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Virtual Energy

Joel B. Eisen
University of Richmond School of Law

Felix Mormann
Texas A&M University School of Law, mormann@law.tamu.edu

Heather E. Payne
Seton Hall University School of Law

VIRTUAL ENERGY

Joel B. Eisen[*]
Felix Mormann[**]
Heather E. Payne[***]

From employment to education, many areas of our daily lives have gone virtual, including the virtual workplace and virtual classes. By comparison, the way we generate, deliver, and consume electricity is an anachronism. And the electric industry's outdated business model and regulatory framework are failing. For the last century-and-a-half, we have relied on ever larger power plants to generate the electricity we consume, often hundreds of miles away from the point of production. But the outsized carbon footprint of these power plants and the need to transmit their output over long distances threaten the electric grid's reliability, affordability, and long-term sustainability. There is hope, however.

We here make the case for "virtual energy" as a diverse suite of widely dispersed resources that can combine and interconnect to provide, in the aggregate, the same services as a far-away conventional power plant. In computing, "virtual" refers to something simulated by software to appear real when, in fact, it does not exist. A virtual computer exists only in the cloud—and commonly consists of multiple computers that interconnect to maximize performance. In the same vein, solar panels, battery storage, electric vehicles, and other virtual energy resources (VERs) can coordinate to become virtual power plants that mimic, and ultimately replace, conventional power plants. Along the way, VERs offer a cost-effective strategy for making our electricity system more sustainable, more reliable, and more democratic.

[*] Professor of Law, University of Richmond School of Law.

[**] Professor of Law, Dean's Research Chair, Texas A&M University School of Law; Professor of Engineering, Texas A&M College of Engineering.

[***] Professor of Law, Seton Hall University School of Law.

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To realize virtual energy's full potential, however, requires a radical rethinking of how the electric grid is managed, and by whom. While large-scale power plants connect to high-voltage transmission networks run by independent operators, most VERs tap into the low-voltage distribution grid. For much of the country, that grid is owned and operated by electric utilities who view virtual energy as a threat to their business model of delivering electricity they generate in-house. For VERs to renew America's ailing electricity sector, they must first gain easier access to the grid. To achieve this goal, we propose a novel approach to grid governance: the creation of Independent Distribution System Operators (IDSOs) to level the playing field and promote competition among traditional and virtual sources of energy. Incumbent utilities may be reluctant to embrace such radical change but, we argue, can be persuaded to enter into a grand bargain modeled after the great compromise over workers' compensation that reshaped relations between employers and employees at the dawn of the 20th century.

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I. Introduction

America runs on electricity. From automotive manufacturing in Detroit and server farms in Silicon Valley to the heating and cooling of our homes and the charging of our smart devices, electricity is as vital to our economy and lifestyle as the air we breathe is to our survival.[1] But the U.S. electricity system is broken. During the 2021 winter storm Uri, temperatures that would barely raise an eyebrow in most parts of the country left millions of Texans without power, many for days.[2] Water supply systems and other electricity-dependent essential services collapsed, some taking weeks to come back online.[3] Hundreds died, and the storm's disruptive impact on the local economy caused billions of dollars in damages.[4] Similarly, major portions of California have been ablaze with wildfires in recent years, many of them caused by sparks from faulty power lines.[5] Billions of dollars in economic losses were incurred, while tens of thousands lost their homes and, worst of all, hundreds lost their lives.[6]

In this Article, we demonstrate that these and other failings of the U.S. electric system can all be traced back to an outdated regulatory framework and adherence to nineteenth-century business models that prevent the proliferation of safer, cleaner, and more affordable energy technologies.[7] For more than a century, we have relied on large-scale power plants, often located hundreds of miles from the point of consumption, to power all aspects of American life.[8] But this legacy system is broken, its technologies largely obsolete, and its regulation a deterrent to more advanced technologies available today. We here make the case for opening the electric grid and its regulatory framework to better accommodate

1. *Electricity Explained: Use of Electricity*, U.S. ENERGY INFO. ADMIN. (Apr. 20, 2023) https://www.eia.gov/energyexplained/electricity/use-of-electricity.php [https://perma.cc/J5LE-J8MN].

2. Alexandra Klass, Joshua Macey, Shelley Welton & Hannah Wiseman, *Grid Reliability Through Clean Energy*, 74 STAN. L. REV. 969, 974 (2022); Chris Stipes, *New Report Details Impact of Winter Storm Uri on Texans*, U. HOUS. (Mar. 29, 2021), https://uh.edu/news-events/stories/2021/march-2021/03292021-hobby-winter-storm.php [https://perma.cc/4AVX-U23E].

3. Klass et al., *supra* note 2, at 974–75; Glazer et al., *Winter Storm Uri: A Test of Texas' Water Infrastructure and Water Resource Resilience to Extreme Winter Weather Events*, 8 J. EXTREME EVENTS, Dec. 2021, at 2150022-1, 2150022-14–15 (2021).

4. Jess Donald, *The Economic Impact of the Storm*, TEX. COMPTROLLER FISCAL NOTES 3 (Oct. 2021), https://comptroller.texas.gov/economy/fiscal-notes/2021/oct/winter-storm-impact.php [https://perma.cc/GP3M-J6Q9]; Stipes, *supra* note 2.

5. Elias Kohn, *Mitigating PG&E's Wildfire Ignitions: A Framework for Environmental Resilience and Economic Stimulus*, 12 GEO. WASH. J. ENERGY & ENV'T. L. 3, 3 (2021).

6. Will Scharffenberger, *Environmental Justice Issues Surrounding California Wildfires*, 45 ENVIRONS ENV'T L. & POL'Y J. 261, 273 (2022).

7. For a succinct account of the history of U.S. electricity governance, see Joshua C. Macey & Jackson Salovaara, *Rate Regulation Redux*, 168 U. PA. L. REV. 1181, 1194–1203 (2020).

8. *See* Alexandra B. Klass, *The Electric Grid at a Crossroads: A Regional Approach to Siting Transmission Lines*, 48 U.C. DAVIS L. REV. 1895, 1911 (2015) (explaining how the introduction of single-phase alternating current in the late 19th century enabled the rise of long-distance transmission lines for electricity); *Centralized Generation of Electricity and Its Impact on the Environment*, EPA (Feb. 23, 2023), https://www.epa.gov/energy/centralized-generation-electricity-and-its-impacts-environment [https://perma.cc/9VAZ-HDLQ].

virtual energy resources (VERs), such as aggregations of solar, wind, battery storage, and electric vehicles.[9] Modern remote sensing and control technology readily allows for integrating large numbers of these dispersed energy resources into a unified portfolio that can be managed collectively. Simply speaking, one home's back-up battery installation can combine with another home's solar panels and their neighbors' electric vehicles to become a virtual power plant that the grid operator can dispatch as needed. While individually smaller than traditional coal and natural gas-fired power plants, the nimbleness of VERs allows them to provide such multi-faceted services to the power grid that, in the aggregate, they can readily replace larger plants—for a safer, cleaner, and more resilient electricity system.[10]

Blackouts, wildfires, and other salient shocks to our economy and conscience are just the tip of the iceberg of problems that plague the American electric system. From a governance perspective, headlines decrying blatant corruption in the U.S. energy sector have hardly subsided since the Enron scandal of 2001 but, rather, have become a mainstay of news reporting.[11] Then there is the 800-pound gorilla in the room: the electricity sector's outsized contribution to climate change.[12] Global warming has already increased both the frequency and severity of extreme weather events.[13] The intervals between so-called 100-year

9. "Aggregation," as used in this Article, means the "assembly of a portfolio of [distributed energy resources] from multiple customers that can be managed collectively to provide energy, capacity, or ancillary services." JANINE MIGDEN-OSTRANDER, JOHN SHENOT, CAMILLE KADOCH, MAX DUPUY & CARL LINVILL, REGUL. ASSTISTANCE PROJECT, ENABLING THIRD-PARTY AGGREGATION OF DISTRIBUTED ENERGY RESOURCES 10 (2018). *See also* Joel B. Eisen & Felix Mormann, *Free Trade in Electric Power*, 2018 UTAH L. REV. 49, 49, 92–97 (surveying early efforts to aggregate distributed energy resources).

10. MIGDEN-OSTRANDER ET AL., *supra* note 9, at 10 (listing "energy security, resiliency, and emissions reductions" as benefits of distributed generation). *See also* Maria Gallucci, *Puerto Rico Will Link up 7,000 Solar Systems to Help Its Shaky Grid*, CANARY MEDIA (Nov. 1, 2022), https://www.canarymedia.com/articles/solar/puerto-rico-will-link-up-7-000-solar-systems-to-help-its-shaky-grid [https://perma.cc/ZY6C-UQPP]; Miranda Wilson, *Northeast Embraces First-of-a-Kind Virtual Power Plant*, E&E NEWS (Oct. 12, 2022), https://www.eenews.net/articles/northeast-embraces-first-of-a-kind-virtual-power-plant/ [https://perma.cc/LQ7G-2BBU].

11. David Pomerantz, *John Oliver Explains Utility Scandals*, ENERGY & POL'Y INST. (May 16, 2022), https://www.energyandpolicy.org/john-oliver-utility-scandals/ [https://perma.cc/K5Y2-BFQ7] (noting utility scandals have become so mainstream that even John Oliver is covering them now and listing other utility scandals). *See also* John C. Coffee Jr., *What Caused Enron—A Capsule Social and Economic History of the 1990s*, 89 CORNELL L. REV. 269, 270 (2004) (Enron and other scandals are traceable to "pervasive problems . . . that undercut existing systems of corporate governance").

12. Uma Outka, *The Renewable Energy Footprint*, 30 STAN. ENV'T L. J. 241, 242 (2011). For precise figures, see *Greenhouse Gas Emissions by Sector, World*, OUR WORLD IN DATA, https://ourworldindata.org/grapher/ghg-emissions-by-sector (last visited Oct. 15, 2023) [https://perma.cc/9XF6-H67B].

13. *See, e.g.*, Samuel Bartusek, Kai Kornhuber & Mingfang Ting, *2021 North American Heatwave Amplified by Climate Change-Driven Nonlinear Interactions*, 12 NATURE CLIMATE CHANGE 1143, 1143 (2022). *See also* Roz Pidcock & Robert McSweeney, *Mapped: How Climate Change Affects Extreme Weather Around the World*, CARBON BRIEF (Aug. 4, 2022, 4:30 PM), https://www.carbonbrief.org/mapped-how-climate-change-affects-extreme-weather-around-the-world/ [https://perma.cc/5DR7-L4RH] (mapping extreme weather events scientifically linked to anthropogenic climate change).

floods and droughts are no longer measured in decades, but years.[14] These and other manifestations of our changing climate displace millions of people every year, disrupt vital supply chains for food and other essential goods, exacerbate systemic risk on financial markets, and require massive investment in more resilient infrastructure.[15]

Historically, the United States and the rest of the world have relied primarily on the burning of coal, natural gas, and other fossil fuels to generate the electricity to power our homes, businesses, and industrial facilities.[16] Unfortunately, combustion of these hydrocarbons produces inordinate amounts of the greenhouse gasses that drive global warming and climate change.[17] Today, the electricity sector is responsible for one-quarter of all U.S. greenhouse gas emissions.[18] If utility business continues as usual, a hotter planet, with more frequent and more extreme weather events, will make things even worse by driving up our electricity consumption, for air conditioning and other uses.[19]

There is hope yet. The electric industry is at a turning point, one where it could trade its status as carbon supervillain for the cape of the climate superhero. But to do so will require a complete rethinking of the way we generate, deliver, use, and trade electricity. An integral portion of these efforts is to replace legacy fossil fuels with VERs that can shrink, if not eliminate, the electricity sector's carbon footprint.[20] What sounds like a fairly straightforward substitution—benching the team's aging players in favor of new talent—is, unfortunately, anything but straightforward. The fossil-fueled veteran players and their utility agents have enjoyed over a century of regulatory privileges and protection to entrench themselves and will not leave the pitch without a fight.[21] To realize the electricity sector's full superhero potential will require not just a new playbook but rewriting the rulebook itself.

Today's regulatory framework, utility business model, and aging electric grid are ill-adapted to meet the scope of our climate challenge. Incumbent interests, at best, work to maintain the status quo or, worse, add more fossil generating

14. *See, e.g.*, *Grand Forks, ND, USA*, UNION OF CONCERNED SCIENTISTS, https://web.archive.org/web/20201028035050/https://www.climatehotmap.org/global-warming-locations/grand-forks-nd-usa.html (last visited Oct. 15, 2023) [https://perma.cc/SCW4-9KAS].

15. *See, e.g.,* Donald, *supra* note 4, at 3.

16. *Electricity Explained: Electricity in the United States*, U.S. ENERGY INFO. ADMIN. (June 30, 2023), https://www.eia.gov/energyexplained/electricity/electricity-in-the-us.php [https://perma.cc/4STJ-2NXW].

17. *Greenhouse Gas Emissions by Sector, World*, *supra* note 12.

18. *Sources of Greenhouse Gas Emissions*, EPA, https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions (Apr. 28, 2023) [https://perma.cc/W3A9-8U52].

19. *Climate Change Indicators: Residential Energy Use*, EPA, https://www.epa.gov/climate-indicators/climate-change-indicators-residential-energy-use (July 21, 2023) [https://perma.cc/8NRU-UQBA].

20. Jesse D. Jenkins, Max Luke & Samuel Thernstrom, *Getting to Zero Carbon Emissions in the Electric Power Sector*, 2 JOULE 2498, 2498 (2018) (more clean energy on the grid is the "linchpin of efforts" to limit greenhouse-gas emissions).

21. For an early account of the monopoly privileges bestowed upon electric utilities as part of the "social control of business," see generally Marshall E. Dimock, *British and American Utilities: A Comparison*, 1 U. CHI. L. REV. 265 (1933). *See also* William Boyd, *Public Utility and the Low-Carbon Future*, 61 UCLA L. REV. 1614, 1635–51 (2014) (unpacking the public interest justification behind utility monopoly privileges).

units into the grid.[22] Thousands of miles of new transmission lines are needed to connect wind, solar, and other low-carbon generators in remote, but resource-rich areas to the metropolitan areas where clean power is most needed.[23] New interstate transmission lines are, however, notoriously difficult to build as a number of states, often with vested fossil-fuel interests, actively block new projects.[24] Even projects passing through generally supportive states get caught up in acrimonious debates over the allocation of attendant costs and benefits.[25] Add to that an outdated regulatory framework that grants incumbent utilities the right of first refusal on new transmission projects, among other anti-competitive advantages, and the conclusion becomes obvious: adherence to our historic reliance on large-scale power plants, often located hundreds of miles from the point of consumption, will not deliver the pace and degree of decarbonization needed to transform the electricity sector from carbon villain to climate hero.[26]

The only viable solution to these intersecting issues is to move away from centralized electric generation and toward VERs. In this Article, we use the term "virtual energy" to describe a wide range of new resources poised to enter the electric grid and to transform how power is generated, delivered, and used. In computing, "virtual" means made by software and appearing as if it physically exists when, in fact, it does not, such as the "virtual reality" experience offered by modern video games.[27] A "virtual computer" exists only in the cloud—and commonly consists of multiple computers that interconnect to maximize performance.[28] Virtual energy resources share many of the same characteristics and function in similar fashion. Homes with solar panels and energy storage, wind

22. *See, e.g.*, Jeff St. John, *Why Does Duke Energy's Carbon Plan Shortchange Solar?*, CANARY MEDIA (Sept. 19, 2022), https://www.canarymedia.com/articles/utilities/why-does-duke-energys-carbon-plan-shortchange-solar [https://perma.cc/5QRE-STAQ].

23. Avi Zevin, Sam Walsh, Justin Gundlach & Isabel Carey, *Building a New Grid without New Legislation: A Path to Revitalizing Federal Transmission Authorities*, 48 ECOLOGY L.Q. 169, 171 (2021); Alexandra B. Klass & Jim Rossi, *Revitalizing Dormant Commerce Clause Review for Interstate Coordination*, 100 MINN. L. REV. 129, 130 (2015) ("Building new high-voltage transmission lines is essential for large-scale energy projects such as wind turbine farms and solar thermal facilities . . . .").

24. This is ably described in Ari Peskoe, *Is The Utility Transmission Syndicate Forever?*, 42 ENERGY L.J. 1 (2021); Robinson Meyer, *Unfortunately, I Care About Power Lines Now*, ATL. (July 28, 2021), https://www.theatlantic.com/science/archive/2021/07/america-is-bad-at-building-power-lines-lets-fix-that-transmission-climate/619591/ [https://perma.cc/8RQ6-FLMU]. *See also* Alexandra B. Klass & Jim Rossi, *Reconstituting the Federalism Battle in Energy Transportation*, 41 HARV. ENV'T L. REV. 423, 464 (2017) (efforts to build new transmission infrastructure are "often stymied by opposition from incumbent utilities coupled with state laws").

25. Peskoe, *supra* note 24, at 54; JULIE LIEBERMAN, HOW TRANSMISSION PLANNING & COST ALLOCATION PROCESSES ARE INHIBITING WIND & SOLAR DEVELOPMENT IN SPP, MISO, & PJM v–viii (2021).

26. James W. Coleman & Alexandra B. Klass, *Energy and Eminent Domain*, 104 MINN. L. REV. 659, 692 (2019) (the need to decarbonize the electric grid has created "new demands for a massive build-out of transmission lines to transport renewable electricity to population centers").

27. *Virtual*, OXFORD ENG. DICTIONARY, https://www.oed.com/dictionary/virtual_adj?tab=meaning_and_use#15653852 (last visited Oct. 15, 2023) [https://perma.cc/R3GL-MPWY].

28. *Virtual Machine*, OXFORD ENG. DICTIONARY, https://www.oed.com/dictionary/virtual-machine_n?tab=meaning_and_use#296284919 (last visited Oct. 15, 2023) [https://perma.cc/Q9HD-AA2S].

turbine installations, local microgrids,[29] and electric vehicles can combine and interconnect through the grid to provide, in the aggregate, the same services to local customers that a far-away conventional power plant requires hundreds of miles of transmission lines to deliver.[30] Interconnection via the electric grid, thus, enables virtual energy resources to mimic, and ultimately, replace traditional power plants by acting as "virtual power plants."

If virtual energy is so virtuous, why is there not more of it? The answer is simple. In much of the country, monopoly electric utilities own and operate the grid, and view virtual energy as a threat to their business model of delivering electricity they generate in-house or getting paid to deliver to you over their wires.[31] After all, why should you buy power from your utility company when you can purchase cheaper, cleaner electricity from a nearby solar plant? This is but one of many conflicts of interests for utilities when it comes to virtual energy. Most stem from a situation unique to this industry: utilities have been entrusted with the role of gatekeepers that decide who gets to play on the electric grid, and who remains on the sidelines. As a result, utility incumbents can prevent the proliferation of virtual energy in the U.S. electricity system. At the same time, they can add VERs to the resource mix themselves while blocking others from doing so. But do not expect them to do this. The existing, outdated regulatory framework provides powerful economic incentives for incumbent utilities to maintain the status quo or even add more fossil-fired power plants to the grid.

Utilities are also adept at demanding that they write the rules for the virtual energy transition to avoid catastrophic impacts that (they claim) they alone can prevent. An example is their arguments about grid reliability. Typically, grid operators can see the attributes and status of a centralized power plant and can understand how the plant can contribute to meeting demand.[32] With distributed sources of energy, utilities and grid operators often lack visibility—they cannot see how individual solar panels are performing in real time. Utilities cite this loss of control as a threat to reliable electric service.[33] This is powerful framing—no one wants the lights to go out—but, as we demonstrate, our solution would overcome that argument.

It is time for the regulatory status quo to change. Virtual energy requires a different paradigm for regulating the electric grid than the one we currently have.

29. Microgrids are local networks of electricity generating resources that can operate independently of the main grid. Joel B. Eisen, *Smart Regulation and Federalism for the Smart Grid*, 37 HARV. ENV'T L. REV. 1, 12 (2013); Sara C. Bronin, *Curbing Energy Sprawl with Microgrids*, 43 CONN. L. REV. 547, 547, 559–61 (2010).

30. Like each individual computer, each VER might offer distinct services but, in combination, can displace a traditional power plant. Joel B. Eisen, *Distributed Energy Resources, "Virtual Power Plants," and the Smart Grid*, 7 ENV'T & ENERGY L. & POL'Y J. 191, 205 (2013).

31. Joseph Stekli, Linquan Bai, Umit Cali, Ugur Halden & Marthe Fogstad Dynge, *Distributed Energy Resource Participation in Electricity Markets: A Review of Approaches, Modeling, and Enabling Information and Communication Technologies*, 43 ENERGY STRATEGY REVS., no. 100940, 2022, at 1, 6–7; Alison Gocke, *Nodal Governance of the U.S. Electricity Grid*, 29 DUKE ENV'T L. & POL'Y F. 205, 246 (2019).

32. *See* Macey & Salovaara, *supra* note 7, at 1195–96.

33. Amory B. Lovins & M. V. Ramana, *Three Myths About Renewable Energy and the Grid, Debunked*, YALE ENV'T 360 (Dec. 9, 2021), https://e360.yale.edu/features/three-myths-about-renewable-energy-and-the-grid-debunked [https://perma.cc/X75J-FDEG].

For virtual energy to make a meaningful contribution, the grid itself will have to change in fundamental ways. To realize virtual energy's full potential requires a radical rethinking of how the electric grid is managed, and by whom. Merely incremental changes to the century-old utility business model and the nation's antiquated grid will be insufficient to meet the reliability, affordability, and climate challenges of our rapidly changing world.

At a time when many American families struggle to pay for basic energy needs, it is important to note that virtual energy can help combat energy poverty and improve energy justice. A diversified portfolio of geographically dispersed energy resources not only mitigates climate change—including the social inequities of its disparately felt impacts[34]—but also reduces the need for costly delivery of electric power over long distances. These cost savings translate to lower electricity bills for *all* customers, regardless of whether they can afford to put solar panels on the rooftops of their homes or drive an electric vehicle. Our proposed reforms to grid governance, meanwhile, foster energy justice through more widespread stakeholder participation and greater procedural justice.[35]

This Article engages with the literatures on energy policy, public utilities, climate change, and structural bargaining to make four original contributions. First, we are the first to conceptualize the universe of virtual energy and to demonstrate how its diverse suite of resources offers a cost-effective strategy for making our electricity system more sustainable, more reliable, and more democratic. Second, we reveal the inherent conflicts of interest written into the regulatory framework that governs public utilities and hampers VERs from fully contributing to the electric grid. Third, we propose a novel approach to grid governance by concentrating control over local electricity networks in the hands of a newly created independent institution with no stake in power generation or other segments of the industry. Finally, we use a political economy analysis to outline a grand bargain between utilities and VERs as the path toward meaningful reform of grid governance.

Specifically, we identify and address challenges for the proliferation of VERs along three dimensions: (1) removing barriers that currently inhibit full marketplace access; (2) rewarding value creation—ensuring fair compensation of VERs for all the services they provide to the grid; and (3) establishing a system of grid governance that maintains reliability and fairly compensates VERs for the access they provide to third parties.

To address these issues, Part II of this Article introduces the universe of virtual energy. In Part III, we elaborate on the challenges that currently hinder more rapid growth of virtual energy. Part IV illustrates the chilling effect of legacy utility regulation on VER development by analogy to another area where

34. *See, e.g.*, Rachel Morello Frosch, Manuel Pastor, Jim Sadd & Seth Shonkoff, *The Climate Gap: Inequalities in How Climate Change Hurts Americans and How to Close the Gap*, *in* PLANNING FOR CLIMATE CHANGE 138, 139–42 (Elisabeth M. Hamin Infield, Yaser Abunnasr & Robert L. Ryan, eds. 2018).

35. *See* Shelley Welton, *Decarbonization in Democracy*, 67 UCLA L. REV. 56, 62 (2020) (calling for "more citizen involvement in decarbonization").

local production has arisen as a counterpoint to large, central production: the farm-to-table movement. We illustrate how, and why, small farms have more extensive market opportunities and face fewer barriers to earning adequate compensation for the full value of their products than VERs do in the electric grid. Moving from description to prescription, Part V articulates how oversight can be improved. Specifically, we propose a novel approach for grid governance to level the playing field and promote competition among traditional and virtual sources of energy: the Independent Distribution System Operator (IDSO). Assigning control over the distribution of electric power to an independent party, the IDSO model provides significant benefits, including enhanced market access, transparency, reliability, and more democratic governance. Part VI examines the political economy of our proposal. Incumbent utilities owe much of their dominance to regulatory privileges and protections that can be revoked, as demonstrated by restructuring efforts in a number of states. But pervasive regulatory capture and other factors make widespread revocation of utility privileges politically improbable. Instead, we argue that utilities can, and should, be persuaded to enter into a grand bargain to reform the electric grid, modeled after the original grand bargain between employers and employees that established today's regime for workers' compensation more than a century ago.

Before turning to the substance of our analysis and argument, a caveat is in order: it is easy, amidst the electric system's technical complexity, to lose sight of the institutional arrangements and relational factors that determine its proper functioning and governance. Much of the pertinent scholarship focuses on reliability standards, imbalance settlements, and other technical aspects, at the expense of clarity in explaining the inter-institutional and inter-firm dynamics in the electricity marketplace. To help close this gap, we employ a series of analogies designed to foster a better understanding of complex, and often technical, concepts and to emphasize the crucial role of human interaction and decision-making for grid governance.

II. THE PROMISE OF VIRTUAL ENERGY

Imagine a typical street in American suburbia on a lazy afternoon. Kids are riding their bicycles, one homeowner is mowing his lawn, while another washes her car. Now consider that, as our idyllic scenario unfolds, this street could double as a power plant producing clean, reliable electricity for its residents and others—without the giant cooling towers, the noisy turbines, and the filthy smoke stacks associated with traditional power plants. This is the promise of virtual energy.

Modern remote sensing and control technology can coordinate one home's rooftop solar panels with the back-up battery installed in another home's garage, and the electric vehicles in the neighborhood. The aggregation of previously isolated resources into coordinated VERs creates a virtual power plant that the grid operator can call on as needed. The virtualization of solar, battery, and other distributed resources can significantly reduce, if not altogether eliminate, the impact of weather, range, and other factors that would otherwise affect the ability of each resource to independently contribute to the local electricity network.[36]

In this section, we provide an introduction to virtual energy—the types of resources involved, how they can be integrated with one another and the larger electricity network, as well as the ways in which they differ both from "traditional" energy and from the "distributed" resources commonly considered to be its alternative.

A. The Universe of Virtual Energy

Federal tax support and state incentive programs,[37] along with growing concern over climate change,[38] have promoted massive deployment of rooftop solar panels, electric vehicles, and battery installations in recent years.[39] The literature commonly describes these resources as "distributed energy resources," or DERs, because, unlike large power plants whose physical footprint may resemble that of a small town, these distributed resources can be sited right at the point of consumption, such as on a homeowner's rooftop or in their garage.[40] In recent years, the suite of these distributed resources has expanded considerably to encompass not only batteries and electric vehicles but also controllable loads, such as HVAC systems and water heaters, all located on the consumer's side of the electricity meter.[41] DERs can even include a consumer's behavioral response to changes in electricity demand where individual actions—like unplugging computers and TVs or turning off air conditioners—combine to reduce electric load.[42]

The ongoing proliferation of DERs marks an important step toward rebuilding the nation's electricity sector. But we think of DERs as an evolutionary stage along the way to a cleaner, more reliable, and more democratic electric system, powered by virtual energy. DERs are, if you will, the caterpillar to virtual

36. *See, e.g.*, Felix Mormann, Dan Reicher & Victor Hanna, *A Tale of Three Markets: Comparing the Renewable Energy Experiences of California, Texas, and Germany*, 35 STAN. ENV'T L.J. 55, 89 (2016) (reporting how German aggregators combined 570 megawatts of solar, wind, and biomass-powered generators to bid fast-ramping capacity into local wholesale markets).

37. For an introduction to the complex world of federal tax incentives for clean energy deployment, see Felix Mormann, *Beyond Tax Credits: Toward a Cleaner, More Democratic Energy Future*, 31 YALE J. REG. 303, 311–17 (2014). For a snapshot of state-level rebates and incentives, see *Database of State Incentives for Renewables & Efficiency*, DSIRE, https://www.dsireusa.org (last visited Oct. 15, 2023) [https://perma.cc/C8L4-7Y3V].

38. According to a recent poll, two in three Americans are worried about global warming and climate change. *See* ANTHONY LEISEROWITZ ET AL., CLIMATE CHANGE IN THE AMERICAN MIND 10 (2022).

39. *See* U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2022 17 (2022) (documenting strong sustained growth in renewables).

40. *See* Richard L. Revesz & Burcin Unel, *Managing the Future of the Electricity Grid*, 41 HARV. ENV'T L. REV. 43, 44 (2017); Amy L. Stein, *Distributed Reliability*, 87 U. COLO. L. REV. 887, 915 (2016); *Centralized Generation of Electricity and Its Impact on the Environment*, *supra* note 8.

41. *Distributed Energy Resources (DER)*, TECHTARGET: WHATIS (Mar. 2019), https://www.techtarget.com/whatis/definition/distributed-energy-resources-DER [https://perma.cc/F9YE-A8H2].

42. *See* Joel B. Eisen, *Demand Response's Three Generations: Market Pathways and Challenges in the Modern Electric Grid*, 18 N.C. J.L. & TECH. 351, 382 (2017).

energy's butterfly. To unleash the full potential of DERs, they must pass through the chrysalis of aggregation to become VERs.

Our proposed universe of virtual energy encompasses most DERs, as many of them could combine to provide energy and services in the aggregate. But there is one critical qualifier. With their location behind the meter as the defining feature, DERs sometimes include natural gas generators and other fossil-fueled resources.[43] In recognition of the urgency to decarbonize the electricity sector, we reject such resource agnosticism and, instead, limit our definition of VERs to carbon-free resources, including the aggregation of these assets.[44] Virtual energy also expands the range of qualifying resources beyond those located behind the meter. VERs thus include larger assets, such as community solar installations or grid-level storage solutions, that may pool their output and, by virtue of their aggregation, substitute for power plants.[45] This substitution-through-aggregation feature is the defining attribute of "virtual energy" resources. Our definition of "virtual" hinges on the capacity of resources—without the need for colocation—to pool their output, regardless of whether they are located on the utility or customer side of the electricity meter.

Aggregation of DERs that transforms them into VERs can take many forms. An illustrative example comprises a portfolio of aggregated small-scale energy resources, such as rooftop solar panels, battery storage installations, electric vehicles and charging equipment, and energy efficiency devices, including home appliances, that transact as a single entity.[46] A VER could provide energy locally—imagine the virtual power plant above serving the entire suburban neighborhood—through connections to a shared low-voltage distribution network.[47] Or it could provide services at a larger geographic scale, through connections with wholesale power markets operated by regional transmission operators (RTOs).[48] In that situation, the single combined resource uses shared higher-voltage transmission networks to reach the market. Regardless of the connection, any individual VER is still "virtual" to the grid operator: the aggregated resource is visible, and thus easier to integrate into the resource mix, but no single resource is. To be clear, even in disaggregated form, DERs offer considerable benefits to the grid and its users,[49] but only aggregation and the resulting

43. *Distributed Energy Resources (DER)*, *supra* note 41.

44. We acknowledge that no energy source is completely carbon-free based on a full lifecycle analysis. But given the size of their carbon footprint, especially in relation to natural (fossil) gas and other competing resources, we have rounded down to zero for resources with zero emissions during electricity production and low carbon intensity on a lifecycle basis.

45. NAT'L RENEW. ENERGY LAB., GRID SCALE BATTERY STORAGE: FREQUENTLY ASKED QUESTIONS 3 (2019) (noting that storage and renewable energy can pair to meet grid needs).

46. Eisen, *supra* note 30, at 205 (observing that aggregated resources could be dispatchable like a power plant).

47. *Id.*

48. *Id.* at 198.

49. *E.g.*, NATALIE MIMS FRICK, SNULLER PRICE, LISA SCHWARTZ, NICHOLE HANUS & BEN SHAPIRO, LOCATIONAL VALUE OF DISTRIBUTED ENERGY RESOURCES 49 (2021) (discussing the ability of DERs at specific locations to defer additional investments in the distribution grid).

transformation from DERs to VERs unlocks the full potential of these resources, including greater reliability, affordability, and sustainability of electric service.[50]

Energy resource aggregation may sound like science fiction but has, in fact, long been reality in the context of demand response programs that pay consumers to reduce their use of electricity during periods of peak demand.[51] In its 2016 *FERC v. Electric Power Supply Association* decision, the Supreme Court offered a powerful endorsement of demand response aggregation: "Just like bids to supply electricity, offers from aggregators of multiple users of electricity … to reduce consumption can be bid into the wholesale market."[52] The Court went on to note that aggregated portfolios of demand response have been regular participants in wholesale power markets since the early 2000s.[53] In other words, both the technology to manage aggregated energy resources and the mechanisms to accommodate their market participation are well established. The time has come to scale aggregation and expand the envelope beyond demand response resources.

Today, there are more distributed energy installations than ever before, and the Inflation Reduction Act will accelerate their deployment further.[54] Distributed energy offers substantial benefits. Localized facilities are easier to site and build than larger power plants and infrastructure upgrades that attract opposition, such as new transmission lines.[55] Once interconnected and aggregated into virtual energy, the benefits of VERs further include a lower carbon footprint, increased resilience (ability to withstand outages), fewer transmission losses, and relief of existing congestion on the grid, as well as improved efficiency, when compared to conventional power plants.[56] All these are positives for climate change mitigation and a stronger grid. Cyberattacks, storms, droughts, and other extreme weather events put ever greater stress on our centralized system—a

50. Herman K. Trabish, *California Solar Pilot Shows How Renewables Can Provide Grid Services*, UTIL. DIVE (Oct. 16, 2017), https://www.utilitydive.com/news/california-solar-pilot-shows-how-renewables-can-provide-grid-services/506762/ [https://perma.cc/NR5F-VJG8].

51. Joel B. Eisen, *Aggregation of Distributed Energy Resources in the United States: Current Uses and Potential for More Widespread Deployment*, *in* XIII EUR. ENERGY L. REP. 57, 57 (2020).

52. 577 U.S. 260, 260 (2016) (upholding FERC Orders No. 719 and 745 granting aggregators of demand response access to wholesale electricity markets).

53. *Id.* at 261; *see also* Sharon Jacobs, *Bypassing Federalism and the Administrative Law of Negawatts*, 100 IOWA L. REV. 885, 894–904 (2015) (tracing the rise of aggregated demand response programs); Joel B. Eisen, *Who Regulates the Smart Grid? FERC's Authority Over Demand Response Compensation in Wholesale Electricity Markets*, 4 SAN DIEGO J. CLIMATE & ENERGY L. 69, 75 (2013).

54. BIPARTISAN POL'Y CTR., INFLATION REDUCTION ACT (IRA) SUMMARY: ENERGY AND CLIMATE PROVISIONS (Aug. 4, 2022), https://bipartisanpolicy.org/download/?file=/wp-content/uploads/2022/08/Energy-IRA-Brief_R04-9.26.22.pdf [https://perma.cc/MPA8-XVRL].

55. Hannah Jacobs Wiseman, *Localizing the Green Energy Revolution*, 70 EMORY L.J. ONLINE 59, 59 (2021); Jeff St. John, *How to Move More Power with the Transmission Lines We Already Have*, CANARY MEDIA (July 29, 2022), https://www.canarymedia.com/articles/transmission/how-to-move-more-power-with-the-transmission-lines-we-already-have [https://perma.cc/7RNJ-LV5X] ("Constructing big new transmission lines is difficult and time-consuming even before you consider the intense public opposition to many such projects.").

56. Kyle Richmond-Crosset & Zach Greene, *How Distributed Energy Resources Can Lower Power Bills, Raise Revenue in US Communities*, WORLD RES. INST. (Sept. 30, 2022), https://www.wri.org/insights/distributed-energy-resources-explained-us [https://perma.cc/4A9U-AQW6].

system that lacks the resilience required to respond to these and other threats without major infrastructure upgrades.[57] And because virtual energy can obviate the need to build more centralized infrastructure, it can sidestep the roadblocks that hamper otherwise necessary upgrades and expansions.[58]

The proliferation of VERs—both through deployment of new and aggregation of existing resources—would give these resources the ability to provide services across the full spectrum of what we expect electric generators to provide—generation capacity, energy output, and ancillary services like frequency regulation.[59]

Just as importantly, virtual energy can lower customer costs, above and beyond the potential cost savings from distributed, but disaggregated, energy resources.[60] As electricity price increases continue to outstrip inflation, the proliferation of virtual energy can serve as a buffer against rapacious utility spending and the volatility of fossil fuel price swings.[61] Solar, wind, batteries, smart controls, networking technology, and optimization models are all quickly moving down the cost curve,[62] and rapidly dropping below the costs of building central power plants and transmitting their power.[63] A focus on cost is all the more important given growing concerns over energy access and energy poverty as more and more American households struggle to pay their electricity bills.[64]

57. U.S. GOV'T ACCOUNTABILITY OFF., ELECTRICITY GRID CYBERSECURITY: DOE NEEDS TO ENSURE ITS PLANS FULLY ADDRESS RISKS TO DISTRIBUTION SYSTEMS 7 (2021) (describing shortcomings of the current protection system); Klass et al., *supra* note 2, at 989; Robert Walton, *NERC Warns of Cybersecurity, Reliability Risks as it Outlines Strategy for Adding Tens of Gigawatts of DER*, UTIL. DIVE (Nov. 3, 2022), https://www.utilitydive.com/news/nerc-warns-of-cybersecurity-reliability-risks-DER-strategy/635673/ [https://perma.cc/6YEY-CB43].

58. *See* Alexandra B. Klass & Elizabeth J. Wilson, *Interstate Transmission Challenges for Renewable Energy: A Federalism Mismatch*, 65 VAND. L. REV. 1801, 1804 (2012) (authors lament the "lack of robust federal authority or regional coordinating authority to plan and site transmission infrastructure . . . .").

59. An illustrative example would be a battery that can be dispatched to provide either energy or ancillary services whenever necessary. *See Energy Storage Is Changing the Grid. Here's How to Navigate the New Dynamics.*, UTIL. DIVE (Aug. 1, 2022), https://www.utilitydive.com/spons/energy-storage-is-changing-the-grid-heres-how-to-navigate-the-new-dynamic/627973/ [https://perma.cc/DKL6-7QFT]. VERs could do even more, enabling even those resources that are not typically thought of as dispatchable to provide these services. Herman K. Trabish, *California Solar Pilot Shows How Renewables Can Provide Grid Services*, UTIL. DIVE (Oct. 16, 2017), https://www.utilitydive.com/news/california-solar-pilot-shows-how-renewables-can-provide-grid-services/506762/ [https://perma.cc/NR5F-VJG8].

60. DAVID LITTELL ET AL., REG. ASS'T PROJ., THE ECONOMICS OF DISTRIBUTED ENERGY RESOURCES 23 (2019).

61. Heather Payne, *Private (Utility) Regulators*, 50 ENV'T L. 999, 1014–28 (2020) (demonstrating utilities price increases above inflation and discussing high utility spending plans).

62. *Lazard's Levelized Cost of Energy Analysis—Version 15.0*, LAZARD (Oct. 28, 2021), https://www.lazard.com/media/sptlfats/lazards-levelized-cost-of-energy-version-150-vf.pdf [https://perma.cc/N7F6-QD26] (showing long-term declines in system and component costs).

63. *Id.* at 14 (comparing costs of renewable energy and distributed energy resources to those of conventional power plants).

64. *See infra* Section IV.A.

B. Dispelling Myths and Misconceptions

Current analyses model how distributed resources will contribute to the grid and how regulations can promote those contributions.[65] This tends to focus the conversation on individual resources and types—for example, how to promote community solar or how to value demand response in wholesale markets. But there is little holistic analysis of what happens when DERs are aggregated into VERs at scale and the grid as a whole becomes more virtual.[66] As a result, the ramifications of greater VER deployment are generally under-appreciated.

Could we have a grid that relies much more heavily on VERs? Absolutely. For the past two decades, utilities and other skeptics, often with vested fossil fuel interests, have repeatedly denied the grid's ability to incorporate growing shares of distributed energy, especially solar and wind installations whose output varies based on meteorological conditions.[67] Yet, the doubters' doomsday scenarios of cascading brownouts and blackouts have not materialized, even as parts of the country have surpassed the threshold percentages where, according to the utilities' fearmongering, the electric grid was to run off the rails in terms of reliability—and no dystopian future of massive blackouts occurred when those thresholds were crossed.[68] This demonstrates those purportedly maximum thresholds for intermittent generation were either arbitrary (because the utility did not want to have more competition from distributed resources on their system) or that those claiming the thresholds were woefully mistaken. Most importantly, aggregation of DERs into VERs, and the resulting ability to mimic conventional power plants' output patterns transforms these resources into boosters of, rather than

65. *See, e.g.*, Michael Polsky & Jennifer Layke, *What's Needed to Modernize America's Electricity Grid?*, WORLD RES. INST. (Jan. 7, 2022), https://www.wri.org/insights/whats-needed-modernize-us-electricity-grid [https://perma.cc/79UB-8YHA]; WILL GORMAN ET AL., EVALUATING THE CAPABILITIES OF BEHIND-THE-METER SOLAR-PLUS-STORAGE FOR PROVIDING BACKUP POWER DURING LONG-DURATION POWER INTERRUPTIONS 5 (Sept. 2022), https://eta-publications.lbl.gov/sites/default/files/pvess_report_final.pdf [https://perma.cc/MX2Z-E4TU].

66. *See, e.g.*, *Reimagining and Rebuilding America's Energy Grid*, U.S. DEPT. OF ENERGY, (June 10, 2021), https://www.energy.gov/articles/reimagining-and-rebuilding-americas-energy-grid [https://perma.cc/CHR6-DKV3] (listing DOE priorities around grid modernization without this type of holistic analysis).

67. William Driscoll, *Renewables Up to 90% by 2050 Would Cost Less Than Current Generation Mix: NREL Study*, PV MAG. (June 28, 2021), https://pv-magazine-usa.com/2021/06/28/renewables-up-to-90-by-2050-would-cost-less-than-current-generation-mix-nrel-study/ [https://perma.cc/5MFC-5ZL9] ("utilities claimed that 20% renewables on the grid was infeasible" in 2009).

68. Mormann et al., *supra* note 36, at 87 (reporting that the proliferation of renewables has been accompanied by reduced outages). Distributed energy is, in fact, improving overall grid reliability. Solar in Texas, for example, has helped significantly with tight reserve margins this summer, providing electricity exactly when it was needed most: hot summer afternoons. Dan Solomon, *Solar Power Is Bailing Texas Out This Summer*, TEX. MONTHLY (July 12, 2022), https://www.texasmonthly.com/news-politics/renewable-energy-texas-grid-heat-wave/ [https://perma.cc/Y33L-2X5K].

threats to, reliable electric service.[69] If anything, a higher percentage of VERs can be expected to increase the grid's overall reliability and resilience.[70]

There is more good news. For decades, utilities have charged their customers for running costly and inefficient reserve generators on standby, to be called on in the rare event of an outage or unforeseen surge in demand.[71] VERs' ability to mimic conventional power plants and provide the same services to the grid reduces the need to operate, and pay for, such reserve units.[72]

Likewise, the utility-driven myth that solar, wind, and other non-fossil and non-nuclear energy resources require substantial fossil backup to ensure grid reliability must be put to rest.[73] Studies have shown that new wind capacity, for example, requires less than one percent of its nameplate capacity in fossil-fuel backup.[74] The grid can operate reliably with high penetrations of renewables and other DERs.[75] The remaining challenges for greater reliance on VERs have little, if anything, to do with technological maturity and grid reliability but, rather, center on the electricity sector's outdated regulatory framework and its misplaced faith in utilities as the guardians of the grid.

Finally, we must discuss myths related to cost. Utilities frequently claim that electricity from DERs is more expensive than electricity from conventional power plants.[76] Indeed, utilities have been requesting customers who want carbon-free or renewable generation to pay extra for years, even for electricity that may not come from renewable sources.[77] Meanwhile, the costs of generating electricity from solar, wind, and other renewable generation sources have decreased dramatically, often undercutting those of coal and natural gas-fired

69. Robert Fares, *Renewable Energy Intermittency Explained: Challenges, Solutions, and Opportunities*, SCI. AM. (Mar. 11, 2015), https://blogs.scientificamerican.com/plugged-in/renewable-energy-intermittency-explained-challenges-solutions-and-opportunities/ [https://perma.cc/7YT6-RK3L] (based on the Law of Large Numbers, "renewable energy actually becomes more predictable as the number of renewable generators connected to the grid increases . . . .").

70. *Id.*

71. These "spinning reserves" are large generation units that are standing by to come online at minimal notice and step in to supply power to the grid in case another unit goes down or demand ramps up unexpectedly. Spinning reserves are often inefficient, fossil fuel plants. Steven Ferrey, *Net Legal Power*, 53 SAN DIEGO L. REV. 221, 243 (2016).

72. *Energy Storage is Changing the Grid*, *supra* note 59.

73. Amory B. Lovins & M.V. Ramana, *Three Myths About Renewable Energy and the Grid, Debunked*, YALE ENV'T 360 (Dec. 9, 2021), https://e360.yale.edu/features/three-myths-about-renewable-energy-and-the-grid-debunked [https://perma.cc/X75J-FDEG].

74. Fares, *supra* note 69 ("[A]n additional 15,000 megawatts of installed wind energy only requires an additional 18 megawatts of new flexible reserve capacity to maintain the stability of the grid.").

75. For example, the Southwest Power Pool (SPP) has operated reliably with wind as its primary power source. *SPP Sets Regional Records for Renewable Energy Production*, SW. POWER POOL (Mar. 29, 2022), https://www.spp.org/news-list/spp-sets-regional-records-for-renewable-energy-production/ [https://perma.cc/H5AV-S2WC]. At times, SPP has obtained up to 88.5% of its power from wind. *Id.*

76. LITTELL ET AL., *supra* note 60, at 9.

77. *See, e.g.*, Sarah Vogelsong, *Dominion's Green Energy Package Comes with a Catch: Coal. Businesses Aren't Happy.*, VA. MERCURY (Oct. 30, 2019, 12:01 AM), https://www.virginiamercury.com/2019/10/30/dominions-green-energy-package-comes-with-a-catch-coal-businesses-arent-happy/ [https://perma.cc/QQ53-YRN8] (discussing Dominion's proposed "renewable" offering with questionable renewable resources at a premium price).

power plants.[78] Add to that the well-documented tendency of utilities to "gold plate" their systems with consumer-billed upgrades of questionable value, and it becomes clear why dispersed, independently owned energy resources will drive down overall system costs compared to utility-owned conventional power plants.[79] If standalone DERs offer such compelling cost advantages, their aggregation and transformation into VERs and attendant economies of scale will further amplify overall savings, for the benefit of all customers but, especially, lower-income households who have to spend a disproportionately—and inequitably—high share of their income on electricity bills.

III. Regulatory Challenges For Virtual Energy

The technology required for the proliferation of virtual energy is available in the here and now; the issue is regulation.[80] To appreciate how virtual energy, and its logical predecessor distributed energy, are being held back by our current regulatory structure, start with the rooftop solar panels mentioned in the previous section. Like the backyard garden produces fruit and vegetables for its owner (a metaphor to which we return in a moment), rooftop solar can produce electricity for the roof's owner—and no one else, at the owner's election.

This is hardly the first time this form of hyper-localization has existed in electric power generation. Indeed, it can be thought of as a return of sorts to the early days of electrification. Before Samuel Insull brought together many small systems under various large monopoly umbrellas, each generator served a limited number of properties—often, no further than a few blocks in each direction.[81] This small service area mirrored the trend of pre-electric industrialization, where mechanical energy was used locally.[82] Water mills drove pulley systems, grain mills served local farmers, and so forth.[83]

Why the history lesson? After the first small-scale generators were networked into city-wide (and larger) systems, states realized that they needed to protect customers from the monopolies that were being created. Public utility commissions (PUCs) were formed to regulate prices for vertically integrated businesses, which owned the generation, transmission, and distribution of electricity within a monopoly service territory.[84] Increasing demand—directly

78. Press Release, Int'l Renewable Energy Agency, Majority of New Renewables Undercut Cheapest Fossil Fuel on Cost (June 22, 2021).

79. The incentives for utilities to overinvest in capital assets are well documented. Jonas J. Monast, *Precautionary Ratemaking*, 69 UCLA L. REV. 520, 536 (2022); Harvey Averch & Leland L. Johnson, *Behavior of the Firm Under Regulatory Constraint*, 52 AM. ECON. REV. 1052, 1052 (1962).

80. Driscoll, *supra* note 67.

81. JOEL B. EISEN ET AL., ENERGY, ECONOMICS AND THE ENVIRONMENT 62 (5th ed. 2020) (citing HAROLD L. PLATT, THE ELECTRIC CITY (1991)).

82. *Id.*

83. *See, e.g.*, DENNIS G. SHEPHERD, HISTORICAL DEVELOPMENT OF THE WINDMILL 30 (1991) (noting early American windmills were small-scale).

84. *Developments in the Law, Mandate Versus Movement: State Public Service Commissions and Their Evolving Power Over Our Energy Sources*, 135 HARV. L. REV. 1616, 1616 (2022); William Boyd & Ann E.

coupled with GDP for decades—led to ever increasing numbers of central power plants to serve that demand.[85] By the 1970s, power plants were behemoths that had grown to over 1000 megawatts in size.[86]

We designed a system of regulation for this network where electricity generation was increasingly central, and growing in scale.[87] The regulatory framework developed to manage unidirectional flow from a vertically integrated natural monopoly utility to an end customer.[88] To remove the potential of monopolistic exploitation, PUCs regulated utilities' rates, but in return guaranteed them monopoly franchises over their service territories and rights of first refusal over building new infrastructure, whether it was power plants or transmission lines.[89] Rate regulation has at its core the tension between awarding confiscatory profits to the utility, and awarding so little that the utility does not survive.[90] Well intentioned at first, but over time, it has looked far more often like the former than the latter.

A. *Shortcomings of Existing Regulation*

When production moves local, regulation need not be central. Specifically, assuming that certain functions are natural monopolies that should be the exclusive province of utilities leaves proponents of rooftop solar battling deeply entrenched incumbents with vested interests protected by (out)dated regulation.

Existing regulatory authorities are outmoded in four fundamental ways. The first derives from our long-established system of monopoly rate regulation of utilities. Rate regulation works against virtual energy. It enshrines powerful economic incentives for utilities to view VERs as unwanted competition, and to act to suppress their output.[91] More competition from VERs, coupled with

Carlson, *Accidents of Federalism: Ratemaking and Policy Innovation in Public Utility Law*, 63 UCLA L. REV. 810, 822–23 (2016).

85. U.S. ENERGY INFO. ADMIN., *History of Energy Consumption in the United States, 1775–2009* (Feb. 9, 2011), https://www.eia.gov/todayinenergy/detail.php?id=10 [https://perma.cc/H9QV-CX9P].

86. Sonal Patel, Aaron Larson & Abby Harvey, *History of Power: The Evolution of the Electric Generation Industry*, POWER MAG. (Oct. 1, 2022), https://www.powermag.com/history-of-power-the-evolution-of-the-electric-generation-industry/ [https://perma.cc/P3BC-BFG8].

87. DAVID P. TUTTLE ET AL., ENERGY INST., U. TEX. AUSTIN, THE HISTORY AND EVOLUTION OF THE U.S. ELECTRICITY INDUSTRY 3 (2016), https://energy.utexas.edu/sites/default/files/UTAustin_FCe_History_2016.pdf [https://perma.cc/CQ5E-REHW].

88. Eisen & Mormann, *supra* note 9, at 61.

89. EISEN ET. AL., *supra* note 81, at 13–17 (discussing tradeoff between regulation and franchises); LSP Transmission Holdings, LLC v. Sieben, 954 F.3d 1018, 1023 (8th Cir. 2020) ("Before issuing Order 1000, FERC allowed incumbent public utility transmission providers to exercise their federal ROFR. Under that regulatory regime, incumbents held priority status in choosing to construct new electric transmission lines in their respective service territories.").

90. Bluefield Water Works & Improvement Co. v. Pub. Serv. Comm'n, 262 U.S. 679, 690 (1923); Fed. Power Comm'n v. Hope Nat. Gas Co., 320 U.S. 591, 601 (1944).

91. *See, e.g.*, Michelle Lewis, *An Arizona Utility Just Lost in Appeals Court for Price Gouging Rooftop Solar Customers*, ELECTREK (Feb. 1, 2022, 9:38 AM), https://electrek.co/2022/02/01/an-arizona-utility-just-lost-in-appeals-court-for-price-gouging-rooftop-solar-customers/ [https://perma.cc/4992-ZG54] (discussing a 9th Circuit finding that the Salt River Project violated antitrust laws by designing rate structures to "deter the competitive threat of solar energy systems and to force customers to exclusively purchase electricity" from the utility).

stagnant overall demand for electricity, means more competition for the same pool of customers.

As we discuss below, and further in Part IV, utilities have an intrinsic conflict of interest under the current regulatory system.[92] They are gatekeepers who can use their control over the distribution system to oppose or even seek to prohibit competition with VERs for the supply of electricity.[93] At the same time, they could be participants in virtual energy: they can establish and promote their own VER programs.[94] This gives them every reason to suppress VERs, with the result being an extremely limited set of market opportunities for VERs.[95]

Second, there are vast inefficiencies and other issues with utilities' control of the distribution system. Utilities have used their political muscle and considerable resources in legislatures and PUC proceedings to aggressively fight development of appropriate incentives for VER value creation, and to seek to roll back or hamper existing incentives.[96] This has left us with a system where VER output is not valued fairly, and where compensation for owners is measured against the unlikeliest and most inapt of yardsticks: impacts on utilities' cost structure, rather than VER facilities' energy and environmental contributions to the grid.[97] Because these matters are settled in rushed legislative sessions or PUC proceedings, where ordinary consumers are outmatched in terms of understanding and participating,[98] the situation is only going to worsen rather than improve.

Next, under our current regulatory system, utilities are the sole guarantors of reliability at the local level through their ownership of the distribution grid. This introduces two major problems. Utilities routinely argue that departing from the status quo and having a diverse portfolio of electricity generating facilities featuring more virtual energy would threaten the grid's reliability.[99] The regulatory mismatch is obvious. As we explain below, it is difficult, if not impossible, to rebut their claim that reliability would be threatened with more virtual energy. We do not yet have a counterfactual—a parallel system in which diverse sources

92. *See infra* Part IV.

93. Ivan Penn, *A Solar Firm Plans to Build Off-Grid Neighborhoods in California*, N.Y. TIMES (Sept. 1, 2022), https://www.nytimes.com/2022/09/01/business/energy-environment/sunnova-off-grid-neighborhoods.html?utm_source=substack&utm_medium=email [https://perma.cc/8DMU-26DT].

94. John S. Quarterman, *FPL Opposes Rooftop Solar, Deploys Utility-Scale Solar 2021-12-20*, WWALS WATERSHED COAL. (Dec. 23, 2021), https://wwals.net/2021/12/23/fpl-opposes-rooftop-solar-deploys-utility-scale-solar-2021-12-20/ [https://perma.cc/P7TU-FKF5].

95. Penn, *supra* note 93.

96. Quarterman, *supra* note 94; *HB951: The Duke Energy Ratepayer Rip-Off Bill, Take 2*, NC WARN, https://www.ncwarn.org/hb951-energy-bill-2021/ (last visited Oct. 15, 2023) [https://perma.cc/6J9P-8TDB]; David Roberts, *Nevada's Bizarre Decision to Throttle Its Own Solar Industry, Explained*, VOX (Jan. 20, 2016, 8:30 AM), https://www.vox.com/2016/1/20/10793732/nevada-solar-industry-explained [https://perma.cc/3YPJ-MFG6].

97. St. John, *supra* note 22.

98. Shelley Welton, *Grasping for Energy Democracy*, 116 MICH. L. REV. 581, 636 (2018) ("[I]t is hard to imagine these proceedings encouraging civic participation."); Shelley Welton & Joel Eisen, *Clean Energy Justice: Charting an Emerging Agenda*, 43 HARV. ENV'T L. REV. 307, 345 (2019) (the "dense, technical, and time- and resource-intensive processes" before PUCs discourage consumer participation).

99. Lovins & Ramana, *supra* note 33.

of electricity overlap each other in belt and suspenders fashion to guarantee that there is electricity available at all times. The utility's almost limitless right to prevent virtual energy from being added to the grid in the name of "reliability" can—and does—put a substantial brake on virtual energy's prospects. This cannot continue. Yet, it also would be foolhardy to simply take a leap of faith and ask our nation to trust that a more diverse system featuring more virtual energy will be reliable. We discuss the challenge here, and in Part V, we propose a different approach to this conundrum.

These mismatches exist because of history. Our electricity regulatory system was designed for a portfolio of resources for electricity generation that no longer predominates and is poorly matched to the one we are creating going forward.[100] The problems are increasing as a result of concurrent federal and state jurisdiction over VERs which requires coordination among regulators that is assumed rather than created by positive regulation.[101] The century-old system of rate regulation assumes that monopoly utilities must be compensated for providing service to the public by building centralized infrastructure and thereby earning a guaranteed rate of return.[102] In a system increasingly dominated by virtual energy, these are outmoded assumptions.[103] As we have demonstrated, few centralized power plants are being built, except for those relying on renewable energy.

Why keep the regulatory structure we have now? The answer is simple: it persists. As we discuss more fully below, the only reasons to keep it are inertia and politics, specifically, the utilities' political muscle that preserves the status quo.[104] The status quo is tough to dislodge not because it is an optimal match for the present day, but because the sheer political dominance of utilities allows them to stop progress and stoke fear that any other system would result in higher electricity rates and diminished reliability of the grid.[105] Because no system to replace it exists or has been proposed,[106] it is difficult to appreciate what might take its place or how that might come about.

Relying upon traditional utility regulation—and in particular interposing the utility as gatekeeper between VERs and the markets—is completely incompatible with the idea of virtual energy. Once we have transformed from traditional central power generation to locally based generation, it becomes well agreed upon that electricity generation is not a monopoly function, even if some

100. Amanda Gokee, *'Epic Fail': PUC Decision on Grid Modernization Sends Advocates Back to Square One*, New Hampshire Bulletin (Feb. 11, 2022), https://newhampshirebulletin.com/2022/02/11/epic-fail-puc-decision-on-grid-modernization-sends-advocates-back-to-square-one/ [https://perma.cc/AMY2-7P4E].

101. Eisen, *supra* note 51, at 74.

102. EISEN ET. AL., *supra* note 81, at 13–17.

103. Gokee, *supra* note 100.

104. *Id.* (discussing a utility's request for PUC to reconsider a stakeholder process that would allow input on grid investments and where the PUC—after two years—did shelve the process).

105. St. John, *supra* note 22.

106. *See generally* Joel B. Eisen & Heather E. Payne, *Rebuilding Grid Governance*, 48 B.Y.U. L. REV. 1057 (2023).

states continue to regulate as though it is with small carve outs.[107] There is no reason to treat it as such. Retail electric choice has been adopted in some states, demonstrating that a natural monopoly does not exist for rate design and other retail functions.[108] Developing new transmission can be a competitive process, and the provision of transmission capacity is market-based for two-thirds of the US population who live in areas served by RTOs or Independent System Operators (ISOs).[109]

The distribution grid—the wires that deliver electricity to you—is the only part of the electricity system that still exhibits the requirements that it be considered a natural monopoly.[110] And that is where our analogy to pre-Insull days requires an adjustment. We are not at the infancy of the electric grid—the regulatory framework of consolidated utility control over local distribution networks is already in place. For example, if our rooftop solar owner sometimes does not make enough electricity to meet their demand, they purchase it from the utility, over its distribution wires. That is a lever which utilities can and do use to protect their investments in the grid. To them, more rooftop solar means less ability to recoup investments in distribution infrastructure.

The result is predictable. As more rooftop solar comes online (reducing a customer's need to purchase power from her utility), utilities come to their PUCs with requests for demand charges.[111] That is a fancy term for making sure they pay what the utilities say is their fair share of investments in distribution wires.[112] The conversation about how much utilities should be compensated for the use of their wires takes place in PUC proceedings that utilities can dominate. Not surprisingly, this often winds up with utilities extracting onerous fees from rooftop solar customers for the sheer privilege of existing.[113]

B. How Current Regulation Stymies VERs: The Utility As Gatekeeper And Market Participant

A VER that desires to market its output (or demand reductions) will have to get past the utility that stands as a gatekeeper between VERs and their potential customers. Utilities can, and do, use their gatekeeping role to impose

107. John Farrell, *Electricity's Un-Natural Monopoly,* INST. FOR LOC. SELF-RELIANCE (Jan. 9, 2015), https://ilsr.org/electricitys-unnatural-monopoly/ [https://perma.cc/H3MS-S3WL].

108. EISEN ET. AL., *supra* note 81, at 769–91.

109. Peskoe, *supra* note 24, at 37–46; Heather Payne, *Sharing Negawatts: Property Law, Electricity Data, and Facilitating the Energy Sharing Economy*, 123 PENN. ST. L. REV. 355, 367–72 (2019).

110. David Roberts, *Power Utilities are Built for the 20th Century. That's Why They're Flailing in the 21st.*, VOX (Sept. 9, 2015, 9:10 AM), https://www.vox.com/2015/9/9/9287719/utilities-monopoly [https://perma.cc/5CRQ-Q6YY].

111. Troy A. Rule, *Solar Energy, Utilities, and Fairness*, 6 SAN DIEGO J. CLIMATE & ENERGY L. 115, 121–122 (2015).

112. Herman K. Trabish, *Rate Design Roundup: Demand Charges vs. Time-Based Rates*, UTIL. DIVE (June 2, 2016), https://www.utilitydive.com/news/rate-design-demand-charges-time-based-rates/419997/ [https://perma.cc/HLW8-DVPR].

113. Rule, *supra* note 111, at 122.

bureaucratic obstacles and to require a "massive amount of work" by third-party vendors before they can gain market access.[114] After all, the utility has a blatant conflict of interest: if the utility grants market access to independently owned VERs and other third-party vendors, they become competitors who eat into the utility's market share, reducing the utility's revenues from selling its own electricity. To combat this scenario, utilities engage in obstructionist tactics, often conducted under the radar, that blunt the potential of VERs to market their output to the grid without utility involvement.[115]

Where does this leave a homeowner with rooftop solar? At present, they lack the market access necessary to become a VER. The homeowner can only consume their own production or sell it directly back to the utility.[116] That opportunity is tightly controlled in PUC proceedings that utilities can and do influence to further their self-interest.[117] Existing laws give utilities ample opportunities to exercise their control over the distribution grid to prohibit VERs from using their wires in competition with them,[118] and no state except Texas gives VERs open access.[119] The result is the extremely limited set of market opportunities VERs have today.

Indeed, aggregation of VERs is extremely limited today, essentially limited to utility and wholesale market demand response programs.[120] Opportunities for energy virtualization at the local level do not exist. This situation persists because today's regulatory framework allows utilities to block VERs from participating in aggregation programs.[121] Enrollment of household consumers in third-party demand response programs, for example, has been extremely low to date,[122] in large part because utilities refuse to make the necessary data available to third-party vendors.[123] State rules require utility authorization to share customer usage

114. Email from Kenneth Schisler, Vice President of Regulatory Affairs, cPower, to Joel B. Eisen, May 11, 2022 (copy on file with authors).

115. Heather Payne, *A Tale of Two Solar Installations*, 38 U. HAW. L. REV. 135, 166 (2016).

116. *Id.* at 152–61.

117. *See generally id.*; Welton & Eisen, *supra* note 98, at 320–21.

118. By contrast, decades ago, FERC Order 888 gave electricity generators open access to the interstate transmission grid. *But see Order No. 888*, FERC, https://www.ferc.gov/industries-data/electric/industry-activities/open-access-transmission-tariff-oatt-reform/history-oatt-reform/order-no-888 (Aug. 5, 2020) [https://perma.cc/PZE3-XWFC]. Under Order No. 888 and other FERC rules, utilities cannot prevent independent power producers from interconnecting with the high-voltage portion of the grid and using it, even though the utilities technically own the wires. EISEN ET. AL., *supra* note 81, at 701–12.

119. The Texas grid's openness to these resources likely averted greater harm and longer outages during winter storm Uri as wind and solar outperformed coal and gas power plants under stress. *See* Jacob Mays et al., *Private Risk and Social Resilience in Liberalized Electricity Markets*, 6 JOULE 368, 371–72 (2022).

120. Eisen, *supra* note 51, at 59; Stekli et al., *supra* note 31, at 5.

121. Payne, *supra* note 109, at 367–72 (2019).

122. Jeff St. John, *The Inside Story on Baltimore Gas & Electric's Behavioral-Based Demand Response*, GREENTECH MEDIA (Jan. 11, 2017), https://www.greentechmedia.com/squared/dispatches-from-the-grid-edge/the-inside-story-on-baltimores-behavioral-based-demand-response [https://perma.cc/5MGY-9V52] (indicating a less than 5% nationwide average participation rate in utility demand response programs).

123. By "data" here we mean many different relevant forms—the performance data during an event, the individual peak load contribution for summer, and a differently calculated winter peak load. *See generally* Alexandra B. Klass & Elizabeth J. Wilson, *Remaking Energy: The Critical Role of Energy Consumption Data*, 104 CAL. L. REV. 1095 (2016). We propose that the IDSO control this instead of the utilities. *See infra* Part V.

data, but utilities are reluctant to authorize sharing because they fear data breaches, unauthorized access to utility residential accounts, and, most importantly, competitive pressure from data-enabled market entrants.[124]

Wholesale market participation and aggregation of VERs is a rarity in today's electricity sector.[125] Individual resources have historically been too small to, on their own, meet the minimum size requirements for participation in wholesale markets operated by RTOs via their high-voltage transmission wires.[126] Smaller resources further struggle to meet certain qualification and performance requirements because of their operational constraints. The lower-voltage distribution network, therefore, would seem like a natural home for these resources. But utilities have every incentive to use their dominion over these wires to stymie aggregation and participation of third-party DERs in wholesale markets.[127]

FERC Order 2222 attempts to overcome these barriers,[128] requiring RTOs to make tariff changes to ensure aggregators can participate in their markets.[129] In theory, once the Order 2222 framework is fully implemented, aggregators that bring combinations of resources to the market can compete in all regional wholesale markets on the same footing as traditional power plants and other grid resources.[130] Across the country, RTOs are currently filing their plans with FERC for compliance with Order 2222's many requirements.[131] Some of these plans call for rather extensive utility involvement, including coordination between aggregators and distribution utilities to determine the locational and data components needed for aggregators' registration.[132] The potential for utilities to leverage these processes to hamper the growth of aggregations is readily apparent. Disputes over a utility's stonewalling would need to be resolved via a yet-to-be-created regime for conflict resolution. There, utilities would have the same innate resource advantage they enjoy in other proceedings.[133]

124. Payne, *supra* note 109, at 359–379 (discussing state rules around electricity data sharing, the market for aggregated usage, and utilities' recalcitrance to participate in sharing data).

125. Eisen, *supra* note 51, at 59.

126. *Id.* at 63.

127. *Id.* at 60.

128. *FERC Order No. 2222: Fact Sheet*, FERC (Sept. 17, 2020), https://www.ferc.gov/media/ferc-order-no-2222-fact-sheet [https://perma.cc/XB9J-ZTXH].

129. *Id.*

130. Order 2222 instructed RTOs to establish provisions in their tariffs to allow aggregations to engage as market participants on a level playing field with other resources. *Id.* This process is expected to take years. The MISO RTO, for example, aims for full compliance by 2030. Amanda Durish Cook, *MISO: DER Aggregations Must Wait Until 2030 for Market Participation*, RTO INSIDER (Feb 11, 2022), https://www.rtoinsider.com/29555-miso-der-aggregations-wait-2030-market-participation/ [https://perma.cc/62S2-29TE].

131. *See, e.g.*, Cal. Indep. Sys. Operator Corp., 179 FERC ¶ 61,197 (June 17, 2022) (approving the CAISO filing); N.Y. Indep. Sys. Operator, Inc., 179 FERC ¶ 61,198 (2022) (approving the NYISO filing).

132. PJM Interconnection L.L.C., Docket No. ER22-962-000 (FERC Feb. 1, 2022) (Compliance Filing); Order No. 2222 Compliance Filing of PJM Interconnection, L.L.C. Motion for Extended Comment Period, PJM Interconnection L.L.C., Docket No. ER22-962-000 (FERC Feb. 1, 2022).

133. We do not mean to slight comments that RTOs themselves can create additional barriers. For example, commenters claim that the ISO-NE RTO is imposing metering requirements that fail to take advantage of aggregations' unique capabilities. Protest and Comments of Advanced Energy Economy, PowerOptions & Solar Energy Industries Association, ISO New England, Inc., Docket No. ER22-983-000 (FERC Apr. 1, 2022).

IV. WHAT ELECTRICITY CAN LEARN FROM THE FARM-TO-TABLE MOVEMENT

This Part explains in more detail the multiple mismatches between the system of electricity regulation we have and the one we need as virtual energy grows and develops. To help better understand the challenges involved in regulating for virtual energy, we rely on an analogy throughout this Part: the market opportunities available to a farmer with a small farm who grows produce for local consumption. As we describe below, we are now decades into transforming the food system from one dominated by large farms to one that relies increasingly on local production.[134] In many ways, today's increasing pervasiveness of locally sourced electricity without widespread market opportunities recalls the situation decades ago before local food production and distribution was as prominent as now. And some challenges faced by what has come to be known for short as the "farm to table" movement at its inception are similar to those that virtual energy faces now.

At first, this might seem (pardon the pun) like an apples to oranges comparison. Yet upon further analysis, there are many similarities between the two situations. In both, the production and distribution systems provide an important commodity we all need, whether it is food or electricity.[135] And in both systems, locally sourced products have arisen as competition to the output of large production facilities situated at a distance from eventual consumers, with local food production attempting to compete with or even displace large agriculture businesses[136] and return farming to its local roots.[137] Similarly, virtual energy is not new, but is in many respects a return to locally sourced origins of electricity, which existed for years before the advent of central power plants.

134. MARK BITTMAN, ANIMAL, VEGETABLE, JUNK: A HISTORY OF FOOD FROM SUSTAINABLE TO SUICIDAL 272 (2021) ("Between 1997 and 2015, farm-to-eater sales skyrocketed from $500 million to about $3 billion . . . ."). News Release, U.S. Dept. of Agric., USDA Releases Local Food Marketing Practices Data, (Apr. 28, 2022). Today, that figure is substantially larger, according to government data. *Id.* ("Over 147,000 U.S. farms produced and sold food locally through direct marketing practices, resulting in $9.0 billion in revenue in 2020 . . . .").

135. BITTMAN, *supra* note 134, at 3 ("You gotta eat"); Rhett B. Larson, *Reconciling Energy and Food Security*, 48 U. RICH. L. REV. 929, 929 (2014) (food security and energy security are "two primary policy aims of international and domestic law").

136. There is extensive literature on the local food movement and its importance as a counterpoint to centralized food production. *See generally* LETTERS TO A YOUNG FARMER: ON FOOD, FARMING, AND OUR FUTURE 19 (Martha Hodgkins ed., 2017); TANYA DENCKLA COBB, RECLAIMING OUR FOOD: HOW THE GRASSROOTS FOOD MOVEMENT IS CHANGING THE WAY WE EAT 8 (Nancy W. Ringer & Gwen Steege eds., 2011); Mary Jane Angelo, *Corn, Carbon, and Conservation: Rethinking U.S. Agricultural Policy in a Changing Global Environment*, 17 GEO. MASON L. REV. 593, 650 (2010). For an accessible historical treatment, see *A Brief History of the Farm-To-Table Movement*, LOWCOUNTRY STYLE & LIVING, https://lowcountrystyleandliving.com/a-brief-history-of-the-farm-to-table-movement/ (last visited Oct. 15, 2023) [https://perma.cc/8Z47-D2QP]. The COVID-19 pandemic has highlighted the "fragility of the existing food supply chain that most often relies on food being transported long distances," creating a greater impetus for local or regional food initiatives. Julian Emerson, *Shifting the Focus to Local*, WISC. FARMERS UNION: WFU BLOG (Aug. 25, 2022), https://www.wisconsinfarmersunion.com/post/shifting-the-focus-to-local-farmers-join-together-to-get-healthy-food-to-people-in-their-region [https://perma.cc/5CEX-SVFT].

137. BITTMAN, *supra* note 134, at 136 ("Before the railroads were built, food was usually locally sourced.").

Another similarity between these situations is that the physical systems for getting production to the marketplace resemble each other in important ways. Large agricultural businesses supply massive amounts of produce to the nation's supermarkets, using trucks that move throughout the national highway system to do so.[138] Local farmers competing with larger farms have no need to use these long distance means of "transmission"—their produce gets to market via local streets and roads, so the planes, trains, trucks, or boats traditionally required for the long distance transport of produce are not needed.[139] In this respect, local farms compare to VERs that may have no need to use the interstate electric transmission grid.

Local food production has recognized environmental and societal benefits. Food production, like electricity generation, creates greenhouse gas emissions that contribute to climate change.[140] Produce travels shorter distances to get to the consumer, because it comes from local producers.[141] This reduces the carbon emissions involved in transportation.[142] Small-scale farming typically produces food with little pollution or soil depletion, in contrast to the wasteful environmental practices of large farms.[143] Farm-to-table often celebrates food proximity, where consumers understand the origin of the food because it comes from sources close by.[144] Some of these benefits are similar to those which VER production could achieve, such as the environmental benefits of avoiding long-distance transportation.[145]

Even the criticism that farm to table has engendered has an analogue in the electric grid. Critics argue that locally sourced produce is only economically viable for fancy restaurants and is less affordable for other consumers than food from large farms.[146] Similarly, in the electric grid, some can be expected to argue that VERs would be more expensive than centralized power production on a per-

138. Chip Millard, *From Farm to Table*, 83 PUB. RDS., 2019, at 16, 18.

139. "More than 85% of farmers market vendors traveled fewer than 50 miles to sell at a farmers markets," with more than half of farmers traveling less than 10 miles. *Resources*, FARMERS MKT. COAL., https://farmersmarketcoalition.org/education/qanda/ (last visited Oct. 15, 2023) [https://perma.cc/J5CQ-V7R5].

140. Jason J. Czarnezki, *Food, Law & the Environment: Informational & Structural Changes for a Sustainable Food System*, 31 UTAH ENV'T L. REV. 263, 263–64 (2011).

141. Stephanie Tai, *The Rise of U.S. Food Sustainability Litigation*, 85 S. CAL. L. REV. 1069, 1077–78 (2012).

142. Transportation of food accounts for 5% of total food carbon emissions. *Carbon Footprint Factsheet*, U. OF MICH. CTR. FOR SUSTAINABLE SYS. (Sept. 2022), https://css.umich.edu/publications/factsheets/sustainability-indicators/carbon-footprint-factsheet [https://perma.cc/MWD2-AR3A].

143. Louisa Chalmer, *How Small Farms Can (Sustainably) Feed the Future*, MEDIUM: AGE OF AWARENESS (May 4, 2019), https://medium.com/age-of-awareness/how-small-farms-can-sustainably-feed-the-future-45baf2ef6b4e [https://perma.cc/J5JX-G6KF].

144. *The History of the Farm to Table Movement*, LIGHTSPEED (Jan. 4, 2022), https://www.lightspeedhq.com/blog/history-farm-table-movement/ [https://perma.cc/M6LX-W5LD]; Steph Tai, *Food Sustainability in the Age of Complex, Global Supply Chains*, 71 ARK. L. REV. 465, 474 (2018); Abby Massey, *Farm to Table: Building Local and Regional Food Systems*, SARE OUTREACH 2 (Aug. 2015) https://www.sare.org/wp-content/uploads/Building-Local-and-Regional-Food-Systems.pdf [https://perma.cc/5F55-JHFM].

145. *See The History of the Farm to Table Movement*, *supra* note 144.

146. FARMERS MKT. COAL., *supra* note 139.

kWh basis.[147] In both cases, this only focuses on the price tag and ignores other benefits. And, in Part V, we suggest that a potential side effect of more market opportunities for VER output might be lower electricity prices by avoiding costs of congestion on the transmission grid and other factors that drive prices up.

There is a critical difference between the two systems. We are at the absolute earliest stages of a broader societal understanding of why locally sourced electricity has advantages over that delivered at long distances from central power plants. This movement is battling deeply entrenched incumbents with vested interests protected by (out)dated regulation. By contrast, we now have decades of experience with local farming,[148] and it has much broader acceptance than it did twenty years ago.[149] Decades after the first pioneers attempted to convince us to understand the benefits of locally sourced food,[150] local farmers are more readily accepted by consumers, although they still encounter resistance from those who think local produce is too expensive or trendy.[151]

We do not argue that these two systems are identical, that they should be regulated in the same manner, or even that our system of regulating food production and distribution should be fully emulated as a model. But viewing how local farming has developed over the past several decades can give us a sense of the potential for virtual energy. The similarities and differences between the two systems can enable us to appreciate how a system of utility regulation that regulates for virtual energy might evolve and develop.

Creating more distribution channels and valuing local production has evolved over the past two decades in the food system.[152] Highlighting the market opportunities available for local farmers, and differences in regulation and value creation, point the way to how we would propose regulating virtual energy. We do not pretend that regulatory challenges are resolved fully in the case of food production, but decades of experience can serve as a template for regulating virtual energy. We explain that here and propose a solution in Part V.

147. *See supra* note 76 and accompanying text.

148. *The History of the Farm to Table Movement*, *supra* note 144 (timeline tracing key developments to the 1970s). Law review articles have noted the "major social transformation . . . underway in our nation's food" for many years. An early work in the literature is Neil Hamilton, *Essay—Food Democracy and the Future of American Values*, 9 DRAKE J. AGRIC. L. 9, 24 (2004). The field of food law is still relatively new, but scholars are quickly adapting. *See, e.g.*, Emily M. Broad Leib & Margot J. Pollans, *The New Food Safety*, 107 CAL. L. REV. 1173, 1176 (2019) ("food regulation as a whole is undertheorized").

149. BITTMAN, *supra* note 134, at 272–73.

150. Paul Freedman, *Fifty Years Ago, Berkeley Restaurant Chez Panisse Launched the Farm-to-Table Movement*, SMITHSONIAN (July 16, 2021) https://www.smithsonianmag.com/innovation/fifty-years-ago-berkeley-restaurant-chez-panisse-launched-farm-table-movement-180978181/ [https://perma.cc/6YUU-SCJA] (profile of renowned chef and restaurant owner Alice Waters).

151. David Marchese, *Alice Waters Says People Who Call Her Elitist Just Don't Get It*, N.Y. TIMES (May 14, 2021), https://www.nytimes.com/interactive/2021/05/17/magazine/alice-waters-interview.html [https://perma.cc/52LT-67KR]. A typical criticism is that found in Kathryn Kellogg, *Farm-to-Table Restaurants*, GOING ZERO WASTE, https://www.goingzerowaste.com/blog/farm-to-table-restaurants-worth-the-cost/ (Feb. 27, 2023) [https://perma.cc/84ZB-HZRP] ("Industrial agriculture with its mega-business model supplies most restaurants with cheaper, less environmentally careful products.").

152. Massey, *supra* note 144, at 2–3.

A. Creating New Distribution Opportunities

More extensive market opportunities for virtual energy production do not exist at present, and creating them would present many foundational issues to be sorted out. As an example, let's return to the suburban neighborhood where a VER could possibly serve everyone. That would require some regulatory means for facilitating and overseeing peer to peer sales. At present, this only exists in the theoretical realm, although elsewhere we have explained a possible structure under which it might work.[153]

By contrast, consider the completely different situation that a small farmer encounters. There are many means available to them to distribute their produce.[154] They can trundle down to a farmer's market to set up shop, or sell directly from a stand at the farm.[155] But that just scratches the surface, as there are other ways for local farmers to get their produce to market. They can enter into a bilateral contract with a supermarket, a local distributor, or a restaurant. They can take advantage of innovative arrangements such as community-supported agriculture.[156] As is the case with locally sourced electricity, there is also the alternative of consuming some food produced on the farm rather than selling it in the marketplace. Not being locked into any single one of these options provides flexibility.[157]

The central distinction between distribution channels for food and electricity is not simply their relative availability, but control over them. Selling to a supermarket would put a small farmer in competition with large farms. Critically, though, no farmer gets to decide what food is sold at the supermarket. It's the *supermarket*—not any farmer or regulator—that determines which produce to buy.[158] It can purchase that produce from any source, at the lowest price if it so chooses. Or, it could decide that maintaining a relationship with a farmer who can supply it when bad weather or other conditions make it impossible to deliver across the nation, reducing carbon emissions from cross-country deliveries, is more important than purchasing at the absolute bedrock price, then it might buy from the local farmer. And if it decides that its customers might value (and

153. *See generally* Eisen & Mormann, *supra* note 9.

154. Massey, *supra* note 144, at 3.

155. On-farm stores are a popular option for local farms. News Release, *supra* note 134.

156. Christopher Kaltsas, Note, *Harmony at the Farm: Rediscovering the "Community" in Community Supported Agriculture*, 56 WM. & MARY L. REV. 961, 964 (2015) (there has been a "meteoric rise of the CSA farm format"). For a discussion of various CSA models, see TIMOTHY WOODS, MATTHEW ERNST & DEBRA TROPP. COMMUNITY SUPPORTED AGRICULTURE—NEW MODELS FOR CHANGING MARKETS 1 (2017).

157. Massey, *supra* note 144, at 2–3. We use "supermarket" as a shorthand, even as we acknowledge the upheaval in this business sector, with substantial increases in entities other than supermarkets selling food. Pharmacies, convenience stores, and large retail chains such as Target have increased their market share, often at the expense of traditional supermarkets. Scott Moses, *Reality Check: The Continued Rise of Non-Traditional, Alternative Grocers*, SUPERMARKET NEWS (June 22, 2021), https://www.supermarketnews.com/retail-financial/reality-check-continued-rise-non-traditional-alternative-grocers [https://perma.cc/8XPM-FLU2].

158. FRANK STEENEKEN & DAVE ACKLEY, BPTRENDS, A COMPLETE MODEL OF THE SUPERMARKET BUSINESS 1 (2012).

sometimes pay more for) the virtues of buying local and obtaining organic produce, that might give it another reason to purchase from the local farmer.[159]

No one would—or does—seriously suggest that large farms should have the unilateral right to block a local farmer's sales to a supermarket. True, the supermarket is subject to governmental regulation of all sorts, from food safety and inspection to nutritional labeling requirements and many more.[160] Some of these may impact the types of produce it can purchase. But that system of regulation does not treat food sales as a monopoly and is agnostic to different resources coming from different places. And, to continue the analogy, we are not simply talking about one farmer, but a network with disparate capabilities—akin to what we are creating with virtual energy. What does (or should) prevent a supermarket from contracting with multiple small farmers to have a network that can supply more and more of its needs? Nothing, as some supermarket chains use diversified local supply chains to source different kinds of food.[161]

Back to the electric grid. A VER theoretically could have opportunities to do both the equivalent of selling at farmers' markets and selling to supermarkets, at their election.[162] Yet we have described how utilities can and do impose physical and virtual barriers to prevent VERs from creating, and reaping, value at both the distribution level and the wholesale level for all of the services that they are capable of providing.[163] As long as utilities act as gatekeepers, controlling the distribution grid and preventing market opportunities for VERs, it will be difficult, if not impossible, to see where those opportunities might exist.

The infrastructure for more widespread local distribution of locally sourced electricity is nonexistent. There is no supermarket, and each utility is effectively the equivalent of both the farm and the market. Utilities continue to control the distribution grid, while at the same time are allowed under existing laws to be participants in VER value creation.[164] Amazingly, even though they both produce and distribute electricity, they have the authority to decide when, how, and under which conditions to procure electricity (or demand reductions) from VERs—or even to conduct their own VER projects rather than allow competition. It is as if large farms wanted to have their cake and eat it too: continue selling their produce, claim they are going more local, and simultaneously prevent local farmers from market sales.

159. Two examples will suffice. The Whole Foods Market chain is well known for a product procurement process that favors local and organic products. *See, e.g.*, Eric Rosenberg, *How to Get Your Product Into Whole Foods*, NAV BLOG (Jan. 27, 2021), https://www.nav.com/blog/get-your-product-into-whole-foods-21822/ [https://perma.cc/5GL3-7DP4]. Other supermarket chains track their ESG performance through the nonprofit Ratio Institute's Food Retail Environmental, Social and Governance (ESG) Reporting Standard. *New ESG Reporting Standard Earmarked for Grocers*, SUPERMARKET NEWS (Aug. 1, 2022), https://www.supermarket-news.com/sustainability/new-esg-reporting-standard-earmarked-grocers [https://perma.cc/TFG8-HTGC].

160. U.S. HOUSE OF REP. COMM. ON THE BUDGET, 116TH CONG., A VISIT TO THE GROCERY STORE: HOW THE U.S. GOVERNMENT IMPACTS A ROUTINE TRIP TO THE MARKET (Comm. Print 2019).

161. GROWING LOCAL: CASE STUDIES ON LOCAL FOOD SUPPLY CHAINS 4–5 (Robert P. King, Michael S. Hand & Miguel Gomez eds. 2014).

162. *See supra* notes 47–48 and accompanying text.

163. *See supra* note 114 and accompanying text.

164. *See supra* notes 93–94 and accompanying text.

If utilities intended to build out their own robust systems of VERs, perhaps their paternalistic gatekeeping role might be less problematic. A utility-led boom of VERs, however, is hardly likely. Instead, utilities deny the reality of climate change and slow-walk DER deployment.[165] They often simultaneously promise to conduct their own "local"-like activities and, in reality, do little to nothing of the kind.[166] Utility DER projects have a notable lack of ambition, which only reinforces the idea that there is no competitive pressure motivating utilities to do better.[167] And few utilities even envision VER-like aggregation beyond existing demand response programs.

The reason for this is simple: under the current system of rate regulation, utilities believe they would not get paid as much (if at all) for putting DERs in service. It is rare in our rate regulation system that utilities are rewarded for going small or being required to do so. No utility has any incentive to promote DERs: indeed, the financial incentives work completely to the contrary. Investments in distributed energy are harder to fold into the profit-earning rate base.[168] Moreover, DERs can reduce system demand and thereby postpone, if not altogether cancel, lucrative infrastructure investments like substation upgrades that would go into the rate base and, thus, boost the utilities' bottom line.[169] Not surprisingly, then, the pace of utility DER deployment is slow. Utilities stonewall and

165. Robinson Meyer, *It Wasn't Just Oil Companies Spreading Climate Denial*, ATL. (Sept. 7, 2022), https://www.theatlantic.com/science/archive/2022/09/electric-utilities-downplayed-climate-change/671361/ [https://perma.cc/MKQ5-WQE6] (discussing electric utilities' decades-long record of dismissing climate concerns); Jeff St. John, *New Report Shows Gap Between Utility Carbon Pledges and Climate Change Imperatives*, GREENTECH MEDIA (Jan. 26, 2021), https://www.greentechmedia.com/articles/read/new-report-highlights-gap-between-utility-carbon-pledges-and-climate-change-imperatives [https://perma.cc/3NEN-BD7R]; CARA BOTTORFF, NOAH VER BEEK & LEAH C. STOKES, SIERRA CLUB, THE DIRTY TRUTH ABOUT UTILITY CLIMATE PLEDGES 11 (2022).

166. *See, e.g.*, Julia Pyper, *Georgia Power's Rooftop Solar Program Signs up Only 5 Customers*, GREENTECH MEDIA (June 17, 2016), https://www.greentechmedia.com/articles/read/Georgia-Powers-Rooftop-Solar-Program-Signs-Up-Only-Five-Customers [https://perma.cc/5ZNY-QTD4] (discussing how Georgia Power division received 10,000 inquiries for rooftop solar its first year but only sold five installations); Dave Anderson, *The Real Cost Shift: Utilities Force Customers to Subsidize Attacks on Rooftop Solar*, ENERGY & POL'Y INST. (Nov. 4, 2016), https://www.energyandpolicy.org/real-solar-cost-shift-subsidized-attacks-on-rooftop-solar/ [https://perma.cc/N9T8-B6B8] (discussing ways Florida utilities have attempted to stifle rooftop solar development while increasing the amount of utility-owned large-scale solar in the state).

167. Pyper, *supra* note 166. Even the more ambitious utility programs have obstacles to overcome such as overly broad promises to avoid increased costs for customers. *See, e.g.*, Herman K. Trabish, *NextEra's 'Game-changing' Real Zero Emissions Goal Spurs Questions About Hydrogen, Demand-side Management*, UTIL. DIVE (Aug. 3, 2022), https://www.utilitydive.com/news/nextera-game-changing-real-zero-emissions-goal-hydrogen-demand-side-management/627975/ [https://perma.cc/7X67-QQPX].

168. Peter Behr, *Utility Executives Reveal 'Yawning Gap' in Climate Action*, E&E NEWS (July 18, 2022, 6:56 AM), https://www.eenews.net/articles/utility-executives-reveal-yawning-gap-in-climate-action/ [https://perma.cc/7C86-LVZG] ("Asked about potential barriers that could keep their organizations from hitting clean energy goals, about half said a lack of capital, and a similar percentage listed concerns that regulators would not permit rate increases that would cover the investments."). *See also* Herman K. Trabish, *97% of Smart Meters Fail to Provide Promised Customer Benefits. Can $3B in New Funding Change That?*, UTIL. DIVE (Oct. 5, 2022), https://www.utilitydive.com/news/97-of-smart-meters-fail-to-provide-promised-customer-benefits-can-3b-in/632662/ [https://perma.cc/E9U2-3EW3].

169. SUSAN F. TIERNEY, ANALYSIS GROUP, THE VALUE OF "DER" TO "D": THE ROLE OF DISTRIBUTED ENERGY RESOURCES IN SUPPORTING LOCAL ELECTRIC DISTRIBUTION SYSTEM RELIABILITY 24 (2016).

slow-walk, objecting to being prodded to do more on the basis that it is not economically advantageous for them.[170]

The remedy for this is not to encourage utilities to do more DER projects or make existing ones better. That would run into the same tailwinds we just described, unless the system of rate regulation were to fundamentally change. Even if it did, continuing to rely on utilities to deploy DERs and leverage them somehow into VER programs would produce suboptimal results.[171] As we have demonstrated elsewhere, utilities are not nimble innovators who are accustomed to developing start up projects that reach the mass market.[172] Rather than expecting utilities to build out VER projects, it makes more sense to remove their ability as gatekeepers to hinder those conducted by others. Return for a moment to our example about third-party demand response aggregations, which involves many steps for signing up and education, some of which can be influenced by utilities to ensure that programs do not succeed, by raising bureaucratic hurdles and skewing educational messages. We believe there should be better and simpler means for customers to access virtual energy without involvement by utilities.[173] We return to this in Part V.

B. Appropriate Compensation for Value Creation

Another set of regulatory mismatches for virtual energy is in how output from VERs would be valued. At the same time that effective regulation of virtual energy must create more distribution channels for VERs, it must also ensure that VERs receive full compensation for marketing their output on the distribution grid. The existing system of rate regulation works against this.

Again, we see this with the procedures for valuing the output from DERs, which rely upon PUC proceedings which utilities can influence heavily with their substantial political muscle and sophisticated understanding of PUC processes. Second, the valuation methodologies rely on outdated technical assumptions based on a system that relies on nonvirtual energy, not one that does. Finally, valuation relies on compensating utilities for their losses, not compensating DER owners fairly for the electricity they produce and the other benefits associated with VERs.

Value creation for DERs to date has primarily been done by PUCs setting values per kWh of energy (and sometimes capacity) exported to the grid.[174] The best-known mechanism for compensating DERs is net metering.[175] In the

170. Joseph P. Tomain, *Traditionally-Structured Electric Utilities in a Distributed Generation World*, 38 NOVA L. REV. 473, 511–12 (2014).

171. Joel B. Eisen, *Can Urban Solar Become a "Disruptive" Technology?: The Case For Solar Utilities*, 24 NOTRE DAME J.L., ETHICS & PUB. POL'Y 53, 64 (2010).

172. *Id.*

173. Email from Kenneth Schisler, *supra* note 114 ("[F]or small demand response applications in the mass market we need to figure out a way not to need the utility to be involved.").

174. *See supra* Section III.B (noting FERC Order 2222 aims to change this, at least in part).

175. *See generally* Heather Payne & Jonas Monast, *Valuing Distributed Energy Resources: A Comparative Analysis*, U.N.C. CE3 6 (2018).

familiar metaphor to explain net metering, the electricity meter "spins backward": when the solar panels create more electricity than the customer needs, it is exported to the grid, sometimes at the retail electricity rate.[176] Recently, net metering structures have come under fire for two principal reasons. Some claim that compensating DERs at the retail rate for electricity overcompensates them because their owners still use the entire grid without paying their fair share for its use.[177] And, the argument goes, this overcompensation cross-subsidizes wealthier ratepayers who were first adopters of solar systems when they were more expensive than now, at the expense of lower income ratepayers.[178]

Taking these arguments at face value misses the compelling counter-arguments that have been raised, notably that compensating net metering customers at retail rates takes into account the environmental benefits of having DERs on the grid.[179] If virtual energy stays local, as it were, and bypasses the long-distance electricity network—think of the farmer selling directly into local farmers' markets—setting the level of compensation for net metering exporters at a level that assumes an impact on the full grid is inapt. It is as if the only mechanism we would use to compensate a farmer in Virginia is to assume that they would sell their produce in Washington state.

Our aim is not to decide how these arguments over net metering should be resolved. Today, net metering is not the new, relatively limited system that it was twenty years ago, so arguments that it should change have some appeal.[180] But all of this misses a larger point: if these arguments are settled in PUC proceedings, utilities can influence them and convince their PUCs that VERs should not be compensated fairly.[181] The arguments about cross-subsidization and fair compensation primarily come from utilities, although they have gained some allies among those advocating for energy democracy. This dynamic is the core of the problem. As long as PUCs are in charge of making these determinations, and they are receptive to utilities (if not outright captured by them), then it is less likely that VERs will be compensated fairly. At the outset, net metering was a blunt instrument that did not attempt to set the level of fair compensation for the local electricity produced.[182] There was no indication in any early net metering scheme that compensation at the full retail rate was the appropriate level. Yet

176. *Payne*, *supra* note 115, at 154–61; Payne & Monast, *supra* note 175, at 4. *See also* GALEN L. BARBOSE, PUTTING THE POTENTIAL RATE IMPACTS OF DISTRIBUTED SOLAR INTO CONTEXT 28 (Jan. 2017), https://emp.lbl.gov/publications/putting-potential-rate-impacts [https://perma.cc/2J9H-Z94V].

177. Ari Peskoe, *Unjust, Unreasonable, and Unduly Discriminatory: Electric Utility Rates and the Campaign Against Rooftop Solar*, 11 TEX. J. OIL, GAS, & ENERGY L. 211, 216 (2016).

178. @AhmadFaruqui, Twitter (Sept. 14, 2022, 10:26 PM), https://twitter.com/AhmadFaruqui/status/1570237642301935618 [https://perma.cc/F6Q7-K7N2] (highlighting the absurdity of utility efficiency arguments using a food purchasing analogy).

179. Kyle Richmond-Crossett & Zach Green, *How Distributed Energy Resources Can Lower Power Bills, Raise Revenue in US Communities*, WORLD RES. INST. (Sept. 30, 2022), https://www.wri.org/insights/distributed-energy-resources-explained-us [https://perma.cc/9ENA-ZWF8].

180. Payne & Monast, *supra* note 175, at 6.

181. *See supra* Section III.B.

182. Eisen, *supra* note 171, at 60.

focusing on that fact today simply misses the point that some formula for appropriate valuation is necessary without utility dominance in the proceedings.

Consider how this has worked in adjusted net metering schemes, such as that put in place by Arizona. The new scheme relies on estimating the utility's avoided cost, based on the impact on the broader transmission and distribution grid of net energy exports from DERs.[183] From the perspective of the customer exporter this has many drawbacks. Instead of deciding whether the DER owner is being fairly compensated, it relies on impacts on utilities' cost structures.[184] The utility has every incentive to minimize the costs that will be avoided, as the eventual calculation of value will change its rate of return, and transparency is often hard to come by. Avoided cost calculations are also often based on marginal fuel costs only, rather than the full avoided cost including capital deployment, and certainly do not include internalizing externalities like environmental benefits and line losses.[185] Even the more up to date approaches, like New York's value of DER proceeding, are not guaranteed to value DERs fairly.[186]

We have no confidence that leaving valuation of VERs to PUC proceedings would fare any better, as it would suffer from the same drawbacks identified above. Because the utility is in competition with VERs, the result is not likely to be optimal if the utility has any say in setting the level of value creation. As in net metering proceedings, utilities will have every incentive to claim VERs will be too costly, harmful to them, and produce few benefits. Given the potential for influence that utilities have in PUC proceedings, and the challenges for citizens who attempt to intervene in these proceedings, it is unlikely that effective counter-arguments will be raised.

To return to the farm analogy, differences between valuing local produce and valuing locally sourced electricity practically leap off the page. Rewarding the farmer for the value created is a straightforward matter—the customer pays the price the farmer sets by taking relevant factors such as production costs into account.[187] There is no suggestion that any means other than arms-length bilateral negotiations should set the price. If a farmer sets the price at too high a level—$40 per pound for artisanal cucumbers, say—they will simply fail to sell them. The incentives for value creation are also more straightforward for a farmer: over time, the farmer controls how to evaluate market responses and adjust accordingly.[188] This is not at all the case on the electric grid at present. The system of value creation on the electric grid we have now is as if large farms had

183. The Commission's Investigation of Value & Cost of Distributed Generation, 34 P.U.R.4th *1 (2017).

184. *Id.*

185. *Id.* at *14.

186. James M. Van Nostrand, *Quantifying the Resilience Value of Distributed Energy Resources*, 35 J. LAND USE & ENV'T L. 15, 25–26 (2019).

187. Allan Pinto & Ariana Torres, *What You Need to Know about Selling in Farmers Markets—Let's Talk About Prices*, PURDUE UNIV. VEGETABLE CROPS HOTLINE (Aug. 31, 2017), https://vegcropshotline.org/article/what-you-need-to-know-about-selling-in-farmers-markets-lets-talk-about-prices/ [https://perma.cc/H9CP-VW2N].

188. MEGAN L. BRUCH & MATTHEW D. ERNST, A GENERAL GUIDE TO PRICING FOR DIRECT FARM MARKETERS AND VALUE-ADDED AGRICULTURAL ENTREPRENEURS 2 (2011).

a voice in deciding how much a local farmer was paid for their product, and could also argue that their cost of growing, transporting, and distributing food would be adversely affected and should serve as the sole basis for determining this payment.

The solution to this is straightforward in concept. A structure should exist that values electricity provided by VERs at prices set by a market, without influence from utility gatekeepers. That value, like that of locally sourced cucumbers, will depend on many different variables, including location. The market price of electricity should reflect the value to the customer at that place, at that time. In the next Part, we describe how a system of this sort might come about.

V. GATEKEEPING WITHOUT CONFLICTS OF INTEREST: THE INDEPENDENT DISTRIBUTION SYSTEM OPERATOR

The need for effective regulation of virtual energy is readily apparent. To realize virtual energy's full potential and achieve its wide-ranging benefits, from lower costs to reduced GHG emissions to greater resiliency, regulation must be matched to the needs of local producers rather than the needs of utilities. Too much of today's utility regulatory system is premised on a very different paradigm: the need of utilities to maintain their franchises, earn rates of return, and provide monopoly service to the public. Much recent scholarship, including ours, focuses on the many ills that this creates, such as exorbitant rates of return.[189] But we have demonstrated a very different problem—our current system of regulation perpetuates the utilities' conflict of interest as gatekeeper and market participant at the same time that VERs could gain momentum.[190]

As illustrated by our farm analogy, the distribution wires represent the only viable sales channel for any electricity generators, virtual or other, seeking to market their products. It is only natural for utilities whose power plants compete with other generators to want to abuse their control over wire assets to gain a competitive advantage, such as by denying other generators access to the grid. The solution to this problem is straightforward. The system for regulation of virtual energy must encourage more VERs and remove roadblocks to their ability to sell their output. In doing so, the system must transform from monopoly regulation to market-based regulation.

The gatekeeping currently performed by utilities—and allowed to continue by their regulators—stifles the innovation and benefits VERs can provide. We propose a new system for gatekeeping without conflicts of interest. This entails transformation of distribution system regulation, with a third-party operator standing independently from utilities and supervising the operation of—and investment into—distribution wires. We call this the "independent" distribution

189. *Payne*, *supra* note 61, at 1023–25.

190. This conflict of interest is aptly illustrated by James M. Van Nostrand, *Keeping the Fox from Managing the Henhouse: Why Incumbent Utilities Should Not Be Allowed to Operate the Distribution System Platform*, 8 GEO. WASH. J. ENERGY & ENV'T L. 23, 24 (2017).

system operator, or, for short, "IDSO."[191] As this Part explains, these must be independent nonprofit organizations created anew, as was the case with the ISO/RTOs that took over management of high-voltage transmission from utilities.[192] The IDSO model has already proven itself in other jurisdictions as a reliable, nondiscriminatory platform for managing grid access and reliability of power delivery.[193]

Creation of an IDSO has the potential to level the playing field and reduce barriers to entry for virtual energy. The potential benefits of moving to the IDSO model are substantial: enhanced market access for VERs, visibility for VERs into the distribution system, and superior reliability of the grid. Importantly, the IDSO also has the ability to broaden stakeholder engagement, making the grid more democratic in the process. Indeed, as we describe in this section, to achieve independence, open access, stakeholder engagement, and new market opportunities for VERs, we must have independent DSOs and nothing less.

In this Part, we first address why the IDSO is so critical for the future development and adoption of virtual energy, recognizing that many of the reasons the IDSO is critical equate to the specific benefits that can be derived from its creation. After explaining its responsibilities at a high level, recognizing that there will be some state-to-state variation in the final product, we outline the many benefits that adoption of the IDSO model can provide to our energy system. We then proceed to anticipate and refute utilities' most prevalent arguments against this transition. We leave one important question for Part VI: why stakeholders in the electric grid (especially utilities) would agree to create IDSOs?

A. IDSOs: Ending Utility Control Over Distribution Wires

Technically, there is a simple way to end utilities' control over the distribution system gate: through proceedings conducted by state PUCs, take control of the wires away from utilities and give it to IDSOs.[194] The IDSO becomes a third-party operator that has no stake in the generation market and thus does not suffer from the same conflict of interest as the utility. As an operator, the IDSO

191. In using this term, we recognize that others have called for the formation of IDSOs. James M. Van Nostrand, *Getting to Utility 2.0: Rebooting the Retail Electric Utility in the U.S.*, 6 SAN DIEGO J. CLIMATE & ENERGY L. 149, 182–83 (2015) (crediting former FERC Chairman Jon Wellinghoff for the idea). *See also* William Driscoll, *To Facilitate a High-DER Grid, California Explores How Distribution Grids Should Be Operated*, PV MAG. (Aug. 25, 2022), https://pv-magazine-usa.com/2022/08/25/to-facilitate-a-high-der-grid-california-explores-how-distribution-grids-should-be-operated/ [https://perma.cc/ZN6Q-L2S3] (discussing potential for this in California).

192. Some of the IDSO principles laid out in this Section strive to emulate the successes of ISOs and RTOs, while other principles aim to avoid replicating the early mistakes of these organizations. After all, the governance rules and processes of ISOs and RTOs have attracted their share of criticism and calls for reform. *See* Shelley Welton, *Rethinking Grid Governance for the Climate Change Era*, 109 CALIF. L. REV. 209, 225 (2021); Daniel Walters & Andrew N. Kleit, *Grid Governance in the Energy Trilemma Era: Remedying the Democracy Deficit*, ALA. L. REV. 1044 (forthcoming 2023); Eisen & Payne, *supra* note 106, at 1064.

193. *See, e.g.*, Astrid Cullmann & Maria Nieswand, *Regulation and Investment Incentives in Electricity Distribution: An Empirical Assessment*, 57 ENERGY ECON. 192, 192 (2016) (noting the 2400 DSOs operating across Europe).

194. Walters & Kleit, *supra* note 192, at 1068.

also does not have the same conflict around capital investment and the need to continually invest to maintain or increase returns and profit. This may seem like a daring idea, but it has been done before.[195] The electricity sector has had remarkable success creating "wire independence" at the transmission level. Following FERC Orders No. 1000 and 2000, utilities all over the country have turned control over their high-voltage transmission lines over to ISOs or RTOs.[196] Free from any conflicts of interest, these operators manage their newly entrusted wire assets so as to ensure open, nondiscriminatory access for all interested generators. The IDSO concept is a similar independent operator model applied to low-voltage distribution networks.

How would this work? A PUC would establish the IDSO and divide responsibilities between the IDSOs and the utilities subject to its jurisdiction. At its core, this would involve re-allocating responsibility among utilities, generation owners, the IDSO and other stakeholders. Some pioneering work has been done in the U.S. and Europe to describe how to do this. Roughly speaking, in this conceptual analysis, the IDSOs would perform functions akin to those of ISO/RTOs. These would include safeguarding open access for VERs, including setting and administering interconnection policies. Acknowledging the gatekeeper role that utilities have played, it is imperative that any IDSO design strip incumbent utilities of any authority over interconnection and other core responsibilities, giving these responsibilities to the IDSO instead.[197]

The IDSO would also perform coordination and dispatch to match VERs and other generation resources to demand, and engage in long-range planning for ensuring that the future supply of electricity will meet future demand.[198] This would leave utilities with considerable responsibility for delivering electricity to end users, for customer service and outage restoration, and for operation and maintenance of the distribution system, among other tasks.

By adding a new entity into the distribution-level mix, there could be some confusion about who is now expected to do what. But as the FERC-ISO/RTO-generator model has made clear, it should not be impossible to determine the appropriate PUC-IDSO-VER/utility boundaries either. While the change in the PUC role may be somewhat murky, the core role for the IDSO is simple: ensuring

195. *Id.* at 1070.

196. *See* TRAVIS LOWDER & KAIFENG XU, NAT'L RENEWABLE ENERGY LAB'Y, THE EVOLVING U.S. DISTRIBUTION SYSTEM: TECHNOLOGIES, ARCHITECTURES, AND REGULATIONS FOR REALIZING A TRANSACTIVE ENERGY MARKETPLACE 13 (2020).

197. Such core responsibilities include hosting capacity analysis that evaluates the "maximum level of DER penetration under which the distribution system can continue to operate safely and reliably." *Id.* at 20. California's PUC has approved an "integration capacity analysis" designed to address this need. Kavya Balaraman, *California Moves to Simplify Interconnection Rules for Distributed Energy Resources*, UTIL. DIVE (June 27, 2022), https://www.utilitydive.com/news/california-interconnection-rules-distributed-energy-DER-solar/626175/ [https://perma.cc/Z7VG-RQ7R].

198. We already have one example where utilities do not decide whether we have enough supply: the system for regional adequacy of power plant output, which the RTOs control when they undertake regional capacity planning and operate capacity markets.

that VERs can access the grid and obtain commensurate remuneration for the value they provide.

Building on this rough division of responsibilities, we advance several core aspects of the IDSO model. Before we do so, one caveat is in order. Any model for establishing IDSOs should offer ample room for customization, based on the number and properties of participating stakeholders, among other factors. Some foresee a more involved role for legacy utilities than others.[199] Similarly, the critical interface between the IDSO and its counterpart at the transmission level, the ISO or RTO, can be readily adapted to accommodate local needs and objectives, as can the IDSO's role in wholesale power markets.

1. Safeguard Open Access and Provide Enhanced Market Opportunities

We have highlighted the limited market opportunities available to VERs, and utilities' ability to squelch competition by abusing their position as gatekeepers. IDSOs should create appropriate channels in which VERs can sell their output, and remove the ability of utilities to stop them from doing so. No "supermarket" for electricity exists yet, so one should be created. The solution is twofold: first, to give VERs open access to the distribution wires; and second, for the IDSOs to create market-like trading platforms at the distribution levels (akin to those the ISO/RTOs maintain) where VERs could sell their electricity directly to customers.

Creating new distribution channels for accessing locally sourced electricity without barriers erected by utilities would allow VERs to reach more consumers. Some customers would rather not purchase electricity from a utility company when they can purchase electricity from nearby solar and other resources. It might be cheaper, if it avoids the added costs associated with congestion on the electric grid. It might have many other benefits comparable to those of local farming. A consumer would know with precision that the electricity was generated with renewable resources and could match a producer to the output (instead of the system we have now where all producers effectively add their undifferentiated electricity to the grid, and we use an accounting methodology to match consumption to output). Locally sourced electricity might even be easier to obtain, if the bureaucratic obstacles imposed by utilities could be overcome.

No distribution-level markets exist in the U.S., although recent scholarship in science, engineering, and law points toward pathways for achieving them.[200] As noted above, no VER can sell their output directly to consumers at present.[201] Years from now, we may have means of peer-to-peer trading in widespread use that, like the farmers' market, bypass the distribution wires, but for now these

199. Arthur Gonçalves Givisiez, Kyriacos Petrou & Luis F. Ochoa, *A Review on TSO-DSO Coordination Models and Solution Techniques*, 189 ELEC. POWER SYS. RSCH. 1, 1 (2020).

200. *See, e.g.*, Elena Georgarakis, Thomas Bauwens, Anne-Marie Pronk, & Tarek Alskaif, *Keep it Green, Simple and Socially Fair: A Choice Experiment on Prosumers' Preferences for Peer-to-Peer Electricity Trading in the Netherlands*, 159 ENERGY POL'Y, Oct. 2021, at 1, 1 (summarizing the literature and providing results of experiment on viability of peer-to-peer trading in the Netherlands); Eisen and Mormann, *supra* note 9, at 51.

201. *See supra* Subsection V.A.1.

scenarios exist only on the drawing board, or at very small scale.[202] Today, it is as if local farmers had to share roads that large farms own. Here, we must acknowledge an important, but, we believe, not insurmountable difference from our farm analogy. For the moment, the connection to any marketplace for electricity will continue to take place over distribution wires that utilities own.

The potential for conflict is obvious. If the utility could block the use of its wires then it would be impossible for VERs to bring their output to market. The solution is for the IDSO to administer the markets. As established and administered by IDSOs, these markets would be the functional equivalent of the regional wholesale markets for energy, capacity and ancillary services that RTOs currently run. This would require coordination between the IDSOs and the RTOs to ensure optimal participation in both types of markets by VERs. It would also require new regulation that compensates VERs for the full value they create and puts an end to the conflicts of interest presented by utilities' dual roles as gatekeepers and electricity producers.

In these markets, utilities and VERs should compete on a level, nondiscriminatory playing field. Utilities should be able to grow and develop their VER projects if they so choose. But just as VERs do—and just as a local farmer does with growing food—they should shoulder the challenge of producing cost-effective or environmentally beneficial electricity without competitive advantages. As a result, any system that allows for market opportunities by all participants—including and fostering competition between utilities and VERs—must include safeguards against incumbent bias.

2. Create Transparency on the Distribution System

Open access to the distribution system for VERs is inefficient without transparency. Utilities discourage competition from VERs by monopolizing both the wires themselves and the data about how they are used. The reason for this is obvious, and despite protestations, comes from one place: greed. They use this data control for multiple purposes—billing customers, of course, but also running their own demand response programs and, more nefariously, keeping usage and locational data from others.[203] The solution is for the IDSO to support data transparency, which, as described below, it can and should do in multiple ways.

With adequate data access, nonutility providers could help customers take specific actions—like insulation or other building envelope improvements—which optimize their electricity usage, decreasing not only that customer's bill but also minimizing the investment that needs to occur in the distribution system.[204] The gatekeeping issues associated with the first example can be solved

202. *See, e.g.*, Diane Cardwell, *Solar Experiment Lets Neighbors Trade Energy Among Themselves*, N.Y. TIMES (Mar. 13, 2017), https://www.nytimes.com/2017/03/13/business/energy-environment/brooklyn-solar-grid-energy-trading.html [https://perma.cc/N65T-DHY9] (discussing Brooklyn microgrid project).

203. Eisen & Mormann, *supra* note 9, at 63.

204. *Id.* at 64.

by regulators ruling that customers own their utility data and mandating easy access by customers and third parties to that data. Efforts around this gatekeeping are already underway.[205]

But information is more widely useful throughout the distribution system. Understanding where on the distribution grid solar could offset peak demand and thus defer otherwise needed investment, for example, would benefit all customers by decreasing the utility's capital expenditures and therefore its rate base. But in either case, this is not the outcome that the utility would want. They want neither their kWh sales nor their investment into the system decreased. The only way to stop this from occurring is to mandate additional data access for operational distribution-level utility data.

While utilities have long striven to quash any mention of them providing this data outside their closed operational universe based on potential terrorist attack or similar threat, utilities' behavior toward VERs demonstrate how allowing them to maintain this data in secret is harming all of society.[206] With operational data showing where there was stress (and at what times of day), it would be possible not only to target where VERs could do the most good for the entire system, but would decrease the costs associated with the distribution system for everyone.

Beyond keeping things humming smoothly, the cost of maintaining and upgrading the distribution system is an important consideration for the future of the relationship among the IDSO, the utilities, and utility consumers. Monopoly incumbent utilities are focusing their planned capital spending on the distribution system because it is the one place that—so far—they have no competition. Their grid modernization proposals invariably bundle new programs with expensive new investments that they claim are necessary to run them.[207] Over the next decade, that will equate to billions of dollars that ratepayers will need to repay—with high returns guaranteed to utilities.[208] To make the system as cost-effective as possible for all, this needs to change. Every dollar spent that does not go into the rate base but instead is invested by nonmonopoly entities for market-based compensation which is not guaranteed can decrease costs to all customers.

The IDSO can support this data transparency in multiple ways. First, it can work with PUCs where explicit energy data ownership has not been addressed and ensure that customers have ownership of their data, easy access exists for them and third-party VER providers, and operational data needed for the energy transition is readily available. Second, due to the current gatekeeping and conflicts of interest that exist around deployment of VERs, the IDSO must have control of both the interconnection queue and hosting/capacity analyses,

205. Payne, *supra* note 109, at 372–79; State of New Jersey Board of Public Utilities, Advanced Metering Infrastructure, Docket EO20110716, https://publicaccess.bpu.state.nj.us/CaseSummary.aspx?case_id=2109555 (last visited Oct. 15, 2023) [https://perma.cc/L7T5-N6JQ].

206. *See supra* notes 91–98 and accompanying text; Pomerantz, *supra* note 11.

207. *See* Quarterman, *supra* note 94; Jeff St. John, *Open-Sourcing the Grid Emissions Data Needed for 24/7 Clean Energy*, CANARY MEDIA (Aug. 30, 2022), https://www.canarymedia.com/articles/emissions-reduction/open-sourcing-the-grid-emissions-data-needed-for-24-7-clean-energy [https://perma.cc/QKC2-WYEG].

208. *See* St. John, *supra* note 207.

allowing for VERs to easily determine where they can provide the most system value, the most individual value, and where no additional upgrades or investment would be necessary for them to deploy. The IDSO controlling these analyses will ensure that incumbent monopoly utilities cannot force VERs to pay for unnecessary upgrades, or spend time investing in projects only to be told later that they will have to wait years to be able to interconnect, as is often the case now.[209] This data transparency will also enable companies to ensure their electricity is carbon free to meet corporate goals.[210]

3. *Plan For Investments in the Distribution System*

With data in hand, the IDSO will also be able to determine—in a transparent way—what investment is truly necessary in the distribution grid, ensuring that incumbent monopoly utilities do not "gold-plate" their system simply for the purpose of increasing rate base and the associated profit.[211] The IDSO will also be able to provide data to PUCs to inform conversations around minimum bills, nonbypassable charges, and other categories where the utility is currently the only entity with sufficient information, which can therefore be manipulated for their gain and profit.

In addition, the process of planning for and building new transmission in RTOs/ISOs can be competitive.[212] We also expect the planning for and construction of new or upgraded distribution facilities and wires to be open for competition.

209. Interconnections in PJM are currently out five years to six years, SPP up to eight years, and MISO is about four years out. Emma Penrod, *Why the Energy Transition Broke the U.S. Interconnection System*, UTIL. DIVE (Aug. 22, 2022), https://www.utilitydive.com/news/energy-transition-interconnection-reform-ferc-qcells/628822/ [https://perma.cc/7TAK-SUCU]. The issue is so dire that FERC has proposed a new process. Rao Konidena, *Breaking Down the FERC Interconnection NOPR*, POWERGRID INT'L (June 29, 2022), https://www.power-grid.com/td/breaking-down-the-ferc-interconnection-nopr/ [https://perma.cc/4X7R-SPAL]. Therefore, while we note that—due to the needed transparency—interconnection must sit with the IDSO, enough resources must be made available to avoid significant backlogs.

210. St. John, *supra* note 207.

211. RICHARD MCMAHON, MARK AGNEW, DANIEL FOY & ERIC YANG, EDISON ELEC. INST., INDUSTRY CAPITAL EXPENDITURES 1 (2022), https://www.eei.org/-/media/Project/EEI/Documents/Issues-and-Policy/Finance-And-Tax/bar_cap_ex.pdf?la=en&hash=3D08D74D12F1CCA51EE89256F53EBABEEAAF4673 [https://perma.cc/JY73-RJBB] (showing projected record capital expenditures by U.S. investor-owned utilities in 2022 and 2023). *See also* EDISON ELEC. INST., 2021 FINANCIAL REVIEW 72–73 (2021), https://www.eei.org/-/media/Project/EEI/Documents/Issues-and-Policy/Finance-And-Tax/Financial_Review/FinancialReview_2021.pdf [https://perma.cc/9R5F-ZRLF] (showing requested return on equity and treasury rate); Driscoll, *supra* note 67.

212. That is not to imply that the process is always smooth, as disagreements about interconnection queues amply demonstrate. Ethan Howland, *Tesla, Google, Other Corporate Power Buyers Back FERC Interconnection Reform Plan But See Pitfalls*, UTIL. DIVE (Oct. 17, 2022), https://www.utilitydive.com/news/tesla-google-amazon-apple-ferc-interconnection-reform/634231/ [https://perma.cc/CTT8-7CK6]. Similar issues exist around new transmission capacity both within RTOs/ISOs and outside. Ethan Howland, *MISO Intends to Exclude Invenergy's 5-GW Grain Belt Express Line from Upcoming Transmission Process*, UTIL. DIVE (Oct. 20, 2022), https://www.utilitydive.com/news/miso-invenergys-grain-belt-express-transmission-ferc-gbx-line/634563/ [https://perma.cc/P9EB-UPBQ].

4. Provide Superior Reliability

Moving to widespread adoption of the IDSO model inevitably raises a central question: who would guarantee reliability of the grid? Our answer is novel, but feasible: the IDSO would, with some form of coordination between it and PUCs. Utilities are "fundamentally mismatched with the needs of a modernizing grid."[213] The IDSO is the answer to how we move forward, especially on reliability.

Utilities would be the first to say this could not work. They are adept at regaling us with doomsday scenarios of how grid reliability would suffer as DERs are being added to the grid that they cannot see or control.[214] They claim there would not be enough electricity because they would not know whether enough was exported to the grid, or whether enough was being made in the aggregate. Small-scale resources, they say, cannot produce at the scale needed to meet demand, and often produce intermittently.[215] Or they say that with the VERs as both producer and consumer, they might not export their electricity to the grid but simply use it themselves.[216] As one commentator put it succinctly, "Utilities are conservative when it comes to adopting new technologies and leery of novel approaches to operating their grids," especially when there are misaligned incentives.[217] Those "misaligned incentives" are, of course, often a desire to install more capital assets in order to achieve a larger profit for shareholders.[218]

Utilities' vaunted reliability is hardly rock solid, as has been aptly demonstrated by outages following extreme weather and other events.[219] They argue the system we have now is reliable and, when it is not, they can adjust to any eventualities that arise. The sole exception to this, they say, is fluctuations in the ability to meet supply and demand that might be brought on by VERs over which they have no visibility. Leave everything to them when they can see it, and presumably it will all turn out well.

Despite utilities' recent reliability setbacks, their arguments about reliability are powerful messaging, as they would be in our farm analogy if for many years the large farms had been the sole guarantors of making sure enough food is available. Utilities can easily create perceptions of fear that doing anything other than what we do now would be catastrophic in a nation that relies heavily on electricity.[220] Why rock the boat when we have a system that keeps the lights much more often than not? Utilities also have inertia in their favor, as there is

213. Jeff St. John, *How to Move More Power with the Transmission Lines We Already Have*, CANARY MEDIA (July 29, 2022), https://www.canarymedia.com/articles/transmission/how-to-move-more-power-with-the-transmission-lines-we-already-have [https://perma.cc/9M52-NEYB].

214. *See supra* notes 67–68 and accompanying text.

215. Klass et al., *supra* note 2, at 984.

216. *Id.* at 1032.

217. St. John, *supra* note 213.

218. *Id.* ("Simply put, most U.S. transmission-owning utilities make money by convincing regulators to allow them to invest in new power lines and make other capital expenditures for equipment—not by making the power lines they already have work more efficiently.").

219. Klass et al., *supra* note 2, at 985.

220. *See supra* notes 67–68 and accompanying text.

little clamor today for doing anything other than leaving them in control of reliability.[221] Finally, there is currently no opportunity for any VER to rebut any of these arguments, as their own output is insufficient to bridge any gaps in supply that might occur. Large-scale networks of VERs could theoretically provide aggregated supply to meet demand on the grid—indeed, our definition of "VER" contemplates this—but we are not there yet.[222] To return to the farm analogy, it is as if large farms could argue that without them, access to food would be diminished so that some might have to go without it. And no individual small farmer could argue to the contrary.

We call out utilities' doomsday slippery slope arguments for exactly what they are: an attempt at intimidation and fear mongering. Indeed, intimidation and fear mongering about both unknowns and technological innovations have been the mainstay of monopolies for centuries.[223] Utilities' reliability arguments about virtual energy—a different context from any they have ever encountered—are obviously unproven. We have never tried to rely on an electric grid with more virtual energy. And there is no possible counterfactual. No one can prove today that a system that relies on more virtual energy can (or cannot) deliver electricity reliably. But we cannot simply eschew having more virtual energy because we have never tried to rely on it—that would give utilities a veto over it. If we leave utilities in charge of reliability, we have assigned this crucial task to an entity that is both the gatekeeper and a participant in the production of electricity, in competition with VERs. It is as if we put the supermarket in charge of guaranteeing there would be enough food, and did not punish it when suppressed purchases from local farmers in favor of its own brands. Far from punishing it: we would reward it with a handsome, guaranteed profit under rules that bear no relationship to whether the utility chose small producers over itself.

Consider a striking difference from the farm analogy. No supermarket is in the business of guaranteeing that each of us will have enough to eat, or that there will be enough to eat in the aggregate. In fact, there is no such central authority. The guarantee of reliability in the food system depends on a system where multiple outlets exist to buy food, and more are coming into place every day. It is true that none of this guarantees that there will always be enough food to eat for everyone everywhere.[224] The answer is not to give one firm a monopoly to sell food, but instead to coax more production throughout the system and create a different, but just as solid, guarantee of reliability. Indeed, utilities are not required to guarantee you electricity now; they are simply required to attempt to

221. *See* discussion *supra* Section III.A.

222. *See supra* notes 128–33 and accompanying text (discussing implementation of FERC Order 2222).

223. *See, e.g.*, Charles River Bridge v. Warren Bridge, 36 U.S. 420, 608 (1837) (Story, J., dissenting) (arguing that, unless the law protects monopolies, needed investment and innovation will not occur).

224. Throughout the United States, there are "food deserts" where not enough is made available at the present. *See* Sarah Whitley, *Changing Times in Rural America: Food Assistance and Food Insecurity in Rural America*, 16 J. FAM. SOC. WORK 36, 37 (2013) (food deserts are "places with no grocery store or only one with a small grocer that carries limited and expensive food items").

serve you.[225] Just as you may not sue the grocery store if they happen to be out of onions, you may not sue your utility for a blackout.

It would be too bold a leap in today's electric grid to add large amounts of virtual energy with absolutely no guardrails to ensure that our system remains reliable. But at the other end of the spectrum, we do not need to continue indefinitely to rely on utilities as central authorities over electric grid reliability. Instead, we think it more useful to change *who* guarantees against the risk. At the same time that we make broader distribution channels for locally sourced electricity available, we could—and should—mandate that the decisions and criteria that are important to securing reliability should not be within a utility's sole purview, and should instead be made by the IDSO. Indeed, we already have one example where utilities are not in the position of deciding whether there is enough supply on the grid: the system for regional adequacy of power plant output, which is within the RTOs' control.[226]

5. More Democratic Distribution Grids Promote Energy Justice

In addition to its many operational, economic, and locational benefits, the IDSO model also represents a substantial opportunity to promote energy justice. Advances in energy justice require rethinking every aspect of the complex systems by which energy is sited, produced, delivered, and used, to provide "more resilient, affordable, sustainable, and equitable energy infrastructure."[227] Many scholars have called for energy law to better incorporate concerns of fairness and equity, and actively discuss how policy decisions in the clean energy transition can promote justice for lower-income utility customers and people of color.[228]

The agenda of energy justice concerns is broad and evolving[229] but, at its core, coalesces around three key objectives, all of which the IDSO model would

225. Ellen M. Gilmer, *Can You Sue When the Power Goes Out? Liability Shields Explained*, BLOOMBERG L. (Feb. 17, 2021, 10:49 AM), https://www.bloomberglaw.com/bloomberglawnews/environment-and-energy/XADMCUKS000000?bna_news_filter=environment-and-energy#jcite [https://perma.cc/CNH8-59HT].

226. Robert Walton, *Reserve Margin May Need to Rise to 300% by 2040 as More Renewables Added to grid: ISO New England*, UTIL. DIVE (Aug. 2, 2022), https://www.utilitydive.com/news/new-england-future-grid-study-iso/628622/ [https://perma.cc/FY2X-KNDS].

227. Stephanie Lenhart & Dalten Fox, *Participatory Democracy in Dynamic Contexts: A Review of Regional Transmission Organization Governance in the United States*, 83 ENERGY RSCH. & SOC. SCI. 1, 1 (2022).

228. *See generally* Gabriel Chan & Alexandra B. Klass, *Regulating for Energy Justice*, 97 N.Y.U. L. REV. 1426 (2022); Richard J. Wallsgrove, *Restorative Energy Justice*, 40 UCLA J. ENV'T L. & POL'Y 133 (2022); Shelley Welton, *Decarbonization in Democracy*, 67 UCLA L. REV. 56 (2020); Shalanda H. Baker, *Anti-Resilience: A Roadmap for Transformational Justice within the Energy System*, 54 HARV. C.R.-C.L. L. REV. 1 (2019); Felix Mormann, *Clean Energy Equity*, 2019 UTAH L. REV. 335 (2019); Welton & Eisen, *supra* note 98; Uma Outka, *Fairness in the Low-Carbon Shift: Learning from Environmental Justice*, 82 BROOK. L. REV. 789 (2017). For an in-depth case study of energy justice efforts in one state, see Joel B. Eisen, *COVID-19 and Energy Justice: Utility Bill Relief in Virginia*, 57 U. RICH. L. REV. 155 (2022).

229. Welton & Eisen, *supra* note 98, at 308. *See also* Jeff St. John, *With Renewables, Native Communities Chart a Path to Energy Sovereignty*, CANARY MEDIA (Oct. 10, 2022), https://www.canarymedia.com/articles/energy-equity/power-by-the-people-native-energy-sovereignty [https://perma.cc/BWU8-LC2E].

advance.[230] The first objective is greater distributional justice, to be achieved via a more equitable distribution of the benefits flowing from the deployment of distributed resources.[231] As we have demonstrated already, the growing deployment of VERs will yield many benefits, but it is vital that those benefits be distributed in an equitable manner through the design and implementation of carefully designed policies.[232]

In the context of VER deployment, distributional justice has a number of dimensions. Scholars have discussed promoting equity in distributing the monetary rewards for the services that distributed resources provide, whether through net metering or other compensation systems.[233] It is well documented that lower-income households often have fewer opportunities to invest in, and reap the financial benefits of, distributed energy technologies, such as solar energy systems.[234] Moreover, these concerns do not exist in a vacuum, as lower-income households and people of color face disproportionately greater economic hardships associated with high utility bills, which scholars call "energy insecurity" (or energy poverty).[235] Studies have demonstrated that a growing number of U.S. households struggle with a high energy burden, defined as the inability to adequately meet basic household energy needs.[236] Many of these households seek to mitigate their financial burden by limiting energy consumption, which in turn poses challenges such as maintaining a healthful home temperature.[237]

The IDSO model features a number of opportunities to promote distributional justice in the deployment of VERs, principally (but by no means exclusively) by lowering the costs associated with the distribution system for all utility

230. This taxonomy builds on the three-part analytical framework first described in Dr. Darren McCauley, Dr. Raphael J. Heffron, Dr. Hannes Stephen & Kristen Jenkins, *Advancing Energy Justice: The Triumvirate of Tenets*, 32 INT'L ENERGY L. REV. 107 (2013).

231. *Id.*

232. Mormann, *supra* note 228, at 346 (noting the importance of "policy equity" in decarbonization policy).

233. Welton & Eisen, *supra* note 98, at 325–28; Mormann, *supra* note 228, at 362–65.

234. Sanya Carley & David M. Konisky, *The Justice and Equity Implications of the Clean Energy Transition*, 5 NATURE ENERGY 569, 572 (2020).

235. Michelle Graff & Sanya Carley, *COVID-19 Assistance Needs to Target Energy Insecurity*, 5 NATURE ENERGY 352, 352 (2020); Shelley Welton, *Grid Modernization and Energy Poverty*, 18 N.C. J.L. & TECH. 565, 587 (2017); Dan Boyce & Jordan Wirfs-Brock, *High Utility Costs Force Hard Decisions for the Poor*, INSIDE ENERGY (May 8, 2016), https://insideenergy.org/2016/05/08/high-utility-costs-force-hard-decisions-for-the-poor/ [https://perma.cc/6PMP-E9MD]; Robert Walton, *EIA Raises Retail Electricity Price Forecast for This Year and Next, Signaling More Pain for Consumers*, UTIL. DIVE (Oct. 13, 2022), https://www.utilitydive.com/news/eia-raises-retail-electricity-price-forecast-for-this-year-and-next-signal/634018/ [https://perma.cc/U6QY-2AME].

236. *Low-Income Community Energy Solutions*, U.S. DEP'T OF ENERGY, OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, https://www.energy.gov/eere/slsc/low-income-community-energy-solutions (last visited Oct. 15, 2023) [https://perma.cc/9W3E-F4X4]. A 2015 study by the U.S. Energy Information Administration found that "roughly one in three U.S. households [were] struggling to pay their energy bills, and one in five [were] either reducing or eliminating spending on other necessities to pay utility bills." Eisen, *supra* note 228, at 161–62 (citing Chip Berry, Carolyn Hronis & Maggie Woodward, *One in Three U.S. Households Faces a Challenge in Meeting Energy Needs*, U.S. ENERGY INFO. ADMIN. (Sept. 19, 2018), https://www.eia.gov/todayinenergy/detail.php?id=37072 [https://perma.cc/H9CW-8V3H]).

237. Shuchen Cong, Destenie Nock, Yueming Lucy Qiu & Bo Xing, *Unveiling Hidden Energy Poverty Using the Energy Equity Gap*, 13 NATURE COMMS., May 2022, at 1, 2.

customers.[238] Without a profit motive, the IDSO would have substantial opportunities to decrease the costs associated with operating the distribution system. This would, in turn, translate to lower utility bills, as the costs of distribution make up a considerable portion of utility bills.[239] Importantly, these cost benefits would accrue to all ratepayers in the system, regardless of whether they own or operate VERs. Unlike tax incentives for rooftop solar or electric vehicles that disproportionately benefit the wealthy,[240] the IDSO model's tide of cost savings would raise all boats, but especially lower-income households who spend a disproportionately greater portion of their income to meet basic energy needs. Moreover, it is not necessary to design the IDSO's rate structure for maximum efficiency. Instead, the IDSO's wire charges could be tiered to offer those with severe energy burdens rates for distribution system use set at or below cost.[241]

More widespread deployment of VERs could also provide increased opportunities for access to markets and, with it, increased compensation to a broader range of utility customers. This could especially benefit those who enjoy less access to clean energy technologies today. Consider, for example, a community solar project that is sited in and owned by residents of a historically disadvantaged community.[242] In the IDSO model, there would be more opportunities to monetize the project's output on distribution-level markets, and therefore greater incentives to develop more projects in more places.

A second objective of energy justice is to enhance procedural justice, defined as "'the fairness of the process by which goods are allocated and decisions made,' with a particular focus on 'the opportunity for all interested parties to participate in the decision process.'"[243] In numerous ways, some of which we have described above, "energy law fora present particularly challenging arenas for broad-based participation"[244] due to complex, often Byzantine procedures tilted in favor of utilities, and an imbalance of resources working against those who wish to participate. As specifically discussed in several recent articles by Professor Shelley Welton and others, ISO/RTO governance structures are not

238. *See supra* notes 49–50 and accompanying text.

239. Mormann, *supra* note 228, at 363.

240. Severin Borenstein & Lucas W. Davis, *The Distributional Effects of US Clean Energy Tax Credits*, 30 TAX POL'Y & ECON. 191, 217 (2016).

241. *See* Mormann, *supra* note 228, at 343 (noting this as a potential reason to deviate from precise balancing of costs and benefits).

242. For a discussion of how to identify communities for purposes of remedying historical disadvantages in energy availability and other metrics, see Danielle Stokes, *From Redlining to Greenlining*, 71 UCLA L. REV. (forthcoming 2024). *See also* Michelle D. Layser, *The Pro-Gentrification Origins of Place-Based Investment Tax Incentives and a Path Toward Community Oriented Reform*, 2019 WIS. L. REV. 745, 760–61 (2019) (distinguishing between community-oriented and spatially oriented place-based tax incentives).

243. Welton & Eisen, *supra* note 98, at 343.

244. *Id.* at 311; *see also* Welton, *supra* note 35, at 73–74; Julian Spector, *5 Big Takeaways on the Grassroots Clean Energy Revolution*, CANARY MEDIA (Oct. 10, 2022), https://www.canarymedia.com/articles/energy-equity/power-by-the-people-week-introduction-overview [https://perma.cc/P88J-77PV] ("But, much like democracy at large, the American energy system often fails to answer to the voice of the people. Well-resourced incumbent utilities and energy companies wield tremendous influence, and they regularly co-opt the entities meant to oversee them for the public good.").

designed to foster widespread participation,[245] in part because they were created at a time when energy justice concerns were not as paramount in the national conversation as they are now.[246]

IDSOs must not replicate the mistakes of ISO/RTO governance but must be broadly inclusory. Enhancing public participation in decision-making in the IDSO model might involve design of governance structures that give representation to broad groups of stakeholders and promote transparency.[247] In addition, the IDSO structure can feature broad-based opportunities for stakeholders to engage in grid planning and market design activities. Further opportunities are available in the development of policies that plan for new capacity on the distribution grid. The IDSO can, and should, be a broad-based and participatory mechanism for considering where new physical infrastructure, if any, is going to be built and which communities will be affected.

A final objective of energy justice is recognition justice, which argues that in the energy transition, "individuals must be fairly represented, that they must be free from physical threats and that they must be offered complete and equal political rights."[248] The IDSO model offers numerous opportunities for creativity in this regard. For example, the IDSO can engage in outreach activities designed to bring grassroots groups involved in energy justice into its activities, as a means of fostering collective engagement and strengthening the nascent networks involved in energy justice.[249] It could also create educational programs designed to help stakeholders develop the expertise necessary to become acquainted with the economic and technological issues involved in clean energy development and market administration.[250]

The IDSO has a considerable advantage over existing institutions with a view toward achieving the objectives of energy justice. The conversation in the energy literature has just begun to emphasize the need for designing electricity markets and institutional arrangements to promote equity and avoid harmful impacts on consumers.[251] Could utilities, at least in theory, serve the same function? Perhaps, but over a century of business practices that neglect, if not altogether ignore, energy justice concerns offer little hope for such a profound change of course. Starting with a blank slate with no need to reform existing institutions or break up ossified power structures, the IDSO is perfectly situated to emerge as

245. *See* Eisen & Payne, *supra* note 106, at 1115; *see also* Lenhart & Fox, *supra* note 227, at 2; Welton, *supra* note 192, at 223, 243.

246. Lenhart & Fox, *supra* note 227, at 11–12.

247. Eisen & Payne, *supra* note 106, at 1071.

248. Wallsgrove, *supra* note 228, at 141–42. The ramifications of Professor Wallsgrove's interesting proposal to replace "recognition justice" with "restorative energy justice," thereby merging energy justice with the literature on restorative justice, are beyond the scope of this Article.

249. Mary Finley-Brook, Travis L. Williams, Judi Anne Caron-Sheppard & Mary Kathleen Jaromin, *Critical Energy Justice in US Natural Gas Infrastructuring*, 41 ENERGY RSCH. & SOC. SCI. 176, 178 (2018) (noting the considerable potential for grassroots group involvement in promoting energy justice).

250. *See* Stokes, *supra* note 242, at 51.

251. *See generally* SHELLEY WELTON, KLEINMAN CTR. FOR ENERGY POL'Y, WHOLESALE ELECTRICITY JUSTICE (2022).

the new fulcrum for challenges and opportunities surrounding greater energy justice.[252] From the outset, IDSOs can be designed with careful attention to energy justice concerns and provide mechanisms to modify governance structures if needed.

B. A Rebuttal to Utility Arguments Against IDSOs

We would naturally expect utilities to make strong arguments against independent administration of the distribution system. After all, having an IDSO in place removes their control and advantages—that is precisely what we intend. In response, they—and even some other stakeholders—might argue that only utilities can handle oversight responsibilities for the distribution system because they alone understand it.[253] But we must forcefully reject any suggestion that the utilities should assume this function, as it would exacerbate current conflicts of interest and allow them to dominate new market pathways with reinforced control of the gates.[254]

Utilities would likely respond that nothing else will work, claiming that they are the only entities with in-depth knowledge of distribution grids and should therefore be the ones to continue to administer them. But knowledge does not necessarily translate to independence. Leaving utilities in charge does nothing to address the underlying unsatisfactory power imbalance.

Utilities are also likely to argue that there is no alternative to them administering the distribution grid because a new—and hitherto unknown—type of entity would have to be created for this purpose.[255] They would argue that the functions to be undertaken by an IDSO are too important to be assigned to a new, unproven institution because reliability would suffer. And, they are likely to claim, having an IDSO would lead to wasteful duplication of responsibilities.[256] But these types of arguments have been raised before, and proved unsuccessful. ISO/RTOs were created where none previously existed to take on the responsibilities of independence in administering the transmission system.

Summing up this discussion, the answer to all of the utilities' arguments is not to reject interposition of new intermediaries in the distribution system, but to engage in careful transitioning to ensure smooth continuity of operations and launches of new features such as distribution level markets. Moreover, "independent" does not have to mean "completely from scratch." We anticipate that just as utilities turned over operational control of their transmission wires to

252. Eisen & Payne, *supra* note 106, at 1085, 1125 (discussing the conditions under which existing institutions should be reformed or ended).

253. *See, e.g.*, JD Burrows, *As New York Plots Its Energy Future, a Question Emerges: Who Should Own DG?*, ENGIE (July 28, 2014), https://www.engieresources.com/as-new-york-plots-its-energy-future,-a-question-emerges-who-should-own-dg [https://perma.cc/M22F-U23J] (utility discussion on how it has "specialized knowledge and personnel" and "traditional utility responsibilities" will be part of any DSO going forward).

254. *See* Eisen & Payne, *supra* note 106, at 1077.

255. *Id.*

256. *See* Van Nostrand, *supra* note 191, at 183 (noting that this argument was successfully made against having IDSOs in New York as part of its REV proceeding).

ISO/RTOs under open access, they will cede control of the functions described above to IDSOs, which will go a long way toward legitimizing the IDSOs. And of course, "independent" does not mean "completely at arms' length" either: as in ISO/RTOs, utilities would be important stakeholders that would have a say—but not the final one—in the IDSO's structure and operations.

VI. A GRAND BARGAIN: GETTING UTILITIES TO "YES"

There remains only one question, and it's a big one. Why would utilities ever agree to relinquish their gatekeeping role and cede control of their wires to an IDSO? The problem with transitioning to IDSOs is that over a century of regulatory privileges and protections have created an electricity system with deeply entrenched interests. How could this change?[257] That is, how does one convince deeply entrenched legacy utilities to give up the (anti-)competitive advantages afforded by their dual role as generators and gatekeepers to the distribution network? We argue that the resolution of this seeming impasse requires a grand bargain, in which utilities obtain substantial benefits in exchange for voluntarily relinquishing their control over the distribution wires to IDSOs.

Indeed, to fix America's broken electricity sector, there is no realistic alternative to a grand bargain for virtual energy. Electric utilities have spent the past century-and-a-half building the dominant gatekeeping position they enjoy today. Their control over the distribution grid means that VER output must use their wires, which they have every incentive to resist. No new distribution wires are forthcoming, as building a parallel last-mile system for bringing electricity to consumers would be as prohibitively expensive as new cable or phone wires.[258] Given that cost recovery for distribution-level investments takes years, utilities will act as gatekeepers to hinder competition and prevent full market opportunities for VERs, at least until they have fully recovered their investments and made handsome profits to boot. Moreover, utilities argue that more VERs will require more distribution-level infrastructure that they should be compensated for building.[259] Along the way, utilities have accumulated considerable political clout at both the federal and state level.[260] At the same time that we are establishing the independence that allows virtual energy to grow and prosper, we must make it worth the utilities' while to transition, or otherwise they will stymie it.

Theoretically, striking a deal with utilities might not be necessary, as change could come about by regulatory mandate. PUCs could order utilities to

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257. We are aware that entire disciplines deal with change management and organizational behavior during major sociotechnical transitions, some of which we have written about ourselves in *Rebuilding Grid Governance*, Eisen & Payne, *supra* note 106, at 1077, and other works. For now, we are reflecting our own perspectives about the utility system.

258. *See* Payne, *supra* note 61, at 1034.

259. Utilities have also tried to argue that some of the projects they wanted to build before but were not approved are now needed even more because of VERs, even though that is not accurate. EISEN ET AL., *supra* note 81, at 1048–52.

260. Finley-Brook et al., *supra* note 249, at 179.

cede control over their networks to IDSOs. There is little doubt that PUCs have the authority to do this, as we discuss more fully below. Indeed, we might well argue that they *should* use their statutory powers to bring about dramatic institutional change. But pervasive regulatory capture and other disincentives to action render this path forward politically improbable.[261] Utilities are unlikely to submit to IDSO control and would resist any PUC's efforts to force such radical change on them unless it somehow furthered the utility's interests. Mindful of the political economies involved, this Part explores what it would take to secure the necessary buy-in from incumbent utilities to facilitate the nationwide roll-out of the IDSO model. We define the broad contours of an agreement—a grand bargain—to transition to independent control of utilities' distribution wires through voluntary action.

A. Regulatory Removal of Utility Control over Distribution?

The relationship between electric utilities and the public utility/service commissions that regulate them is often likened to a regulatory compact.[262] But this characterization is misleading insofar as the privileges granted to the utility by its regulator are not the product of a typical *quid pro quo* exchange at arm's length.[263] Recent archival work has demonstrated that the responsible state regulatory agencies generally established utility privileges, including monopoly control over distribution networks, through unilateral permits that conditioned said privileges upon the provision of universal service at reasonable rates.[264] From a doctrinal standpoint, these grants of privilege lack the contractual requirement of bargained-for consideration and should therefore be open to unilateral modification by the state agency.[265]

But what about the protections afforded to the utility under the Fifth and Fourteenth Amendments of the Constitution? After all, most utilities are

261. For a general account of regulatory capture's prevalence among federal and state agencies, see Michael A. Livermore & Richard L. Revesz, *Regulatory Review, Capture, and Agency Inaction*, 101 GEO. L.J. 1337, 1340–41 (2013); Sidney A. Shapiro & Rena Steinzor, *Capture, Accountability, and Regulatory Metrics*, 86 TEX. L. REV. 1741, 1744–45 (2008). For a more utility-specific account, see Heather Payne, *Game Over: Regulatory Capture, Negotiation, and Utility Rate Cases in an Age of Disruption*, 52 U.S.F. L. REV. 75, 81–83 (2018).

262. *See* Emily Hammond & David B. Spence, *The Regulatory Contract in the Marketplace*, 69 VAND. L. REV. 141, 141, 142 n.1 (2016) (describing the regulatory compact between utilities and their regulators as a 19th century concept to ensure "ordered regulation").

263. *See* Harvey L. Reiter, *Competition Between Public and Private Distributors in a Restructured Power Industry*, 19 ENERGY L.J. 333, 334 (1998) (describing the regulatory compact as a "myth"); Jim Chen, *The Death of the Regulatory Compact: Adjusting Prices and Expectations in the Law of Regulated Industries*, 67 OHIO ST. L.J. 1265, 1315 (2006) (the regulatory contract is a "misleading metaphor whose time has passed"). *See also* Letter from Ari Peskoe, Senior Fellow in Elec. Law, Harvard Env't Pol'y Initiative, to Quadrennial Energy Rev. Task Force, Off. of Energy Pol'y & Sys. Analysis, U.S. Dep't of Energy, ("The term 'regulatory contract' does not appear in any PUC order or court decision until 1982, seventy-five years after states first passed public utility laws to regulate investor-owned utilities.").

264. Joshua C. Macey & Brian Richardson, The Contractarian Origins of the Administrative State (working paper) (on file with authors).

265. *See* Letter from Ari Peskoe, *supra* note 263, at 7–8.

investor-owned and their assets private property.[266] Would regulatory reassignment of distribution network control away from the owning utility to an IDSO not constitute a regulatory taking? Most probably so,[267] but that does not prevent the state regulator from moving forward, in keeping with time-honored principles of public utility law.

In 1877, the Supreme Court set the foundation for public utility law when it upheld a similar regulatory taking by a state agency in *Munn v. Illinois*.[268] In its seminal decision, the Court reasoned that private property could be subject to public governance where said property provided such essential services that it was "clothed with a public interest."[269] The Court in *Munn* based its decision on the vital gatekeeping function that the regulated grain elevators in Chicago had assumed for the distribution of grain and flour from the Midwest to the rest of the nation.[270] Much of the Court's language and reasoning in *Munn* readily applies to the role of electric utilities as gatekeepers for the distribution of (virtual) energy.[271]

Support from strong precedent notwithstanding, we do not view a regulatory taking as the ideal path forward to establish IDSOs, except as a strong fallback option and a powerful incentive to bring utilities to the bargaining table when PUCs need to use their authority to define an IDSO's duties and responsibilities. Instead, we argue for a grand bargain for virtual energy to usher in the next era for a modernized electricity grid.

B. Lessons From the Past: The Original Grand Bargain

Today, we use the term "grand bargain" to denote an arrangement of such scope and importance that it serves "to define the focus and pace of subsequent decision-making."[272] Few remember that the term was originally coined in

266. *Investor-Owned Utilities Served 72% of U.S. Electricity Customers in 2017*, U.S. ENERGY INFO. ADMIN. (Aug. 15, 2019), https://www.eia.gov/todayinenergy/detail.php?id=40913 [https://perma.cc/7UVL-LVGR].

267. The justiciability of regulatory takings is generally traced to *Pa. Coal Co. v. Mahon*, 260 U.S. 393, 415 (1922). For a snapshot of more recent decisions on regulatory takings, see Nollan v. Cal. Coastal Comm'n, 483 U.S. 825, 841–42 (1987); Preseault v. Interstate Com. Comm'n, 494 U.S. 1, 12–13 (1990); Lucas v. S.C. Coastal Council, 505 U.S. 1003, 1019 (1992); Dolan v. City of Tigard, 512 U.S. 374, 396 (1994); Lingle v. Chevron U.S.A., Inc., 544 U.S. 528, 548 (2005); Stop the Beach Renourishment, Inc. v. Fla. Dep't of Env't Prot., 560 U.S. 702, 732–33 (2010) (plurality opinion); Ark. Game & Fish Comm'n v. United States, 568 U.S. 23, 38 (2012); Koontz v. St. Johns River Water Mgmt. Dist., 570 U.S. 595, 605–06 (2013); Horne v. U.S. Dep't of Agric., 576 U.S. 350, 367 (2015); Knick v. Twp. of Scott, 139 S. Ct. 2162, 2179 (2019); Bridge Aina Le'a, LLC v. Haw. Land Use Comm'n, 950 F.3d 610, 618 (9th Cir. 2020), *cert. denied*, Bridge Aina Le'a, LLC v. Haw. Land Use Comm'n, 141 S. Ct. 731 (2021).

268. 94 U.S. 113, 135–36 (1876).

269. *Id.* at 126.

270. *Id.* at 132 (plaintiff grain elevators were standing "in the very 'gateway of commerce,' and tak[ing] toll from all who pass").

271. *See, e.g.*, *id*. ("They stand, to use again the language [*sic*] of their counsel, in the very 'gateway of commerce,' and take toll from all who pass. Their business most certainly 'tends to a common charge, and is become a thing of public interest and use.'").

272. David Benson & Andrew Jordan, *A Grand Bargain or an Incomplete Contract: European Union Environmental Policy After the Lisbon Treaty*, 17 EUR. ENERGY & ENV'T L. REV. 280, 287–88 (2008).

reference to the agreement between employees and employers, at the dawn of the 20th century, that gave birth to the institutional framework that governs workers' compensation in the United States to this day.[273] We here propose a grand bargain for virtual energy modeled after the original x compromise over workers' compensation that redefined the relationship among American employers and their employees.

As industrialization surged in the late 19th and early 20th century, so did injuries in the workplace, often with crippling, if not fatal, outcomes.[274] Employees and their dependents mourned loss of limb or life, while employers resented the attendant shortfalls in productivity.[275] And neither side was happy with the applicable regime of tort liability.[276] An injured employee's chances of prevailing in court on a lawsuit for medical expenses, pain and suffering, or loss of earnings were severely hampered by the employer's ability to raise defenses like contributory negligence or assumption of risk.[277] Employers, meanwhile, were wary of the possibility, however remote, that an employee's successful suit would produce an award of damages so high that it threatened the survival of the firm.[278] It was against this backdrop of mutual unhappiness with the status quo that both sides, with ample prodding from government[279] and other interested parties,[280] reached an agreement that remains largely intact today, over a century later.

Early references sometimes describe the compact over workers' compensation as the Great Compromise to highlight the concessions made by both parties.[281] Employees gave up their right to suing their employers under tort law for

273. *See* Emily A. Spieler, *(Re)Assessing the Grand Bargain: Compensation for Work Injuries in the United States, 1900-2017*, 69 RUTGERS U. L. REV. 891, 893 (2017). *See generally* PRICE V. FISHBACK & SHAWN EVERETT KANTOR, A PRELUDE TO THE WELFARE STATE: THE ORIGINS OF WORKERS' COMPENSATION (1st ed. 2000).

274. *See Achievements in Public Health, 1900-1999: Improvements in Workplace Safety-United States*, 48 MORBIDITY & MORTALITY WEEKLY REP. 461, 464 (1999) (noting that annual workplace fatalities peaked at over 20,000 in 1912 before gradually declining to around 5,000, even as the total workforce expanded from 25 million to 139 million working adults).

275. *See* Jason Crawford, *"Someone Has to Get Hurt Occasionally": How Factories Were Made Safe*, ROOTS OF PROGRESS (Sept. 12, 2021), https://rootsofprogress.org/history-of-factory-safety [https://perma.cc/KC49-X6ZZ].

276. *See infra* notes 277–78 and accompanying text.

277. *See* Tracy W. Cary, *The Grand Bargain Is 100! A Look Back at the Alabama Workers' Compensation Act and a Look Ahead*, 81 ALA. LAW. 219, 220 (May 2020) ("Common law tort principles effectively precluded recovery by employees or their families for work-related accidents and deaths.").

278. *Cf.* Lawrence M. Friedman & Jack Ladinsky, *Social Change and the Law of Industrial Accidents*, 67 COLUM. L. REV. 50, 66 (1967).

279. In his 1906 Annual Message to Congress, President Theodore Roosevelt acknowledged that, even with the best precautions, "there are unavoidable accidents and even deaths involved in nearly every line of business" but decried that "[i]t is a great social injustice to compel the employee, or rather the family of the killed or disabled victim, to bear the entire burden of such an inevitable sacrifice . . . society shirks its duty by laying the whole cost on the victim, whereas the injury comes from what may be called the legitimate risks of the trade." Theodore Roosevelt, President of the United States, Sixth Annual Message (Dec. 3, 1906), https://www.presidency.ucsb.edu/documents/sixth-annual-message-4 [https://perma.cc/7NYR-Y6LW].

280. *See generally* UPTON SINCLAIR, THE JUNGLE (1st ed. 1906) (criticizing the appalling workplace, including safety conditions and lack of precautions in the meatpacking industry).

281. *See* Spieler, *supra* note 273, at 893 (noting further that the compensation system was initially known as "workmen's compensation" before changing to "workers' compensation").

an uncertain but potentially highly lucrative damages award.[282] Employers, in turn, submitted to the new framework's regime of strict liability for workplace injuries, giving up their defenses of contributory negligence and assumption of risk, among others.[283] In exchange for their sacrifice, both parties gained critical certainty and predictability. Employees no longer needed to worry that injuries suffered during the discharge of their professional duties would leave them high and dry. Instead, they were all but guaranteed a reliable, if modest, payout.[284] Employers gained the ability to better predict and insure against the risk of liability for workplace injuries. In addition, historical data suggest that both sides benefited from a slow but steady decline in the occurrence of such injuries.[285]

America's struggling electricity sector shows remarkable parallels to the crisis that led employers and employees to agree to redefine their relationship through a novel regime of workers' compensation. Just as government actors and other interested parties urged the parties of yore to meet at the bargaining table, so do plenty of stakeholders, including federal and state government, call for a rethinking of the way our electric grid is governed. New York, for example, has openly questioned the future role of electric utilities in the state.[286] Further, potential VERs and utilities are as unhappy with one another as employers and employees were in the early 20th century. DERs frequently complain over high barriers to access, discrimination by incumbent utilities, and inadequate valuation of their assets and contributions to the grid.[287] Utilities, meanwhile, worry about their dwindling shares in the power generation market and the looming obsolescence of their fossil-fueled power plants amidst tightening rules for air pollution and GHG emissions, among other concerns.[288] Both sides, in other words, have sound reasons to come to the table and discuss potential changes to the status quo.

C. Virtual Energy's Grand Bargain

How would a utility grand bargain for IDSOs work? Those looking to the formation of ISOs and RTOs for precise guidance are likely to be disappointed

282. *See* Ellen Relkin, *The Demise of the Grand Bargain: Compensation for Injured Workers in the 21st Century*, 69 RUTGERS U. L. REV. 881, 883 (2017).

283. *See id.*

284. *See* Price V. Fishback, *Long-Term Trends Related to the Grand Bargain of Workers' Compensation*, 69 RUTGERS U. L. REV. 1185, 1190–91 (2017) (reporting wide-ranging variation across states in the ratio of workers' comp benefits to earnings, from 40% in Mississippi to 80% in Oregon).

285. *Id.* at 1191–92.

286. *See, e.g.*, N.Y. STATE DEP'T OF PUB. SERV., REFORMING THE ENERGY VISION, https://www.ny.gov/sites/default/files/atoms/files/WhitePaperREVMarch2016.pdf (last visited Oct. 15, 2023) [https://perma.cc/3GVK-JNGD] ("The goal is to encourage new roles and business models for electric utilities . . . .").

287. *See supra* Section II.B.

288. The litigation leading to the Supreme Court's recent decision in *West Virginia v. EPA* aptly illustrates utilities' concern over and opposition to the threat of environmental regulation to their fossil-fueled generation assets. 142 S. Ct. 2587 (2022). Several electric utilities joined West Virginia and other state plaintiffs to sue EPA over greenhouse gas-reducing regulation that had never entered into force, even after the Biden Administration's statement the regulation would not be revived. *Id*.

because the IDSO model does not offer the same economies of scale and other benefits that convinced utilities to pool their transmission wires under third-party management. Besides, even with these benefits, many utilities required serious prodding from FERC, such as by withholding approval of desired mergers with other utilities, before they were persuaded to relinquish control over their high-voltage wires.

Most high-stakes negotiations play out under the watchful eye and guidance of a moderator or mediator.[289] For virtual energy's grand bargain, that role must be assigned to the regulator tasked with overseeing utilities—the PUCs. Active participation of PUCs and other responsible agencies in the bargaining process ensures both the utilities' active collaboration and their willingness to compromise. This expands the range of possible outcomes given the PUC's unique ability to modify applicable legal frameworks.[290]

Given the PUC's vast regulatory powers, one might assume that utilities will do all they can to avoid sitting down with their local commissioners, for fear that their own privileges and protections might be curbed. But a utility can avoid its PUC only for so long. That is because, in most jurisdictions, the commission sets the rates the utility can charge for its services, subject to periodic review.[291] Utility incentives to check in with their PUCs are especially strong during times of inflation in order to continually adjust rates to rising prices for fuel, labor, and other inputs.[292]

The stage, then, appears set for a productive bargaining process. But what chips are on the table? What is it that each side wants? For VERs, this question may be relatively easier to answer. A level playing field, nondiscriminatory access to the grid and power markets, as well as adequate remuneration for their contributions are certain to feature prominently on any VER list of objectives. All of these would be amply addressed in the IDSO model.

Utilities' incentives to negotiate might be less obvious. They hold most of the cards and are slow-walking deployment of DERs and other means of

289. *See generally* Lon L. Fuller, *Mediation—Its Forms and Functions*, 44 S. CAL. L. REV. 305 (1971).

290. Even where PUCs have characterized the relationship with their utilities as akin to a regulatory compact, they have never doubted their authority to unilaterally modify the terms of that relationship, often to the utilities' detriment. *See, e.g.*, *Re* Elec. Util. Indus. Restructuring, 1996 WL 467779 (Me. P.U.C. July 19, 1996) (electric industry restructuring "would, in effect, modify th[e] compact"); *Re* Recovery of Stranded Costs Rulemaking, 159 P.U.R.4th 279 (Me. P.U.C. 1995); *Re* Proposed Policies Governing Restructuring of California's Electric Services Industry and Reforming Regulation, 151 P.U.R.4th 73 (Cal. P.U.C. 1994). *See also Re* Regulation of Gas Utilities to Promote Efficient Use of Existing Utility Infrastructure and to Avoid Uneconomic Bypass, 139 P.U.R.4th 140 (Cal. P.U.C. 1992).

291. For insightful accounts of the history of utility rate regulation, see Emily Hammond & David B. Spence, *The Regulatory Contract in the Marketplace*, 69 VAND. L. REV. 141, 149–54 (2016); Joel B. Eisen, *FERC's Expansive Authority to Transform the Electric Grid*, 49 U.C. DAVIS L. REV. 1783, 1797 (2016). *See also* William Boyd, *Just Price, Public Utility, and the Long History of Economic Regulation in America*, 35 YALE J. ON REGUL. 721, 721 (2018) (tracing modern utility rate regulation back to the Aristotelian concept of corrective justice).

292. *See* Paul L. Joskow, *Inflation and Environmental Concern: Structural Change in the Process of Public Utility Price Regulation*, 17 J.L. & ECON. 291, 314 (1974) ("Rapid inflation had quickly changed a very passive and inactive 'rate of return' regulatory process into a very active and continual process of administrative rate of return review.").

addressing the climate crisis—indeed, without utility buy-in, decarbonization of the electric grid is unlikely to happen at the scale and pace necessary. But it is impossible to stick one's proverbial head in the sand for too long. Utilities' shares in the power generation market are dwindling, and the looming obsolescence of their fossil-fueled power plants amidst tightening rules for air pollution and GHG emissions threatens their revenues and profitability. Eventually, they will see the writing on the wall.

We envision three possible forms of incentivization for utilities' ceding operational control of the distribution system to IDSOs: payments for stranded assets, compensation for the use of their wires, and removal of restrictions on entry into certain power generation businesses. Beginning with the first of these, a simplistic view that utilities are resistant to change fails to acknowledge the dynamic nature of the broader business and regulatory context in which utilities operate. The fluctuating price of natural gas and other fuels constantly changes the bottom line of thermal power plants, as do regulations coming out of the Environmental Protection Agency, among many other influences.[293] As societal concern over climate change continues to grow, a broader commitment to decarbonizing the U.S. power sector looms large on the horizon.[294] Utility fears that carbon regulations and policy campaigns for more renewable energy deployment will render their fossil-fueled power plants obsolete and provide a powerful lever for the negotiating parties to exploit. In the past, public utility commissions have sometimes compensated utilities for assets left stranded by regulatory changes.[295] A similar pay-out is likely to feature prominently on any utility's list of objectives. This would echo the "stranded assets" argument during the earlier era of transition to retail competition.[296] To be clear, the utilities' distribution network would not qualify as a stranded asset because utilities would retain ownership of their wires and receive compensation for their use, even after they cede control to the IDSO.[297]

We would naturally expect the utilities to demand compensation for VERs' use of their wires. Recall that this is as if a small farmer had to use a large farm's roads. Utilities could well argue that if they did share their wires, their current

293. *Cf.* Ferrey, *supra* note 71, at 245.

294. In a recent poll, two in three Americans expressed concern about global warming and climate change. *See* LEISEROWITZ ET AL., *supra* note 38, at 10.

295. *See* Emily Hammond & Jim Rossi, *Stranded Costs and Grid Decarbonization*, 82 BROOK. L. REV. 645, 647 (2017) (discussing the challenges surrounding the stranded costs associated with utility investments made obsolete by a changing regulatory landscape). *See also* Alexandra B. Klass, *Future-Proofing Energy Transport Law*, 94 WASH. U. L. REV. 827, 830 (2017) (noting the tension among sunk costs, path dependency, and clean energy development in an era of growing concern over climate change and newly accessible abundant domestic fossil fuel reserves).

296. *See* Lillian Federico & Steve Piper, *Grid Transformation and Stranded Costs: An Old Topic Becomes New Again*, S&P GLOB. (July 23, 2019), https://www.spglobal.com/marketintelligence/en/news-insights/research/grid-transformation-and-stranded-costs-an-old-topic-becomes-new-again [https://perma.cc/QA8W-L2XQ].

297. *Cf.* Hammond & Rossi, *supra* note 295, at 671 ("Marginal plants thus face a temporal gap: with the CPP stalled, and while there is no real price on carbon, these plants could be considered stranded assets.").

investments in distribution infrastructure (and those called for in IRPs and other long-run plans) would not be fully recovered from ratepayers. Although this strikes us as an argument worthy of addressing, our past experience with this yields sobering lessons. Decades ago, states attempted to give consumers options other than utilities for purchasing electricity through restructuring.[298] In some states, this compensation was structured in terms of a fee or charge for the wires' use,[299] which increased would-be competitors costs and made them less competitive with utilities. If done similarly here, that would make VER-sourced electricity more costly and less appealing to consumers than that produced by utilities. It may be more appealing to create a different system of compensation, although in this Part we do not specify its precise nature.

Finally, consider removal of business restrictions. Many restructured states prohibit utilities that own and operate transmission and distribution wires from acquiring generation assets, in an attempt to mitigate potential conflicts of interest. Once a utility has transferred control of its wires to an IDSO, that conflict of interest essentially disappears, opening the door for the utility to enter the power generation market. Other states have restricted utilities' entry into new business types.[300] Forward-looking utilities may further embrace their loss of control over the distribution system and its opening to new market entrants as an opportunity to expand their business.

A caveat is in order: So far, we have painted with a fairly broad brush, treating each set of parties to the bargaining process as if they each spoke with one unified voice, as if all utilities and all VERs had the exact same concerns and objectives. The reality is, of course, far more complex. Just as the details of workers' compensation vary by state and implementing statute,[301] so do states vary in their treatment of both utilities and providers of virtual energy, depending how far along they are on the path to restructuring their government-regulated energy sectors into competitive markets.[302] At one end of the spectrum, approximately half the states adhere to the historic model of monopoly utilities reigning supreme subject to cost-of-service regulation of their rates and investments, across the generation, transmission, and distribution of electric energy.[303] At the other end of the spectrum, a handful of restructured states have abandoned most, if not

298. William T. Reisinger, *Public Utilities Law*, 49 U. RICH. L. REV. 137, 137–43 (2014).

299. *See, e.g.*, Va. Acts of Assembly, Ch. 411, 1999 Va. Acts 411 (adding a "wires charge" via new Va. Code § 56-583 in the law commencing restructuring in Virginia). This was repealed when the state ended its transition to competition in 2007. Reisinger, *supra* note 298, at 138–43.

300. *See, e.g.*, N.C. Gen. Stat. § 62-110.8(b)(4) (2021): "No more than thirty percent (30%) of an electric public utility's competitive procurement requirement may be satisfied through the utility's own development of renewable energy facilities offered by the electric public utility or any subsidiary of the electric public utility that is located within the electric public utility's service territory."

301. *See* Fishback, *supra* note 284, at 1189–95 (explaining the heterogeneity of implementation for the workers' compensation regime across states).

302. For an overview of the varied state of regulation and restructuring in energy markets across the United States, see generally Steve Isser, ELECTRICITY RESTRUCTURING IN THE UNITED STATES: MARKETS AND POLICY FROM THE 1978 ENERGY ACT TO THE PRESENT (Cambridge Univ. Press 2015); Severin Borenstein & James Bushnell, *The U.S. Electric Industry After 20 Years of Restructuring*, 7 ANN. REV. ECON. 437 (2015).

303. Borenstein & Bushnell, *supra* note 302, at 443–44.

all, monopoly protections afforded to local utilities, requiring them to compete on wholesale power markets as well as for retail sales to end users of electricity.[304] The remaining states and utilities register somewhere in between these two extremes, with many maintaining utility monopolies over wire assets and retail sales but requiring utilities to compete on wholesale markets with their generation assets. What this means is that we are, in effect, looking at some fifty different bargaining tables, all with slightly different bargaining chips in play. One size of grand bargain will not fit all. But it does not have to.

A fully monopoly-protected utility, for example, will likely demand more in exchange for opening the door to competition from VERs and others than a utility that is already competing, at the wholesale and/or retail level, with new market entrants. This heterogeneity does not necessarily hurt the prospects of successful bargaining. After all, many utilities in restructured received compensation for stranded assets when their markets were opened to some form of competition. At the same time, the greater existing degree of competition reduces the ask of VERs and others wishing to gain a foothold in the market. Proper negotiation, aware of the differences among states and utilities, can readily account for these nuances, especially since both parties' interests align largely along the same spectrum—from less to more competition and vice-versa.

VII. CONCLUSION

Network neutrality has long been a central topic and, in most jurisdictions, a core tenet of Internet policy.[305] Proponents of network neutrality point to the inability of early Internet technology to discern and discriminate among users and applications as a key driver behind the Internet's roaring success as a catalyst for innovation, free speech, and economic growth, among many other benefits.[306] Whether Internet service providers like AT&T, Verizon, or Spectrum may use more recent technology to limit who gets to use the network's on-ramps, and who does not, has been the recurring subject of high-profile rulemakings and court cases.[307]

304. *Id.* at 445–46.

305. For an overview of the burgeoning literature on network neutrality and Internet policy, see Barbara van Schewick, *Network Neutrality and Quality of Service: What a Nondiscrimination Rule Should Look Like*, 67 STAN. L. REV. 1, 2 (2015); C. Scott Hemphill, *Network Neutrality and the False Promise of Zero-Price Regulation*, 25 YALE J. ON REGUL. 135, 135–36 (2008); Christopher S. Yoo, *Network Neutrality and the Economics of Congestion*, 94 GEO. L.J. 1847, 1847 (2006).

306. *See, e.g.*, Adam Candeub, *Bargaining for Free Speech: Common Carriage, Network Neutrality, and Section 230*, 22 YALE J.L. & TECH. 391, 393 (2020) ("[D]emocracy and innovation depend upon internet freedom."). *See also* van Schewick, *supra* note 305, at 4–5 ("The network neutrality debate was triggered by a change in technology. Initially, the network was application-blind: it could not distinguish between the applications, content, and services that were running over the network.").

307. *See, e.g.*, Preserving the Open Internet, 76 Fed. Reg. 59,192 (Sept. 23, 2011) (codified at 47 C.F.R. pts. 0, 8); Preserving the Open Internet, 25 F.C.C. Rcd. 17,905 (Dec. 23, 2010), *vacated in part*, Verizon v. FCC, 740 F.3d 623 (D.C. Cir. 2014); Inquiry Concerning High-Speed Access to the Internet Over Cable and Other Facilities, Internet Over Cable Declaratory Ruling, Appropriate Regulatory Treatment for Broadband Access to

By contrast, the ability of electric utilities to guard the on-ramps to our nation's power grid has received relatively little scrutiny. For the past century-and-a-half, regulators and policymakers have considered the utilities' gatekeeping dominion a feature, rather than a bug, of the system, intended to ensure reliable electric service. In this Article, we have demonstrated that reliability arguments no longer support limiting access to distribution networks. Open and nondiscriminatory access to the power grid for solar installations, battery storage, demand response, and other distributed resources will not only enhance the network's resilience but also its sustainability and equity.

Nondiscriminatory access to the distribution grid and its markets will allow large numbers of distributed resources to coordinate and pool their output until they become virtual power plants that can mimic, and ultimately replace, the conventional power plants whose inefficiency and pollution exacerbate climate change and air pollution, with inequitably disparate social impacts. Just as virtual computing in the cloud pools the resources of multiple servers to create a sum bigger than its parts, so can virtual energy revolutionize the way we generate, deliver, and consume electricity.

To ensure the network neutrality required for the virtualization of electric power, we propose grid governance reform, with a novel nonprofit entity—the Independent Distribution Service Operator—taking over management of the distribution grid from incumbent utilities. Ceding control over their wires may not seem attractive to utilities initially, but we have presented a number of persuasive arguments why they should enter into a grand bargain modeled after the great compromise over workers' compensation that reshaped relations between employers and employees at the dawn of the 20^{th} century.

Democracy and the innovation economy have been said to depend on the free flow of ideas.[308] Virtual energy and the enabling reforms to grid governance proposed in this Article match the free flow of ideas with the free-flowing power necessary to turn ideas into action—for a more efficient, more sustainable, and more equitable energy economy.

the Internet Over Cable Facilities, 17 FCC Rcd. 4798, 4821–23 ¶¶ 37–38 (Mar. 15, 2002), *aff'd sub nom.* Nat'l Cable & Telecomm. Ass'n v. Brand X Internet Servs., 545 U.S. 967, 987–91, 1000 (2005).

308. Candeub, *supra* note 306, at 393.