Nos. 12-1182 and 12-1183

In The
Supreme Court of the United States

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, et al.,

Petitioners,

v.

EME HOMER CITY GENERATION, L.P., et al.,

Respondents.

AMERICAN LUNG ASSOCIATION, et al.,

Petitioners,

v.

EME HOMER CITY GENERATION, L.P., et al.,

Respondents.

On Writ Of Certiorari To The United States Court Of Appeals For The District Of Columbia Circuit

BRIEF FOR *AMICI CURIAE* BENJAMIN F. HOBBS, SHMUEL S. OREN, JAMES SWEENEY, AND FRANK WOLAK IN SUPPORT OF PETITIONERS

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INTRODUCTION AND INTEREST OF *AMICI CURIAE*[1]

The Transport Rule at issue in this case primarily targets the electric generation sector because fossil fuel-fired power plants account for two-thirds of the nation's sulfur dioxide emissions and nearly a quarter of the nitrogen oxide emissions.[2] In the majority opinion below, the court appears to fundamentally misunderstand the structure, operation, and economics of the modern electric generating industry. Today's electric power sector is regionally interconnected and highly dynamic – and becoming more so every day. To be environmentally effective and economically efficient, any interstate air pollution rule must account for these essential attributes of the nation's electric grid and the wholesale electricity markets in which generators and utilities participate. Otherwise, tighter controls on one generating facility, or on one state, will merely shift production to another facility or another state. The rigid state-by-state approach imposed by the court of appeals ignores this reality, making it highly unlikely that the Environmental

[1] Pursuant to Rule 37.6, counsel for *Amici* state that no counsel for a party authored this brief in whole or in part, and that no person other than *Amici* and its counsel made a monetary contribution to the preparation or submission of this brief. All Petitioners and Respondents have filed letters of consent with the Clerk of the Court.

[2] U.S. Environmental Protection Agency, Clean Energy Website, http://www.epa.gov/cleanenergy/energy-and-you/affect/air-emissions.html.

Protection Agency ("EPA") can achieve the congressional objectives of the Clean Air Act's "Good Neighbor" provision, 42 U.S.C. § 7410(a)(2)(D), and at the same time virtually certain that it will needlessly impose much higher costs on the broader economy by its attempt.

Amici curiae are electrical engineers, economists, and physicists specializing in the study of electricity, the operation of electric power systems, and the design of wholesale electricity markets. They have an abiding professional interest in the proper regulation of the ever more important electric energy industry.[3]

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[3] *Amici* appear here in their individual capacities as scholars, scientists and engineers and not as representatives of the institutions with which they are affiliated.

until 2002, he was also a consultant to the Federal Energy Regulatory Commission's Office of the Economic Advisor. His academic research focuses on stochastic electric power planning models, multi-objective and risk analysis, mathematical programming models of imperfect energy markets, and environmental and energy systems analysis and economics. He holds a Ph.D. in Civil and Environmental Engineering from Cornell University and is a Fellow at the Institute of Electrical and Electronics Engineers and the Institute of Operations Research and Management Science.

Amicus curiae Shmuel S. Oren is the Earl J. Isaac Chair Professor in the Science and Analysis of Decision Making in the Industrial Engineering and Operations Research Department at the University of California, Berkeley. He is the site director of the Power Systems Engineering Research Center. Professor Oren is also a member of the California Independent System Operator Market Surveillance Committee. His academic research focuses on planning and scheduling of power systems and on electricity market design and regulation. He holds a Ph.D. in Engineering Economic Systems from Stanford University and is a Fellow at the Institute of Electrical and Electronics Engineers and the Institute of Operations Research and Management Science.

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Fellow at the Stanford Institute for Economic Policy Research, the Hoover Institution on War, Revolution and Peace, the Freeman Spogli Institute for International Studies, and the Precourt Institute for Energy. His research includes depletable and renewable resource use, electricity market analysis, environmental economics, global climate change policy, gasoline market dynamics, energy demand, energy price dynamics, and housing market dynamics. He was a founding member of the International Association for Energy Economics and is a Senior Fellow at the U.S. Association for Energy Economics and a member of the California Council on Science and Technology. Professor Sweeney has been or is a member of numerous committees of the National Research Council and is a lifetime National Associate of the National Academies. He holds a Ph.D. from Stanford University in Engineering and Economic Systems.

Amicus curiae Frank Wolak is the Holbrook Working Professor of Commodity Price Studies in the Department of Economics at Stanford University. He currently directs the Program on Energy and Sustainable Development in the Freeman-Spogli Institute for International Studies and is a Senior Fellow at the Stanford Institute for Economic Policy Research. Professor Wolak's fields of specialization are industrial organization and econometric theory. His recent work studies methods for introducing competition into infrastructure industries – telecommunications, electricity, water delivery and postal delivery services – and on assessing the impacts of these competition policies on consumer and producer welfare. From January 1998 to March 2011, he was the Chair of the Market Surveillance Committee of the California Independent System Operator. Professor Wolak is a visiting scholar at University of California Energy Institute and a Research Associate at the National Bureau of Economic Research. He is also a member of the Emissions Market Advisory Committee for California's Market for Greenhouse Gas Emissions allowances. This committee advises the California Air Resources Board on the design and monitoring of the state's cap-and-trade market for greenhouse gas emissions allowances. He holds a Ph.D. in Economics from Harvard University.

SUMMARY OF ARGUMENT

American dependence upon electric energy has nearly doubled since a Good Neighbor provision, structurally similar to the current one, was added to the Clean Air Act in 1977.[4] The use of the electricity grid as a conveyance of energy from where it is produced to where it can be put to productive use lies at the heart of the U.S. economy. Electricity's share of U.S primary energy was 41 percent in the year 2011.[5]

[4] Energy Information Administration, Annual Energy Review 2011, 221 (2012), *available at* http://www.eia.gov/totalenergy/data/annual/index.cfm.

[5] *Compare id.* at 219, *with id.* at 3.

The modern integrated system of infrastructure, regulation, and markets that conveys electric energy from power plants to consumers is immensely complex, dynamic, and regional.

Most electricity is derived from the combustion at large central station power plants of fossil fuels, including coal, natural gas, and to a lesser degree, oil.[6] An unfortunate byproduct of the fossil fuel combustion process is the substantial emission of air pollutants. A central objective of the EPA and its state partners in implementing the Clean Air Act has been to reduce the contribution of power plant and other combustion to air pollution and its associated public health impacts.

More than 30 years ago, Congress understood that fully resolving the air pollution problem caused by electric power plants would require taking account of the interstate nature of the harm. The tall smokestacks that are such a familiar sight at power plants were initially constructed to reduce local air pollution impacts. They were largely successful in doing so, but had the unintended consequence of spreading pollutants and consequent pollution impacts into downwind air sheds, often in neighboring states. Congress enacted and later revised the Good Neighbor provision of the Clean Air Act to address these cross-border effects.

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[6] *Id.* at 225.

The court of appeals, in interpreting the Good Neighbor provision, imposes several constraints that limit EPA's flexibility in designing a regional response to the interstate air pollution problem. Underlying this interpretation are assumptions that power plant operations are static and controlled at the state level. Unfortunately, those assumptions fail to appreciate the dramatic developments that have occurred over the past 40 years in the physical and governance structure of the U.S. electric power system.

Today, dynamic, regional, wholesale electric power markets operate via a highly interconnected transmission network that extends seamlessly across state boundaries. Because regional competition between power plants determines which plants operate, and the imposition of pollution controls changes individual power plant operating costs, the rigid state-by-state approach dictated by the court of appeals is destined to create numerous unintended consequences that may well undermine the overall pollution control effort.

Both before and since the last modification of the Good Neighbor provision in 1990, Congress has repeatedly enacted legislation aimed at empowering the Federal Energy Regulatory Commission ("FERC") to foster regional, competitive, wholesale markets for electric energy. Congress must have intended any solution to the regional air pollution problem to take account of the physical, regulatory, and economic structure of the electric power system that is its primary cause. As scholars specializing in the design of the U.S. electric power system, *Amici* respectfully submit this brief to aid the Court in understanding the structure of the modern electricity system and the constraints it places on resolving regional air pollution problems in the United States.

Below, we describe these physical, regulatory, and economic developments in sufficient detail to illustrate the misunderstandings upon which the court of appeals predicated its decision. Then we explain how the interpretation of the Good Neighbor provision articulated by the lower court, when applied to an accurate view of the U.S. electricity system, would most likely prevent EPA from eliminating interstate air pollution harms and would almost certainly result in significant waste of economic resources with no attendant environmental benefits. These additional costs will be imposed not just on electricity generators, but also on the firms and households that consume electricity in the broader U.S. economy.

ARGUMENT

I. The Unique Attributes of Electricity Have Slowly and Inexorably Shaped the Regional Infrastructure and Wholesale Markets that Exist Today.

A. The Fundamental Properties of Electricity Make It Different in Kind from Direct Energy Sources.

Electricity is different from other kinds of energy. To turn on a light, we don't need the source of the energy to be located in the same place. Electricity is the means of conveying energy rather than a source of it; it provides an efficient way to separate the harnessing of energy from its use. This ability to separate the point of generation from the point of end use provides the basis for our complex modern economy as well as the need for the electrical transmission system. It also profoundly affects how energy markets function today.

Thermal power plants are the primary way we convert stored energy into electricity. They consume fossil or nuclear fuel to boil water and use the resulting steam to turn a turbine generator.[7] The spinning generator induces an electrical current in a wire that is then propagated away from the generating plant through transmission lines. In an alternating current

[7] Other energy sources operate on the same principle. Blowing wind turns the turbine on a windmill and falling water spins the turbine at a hydroelectric plant.

system like the one used in the United States, the direction of the electromagnetic wave reverses 120 times per second. Thus, the electrons do not flow from the power plant to the end user, as commonly believed. Rather, they oscillate more or less in place inside transmission wires, causing a wave of energy – or electric current – to flow through the wire, much like energy is transmitted when one billiard ball strikes another, when sound travels through air, or when a wave crosses the ocean.

The physics of electricity generation make it possible to move energy long distances from power plants to end users, but also pose two important challenges for the operators of electric grids. First, unlike water or fossil fuel, electricity cannot be stored economically for most uses with current technologies. Thus, the generation of electricity at power plants must be continuously balanced against the consumption of electricity drawn out of the system by end users, known as "load." In effect, "[e]lectricity is the ultimate 'just in time' manufacturing process, where supply must be produced to meet demand in real time."[8]

Second, electricity does not necessarily flow from a generator at Point A to a consumer at Point B.

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[8] Paul Joskow, *Creating a Smarter U.S. Electricity Grid*, 26 J. Econ. Perspectives 29, 33 (Winter 2012), *available at* http://pubs.aeaweb.org/doi/pdfplus/10.1257/jep.26.1.29.

Under basic physical laws, electricity distributes itself along the path of least resistance. This means that on an interconnected transmission network or grid, when electricity is consumed at one point in the system (by turning on an electric appliance, for example), power rushes in from surrounding points to reestablish equilibrium across the system.

These unique properties of electricity require careful and constant balancing of the energy load to ensure reliability. When demand increases in one area, the resulting imbalance across the system can cause cascading network failures leading to blackouts. Because there are currently no cost-effective means of storing large quantities of electric energy, grid operators must balance energy supply and demand on a variety of timescales ranging from seconds to decades in order to maintain equilibrium across the network. Different solutions, ranging from second-to-second matching of supply and demand via automatic control of power plants to long-range planning for power plant and transmission adequacy have been developed to address this challenge.

Critical to these load balancing efforts is the ability to coordinate operations between electricity networks. Regional interconnection provides a cost-efficient way to address load and reliability concerns, allowing energy to flow readily to areas of high demand and avoiding system-wide breakdowns.

B. The Need for Reliability and Efficiency of Centralized Electricity Generation Led to Today's Highly Interconnected System.

The basic physical attributes of electricity have, in large part, shaped the electric power system we enjoy today. From an early crazy-quilt of small, local generators powering such urban uses as hotels and stores in downtown business districts, visionary entrepreneurs – most notably, former Edison employee Samuel Insull – developed a business model to centralize electric power generation and transmit electricity over copper wires to end users. That model was built on the development of alternating current, which allowed electricity to be transmitted at higher voltage (or "pressure") with much reduced energy losses, and on the invention of the transformer, which allowed electric current running long distances through high voltage power lines to be "stepped down" to a lower voltage for safe delivery to consumers. With the economies of scale provided by these developments, centralized generators were able to compete against – and eventually out-compete – local distributed generation and gas lamps, forming what we know today as investor-owned utilities.[9]

The rise of centralized power generation in the late 1800's and early 1900's led to "vertically integrated

[9] A full discussion of these developments can be found in Harold L. Platt, *The Electric City* (Univ. of Chicago Press, 1991).

utilities that had constructed their own power plants, transmission lines, and local delivery systems." *New York v. F.E.R.C.*, 535 U.S. 1, 5 (2002). "Although there were some interconnections among utilities, most operated as separate, local monopolies subject to state or local regulation." *Id.* Under this regime, dispatch decisions were made within a single utility's system, which was limited by the Public Utility Holding Company Act to a single state. Formerly codified at 15 U.S.C. § 79 *et seq.*[10]

Fairly early in the development of the electricity industry, however, the state-centered approach began to break down, as utilities sought to enhance reliability and efficiency by interconnecting with adjacent utility networks, raising issues about the reach of state regulatory and rate-setting authority. *See Public Utilities Comm'n of Rhode Island v. Attleboro Steam and Electric Co.*, 273 U.S. 83 (1927) (addressing Rhode Island's ability to regulate prices of electricity generated in-state and delivered over interconnecting transmission lines to a utility in Massachusetts).

In recognition of the growing interconnectivity of electricity transmission, Congress enacted the Federal Power Act of 1935. The Act charged the Federal Power Commission, the predecessor to FERC, with jurisdiction over "the transmission of electric energy in interstate commerce" and "the sale of electric

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[10] This statute was ultimately repealed by the 2005 Energy Policy Act.

energy at wholesale in interstate commerce." 16 U.S.C. § 824(b). Over the next several decades, the electricity grid became increasingly interconnected across states, and technological advances both diversified the sources of electricity generation and reduced the cost of long-distance transmission. Thus, more power plants developed and began serving more distant areas. *New York v. F.E.R.C.,* 535 U.S. at 7.

Today, most electricity in the continental United States is delivered over two major grids, the "Eastern Interconnect" and the "Western Interconnect," which are weakly connected to each other.[11] As a result, outside of Texas, "any electricity that enters the grid immediately becomes a part of a vast pool of energy that is constantly moving in interstate commerce." *New York v. F.E.R.C.*, 535 U.S. at 7, 9. A wholesale electricity customer in one state can now purchase electricity from a power producer in a neighboring state without difficulty.

The Court has long recognized the benefits of interconnection:

> The demand upon an electric utility for electric power fluctuates significantly from hour to hour, day to day, and season to season. . . . [T]he utility's generating capacity must be

[11] Most of Texas is covered by a separate grid operated by the Electricity Reliability Council of Texas. This grid maintains limited interconnections with other states in order to avoid Federal Power Act jurisdiction.

> geared to the utility's peak load of demand, and also take into account the fact that generating equipment must occasionally be out of service for overhaul, or because of breakdowns. . . . The major importance of interconnection is that it reduces the need for the "isolated" utility to build and maintain "reserve" generating capacity.

Gainesville Utilities v. Florida Power Corp., 402 U.S. 515, 517 (1971).

The present interstate grids are the result of nearly a century of deepening interconnection. They are massive spider webs of high-voltage transmission lines allowing energy to flow across thousands of miles. Consequently, the electricity that consumers enjoy in their homes and businesses is increasingly generated at distant power plants, sometimes many states away. The regional nature of the transmission system and the fact that power plants do not tend to be sited near urban areas where most consumers live means that dependable electricity for consumers in one place is bound up with decisions about when to run a power plant hundreds of miles away. A large coal-fired power plant in Indiana, for example, can produce electric energy to balance New York City's energy consumption.

In short, the nature of electricity generation, transmission, and distribution changed dramatically over the first century of the sector's development. While consumers once received power from a relatively close source, electricity transmission is no longer characterized by isolated fiefdoms limited in extent to the territory of one state.

C. Recent Legislative and Regulatory Changes Paved the Way for the Modern Regional Wholesale Electricity Markets.

Congress and FERC have responded to these profound structural changes with a regulatory regime intended to facilitate competitive, efficient, and reliable regional electricity markets. Since passage of the Federal Power Act, the federal government has become increasingly involved in shaping wholesale electricity markets. As technological advances led to diversified electric generating sources and long distance transmission across state lines, federal laws and regulations evolved to keep pace, laying the foundation for our contemporary regional electricity dispatch system.

Spurred originally by the energy crises of the 1970's, Congress initiated a series of steps that have led to the dynamic, regional wholesale markets for electric energy that exist today. First, Congress enacted the Public Utility Regulatory Policies Act of 1978 ("PURPA"). 16 U.S.C. § 2601 *et seq.* By requiring utilities to purchase electricity from nontraditional suppliers (qualifying cogeneration and small power production facilities), PURPA created, for the first time, an obligation on the part of vertically integrated utilities to purchase energy at wholesale from non-affiliated entities.[12]

Congress continued to influence energy markets with enactment of the Energy Policy Act of 1992 ("EPAct 1992"), which compelled utilities to provide transmission services to unaffiliated wholesale generators on a case-by-case basis. 16 U.S.C. §§ 824j-824k.[13] Concluding that individual proceedings to enforce EPAact 1992 were too costly and time-consuming, FERC in 1996 promulgated Orders 888 and 889, which require public utilities that own high voltage transmission systems to offer non-discriminatory open access transmission service. *New York v. F.E.R.C.*, 535 U.S. at 10-11.

The structure of the power industry evolved significantly in response to these regulatory changes. Integrated utilities divested their generating assets, and new market participants emerged, including independent and affiliated power marketers, which do not own or operate any electric facilities but buy and sell electricity on the open market, and independent power producers (or "merchant generators"), which sell electricity to utilities but are not themselves regulated as a public utility. Regional

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[12] PURPA did so by directing FERC to promulgate rules requiring these utility purchases.

[13] EPAct 1992 similarly operated by directing FERC to order utilities to provide these transmission services.

Transmission Organizations, Order No. 2000, 89 FERC 61,285 at *7 (Dec. 20, 1999).

To manage the many new entrants and increasingly complex market structure, FERC attempted to organize owners of transmission lines into Independent System Operators ("ISOs") and Regional Transmission Organizations ("RTOs") as a way to promote grid reliability and to guard against the improper exercise of market power in the provision of transmission services. These independent, non-profit entities are charged with operating a high voltage transmission network owned by utilities in a way that allows open and equal access; they also administer electricity markets that match supply and demand in real time to maintain reliability across the network.[14]

These novel transmission governance structures have given rise, in turn, to the large regional electricity markets that exist today. The Pennsylvania-New Jersey-Maryland Interconnection ("PJM") is an RTO that coordinates the movement of wholesale electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia. The Midcontinent Independent System Operator ("MISO")

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[14] *See generally,* Energy Information Administration, *The Changing Structure of the Electric Power Industry: An Update* (1997), *available at* http://books.google.com/books?id=C5W8uxwMqdUC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false.

is an ISO/RTO that provides open access transmission and real-time load balancing services throughout the Midwest, including all or most of North Dakota, South Dakota, Nebraska, Minnesota, Iowa, Wisconsin, Illinois, Indiana, Michigan, and parts of Montana, Missouri, Kentucky, and Ohio. ISO New England is an RTO serving Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. In addition, New York, California and Texas all have ISOs covering multiple utility service territories. Even in areas where ISOs or RTOs have not been established, supply and demand on the high voltage transmission network are balanced via less centrally coordinated organizational structures called power pools.

The crucial operational difference between ISOs or RTOs and power pools is in how power plants are dispatched to meet demand. In ISOs or RTOs, the grid operator manages a series of energy auctions, selecting bids from generators to sell electric energy necessary to meet forecast demand on the system. All accepted bids are paid the price offered by the highest accepted bid. This approach is known as bid-based dispatch. By contrast, in power pools, the grid operator dispatches power plants based upon the estimated operating costs of the power plants on the system. The power plants with lowest operating costs are dispatched first while those with higher operating costs are dispatched only when demand peaks. This approach is known as cost-based dispatch. In either case, underlying power plant economics determine which generators are directed to turn on and which sit idle on any given day.

This regionalization of electricity market structures continues. Recently FERC issued Order No. 1000, which requires regional transmission planning and cost allocation on the part of all utilities, whether or not they are a participant in an organized wholesale market. And several states now require that their utilities be part of an ISO or RTO. At the same time, PJM and MISO, the two largest multi-state RTOs, are in renewed discussions and planning efforts to form a joint and common energy market that would cover all or part of 23 states and the District of Columbia.[15] Similar efforts at greater regional coordination are also ongoing in the Western Interconnect where the California ISO and PacificCorp, a neighboring utility, are forming an "Energy Imbalance Market" aimed at trading excess supply and demand across system interties. Order Accepting Implementation Agreement, 143 FERC 61,298, at *1 (June 28, 2013).

In short, just as the electricity grid has become physically interconnected over the past century, so too has the regulatory structure that controls its operations. This process has transformed the electric

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[15] *See* 2012 PJM-MISO Joint and Common Market Initiative, *available at* http://www.pjm.com/committees-and-groups/stakeholder-meetings/stakeholder-groups/pjm-miso-joint-common.aspx.

system from one that is driven by local imperatives to one that can respond quickly to changes in either supply or demand conditions across regions. Because the Transport Rule will create just such an economic change in supply, it is essential that it take account of the modern regulatory setting.

II. Today's Regional Electricity Markets Are Inconsistent with the Constraints Posed by the Court of Appeals Decision.

A. Modern Wholesale Electricity Markets Are Regional In Nature.

Modern wholesale electricity markets reflect the unique nature of electricity, the current physical structure of the U.S. electric system, and the legislative and regulatory history described above. Demand "varies widely from hour to hour," but electricity supply and demand must remain balanced for the grid to operate.[16] In many areas of the country, including many areas affected by the Transport Rule, organized wholesale electricity markets determine, through generator bids, which power plants will generate energy (or "dispatch") to facilitate this supply and demand balance. In less tightly organized power

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[16] S. Hunt, *Making Competition Work in Electricity* 32 (John Wiley & Sons, Inc., New York) (2002).

pools, plants are dispatched on an estimated marginal cost basis.[17]

Regardless of whether high voltage transmission is governed by an organized ISO/RTO or through a less centrally coordinated power pool, system operators uniformly rely on economics to determine which power plants to dispatch or turn on.[18] In general, cheaper plants – those with lower marginal operating costs – come on line first. In electricity market terminology, this means that "base load" plants, with high capital costs but the lowest marginal operating costs, are called first, along with renewable energy producers that have no fuel costs; "intermediate load" plants with lower capital costs but higher marginal operating costs are called next; and finally "peaking" capacity plants, with the lowest capital costs but highest marginal operating costs, are called last, when demand peaks.[19]

A simplified example of modern dispatch procedures illustrates how this coordination of dispatch via economics works. On any given day, the PJM system operator could call on a power plant in Ohio, then New Jersey, then Maryland to supply the energy

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[17] *See, e.g.*, United States Department of Energy: Solar Energy Technologies Program, *The Role of Electricity Markets and Market Design in Integrating Solar Generation* 1, Solar Integration Series, May 2011, *available at* http://www1.eere.energy.gov/solar/pdfs/50058.pdf.

[18] Joskow, *Creating a Smarter U.S. Electricity Grid* at 33.

[19] *See, e.g.*, *id*.

needed to meet demand for electricity in the District of Columbia. The operator would make these dispatch decisions based on the generator bids offered in an auction and any binding transmission constraints, also called congestion prices, that exist within the high voltage transmission network. Transmission constraints are generated when a transmission link between two areas of an electricity network is insufficient to allow the lowest cost supply of energy in one to serve demand in the other. Organized wholesale electricity markets produce shadow prices called congestion prices that reflect these physical transmission constraints. Ultimately, dispatch decisions are made based upon the marginal bid for power needed to meet demand plus any congestion price that applies.

At night, the Ohio plant might be called to serve the District of Columbia demand because congestion on the system is low and it is the most economical resource. On a hot summer afternoon, with many air conditioners running at full power, congestion on the network might limit the ability of energy to flow such distances. In response, PJM might instead dispatch nearby resources in Maryland that have higher marginal bids but lower congestion prices to serve demand in the District of Columbia.

In sum, operational decisions in PJM, like other organized wholesale markets and to a lesser degree the power pools, occur through a regional process that is driven by the underlying physics and economics of generation and transmission, combined with the modern scale of electricity market structures. As a consequence, these decisions often do not respect state jurisdictions. Were EPA to craft a Transport Rule that treated state electric systems as isolated and ignored the realities of modern multi-state wholesale electricity markets, these markets would quickly respond to and quite possibly undo many of the Transport Rule's intended outcomes.

B. The Lower Court's Interpretation of the Good Neighbor Provision Is Incompatible with the Physical, Regulatory, and Economic Operation of the U.S. Electric System.

Because the electricity sector is now highly regionalized in both physical structure and operational management, regulatory interventions with significant economic effects cannot be isolated to a single state, just as ripples in a pond spread to its furthest edge. In drawing several "red lines" which EPA cannot cross in implementing the Good Neighbor provision of the Clean Air Act, the court of appeals failed to appreciate these basic facts about the modern U.S. electric system. As a result, the court placed an unnecessary burden upon both EPA and the firms and households that must ultimately bear the economic costs of its regulation.

In concluding that EPA cannot compel an upwind state to eliminate more than its current contribution to a downwind state's nonattainment problem, the court of appeals made a seriously flawed threshold assumption that an upwind state's contribution is fixed. This assumption is simply wrong as a matter of fact. Today's highly interconnected and dynamic regional wholesale electricity markets – markets that adjust "hour by hour" – will alter dispatch as marginal costs change in response to regulatory requirements. This is true irrespective of whether the markets in question utilize a bid-based or cost-based dispatch system. The court's holding would force EPA to ignore these realities and behave as if the dramatic developments in the U.S. electric system over the last half century had not occurred.

In contrast, the Transport Rule that EPA adopted recognizes the realities of the current highly dynamic regional electricity market. It allocates responsibility for emission reductions at the regional level, based upon the availability of cost-effective pollution reduction opportunities at power plants. EPA's approach makes very good sense once one considers how the U.S. electric system operates and how it will respond to the imposition of additional pollution controls at power plants.

Moreover, a regional, market-based allocation of responsibility has the additional benefit of minimizing the costs of resolving the regional air pollution problem. By attempting to allocate the emissions reduction burden to the least-cost providers of reductions, the Transport Rule minimizes costs even if one or more states elects not to join the proposed EPA trading program.

At bottom, a requirement that a state reduce pollutant emissions from electricity production will increase marginal operating costs at power plants within its borders because they will install new pollution controls or burn more expensive, lower sulfur coal, or operate for fewer hours during the year. Changes in marginal operating costs will, in turn, affect regional dispatch decisions, whether that dispatch is bid-based or cost-based.

To take a simple example, suppose a power plant in State A is cheaper to operate than a plant in State B under the present regulatory regime, meaning that power will be dispatched from the plant in State A before the plant in State B, all else being equal. If new pollution controls alter the relative economics such that the plant in State A now becomes more expensive to operate than the plant in State B, the regional grid operator will now call power from the plant in State B, without regard to state boundaries, assuming for purposes of this simple example that there are no constraints that generate congestion prices. In this way, the state in which air pollution is generated, and the relative contribution to downwind nonattainment problems, is shifted due to regional operation of the wholesale electricity market. The lower court forbids EPA to account for these shifts because it mandates a focus on ex-ante upwind state-by-state contributions to downwind state nonattainment.

A state-centric pollution control regime, such as the one directed by the court of appeals, will have serious difficulty adjusting to the dynamics of today's regional markets. This is particularly the case given the specific instructions of the court of appeals that EPA must rely on its static estimates of upwind state contribution to downwind state nonattainment. EPA might get lucky in allocating pollution burdens in a way that did not lead simply to a shift in the location of the pollution burden, or it might opt to overcontrol in all upwind states in order to guarantee elimination of the regional air pollution problem in downwind states, irrespective of any shift in the location of generation and consequent air pollutant emissions. But either solution will be far inferior – from an economic efficiency and pollution control perspective – to the sophisticated regional power plant emissions approach that EPA has crafted.

There are no doubt multiple means for allocating responsibility for the regional air pollution problem created by power plant emissions. But doing so in a way that rigidly adheres to state boundaries and ignores power plant economics makes little sense. As EPA understood,[20] regional markets for wholesale electric energy will adjust to any new costs imposed

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[20] EPA investigated this issue by using the Integrated Planning Model ("IPM") to assess its rulemaking. IPM is a complex model of the U.S. electricity system that simulates power plants, transmission constraints, and the regional structure of U.S. electricity markets. *See* EPA, *Documentation for EPA Base Case v.4.10 Using the Integrated Planning Model,* at 2-9 (Aug. 2010), *available at* http://www.regulations.gov/#!documentDetail;D=EPA-HQOAR-2009-0491-0309.

on power plants in ways that are not constrained by state lines.

The court of appeals spelled out in some detail how it believed that EPA should allocate responsibility for interstate pollution problems using hypotheticals. *EME Homer City,* 696 F.3d 21. These hypotheticals usefully illustrate the court's misunderstanding of power system structure and power market operations. Consider the example the court proprovides of a downwind state that receives significant contributions to its nonattainment from three upwind states. In the court's hypothetical, each upwind state contributes 20 units of pollution to downwind state air, which itself exceeds attainment by 50 units. *Id.* The court believes that the proper procedure for EPA to take in this instance is simply to tell each upwind state to reduce its emissions by 16 2/3 units of pollution, thus resolving the downwind air pollution problem. *Id.*

This "solution" assumes both that the states' grids are not interconnected with each other and that electricity markets are not regional. It ignores the fact that regional electricity markets are likely to redistribute the 50 units of air pollution over the interstate high voltage transmission network in ways that may partially or totally undermine the effectiveness of the strategy.

For example, imposing costs in this simplistic fashion may cause pollution reductions in two of the upwind states, but actively increase pollution in the third as a result of changes in relative bids into the wholesale market by generators. It may also cause emissions to *increase* in the downwind state for similar reasons. It may even cause emissions to shift from the downwind state to one or more of the upwind states. In short, predicting the outcome of a particular regulatory intervention requires EPA to think in terms of the physical and economic structure of the present electric power system, not in the simplistic and anachronistic fashion that animated the court of appeal's hypothetical. Because the court fails to consider that electricity markets will respond dynamically to imposition of new pollution controls, it believes it can substitute its relatively simple solution for the sophisticated modeling supplied by EPA.

In the real world, a power plant's total emissions depend on both the plant's emissions rate and the number of hours the plant operates. The state imposes pollution controls that impact the plant's emissions rate and marginal operating cost, but the state does not directly determine how frequently the plant is dispatched. That operational decision is a wholesale market-driven effect, not one orchestrated by each state. And the wholesale markets in question are almost entirely regional, not state-delimited or state-controlled. Even if a state were to mandate reductions in total emissions at one of its power plants, the effect would be to shift energy production for the regional system to another power plant, either within that state or in a neighboring state. The effect is similar to squeezing a balloon in one's hand. The majority opinion below ignores this reality, much to the detriment of the impacted populations and regional electricity prices.

Further, given that EPA cannot compel state participation in its regional cap-and-trade market, allocation of pollution burdens based upon each upwind state's contribution to downwind state nonattainment is likely to lead to highly inefficient and hence unnecessarily costly outcomes. States that face low marginal abatement costs relative to their neighbors may well opt not to participate in the trading program. This would leave states that face high marginal abatement costs with little flexibility and far higher overall costs. At the national level, this outcome would generate far higher societal costs but identical pollution levels. Thus, utilizing the rigid, state-by-state allocation mandated by the court of appeals creates state-level incentives that are likely to reduce the cost effectiveness of EPA's approach.

By contrast, under EPA's cost-based allocation approach, whether or not states opt to participate in emissions trading, actions taken by power plants within individual states are far more likely to approximate the cost minimizing solution. While *Amici* recognize that cost-effectiveness alone cannot dictate interpretation of the Good Neighbor provision, we urge the Court to consider the difference in economic outcomes between the lower court's and EPA's views of the law. In our opinion, the difference is likely to be substantial.

Without endorsing any particular methodology for selecting states or for allocating pollution reduction burdens across them, *Amici* urge the Court to defer to EPA's expertise in implementing the Good Neighbor provision consistent with the realities of the modern multi-state electric power system. Allowing the agency sufficient flexibility to design a program with a regional focus is the optimal way to ensure that all states act as good neighbors in their implementation of air pollution controls. It is also the most effective way EPA has to minimize the costs of such a program. The decision below, by requiring a static, rigid, state-by-state approach to regional air pollution problems, is very likely to frustrate the statutory objective of the program and virtually certain to result in needless costs to electricity consumers. In contrast, by tailoring regulation to the facts on the ground, EPA's regional approach provides the greatest assurance that interstate causes of nonattainment of air quality standards will be cost effectively eliminated.

CONCLUSION

For the foregoing reasons, *Amici* urge the Court to reverse the misinformed decision below.

Respectfully submitted,

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