Nos. 17-2433, 17-2445 (cons.)

IN THE UNITED STATES COURT OF APPEALS
FOR THE SEVENTH CIRCUIT

VILLAGE OF OLD MILL CREEK, *et al.*,
Plaintiffs-Appellants,

v.

ANTHONY STAR, in his official capacity as Director of the Illinois Power Agency,
Defendant-Appellee,

and

EXELON GENERATION COMPANY, LLC,
Intervening Defendant-Appellee.

ELECTRIC POWER SUPPLY ASSOCIATION, *et al.*,
Plaintiffs-Appellants,

v.

ANTHONY STAR, in his official capacity as Director of the Illinois Power Agency, *et al.*,
Defendants-Appellees,

and

EXELON GENERATION COMPANY, LLC,
Intervening Defendant-Appellee.

On Appeals from the United States District Court for the Northern District of Illinois, Nos. 1:17-cv-01163 & 1:17-cv-01164, Hon. Manish S. Shah, District Judge

BRIEF OF ENERGY ECONOMISTS AS *AMICI CURIAE* IN SUPPORT OF PLAINTIFFS-APPELLANTS

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Appellate Court No: 17-2433, 17-2445

Short Caption: Village of Old Mill Creek, et al. v. Anthony Star, et al.

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TABLE OF CONTENTS

Page

CIRCUIT RULE 26.1 DISCLOSURE STATEMENTS i

TABLE OF AUTHORITIES iii

STATEMENT OF *AMICI CURIAE* 1

BACKGROUND 2

SUMMARY OF THE ARGUMENT 6

ARGUMENT 8

I. For Nuclear Power Plants Operating in MISO or PJM, the Production of Energy Is the Same as the Sale of Energy 8

II. The ZEC Program Will Distort Prices in the Wholesale Energy and Capacity Markets 10

III. The Price Distortions Will Influence Decisions to Exit and Enter the Market for Wholesale Power Generation 11

IV. The ZEC Program Cannot Reasonably Be Counted on to Improve Economic Efficiency by Internalizing the Carbon Externality 13

CONCLUSION 17

CERTIFICATE OF COMPLIANCE

CERTIFICATE OF SERVICE

APPENDIX – List of *Amici Curiae*

TABLE OF AUTHORITIES

CASES Page(s)

FERC v. Electric Power Supply Ass'n,
136 S. Ct. 760 (2016) 3, 16

Hughes v. Talen Energy Mktg., LLC,
136 S. Ct. 1288 (2016) 2, 11, 12

Village of Old Mill Creek v. Star,
No. 17CV1163, 2017 WL 3008289 (N.D Ill. July 14, 2017) ..... *passim*

RULES

Fed. R. App. P. 29(a)(2) 1

ADMINISTRATIVE MATERIALS

FERC Order No. 2000,
89 FERC ¶ 61,285 (1999) 2

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Free Exchange, *Making the second best of it – What it means to do our second best*,
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24 Review of Economic Studies 11 (1956) 14

STATEMENT OF *AMICI CURIAE*

Amici curiae are leading economists and experts in the field of the markets for electric power. *Amici* also serve as professors and teachers of economics; write on economic issues; advise clients on the economic impact of legislation, regulations, and other policies; or previously were employed by an independent system operator ("ISO"). A summary of the qualifications and affiliations of *amici* is provided as an appendix to this brief. *Amici* file this brief as individuals and not on behalf of the institutions with which they are affiliated. None of *amici* are being compensated in connection with this brief.[1] All parties in these consolidated appeals have consented to the filing of this brief. *See* Fed. R. App. P. 29(a)(2).

Although *amici* do not always agree on economic issues presented by energy-market regulations, *amici* share the concern that the Illinois's Zero Emissions Credit ("ZEC") program at issue in this case will have a deleterious effect on the federally regulated wholesale energy and capacity markets. *Amici* have dedicated substantial professional effort to helping to promote the efficient operation of wholesale electric markets, sharing a belief that efficient, competitive markets promote the efficient supply of electric power for the benefit of the public. This brief is intended to explain a number of relevant issues in this case: (1) how the district court misunderstood the functioning of ISO and regional transmission organization ("RTO") markets by finding that the ZEC program is tied to energy production and

[1] Counsel for *amici* drafted this brief in its entirety, and none of the parties or their counsel contributed money to fund the preparation or submission of this brief. Cogentrix Energy Power Management, LLC, and Tenaska, Inc., contributed money to fund the brief.

not energy sales; (2) how this particular subsidy will distort the Federal Energy Regulatory Commission ("FERC")-approved capacity and energy auctions and influence entry and exit decisions of other generators; and (3) why this subsidy may not fulfill the stated purpose of reducing greenhouse gas emissions.

BACKGROUND

1. In a series of orders, FERC restructured wholesale delivery of electric power throughout the nation to promote competition. *See*, *e.g.*, FERC Order No. 2000, 89 FERC ¶ 61,285, at *3 (1999) ("Competition in wholesale electricity markets is the best way to protect the public interest and ensure that electricity consumers pay the lowest price possible for reliable service."). As part of that move to competitive markets, FERC authorized ISOs and RTOs to manage the wholesale transmission of power from generators to buyers, generally referred to as "load-serving entities" ("LSEs"). Illinois is served by two such FERC-authorized entities: the Midcontinent Independent System Operator ("MISO"), an RTO stretching from Manitoba to Louisiana, and PJM Interconnection, an RTO primarily covering the mid-Atlantic region and parts of Illinois and Indiana. Both MISO and PJM operate pursuant to FERC-approved tariffs.

Under the MISO and PJM tariffs, rates paid by LSEs for capacity – their share of the costs of resources reserved or dedicated to the market necessary to meet anticipated maximum demand inclusive of reserve margins – and energy – the electric energy itself – are determined through auction-based markets. *See Hughes v. Talen Energy Mktg., LLC*, 136 S. Ct. 1288, 1291-92 (2016) ("FERC's regulatory scheme includes an auction-based market mechanism to ensure wholesale rates

that are just and reasonable."). Energy auctions, for example, occur both the day before the operating day, to establish a preliminary schedule for power plant dispatch and operation to meet anticipated demand, and during the operating day, to match generation to actual demand. In general, all generators are obligated to submit offers to supply – the prices at which they are willing to offer capacity or to produce power – and all load-serving entities to submit bids to consume – price-based or non-price-based bids for the amount of power they require – for each auction interval, typically hourly. MISO and PJM then run central auctions that "stack" the generators' bids in order from lowest to highest price; select the amount of energy, in order of increasing bid prices, required to meet demand in each market interval; and set a price at each point of injection (supply) or withdrawal (demand) based on the highest price needed to just meet demand – that is, to "clear the market." This "market-clearing" price – the highest accepted bid – is "the price an efficient market would produce" and is paid to all generators. *FERC v. Electric Power Supply Ass'n*, 136 S. Ct. 760, 769 (2016). The auctions also allow for locational price deviations reflecting transmission limits.

Generators can bid $0 per megawatt-hour ("MWh") or even make negative offers (expressing a willingness to pay to have their power accepted), reflecting a desire to take whatever price the auction sets or to be among the last generators asked to reduce power production – to be "backed down." Generators may also "self-schedule" their power – that is, inject power into the grid and agreeing to accept whatever price (positive or negative) the market "clears" through the auction. Such

bidding behavior is typical of generators that are highly inflexible in terms of output, such as legacy nuclear plants; that have high opportunity costs for rapidly changing output; or that receive a production-tied subsidy to offset any market price risk that would be forgone if they did not produce energy. In addition to prices, the auction mechanism establishes schedules that indicate the amount of production expected from each generator and the amount of consumption expected by each load-serving entity.

2. In 2016, the Governor of Illinois signed the Future Energy Jobs Act, which created the ZEC program. *See Village of Old Mill Creek v. Star*, No. 17CV1163, 2017 WL 3008289, at *3 (N.D Ill. July 14, 2017). The stated goal of the ZEC program is "to advance public health and protect the environment by reducing the emissions of air pollutants created by energy generators." *Id.* at *16. In actuality, the ZEC program does not apply to all generators and has a more targeted goal: to keep open two specific nuclear power plants whose owners represented the plants would cease operation without government intervention. The program is designed to ensure that only those two nuclear generators are eligible to receive ZECs. *See id.* at *3 & n.6.

These nuclear generators receive ZECs for each MWh they generate. *See id.* at *3. LSEs such as local electric utilities must pay for all of the ZECs those nuclear generators receive, regardless of existing power purchase contracts or other supply preferences. *See id.* at *3-4. The claimed program-value of the ZEC is "the Social Cost of Carbon" as it would apply per MWh of electricity produced by an

efficient, new, natural gas-fired power plant – currently set in the ZEC program at $16.50 per MWh. *See id.* at *4 n.11. As long as the Market Price Index rate for energy and capacity prices in PJM and MISO – an index made up of wholesale energy and capacity prices in PJM and MISO as determined through their auctions, *see id.* at *4 n.12 – is at or below the Baseline Market Price Index of $31.40, the ZEC program ensures that the nuclear generators receive an additional payment of $16.50 per MWh of actual production on top of what they earn in capacity and energy market revenues. *See id.* at *4 & n.13. If the Market Price Index rate rises above the Baseline Market Price Index of $31.40 per MWh, the amount of the credit is reduced penny-for-penny until it reaches $0. *See id.* at *4. Thus, where the Market Price Index rate is more than $31.40, the ZEC program guarantees a minimum price (currently $47.90) per MWh generated, *see id.* at *5 n.17, and should lower market prices reduce the Market Price Index rate below $31.40, the program guarantees $16.50 of revenue for every MWh generated. Other than to set the initial payment rate of $47.90, the actual ZEC payment received is independent of the social cost of carbon and instead is a function of changes in wholesale power prices relative to the Baseline Market Price Index. Should the Market Price Index rate rise above $47.90, the ZEC would be $0/MWh, and there would be no recognition of or compensation for any environmental value of production from the two units in question, illogically suggesting that as energy and capacity prices rise, the incremental value of carbon reduction falls.

SUMMARY OF THE ARGUMENT

Economic analysis can help to explain the effects of the ZEC program on FERC-regulated capacity and energy auctions in MISO and PJM, as well as the broader impacts of the ZEC program on existing and potential new generators and on the stated goals of advancing public health and protecting the environment.

First, the ZEC program has impacts on the FERC-regulated MISO and PJM auction-based markets that the district court failed to consider based on the incorrect assumption that receipt of ZEC program credits does not require participation in the energy market. *See*, *e.g.*, *Village of Old Mill Creek*, 2017 WL 3008289, at *13. That assumption fails to take into consideration that, in the real world – as a matter of both physics and tariff requirements – nuclear generators such as the ZEC recipients *must* inject the power they generate into the electric grid. This injection constitutes a sale into the relevant ISO's or RTO's energy market. In this context, there is no difference between the production and injection of energy by a generator interconnected with an ISO or RTO grid and the sale of that energy into that ISO's or RTO's FERC-regulated market.

Second, the ZEC program will distort prices in the MISO and PJM energy and capacity auctions in two ways. Without the ZEC program, according to their owner, the eligible nuclear plants would receive insufficient revenue to cover their operating costs, and thus would choose to retire. The ZEC program's subsidy prevents this retirement. For this reason, the program results in a greater supply of energy in the market and, through the dynamics of supply and demand, reduces market-clearing prices of energy in the wholesale market below the prices that the

market would otherwise produce had these units retired. Moreover, the ZEC program similarly results in a greater supply of capacity eligible to bid into the capacity market, again shifting the supply curve outward from where it would have been absent the subsidy. This shift produces lower prices in the capacity market than it would produce were these units retired. These effects are unambiguous and directly impact market prices (in a downward direction) for both energy and capacity.

Third, the lower prices in the energy and capacity markets will dampen or prevent the entry of new resources directly, and the potential for continued subsidies for additional favored existing resources may further undermine developers' and investors' trust in competitive wholesale markets' ability to reward efficient new investment. Current and expected market prices serve as the primary signal to potential entrants and affect their willingness to enter the market. Government action that artificially suppresses market prices will discourage entry of new generation into the market, including the new renewable and flexible resources best suited to achieving the goals of timely decarbonization.

Fourth, the ZEC program is a half measure that may reduce carbon emissions less than simply doing nothing – an insight supported by the well accepted "theory of the second best," which in layman's terms means that a partial solution to a complex problem, rather than solving the problem, may actually make it worse. The ZEC program is not a first-best economic solution (no one would say that it is); as a result, it cannot be counted on to yield the least-cost path to reducing

carbon emissions, particularly where the incentives only apply to two generators out of the entirety of PJM and MISO. For example, the ZEC program could force the retirement of more efficient low-emissions generators and block the entry of more efficient zero-emissions generators. Moreover, the least-cost path to a low-carbon future is virtually certain to include increased variable wind and solar power generation, which require an increasing amount of highly flexible generation and load management resources. Nuclear generation, however, is extremely inflexible. By artificially prolonging the life of these two nuclear facilities, the ZEC program creates a barrier to entry for the flexible resources likely to be essential to achieve significant reductions in greenhouse gas emissions. Thus, the economic reality is that the ZEC program may create very real barriers to the rapid, efficient, market-driven deployment of lower cost, clean energy systems. And, by sustaining less flexible offers from the impacted units, the ZEC program could even increase emissions by increasing short-term operation of higher carbon producing units needed to balance operational variation in the overall market demand.

ARGUMENT

I. For Nuclear Power Plants Operating in MISO or PJM, the Production of Energy Is the Same as the Sale of Energy

The district court believed that "the ZEC program does not *mandate* auction clearing in PJM or MISO, and the state . . . is not imposing a condition directly on wholesale transactions." *Village of Old Mill Creek*, 2017 WL 3008289, at *13; *see also id.* at *14 n.32 ("The program, however, does not require auction clearing."). Indeed, the court speculated that one of the nuclear generators could "seek ICC

approval to sell its energy at retail" to avoid participating in the MISO auction for energy. *Id.* at *13 n.30. This understanding was incorrect. The nuclear power plants that are eligible for the ZEC subsidy cannot produce power if they do not inject and, thereby, sell it into an ISO or RTO administered power system. In order to inject electricity into that system, any generator that is a market participant in the ISO and RTO markets must offer the unit into the day-ahead or real-time market, and all such injections constitute a sale and are compensated through the ISO's or RTO's settlement process at the relevant market's clearing price. This means that a subsidy on the generation of power by these facilities is necessarily also a subsidy on the sale of power in a FERC-regulated wholesale market. There are no two ways about it. The power these plants inject into MISO and PJM is sold, like all power injected into MISO's and PJM's bulk power transmission grids, and, consequently, paid for by load interests through the market settlement processes. *See id.* at *3 (generators "have no alternative to selling their output in MISO and PJM auctions").

Nuclear generators, because they have little ability to vary their output in response to demand, frequently elect to "self-schedule" their plants. This means they submit quantity bids – bids to commit the planned megawatt output of their plants to operate during the specific market period – without specifying prices for those bids. Such bidders are willing to accept whatever price at which the market clears and commit to injecting that amount of power in return for being paid that price. After the market clears, MISO's and PJM's market settlement processes pay

the self-scheduled generator that price for the injected MWh and charge the LSEs for the equivalent withdrawal, effectuating the sale. Thus, the fact that nuclear generators self-schedule their energy into MISO and PJM does not mean they do not sell the energy in the wholesale market – on the contrary, it means they necessarily sell the power in the wholesale market. Otherwise, they would not be allowed to generate at all.

Because of this, any subsidy tied to production of energy is necessarily linked to the resource clearing in the energy market and, equivalently, to the resource selling into that market.

II. The ZEC Program Will Distort Prices in the Wholesale Energy and Capacity Markets

By paying a subsidy for each MWh generated and sold by the ZEC-eligible nuclear generators, the ZEC program influences pricing in the energy and capacity markets operated by PJM and MISO in two ways.[2]

First, the two ZEC-eligible nuclear plants were represented as planning on shutting down and exiting the MISO and PJM capacity and energy markets. *See Village of Old Mill Creek*, 2017 WL 3008289, at *3 ("Exelon Corporation announced that it would shut down two of its nuclear generator facilities, Clinton and Quad Cities."). The existence of the ZEC program will now keep these ZEC-eligible

[2] *See Village of Old Mill Creek*, 2017 WL 3008289, at *4 (the ZEC program "will affect the FERC-approved energy market auction structure not only because the nuclear plants will not retire as scheduled, but also because they will continue to bid into the wholesale market auctions at artificially lower prices"); *id.* at *14 n.32 ("There is no dispute that ZECs will affect the market and that Illinois has created a subsidy that favors certain participants in the wholesale auctions.").

nuclear plants in the energy market, even though they would shut down if they were subject to market forces without the subsidy. *See id.* ("When the governor signed the [ZEC program] into law, Exelon confirmed that Clinton and Quad Cities would operate for another ten years due to the new legislation."). This artificially increases supply in the energy market, relative to the level that would result in the absence of the subsidy. Through this greater supply and the dynamics of supply and demand, the ZEC program therefore suppresses the market-clearing price for energy in the wholesale market. The FERC-sanctioned auction-based markets are designed to produce just and reasonable rates. *See Hughes*, 136 S. Ct. at 1291-92. This result, however, can only happen if excess or uneconomic generation exits the market in response to prices that are too low to justify their continued operation.

Second, the continued operations of these ZEC-eligible nuclear generators also results in an excess supply of capacity eligible to bid into the MISO and PJM capacity markets. The greater supply relative to demand for capacity has the potential to artificially depress prices in the capacity market relative to the operation of the market in the absence of the ZEC program.

III. The Price Distortions Will Influence Decisions to Exit and Enter the Market for Wholesale Power Generation

Distorting equilibrium pricing has consequences: the ZEC program will interfere with efficient market entry and exit decisions. The clearing price has functions outside of simply setting the amount paid and received by buyers and sellers. The auction system "identif[ies] need for new generation." *Hughes*, 136 S. Ct. at 1293. "A high clearing price in the capacity auction encourages new

generators to enter the market, increasing supply and thereby lowering the clearing price in same-day and next-day auctions[;] . . . a low clearing price discourages new entry and encourages retirement of existing high-cost generators." *Id.* If a generator's marginal cost is above the expected market-clearing price, the owner should take that as a signal to exit the market; if a prospective generator believes its marginal cost will be below the expected market-clearing price, the investor-developer should take that as a signal to enter the market.

Prior to the creation of the ZEC program, market signals in both MISO and PJM indicated that the ZEC-eligible nuclear power plants were not economical and should retire. *See Village of Old Mill Creek*, 2017 WL 3008289, at *3. The plan to close those plants was not the result of a market failure. On the contrary, it reflected the reality of competition among generators to meet energy demand and reliability needs in the wholesale power market. The reduction in supply that would have resulted from plant retirement would have tended to raise near-term energy prices, encouraging new generators to enter the generation market if they could be profitable at the new energy prices.

Instead, the ZEC program is keeping the nuclear plants in the generation market, maintaining excess capacity. The lower market equilibrium price created by the ZEC subsidy acts as a barrier to entry for new resources, including (perversely) more efficient, renewable resources and the flexible generation needed to support them. The artificially lower market-clearing price discourages investment in new generators that would be more efficient than the nuclear plants

at the competitive market price. With the ZEC program, more efficient new generators are instead signaled to stay out of the market because they cannot recoup their operating costs. Similarly, existing, more efficient generators that would be profitable at the competitive market price, may not be profitable at the artificially lower market price created by the ZEC program and be forced from the market. *See also id.* at *4 ("[L]ow revenues could cause generators that are more efficient than the ZEC recipients to exit the market or it could deter potential new generators from entering the market.").

IV. The ZEC Program Cannot Reasonably Be Counted on to Improve Economic Efficiency by Internalizing the Carbon Externality

The ZEC program may delay, rather than promote, achievable, beneficial, and cost-effective carbon emission reductions. A stated goal of the ZEC program is to reduce carbon emissions. *See Village of Old Mill Creek*, 2017 WL 3008289, at *3. The ZEC program is not, however, a broad effort to promote zero-emissions generation resources or reflect carbon costs in the market as a whole; it favors only the two ZEC-eligible nuclear generators and only operates when prices are low. Other generators that produce energy without carbon emissions – and that have a smaller overall carbon footprint – are excluded from the program. Moreover, the level of carbon intensity varies significantly among fossil-fuel plants with different efficiency and technology, such as between a legacy coal-fired plant and a new gas-fired combined cycle plant. The ZEC program ignores such considerations.

The theory of the second best states that achieving an efficient price (such as by fully internalizing an externality) for one good or service in a market with

multiple inefficient prices for goods and services without also setting efficient prices for those other goods and services cannot be relied on to improve the overall efficiency of the market. *See generally* R.G. Lipsey & K. Lancaster, *The General Theory of Second Best*, 24 Review of Economic Studies 11, 11-31 (1956). Correcting one inefficient pricing problem may make the overall market less efficient rather than more efficient. Further, if one necessary condition to produce an optimal or first-best allocation of resources is absent, it is not necessarily true that the rest of the necessary conditions, if they exist, will lead to a beneficial "second-best" allocation. Rather, the resulting allocation may involve multiple distortions from optimal conditions, and the true "second best" allocation might look very different from the first-best allocation.

In layman's terms, if one is baking cookies, and the best possible cookie contains both chocolate chips *and* coconut, it is not necessarily true that the second-best cookie contains either chocolate chips *or* coconut. The second-best cookie might be a gingersnap, something completely different from the first-best cookie.[3]

The theory of the second best is not a reason not to aspire to incremental progress, but it does counsel careful consideration of the collateral impact of such partial achievements. The theory is at play here. Rather than the first-best solution, such as a price on all carbon-emitting resources or even a reasonably broad approximation – such as a renewable energy credit ("REC") program, which Illinois

[3] *See* Free Exchange, *Making the second best of it – What it means to do our second best*, The Economist, Aug. 21, 2007, https://www.economist.com/blogs/freeexchange/2007/08/making_the_second_best_of_it.

already has, *see id.* at *3 n.10 – Illinois is providing a selective subsidy to two low-carbon resources out of all the suppliers of energy and capacity in PJM and MISO with a broad mix of operating technologies and carbon intensity. This cannot be counted on to improve the economic efficiency of the Illinois power sector, to result in lower costs over time for safe and reliable power, to result in the least-cost path to carbon emissions reductions, or even to lead to a net reduction in carbon emissions at all.

For example, the ZEC program could force the retirement of low-emissions generators that are more efficient than the ZEC-eligible nuclear plants and that would have survived had the ZEC-eligible plants retired. Moreover, the artificially suppressed price of power may prevent the entrance of new zero-emissions generators that the ZEC program nominally supports. Thus, the ZEC program may result in *less* overall low-emissions generation supplying Illinois consumers than if it were never created.

Moreover, by far the lowest cost, new, zero-carbon resources are variable wind and solar power generators. The least-cost path to a low-carbon future is virtually certain to include significant increases in their deployment. These renewable resources, however, are variable; they cannot guarantee to match their power injections with consumption, which system operators require for reliability. "Suppliers must generate – every day, hour, and minute – the exact amount of power necessary to meet demand from the utilities and other [LSEs] that buy power

at wholesale for resale to users." *Electric Power Supply Ass'n*, 136 S. Ct. at 768. Otherwise, massive outages could occur.

To integrate these variable renewable resources into the power grids effectively, what is needed are flexible generation resources (in addition to flexible loads) – that is, generators that can come online quickly, ramp up to meet demand that the wind and solar cannot meet, and go offline quickly when supply rises or demand falls. The ZEC program, however, acts as a barrier to entry and (what amounts to the same thing) an inducement to exit to these flexible generators. Instead, the ZEC program preserves expensive, inefficient, and inflexible generation that must operate even when there is ample wind and solar energy to meet demand – displacing those resources. Additionally, the fact that rising energy prices and the associated Market Price Index can eliminate any ZEC program credit payments linked to the social cost of carbon undermines any potential claim that the subsidy reflects some internalization of an externality and an improvement in overall social welfare, as opposed to a protectionist subsidy.

For these reasons, the ZEC program would distort the efficient market dynamics that FERC relies on to produce wholesale market prices that are just and reasonable, would act as a barrier to the entry of new, less costly and more efficient generation, including the efficient zero-carbon resources and complementary flexible resources needed to achieve reasonable carbon reduction goals, and in doing so may actually impair progress towards a zero-carbon electric grid.

CONCLUSION

The Court should reverse the district court's order dismissing the complaints.

Dated: September 6, 2017

Respectfully submitted,

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CERTIFICATE OF COMPLIANCE

I certify that this brief complies with the type-volume limitation of Circuit Rule 29, the typeface requirements of Federal Rule of Appellate Procedure 32(a)(5)(A) and Circuit Rule 32(b), and the type-style requirements of Federal Rule of Appellate Procedure 32(a)(6). This brief was prepared using a proportionally spaced typeface (Century Schoolbook, 12 point). Exclusive of the portions exempted by Federal Rule of Appellate Procedure 32(a)(7)(B)(iii), this brief contains 4,366 words. This certificate was prepared in reliance on the word-count function of the word-processing system (Microsoft Word 2013) used to prepare this brief.

September 6, 2017

s/ *Aaron M. Panner*
Aaron M. Panner

APPENDIX

List of *Amici Curiae*[*]

Mark Cooper holds a doctorate from Yale University. He is a former Yale University and Fulbright Fellow, a recipient of the Esther Peterson Award for Consumer Service, and a fellow at the Institute for Energy and the Environment at Vermont Law School and Silicon Flatirons at the University of Colorado School of Law. He has published six books and hundreds of articles and papers on energy, media, telecommunications, and high-technology industries. Most recently, he is the author of *The Political Economy of Electricity: Progressive Capitalism and the Struggle to Build a Sustainable Power Sector* (Praeger, 2017). He has provided expert testimony more than 400 times for public interest clients including attorneys general, people's counsels, and citizen interveners before state and federal agencies, courts, and legislators in dozens of jurisdictions in the United States and Canada.

Steven Corneli directed or supported NRG Energy's national wholesale market design, development, and advocacy strategy from 2003 to 2016. He has been an expert witness and participant in FERC contested case proceedings, technical conferences and settlements, and is currently researching wholesale market improvements that support the decarbonization of the U.S. power system. He has a master's degree in Energy, Technology, and Environmental Policy from the University of Minnesota's Humphrey Institute and additional graduate-level coursework in Applied Economics.

Devin Hartman is electrical policy manager and senior fellow at the R Street Institute, where he leads research on policies affecting competitive electric markets. He previously performed economic analysis of retail and wholesale electricity markets at the Indiana Utility Regulatory Commission and the Federal Energy Regulatory Commission.

Andrew N. Kleit, Ph.D., is a Professor of Energy and Environmental Economics and MICASU Faculty Fellow in the Department of Energy and Mineral Engineering at the Pennsylvania State University.

Robert J. Michaels, Ph.D., is Professor of Economics at California State University, Fullerton, and Adjunct Scholar at the Cato Institute and the Institute for Energy Research. He has published extensively in these topic areas and testified before FERC, state utility commissions, and congressional committees.

Marc D. Montalvo is President of Daymark Energy Advisors, where he advises investors, developers, utilities, and government agencies regarding competitive power market design, wholesale market regulations and policy, and capital budgeting and energy infrastructure investments. He was previously employed as

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[*] Affiliations provided for informational purposes only.

direct of market development, director of internal market monitoring, and director of enterprise risk management at ISO New England. He has testified before FERC on market design issues in ISO New England, New York ISO, PJM, and MISO.

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Roy J. Shanker, Ph.D., has been an independent consultant in energy markets since 1980 and consultant on electric industry matters since 1973. He has been actively involved in the design, development, and conduct of the PJM and New York Independent System Operator markets since 1995. He has been an invited speaker at the FERC and testified on numerous occasions as an expert witness.

CERTIFICATE OF SERVICE

I hereby certify that, on September 5, 2017, I served the foregoing Brief of Energy Economists as *Amici Curiae* in Support of Plaintiffs-Appellants on all counsel of record by email having been unable to file and serve counsel using the CM/ECF system. I further certify that on September 6, 2017, I served the foregoing Brief, as an attachment to the Motion of Energy Economists for Leave to File Brief as *Amici Curiae* Out of Time, with the Clerk of the Court for the United States Court of Appeals for the Seventh Circuit by using the CM/ECF system. I certify that all participants in the case are registered CM/ECF users and that service will be accomplished by the CM/ECF system.

s/ *Aaron M. Panner*
Aaron M. Panner