa.gov/grants/2021-targeted-airshed-grant-program-closed-announcement-fy-2021.

[97] Studies have found that states historically significantly underreport violations. Cynthia Giles, Harvard Law School, *Environmental & Energy Law Program, Next Generation Compliance: Noncompliance with Environmental Rules Is Worse Than You Think* (April 14, 2020) (citing sources).

[98] The applicable section depends on whether the Tribal Nation has requested and been approved for "Treatment as a State" under the Clean Air Act.