ORAL ARGUMENT NOT YET SCHEDULED

Case No. 23-1157 (and consolidated cases)

IN THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

STATE OF UTAH, *et al.*,

Petitioners,

v.

U.S. ENVIRONMENTAL PROTECTION AGENCY, *et al.*,

Respondents.

On Petitions for Review of Final Action by the
United States Environmental Protection Agency
88 Fed. Reg. 36,654 (June 5, 2023)

BRIEF OF *AMICI CURIAE* GRID EXPERTS BENJAMIN F. HOBBS, BRENDAN KIRBY, KENNETH J. LUTZ, and SUSAN F. TIERNEY IN SUPPORT OF RESPONDENTS

Of Counsel:

WILLIAM BOYD
UCLA School of Law
405 Hilgard Avenue
Los Angeles, CA 90095
Tel: (202) 294-2099
boyd@law.ucla.edu

CARA A. HOROWITZ
RUTH LAZENBY
JULIA STEIN
Frank G. Wells Environmental Law Clinic
UCLA School of Law
405 Hilgard Avenue
Los Angeles, CA 90095
Tel: (310) 206-4033
horowitz@law.ucla.edu

Counsel for Amici Curiae

June 24, 2024

CERTIFICATE AS TO PARTIES, RULINGS, AND RELATED CASES

I. Parties and *Amici*

Except for the following, all parties, intervenors, and *amici curiae* appearing before this Court are listed or referenced in the Initial Brief for Respondents U.S. Environmental Protection Agency, ECF No. 2060371 (filed June 17, 2024): *Amici* Benjamin F. Hobbs, Brendan Kirby, Kenneth J. Lutz, and Susan F. Tierney ("*Amici*").

II. Rulings Under Review

These consolidated cases involve petitions to review the U.S. Environmental Protection Agency's final action entitled "Federal 'Good Neighbor Plan' for the 2015 Ozone National Ambient Air Quality Standards," published at 88 F.R. 36,654 (June 5, 2023).

III. Related Cases

A list of related cases is provided in the Initial Brief for Respondents U.S. Environmental Protection Agency at ii-iii.

RULE 29 STATEMENTS

Amici certify that no party in these consolidated proceedings has objected to the filing of this amicus brief.

Pursuant to Fed. R. App. P. 29(a)(4)(E), undersigned counsel for *Amici* states that no party or party's counsel authored this brief in whole or in part, and no other person besides *Amici* or their counsel contributed money intended to fund preparing or submitting the brief.

Pursuant to D.C. Cir. R. 29(d), undersigned counsel for *Amici* state that a separate brief is necessary due to *Amici*'s distinct expertise and interests. *Amici* are engineers and analysts with expertise in the operation, structure, economics, regulation, and reliability of the U.S. power system. No other *amici curiae* appearing in this case share these perspectives or expertise, as far as *Amici* are aware. Accordingly, *Amici*, through counsel, certify that filing a joint brief would not be practicable.

/s/ Cara Horowitz
CARA HOROWITZ
June 24, 2024

TABLE OF CONTENTS

TABLE OF AUTHORITIES

STATUTES

REGULATIONS

FEDERAL REGISTER

OTHER AUTHORITIES

GLOSSARY OF ABBREVIATIONS

NO_x	nitrogen oxides
The Plan	"Good Neighbor Plan" for the 2015 Ozone National Ambient Air Quality Standards
EPA	United States Environmental Protection Agency

AMICI CURIAE'S STATEMENT OF IDENTITY, INTEREST IN CASE, AND SOURCE OF AUTHORITY TO FILE

Amici are among the nation's leading engineers and analysts with expertise in the operation, regulation, and reliability of the U.S. power system.[1] They have expertise in grid structure, operations, economics, and modernization; integration of renewable energy generation; and power-system reliability and planning. *Amici* have a significant interest in the efficient functioning and regulation of the grid. The U.S. Environmental Protection Agency's "Good Neighbor Plan" for the 2015 Ozone National Ambient Air Quality Standards (the "Plan") sets forth the federal implementation plan for nitrogen oxides ("NO_x") attainment at issue in this case. To aid the Court's understanding of the technical matters at issue and the reliability impacts of the Plan, this brief clarifies how and why the grids are designed and operated as they are; how major trends, including the energy transition, are impacting grid operation; and how such trends are changing approaches to ensuring grid reliability.

---

[1] *Amici's* credentials are summarized in the Addendum to this brief.

SUMMARY OF ARGUMENT

A primary challenge Petitioners raise to the U.S. Environmental Protection Agency's ("EPA") adoption of the Good Neighbor Plan is that it will jeopardize the reliability of the electric power system. In Petitioners' telling, the Plan will destabilize the grid by prematurely pushing stable coal-powered generation offline, either permanently or for significant durations as equipment is upgraded. But in reality, the Plan does no such thing, for two reasons.

First, independently of the Plan, the grid is already transforming and shifting away from coal-powered generation—and grid operators and regulators are already successfully deploying a suite of tools and resources that ensure the reliability of the grid as this transition occurs. No evidence in the record, or that we otherwise know of, suggests that the Plan will push the grid or grid operators beyond their ability to adapt to such changes and maintain reliable service.

Second, the decline in coal generation that Petitioners place at the center of their reliability arguments (and erroneously attribute to the Plan) is not, in fact, the principal driver of reliability concerns; instead, grid reliability is threatened by a range of stressors and disruptions from extreme weather and aging electricity infrastructure to the changing nature of the aggregate load with increased distributed generation, electrification, and large data centers requiring flexibility that baseload generation is ill-equipped to supply. Meeting many of these conditions requires addressing the energy transition head on, rather than obstructing it. These more significant concerns are not only already being addressed by grid operators, utilities and other reliability organizations, but, to the extent EPA's rule impacts them at all, it has the potential to alleviate, rather than exacerbate, them.

The electrical grid is designed to provide affordable, reliable power to all energy consumers. Grid reliability requires several core elements: sufficient generation of electricity that can provide the many reliability services needed across time and space; stable and dependable delivery of that electricity through transmission and distribution in the face of possible disturbances; operating tools and systems that ensure the real-time balancing of the whole system so supply continuously matches demand; and flexibility in some portion of demand itself to respond to changing conditions on the grid. Several trends today—economic, technological, environmental, and regulatory—are contributing to a transformation of the grid and a parallel evolution in grid reliability tools. These trends include the longstanding decline in coal generation, the rapid rise of renewable generation and energy storage technologies, the increasing cost-effectiveness of combined cycle natural gas generation compared to coal-fired supply, and the increase in frequency and severity of extreme weather events.

The Plan has not caused these well-established trends; instead, it acts in concert with them. It acknowledges the longstanding and continuing replacement of coal generation with renewable and natural gas generation, the effects of which easily swamp any role of the Plan in altering the nation's electricity generation mix. Nothing in the Plan will prevent grid operators from using their ordinary tools and methods to ensure the reliable delivery of electricity. Indeed, the record supports EPA's well-founded conclusion that the Plan poses no material risk to electric system reliability, as grid operators and regulators continue to prioritize resilient distribution and transmission alongside operational reliability and load balancing.

The sensibility of the Plan is unsurprising. EPA assessed the effect of the regulation on grid reliability during the rulemaking process, consulting with expert actors charged with ensuring reliability and incorporating their feedback in the final version. EPA has developed a regulation that acts in concert with the ways the grid is already changing and that is wholly consistent with the operation of a reliable, resilient grid.

ARGUMENT

I. The Physical Constraints and Resource Mix of the Grid Shape the Strategies Required to Ensure Reliability of Service.

Engineers have declared the U.S. power system the largest, "most complex machine ever made." PHILLIP F. SCHEWE, THE GRID: A JOURNEY THROUGH THE HEART OF OUR ELECTRIFIED WORLD 1 (2007). The grid is a highly interconnected system in which supply must be balanced with demand in real-time, all of the time. This system operates with several unique features. Together, these features both require and facilitate continuous orchestration of grid operations to ensure uninterrupted service. Ensuring the reliability of this system results from a multifaceted set of control systems and back-up capabilities that is constantly evolving alongside the grid itself.

a. Each of the three electric systems operates as a single, interconnected machine.

Every electric generator in the continental United States is part of one of three large regional grids (called "interconnections") and is linked to other generators and consumers through transmission and distribution lines. These three main interconnections—the Eastern Interconnection, the Western Interconnection, and the Electric Reliability Council of Texas—can each "be viewed as a single large machine with every generator pulling together to supply electricity to all customers." NORTH AM. ELECTRIC RELIABILITY CORP., BALANCING AND FREQUENCY CONTROL REFERENCE DOCUMENT 1 (May 11, 2021).

Each of these electrical interconnections consists of several components essential to ensuring reliable and cost-effective power to consumers: generation, transmission, distribution, and grid operation. **First**, a diverse set of generators converts primary energy (such as coal, natural gas, sunlight, or wind) into electricity. **Second**, within each grid, a network of high-voltage transmission lines allows power to flow from where it is produced to where it is needed, sometimes over hundreds or even thousands of miles. **Third,** local substations receive electricity from high-voltage transmission lines and lower the voltage for delivery to consumers via local distribution networks. **Fourth**, in any particular electrical area, a single operator (called a "balancing authority") must send signals to schedule and dispatch generators' output so that supply meets demand at all times, even as demand changes in real time.

Interconnection is the defining feature of these electric systems. Interconnection allows grid operators to call upon generators to produce power and provides multiple routes for power to travel if a power plant or transmission line goes offline in one area and as demand fluctuates. The fundamental purpose of each machine's interconnectedness is to allow grid operators to continuously balance electricity supply and demand over vast regions, and to take advantage of different power supply sources (with different costs), thus ensuring all consumers access to affordable and reliable power. This feat is accomplished through orchestrated second-by-second shifts among different generators, which the grids' physical structure is designed to facilitate. Interconnection also facilitates system reliability: If one line goes down, electricity can flow through alternative routes; when a generator fails, other generating capacity that has been held in reserve can pick up the load smoothly without a power interruption.

Reliability-constrained economic dispatch of electric power occurs on multiple scales—yearly, seasonally, monthly, weekly, daily, hourly, and in even shorter intervals—as grid operators respond to variable supply, demand, and operational constraints by managing shifts among generators. Renewable energy generators typically receive dispatch priority because they have lower variable costs than fossil-fuel-fired generators, which must purchase fuel.

Keeping the grid online and ensuring it can meet consumers' electricity demand in real time—ensuring grid reliability, in other words—is an essential task of grid operators with oversight from regulators. Ensuring that every time someone seeks to use electricity, that electricity is instantaneously delivered requires three primary elements: 1) adequate electricity generation, 2) consistent and resilient delivery of that electricity, and 3) effective load balancing.

Planning to ensure the adequacy of resources on the system underpins the ability of the system to meet reliability standards. Planning is critical to ensure there is always adequate generation to meet expected regional demand, plus additional capacity in case generators go offline for maintenance or equipment failures. Throughout the country, North American Electric Reliability Corporation-certified Balancing Authorities conduct reliability assessment planning and Reliability Coordinators oversee the planning process, all under FERC-approved mandatory Reliability Standards. In energy systems that have been restructured, Regional Transmission Organizations or Independent System Operators are charged with ensuring reliability, particularly amidst retirements of older generators and the entry of new resources. In regions of the country without a Regional Transmission Organization or Independent System Operator, an electric utility typically serves as the balancing authority for a particular geographic area of the grid.

Grid operators have a variety of tools at their disposal to ensure that there will be operational reliability at any given time. Interconnection, for example, is not only important for delivery but is also a longstanding tool for sharing and operating resources (allowing each individual utility to rely on a more diverse set of electrical equipment to meet demand and provide backup power). The first power plants constructed in the late 1800s initially served only local customers and relied on backup generators. These local utilities, however, quickly learned the "benefits in reliability and realized reduced expense associated with maintaining operating reserves by connecting to neighboring systems." NORTH AM. ELECTRIC RELIABILITY CORP., *supra*, at 4. Transmission lines that interconnect regions facilitate the sharing of generation resources, which "allows regions to carry lower planning reserve margins for the same level of resource adequacy." NAT'L RENEWABLE ENERGY LAB., EXPLAINED: FUNDAMENTALS OF POWER GRID RELIABILITY AND CLEAN ENERGY 11 (2024). Increasingly, energy storage and demand response programs are contributing to resource adequacy as well.

The electric system's reliability also depends upon maintaining and operating transmission and distribution systems. These delivery systems must be reliable and resilient: able to "bounce back" after incidents such as extreme weather events. Alexandra Klass et al., *Grid Reliability Through Clean Energy*, 74 STANFORD L. R. 984 (2022). In practice, this is largely an exercise in managing disruptions to delivery systems—most often, local distribution lines—caused by weather events. NAT'L ACAD. OF SCIENCES, ENGINEERING, AND MEDICINE, ENHANCING THE RESILIENCE OF THE NATION'S ELECTRICITY SYSTEM 1 (2017). Historically, disruption to electricity distribution equipment by weather events has been the greatest threat to reliability. NAT'L RENEWABLE ENERGY LAB., EXPLAINED: RELIABILITY OF THE CURRENT POWER GRID 1 (2024).

Even with adequate power and a well-maintained system of lines, the grid can fail if electric generation and electricity demand are out of balance at any given moment. Electricity is not a physical substance piped through lines. Generators do not "generate" electrons and consumers do not "consume" electrons. Instead, electric power is injected into and withdrawn from the grid. Electrons in an alternating current electrical network (such as exists in the United States) merely move back and forth at a frequency of 60 cycles per second. Because all electricity within a grid is pooled, the electric power added by any single generator becomes part of an undifferentiated flow on the network. As with water added to a pool, consumers cannot distinguish, say, coal-generated power from wind-turbine-generated power once it has been injected into the grid.

Historically, balancing load required second-by-second matching of electricity withdrawals to electricity generation. Increasingly, however, the formula is evolving to reflect the deployment of energy storage. Load balancing is still necessary, but energy storage provides a buffer. Energy storage systems can add power to the grid when needed and pull excess power from the grid to recharge the storage system, and they can do so on very short notice. Energy storage thus adds flexibility to balancing because it allows for more nimble response. This kind of flexible resource presents a stark contrast with "baseload" resources like coal, which have long ramp times and are not adequately flexible to respond quickly to changes in load. Demand response programs also increasingly assist with load balancing by shifting load to match generation, rather than vice versa.

b. Grid reliability strategies are evolving to accommodate changing grid characteristics and reliability challenges.

Robust tools are in place, and are evolving constantly, to ensure operational reliability on the grid. The primary trends now driving changes to reliability tactics are the longstanding decline of aging coal generation; the rapid growth in renewable generation and energy storage; and the rise in extreme weather events. Grid operators have tools to respond well to each of these trends to safeguard the delivery of power.

A large subset of existing coal-fired generating units are old, sometimes running well beyond their expected operating lives. The economics of producing power from other types of generating equipment, including gas-fired generation, wind, solar, and storage, have rendered many old and inefficient coal-fired power plants uneconomic. Many have retired for this reason, and many more will do so in the near future. Technological developments, state and federal policy, and simple economics have contributed to the rise of renewable generation and energy storage, alongside energy efficiency and demand response programs.

The biggest reliability threats, however, come from changing weather conditions that are putting stress on the traditional approaches to maintaining and operating facilities. Extreme weather events "continue to pose the greatest risk to reliability due to the increase in frequency, footprint, duration, and severity." NORTH AM. ELECTRIC RELIABILITY CORP., 2023 STATE OF RELIABILITY OVERVIEW 5 (2023). The increase in climate change-driven extreme weather is "[o]ne of the greatest uncertainties in maintaining reliability." NAT'L RENEWABLE ENERGY LAB., EXPLAINED: MAINTAINING A RELIABLE FUTURE GRID WITH MORE WIND AND SOLAR 5 (2024).

Despite these trends, ensuring a renewable and reliable grid is possible today using developing approaches and existing technology. *See generally* Larson et al., PRINCETON UNIVERSITY, NET-ZERO AMERICA REPORT (2021); GOLDMAN SCHOOL OF PUBLIC POLICY, 2035: THE REPORT (2020). While new technologies are sure to accelerate reliability solutions, the necessary changes are already here and are being implemented now.

To replace aging coal infrastructure, renewable resources are increasingly being deployed in ways that allow for reliable service. Tools that enhance this transition include greater overall generation capacity; a geographic diversity of renewables siting; diversity of types of generation; robust interconnection and improved transmission infrastructure; demand response and load flexibility tools that can better align demand with the availability of renewable energy; the deployment of energy storage; better forecasting of weather and its impacts on electricity use and supply; and improved tools to provide situational awareness and visibility into operating conditions around the grid. Each of these tools helps to accommodate the variability of renewable sources and provides additional benefits to grid reliability.

A portfolio of diverse generation sources can replace aging infrastructure and ensure resource adequacy, including renewables, because different types of generating equipment offer different reliability services. Hibbard et al., *Electricity Markets, Reliability, and the Evolving U.S. Power System*, ANALYSIS GROUP (June 20, 2017). This is true for three main reasons.

First, replacing aging fossil fuel plants with non-baseload power enhances reliability by reducing the system's reliance on large generating units with slow ability to change levels of output, in favor of smaller, more nimble and flexible generation sources that are better able to follow the variable aggregate load. The idea of baseload power providing unmatched reliability is outdated: To the contrary, fossil fuel plant disruption—both gas and coal—has driven service interruptions in recent years due to extreme weather. In 2022, conventional generation "experienced its highest level of unavailability (8.5%) overall since NERC began gathering [Generating Availability Data Systems] data in 2013." NORTH AM. ELECTRIC RELIABILITY CORP., 2023 STATE OF RELIABILITY OVERVIEW 7 (2023). Coal-fired power plants have experienced increasing levels of unplanned outages. NORTH AM. ELECTRIC RELIABILITY CORP., 2024 STATE OF RELIABILITY OVERVIEW 8 (2024).

A grid designed around fossil fuel generation assumes there is central control over these "baseload" plants. Because this assumption is built into the design, that grid simply cannot deliver when these kinds of generation fail due to weather. Making matters worse, reliance on fossil fuel generation, by exacerbating climate change, will contribute to an increasing frequency of those same extreme weather events that challenge grid reliability over the long run. A grid designed around renewables, on the other hand, assumes variability and builds fluctuating weather patterns into its approach. This variability-friendly approach to reliability hardens the grid to extreme weather events.

Second, increasing renewable generation capacity spurs the development of new transmission capacity, which itself enhances resilience. Regulators and grid operators have vigorously taken up the task of speeding the interconnection of the massive queue of new renewable generation.[2] New and upgraded transmission infrastructure will harden the grid by modernizing equipment and building in

[2] The Federal Energy Regulatory Commission recently issued a rule regarding long-term transmission planning and cost-allocation. 89 Fed. Reg. 49280. The Department of Energy promulgated a new rule to streamline permitting of transmission. 10 C.F.R. § 900. Along with other grid enhancing technologies, innovations to transmission cables that can accommodate double the load can increase transmission capacity by reconductoring circuits.

redundancy that will lessen risks from network outages and wildfire danger. These upgrades will also allow for greater throughput capability, supporting geographic and resource diversity alongside greater resilience.

Third and last, the geographic and source diversity of new renewable generation will provide yet another set of independent benefits, including by reducing threats from extreme weather. A more geographically diverse array of generation resources increases systemwide resiliency to weather variation, extreme weather events, and variations in the timing and shape of consumers' demand. Resource diversification also reduces risks associated with fuel supply constraints and price shocks. NAT'L RENEWABLE ENERGY LAB., RENEWABLE ENERGY TO SUPPORT ENERGY SECURITY 3 (2019).

c. Coal generation is in longstanding decline because it is not competitive with natural gas and renewable generation.

Coal-fired generation has been in decline for over a decade, both in absolute amounts and in the share of total power it provides. Renewable generation capacity is growing. In the U.S., coal generation at many power plants simply cannot compete with the high efficiency of combined cycle gas combustion turbines coupled with low gas prices, or with the near-zero operational costs of renewable generation.

A reasonable expected operating life of coal-fired units is 40 years, but the average age of the currently operating coal fleet is 47.2 years. BRATTLE GROUP, A REVIEW OF COAL-FIRED ELECTRICITY GENERATION IN THE U.S. 18 (2023). Aging coal plants become more expensive to maintain and operate, and can become increasingly unable to provide many needed reliability services. *Id.* at 19 (on operating costs of aging coal plants). As a result, it can be less expensive to build new renewable generation than to continue to maintain and operate coal-generating units that are already beyond their expected operating lives.

The decline of coal cannot be viewed in a vacuum. Due to the systems of economic dispatch described above, the retirement of coal generation and the entry of new natural gas and renewable generation are interrelated. As an enormous quantity of renewable capacity has come online, it has contributed to decreasing output at coal-fired power plants as a natural outcome of market forces in combination with federal financial incentives, state policies, and purchasing preferences of many large electricity customers. Renewable generation in the U.S. surpassed coal generation in 2022. ENERGY INFO. ADMIN., *Renewable Generation Surpassed Coal and Nuclear in the U.S. Electric Power Sector in 2022* (March 27, 2023), https://www.eia.gov/todayinenergy/detail.php?id=55960.

While facilitated by economic dispatch principles, the decline in coal is driven primarily by cost changes and by financial incentives for renewables.

Combined cycle gas combustion turbine generation is now significantly more efficient and more flexible than a substantial number of coal-fired steam generation units. ENERGY INFO. ADMIN., *Most Combined-Cycle Power Plants Employ Two Combustion Turbines with One Steam Turbine* (April 25, 2022), https://www.eia.gov/todayinenergy/detail.php?id=52158. Renewable generation, meanwhile, has near-zero operating costs, and with rapidly evolving technology alongside policy incentives, the overall costs of renewable generation are falling rapidly.

State policy tools like emissions targets and renewable portfolio standard requirements have also driven the decline of coal generation. *See, e.g.* BRATTLE GROUP, *supra*, at 23. At the federal level, the Inflation Reduction Act is expected to increase renewable and low-emissions generation even more, primarily through tax credits for wind, solar, energy storage, and other clean energy resources. S&P Global estimates that 24.3 gigawatts, or about 41%, of coal retirements projected by 2030 will be due to Inflation Reduction Act incentives for other generating technologies. Taylor Kuykendall et al., *Inflation Reduction Act to Accelerate U.S. Coal Plant Retirements*, S&P Global (Feb. 2023), https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/inflation-reduction-act-to-accelerate-us-coal-plant-retirements-74196498.

Coal's decline shows no signs of slowing and is projected to continue. This reduction is expected to be frontloaded, with a heavy decline before 2030 and most of the aging and less efficient coal infrastructure likely retiring before 2040. *Id.*; Susan Tierney, *U.S. Coal-Fired Power Generation: Market Fundamentals as of 2023 and Transitions Ahead*, ANALYSIS GROUP 38-40 (2023). The adoption of renewable generation and energy storage, on the other hand, is increasing at near exponential rates.

II. The Good Neighbor Plan Will Not Jeopardize Grid Reliability.

The Plan will not jeopardize reliability for two key reasons. First, the Plan's marginal impact on coal retirements will not result in "disorderly retirement," as petitioners argue. Second, and crucially, the longstanding trend of coal power plant closures and the projected continuation of this trend do not, as petitioners claim, "necessarily impact reliability." Industry Petitioners Brief 82 (April 1, 2024), ECF No. 2047829. Petitioners' errors are manifold: They misattribute to the Plan a causal role in compounding existing trends, when instead the plan is simply designed around reasonable projections of preexisting trends. Petitioners also selectively focus on one element of reliability—resource adequacy—at the expense of other elements that will likely benefit from the systemwide changes in the power generation market and infrastructure that the Plan assumes. Finally, Petitioners mischaracterize EPA's consideration of reliability concerns throughout the rulemaking process.

a. The Good Neighbor Plan's emission program will not cause "disorderly retirement" of coal plants.

Petitioners argue that the Plan's Cross State Air Pollution Rule Trading Program will push coal generation offline because it fails to provide sufficient emissions allowances to cover necessary grid operations. Petitioners also argue that "[e]ven if allowances are available . . . the [Plan's] enhancements will require EGUs to install controls or shutdown. Those powerplant closures will necessarily impact reliability." Industry Petitioners Brief, *supra*, 82. Each argument is addressed in turn below.

i. The Cross State Air Pollution Rule Trading Program's allowances are more than adequate to maintain reliability.

Emissions trading programs, like the Cross State Air Pollution Rule Trading Program, work by setting an overall emissions budget and issuing allowances equal to that budget to be divided amongst sources. Individual emitters can choose to emit over and above their share of that target, but they must purchase allowances to offset those emissions. This well-established structure is designed to ensure an overall decline in emissions while allowing emitters flexibility to determine how they will comply.

Petitioners claim that the supply of allowances for electric generating units is too low and compliance costs will therefore be too high. As a result, they claim, coal-generating units will be forced to "disorderly retire," jeopardizing grid reliability. Industry Petitioners' Brief at 81. But the program's allowances are more than adequate and, to the extent that costs of compliance result in owners deciding to retire their plants, this reflects broader economic trends, not an overly stringent rule. Petitioners fail to acknowledge EPA's reasonable and substantial efforts to ensure an adequate allowance supply based on the best evidence available.

The initial calculation and allocation of allowances is frequently a source of contention in emission trading programs, particularly by regulated industry. But EPA's calculation and allocation of NO_x allowances followed longstanding processes and relied on well-regarded industry modeling. 88 Fed. Reg. 36654, 36698-99. EPA allocates allowances on the basis of each state's emission budget. These budgets are set at the sum of projected emissions remaining from electric generating units were the Plan's specified pollution controls in place. EPA, ALLOWANCE ALLOCATION UNDER THE FINAL RULE TSD 2 (2023), EPA-HQ-OAR-2021-0668-0132, JA___.

This approach identifies, but does not mandate, readily available technology that could reduce emissions. The Plan then requires compliance with emissions budgets equivalent to the reductions that would stem from installing those pollution controls, affording flexibility to generating units to choose how to comply while maintaining a level of output consistent with economic dispatch given the plant efficiencies and variable costs. Power plants can choose to comply through a range of methods, from conducting maintenance on existing controls to making operational changes that reduce overall emissions, like using more efficient units or switching to lower-emission fuels. The central requirement is that collectively, the regulated generating units in each state must achieve emissions reductions equivalent to those attributable to the pollution control technologies EPA has identified.

Petitioners insist that EPA has set the allowance cap too low because it either underestimated overall NO_x emissions in the absence of controls, overestimated emissions reductions attributable to pollution reduction technology, or both. But EPA's overall projections for NO_x emissions are, if anything, overly conservative in favor of industry, and EPA's reduction estimates attributed to the pollution controls are sound.

EPA's overall NO_x projections relied on the best available data for existing generating units and incorporated up-to-date assumptions about new builds, firmly committed retirements, and electricity demand, among other factors. 88 Fed. Reg. 36654, 36699. Fleet data for the inventory EPA's modeling used is sourced from the Energy Information Administration and EPA's Emission Tracking System, and is supplemented with comments from utilities and regional EPA offices. EPA, DOCUMENTATION FOR EPA'S POWER SECTOR MODELING PLATFORM V6 USING THE INTEGRATED PLANNING MODEL 4-2 (2021), EPA-HQ-OAR-2021-0668-1145, JA___. EPA's projected reductions attributed to pollution controls are thorough, appropriate, and based on valid data. EPA, THE EGU NOX MITIGATION STRATEGIES FINAL RULE TSD (Feb. 2022), EPA-HQ-OAR-2021-0688-0125, JA___.

The conservative assumptions that undergird EPA's modeling create a buffer in allowances, leaving significant room in the unlikely event that electric generating units fail to adopt the pollution controls envisioned or that these control technologies fail to perform as expected. Such underperformance, however, is highly improbable, because EPA's selection of pollution controls reflects widespread and technologically mature controls, and the Agency's projections for emissions reductions from the selected controls are appropriate and conservatively calculated.

The Plan's modeling is in line with current trends; the Plan provides multiple flexibility mechanisms and reliability safeguards, responsive to feedback from

Regional Transmission Organizations. The record supports EPA's conclusion that the trading program will contain adequate allowances to support industry operation without reshaping current generation trends.

Finally, Petitioners' claim belies the reality of the electric industry: When power plant owners choose to retire their units, they indicate their intention to do so to grid operators, which then perform reliability analyses to determine how to ensure reliability before the unit is allowed to retire. Power plants do not, and cannot, simply "disorderly retire." This phrase misconstrues how the industry operates in the real world.

ii. The Plan's enhancement measures, such as its backstop daily emissions rates, are reasonable provisions that will not undermine grid reliability.

Petitioners further argue that even if one concedes that the Plan's trading program provides sufficient allowances, other features of the Plan intended to ensure efficient use of existing pollution controls—known as its "enhancements"—will undermine the Plan's efficacy and harm grid reliability. But the Plan's enhancements will not "[hamstring] the flexibility of its trading program," as Petitioners assert. Industry Petitioners Brief 82. EPA deferred some enhancements to 2030, by which point many of the coal retirements projected independently of the Plan—consisting predominantly of the older coal plants that would likely choose to retire rather than comply with the Plan's enhancements—will have already occurred.

The Plan's "enhancements" are intended to "help maintain control stringency over time and improve emissions performance at individual units, offering an extra measure of assurance that existing pollution controls will be operated during the ozone season." EPA, REGULATORY IMPACT ANALYSIS FOR THE FINAL FEDERAL GOOD NEIGHBOR PLAN ADDRESSING REGIONAL OZONE TRANSPORT FOR THE 2015 OZONE NATIONAL AMBIENT AIR QUALITY STANDARD 21 (2023), EPA-HQ-OAR-2021-0668-0151, JA___. The program's enhancements include dynamic budgeting and backstop daily emissions rates for coal-fired units of 100 MW or greater. 88 Fed. Reg. 36654, 36664.

Petitioners' primary reliability concern focuses on the backstop daily emissions rate for electric generating units, which is intended to maximize easily obtainable NO_x emissions reductions by preventing idling or "non-optimization" of controls. 88 Fed. Reg. 36654, 36767. The backstop daily emissions rate requires generating units to limit emissions to the level that can be achieved with consistently operating Selective Catalytic Reduction controls. The daily rate applies first to plants that already have Selective Catalytic Reduction and is extended to plants without existing Selective Catalytic Reduction in later years of the program, but no later than 2030. 88 Fed. Reg. 36654, 36767.

The Plan's backstop daily emissions rates are unlikely to result in power plant closures independent of preexisting trends. For plants with Selective Catalytic Reduction controls, which include most plants in affected states, the operating costs of turning on their pollution controls are small and incremental. REGULATORY IMPACT ANALYSIS, *supra*, at 138, JA___. Plants without Selective Catalytic Reduction controls, on the other hand, will not have their backstop daily emissions rate imposed until at least the second control period and possibly as late as 2030. 88 Fed. Reg. 36654, 36767. The coal plants that opt not to adopt these conventional and widespread controls are likely to be in the ever-growing category of coal plants already beyond their expected operating lives. As such, many of these plants are also highly likely to be part of the retirements expected prior to or in 2030 and, as a result, the backstop daily emissions rate may never apply to them.

The Plan includes additional protections to ensure that reliability will not be impacted by its enhancement provisions. The Plan allows a 50-ton buffer, for example, before applying the daily emissions rate allowance surrender ratio in order to accommodate startup emissions and avoid discouraging plants from coming online when necessary. 88 Fed. Reg. 36654, 36774. As a final safeguard, the Plan does not limit an electric generating unit's ability to seek an emergency waiver authorization from the Department of Energy under Federal Power Act 202(c), 16 U.S.C. § 824a(c). These waivers can waive compliance with environmental standards when necessary to ensure reliability, given sudden changes in electricity demand. *See* U.S. DEP'T OF ENERGY, DOE's Use of Federal Power Act Emergency Authority, https://www.energy.gov/ceser/does-use-federal-power-act-emergency-authority-archived.

In sum, the Plan does not require plant retirements or change the underlying dynamics already driving the industry's turn away from increasingly uneconomic coal generation. The trading program's structure and allocation of allowances offers flexibility to electric generating units to choose how they meet the Plan's requirements. To the extent that the choices facing coal generating units are constrained, this constraint reflects the increasingly and fundamentally uneconomic nature of coal generation in a changing energy landscape, not an overly stringent Plan. The gradual shifts that the Plan contemplates are modest compared to broader changes already underway, as the power sector trends toward cheaper and more efficient lower-carbon sources.

b. The longstanding trend away from coal and toward renewable generation will improve, not jeopardize, reliability.

Petitioners conclude not simply that the enhancements will reduce the emissions trading program's flexibility, but go further, arguing that resulting "powerplant closures will necessarily impact reliability." Industry Petitioners Brief 82. This claim is not based in fact. Instead, there is strong evidence that the current independent trend of accelerating coal plant closures and parallel buildout of renewable generation and infrastructure will improve reliability and resiliency.

Petitioners are asking EPA to regulate for a world that does not exist, based on an unrealistic view about circumstances on the grid going forward. Historical approaches to ensuring resilient transmission and distribution, resource adequacy, and load balancing have been predicated on the specifications of the grid we used to have: one designed to deliver generation from large, centralized, fossil-fuel steam generating units. Petitioners' reliability claims rely on this vision, but approaches to reliability designed around those historical characteristics can no longer meet the needs of the grid we have today.

The contemporary grid is made up of diverse generation sources, and reliability is driven by upgrades to transmission and increasing resilience, with a growing contribution from storage, not by "baseload" generation. Coal-fired steam generating units have slow ramp rates, high minimum loads, long startup times, and are inflexible from an operational point of view, which makes them ill-suited to providing the flexibility needed to manage the modern grid. Many of the reliability tools the grid needs today rely on the ability to adjust generation rapidly in response to highly variable load and to changing output at some renewable projects. Coal generation cannot adjust with flexibility to changes in load and other low-cost power producers.

Petitioners also selectively focus on only one element of reliability—resource adequacy—at the expense of other elements that will likely benefit from the systemwide changes the Plan assumes. Propping up coal generation does nothing to address reliability concerns around extreme weather events, which pose the greatest threat to reliability. Slowing the transition to a renewable grid could, therefore, impose even greater reliability risks.

Coal-fired units have an average age well beyond the typical expected operating life of 40 years, and as with any complicated piece of equipment, outage rates increase significantly towards the end of a plant's life. Costs of maintenance increase and plant functioning can decline as generating units age, presenting particular concern during extreme weather events. As the coal fleet ages, reliability analysts have noted "consistently increasing outage rates for coal over the observed five years, correlating with higher numbers of startups and maintenance outages." NORTH AM. ELECTRIC RELIABILITY CORP., 2023 STATE OF RELIABILITY OVERVIEW 7 (2023).

In sum, far from displaying "disorderly retirement," the decline of coal generation is a consistent, decades-long trend that shows no sign of letting up. This ongoing trend will continue to catalyze changes to the grid that will make it more nimble, resilient, and flexible.

c. EPA consulted grid reliability experts and grid operators, resulting in a well-considered Plan.

It is not surprising that the Plan does not jeopardize reliability. EPA considered reliability as it developed the Plan, consulting extensively with grid reliability experts and working in collaboration with affected Regional Transmission Organizations to address concerns throughout the rulemaking process. EPA's conclusions about the effects of the Plan are in line with the record and with the weight of expert views.

Petitioners accuse EPA of "eschewing analysis, data, and consultation with experts in favor of guesswork," but this is plainly not the case. Industry Petitioners Brief 82. As discussed above, ensuring reliability is an intensive task involving many actors. The primary actors charged with ensuring reliability are the Federal Energy Regulatory Commission and the North American Electric Reliability Corporation, as well as system operators and Regional Transmission Organizations. 88 Fed. Reg. 36654, 36679, JA__. EPA engaged with system operators and the Federal Energy Regulatory Commission throughout the rulemaking process, hosting meetings with reliability organizations to get their feedback on the Plan. 88 Fed. Reg. 36654, 36774, JA__. EPA's modifications responsive to the resulting feedback are apparent in the final Plan. 88 Fed. Reg. 36654, 36772, JA__. In the lead up to the promulgation of the Plan, EPA also coordinated with the Department of Energy to develop a new Memorandum of Understanding facilitating interagency collaboration to support reliability. EPA & U.S. DEP'T OF ENERGY, JOINT MEMO ON INTERAGENCY COMMUNICATION AND CONSULTATION ON ELECTRIC RELIABILITY 1 (2023).

Petitioners argue that two grid operators have issued reports confirming that the Plan threatens reliability. Industry Petitioners Brief 84. But neither report confirms that EPA's Plan is a specific threat to reliability. The PJM Report cited by Petitioners generally describes "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" as "hastening the decline in thermal resources." PJM, ENERGY TRANSITION IN PJM: RESOURCE RETIREMENTS, REPLACEMENTS & RISKS 5 (2023). The Midcontinent System Operator Report makes no mention of the Plan, instead identifying a shortfall of committed resources it attributes to "Wall Street investment criteria that make it more challenging to build new dispatchable generation"; "[t]he approximately $370 billion in financial incentives for clean-energy resources in the federal Inflation Reduction Act"; and EPA regulations prompting coal and gas resources to retire. MIDCONTINENT SYSTEM OPERATOR, MISO'S RESPONSE TO THE RELIABILITY IMPERATIVE 7 (2024).

In summary, these reports do not support the idea that the Plan jeopardizes reliability—and certainly not that EPA's decision making was arbitrary and capricious on this score. The PJM report merely affirms that a range of preexisting conditions is leading to the decline of coal power plants, conditions which EPA well understood. The PJM report does not meaningfully engage the question of the Plan's role in this trend—or, for that matter, the question of whether this trend threatens the reliability of the grid (which, as we have noted throughout this brief, we believe it does not). The second report does not mention the Plan at all. Nonetheless, EPA considered commenters' views on these issues in its rulemaking process, and its decisions based on record evidence—which robustly supports EPA's conclusions about reliability—cannot be said to be arbitrary and capricious.

A transformation is well underway in our electric power system. That transformation is defined by a shift away from coal-fired generation and towards renewable generation, storage, and gas-fired generation, and is paired with a suite of tools to enhance grid reliability throughout this transition. EPA's Plan correctly takes this transformation into consideration but will not drive its outcome. Instead, the Plan makes reasonable and justified assumptions about this transformation, resulting in a Plan that will have no material impacts on grid reliability.

CERTIFICATE OF COMPLIANCE

I hereby certify that the foregoing brief complies with the type-volume limitations set forth in D.C. Cir. R. 32(e)(3) and Fed. R. App. P. 29(a)(5) because this brief contains 6411 words, excluding the parts of the brief exempted by Fed. R. App. P. 32(f) and D.C. Cir. R. 32(e)(1). The foregoing brief complies with the typeface requirements of Fed. R. App. P. 32(a)(5) and the type style requirements of Fed. R. App. P. 32(a)(6) because this brief has been prepared in a proportionally spaced typeface using Microsoft Word in 14-point Times New Roman font.

/s/ Cara Horowitz
CARA HOROWITZ
June 24, 2024

CERTIFICATE OF SERVICE

I hereby certify that, on this 24th day of June, 2024, I caused the foregoing to be electronically filed with the Clerk of the Court for the United States Court of Appeals for the District of Columbia Circuit using the Court's CM/ECF system, which constitutes service on all parties and parties' counsel who are registered ECF filers.

/s/ Cara Horowitz
CARA HOROWITZ
June 24, 2024

ADDENDUM – CREDENTIALS OF GRID EXPERTS

Benjamin F. Hobbs is the Theodore M. and Kay W. Schad Professor in Environmental Management in the Department of Environmental Health and Engineering at Johns Hopkins University ("JHU"). He has a joint appointment in the Department of Applied Mathematics and Statistics, and is Global Director of the Electric Power Innovation for a Carbon-free Society, a multi-country research center supported by the National Science Foundation. He is also on the Leadership Council of the JHU O'Connor Sustainable Energy Institute. His research focuses on electric power and energy market planning, risk analysis, and environmental and energy systems analysis and economics. He is Chair of the California Independent System Operator Market Surveillance Committee and a Fellow of Life Fellow at the Institute of Electrical and Electronics Engineers and the Institute of Operations Research and Management Science. He was also a consultant to the PJM Independent System Operator and developed the methodology it uses to create its capacity market demand curve as part of its original Reliability Pricing Model. From 1995 to 2002, he was consultant to the Federal Energy Regulatory Commission's Office of the Economic Advisor. He holds a Ph.D. in Environmental Systems Engineering from Cornell University.

Brendan Kirby is a private consultant with clients including the Hawaii Public Utilities Commission, Grid Lab, National Renewable Energy Laboratory, Energy Systems Integration Group, Electric Power Research Institute, American Wind Energy Association, Oak Ridge National Laboratory, and others. He has forty-nine years of electric grid experience, and has published over 180 papers, articles, book chapters, and reports on power system reliability and integrating renewable energy generation into the power grid. He was a member of the North American Electric Reliability Corporation's Essential Reliability Services Task Force, and previously served on its Standards Committee. He retired from the Oak Ridge National Laboratory's Power Systems Research Program. He is a Licensed Professional Engineer with an M.S. degree in Electrical Engineering (Power Option) from Carnegie Mellon University and a B.S. in Electrical Engineering from Lehigh University.

Kenneth J. Lutz is an Affiliated Professor in the Department of Electrical and Computer Engineering at University of Delaware, where he does research and teaches specially designed courses on the modernization of the electric grid. He has decades of experience in the regulation of utilities. He founded AMR Strategies, LLC, to help utilities modernize their grids. Previously, he served as an IEEE/American Association for the Advancement of Science Congressional Fellow for United States Senator Ron Wyden, where he played a key role in drafting federal legislation for renewable energy and energy efficiency. He has a Ph.D. in electrical engineering from the Johns Hopkins University and a B.E.E. from the University of Delaware.

Susan Tierney, a Senior Advisor at Analysis Group, is an expert on energy economics, regulation, and policy, particularly in the electric and gas industries. She has consulted to and been an expert witness on behalf of businesses, federal and state governments, tribes, environmental groups, energy consumers, foundations, and other organizations on energy markets, economic and environmental regulation and strategy, and energy projects. Previously, she served as the Assistant Secretary for Policy at the U.S. Department of Energy. She was the Secretary of Environmental Affairs in Massachusetts, a Commissioner at the Massachusetts Department of Public Utilities, and Executive Director of the Massachusetts Energy Facilities Siting Council. Dr. Tierney has authored numerous articles and spoken frequently at industry conferences. She serves on a number of boards and advisory committees, including chairing the Board of Resources for the Future and chairing the National Academies' Board on Energy and Environmental Systems. She is a member of the advisory councils at the New York University's Institute for Policy Integrity and the New York Independent System Operator. She was a member of several of the National Academies' expert committees, including on The Future of Electric Power in the U.S. (2021) and

Enhancing the Resilience of the Nation's Electric Power Transmission and Distribution System (2017). She previously chaired the Department of Energy's Electricity Advisory Committee and served on the U.S. Secretary of Energy Advisory Board and the U.S. Environmental Protection Agency's Clean Air Act Advisory Council. She earned her Ph.D. and M.A. in regional planning at Cornell University and her B.A. at Scripps College.