Resilient and Sustainable Energy Technologies and Systems

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Mobilizing Microgram for Energy Justice
Stan. Tech L. Rev P250, Spring 2023

ABSTRACT

Accelerating climate change has unleashed historic storms, floods, and fires. To reduce emissions, the world is moving away from fossil fuels toward electrification through cleaner sources. Yet the U.S. electric utility system, much of it built a century ago, is not only failing to stand up under these conditions, but in some instances actually sparking the wildfires. Moreover, just as we are increasing our reliance on electricity for critical needs including transportation, heating, communication, data, and medical devices the United States has suffered a growing number of blackouts, brownouts, and preventative public safety power shutoffs.

Twenty-first century technologies, such as rooftop photovoltaic solar, improved batteries, and microgrid controllers, have made clean energy microgrids increasingly appealing as a defense. The military and corporations have turned to electricity self-sufficiency in the form of stand-alone microgrids to limit their vulnerability and provide reliability and resilience in response to utility failures.

Yet grid-connected microgrids are still struggling to gain a toehold in territories now served by large for-profit utility companies. This for-profit model is the dominant form of electricity service in the United States, and resistance from these companies, as well as from some of the entrenched businesses and regulators whose jobs depend on perpetuation of this century-old model, has stalled deployment of new technologies. These obstacles have recently hindered the construction of microgrids, preventing development of a type of system that could provide critical back-up services to disadvantaged communities who lack resources to advocate for themselves or to purchase energy alternatives. Providing critical back-up power as a defense for those who can least protect themselves through these community microgrids could both literally and figuratively provide shelter from the storms.

Grid Reliability Through Clean Energy
74 Stan. L. Rev. 969, May 2022

ABSTRACT

In the wake of recent high-profile power failures, policymakers and politicians have asserted that there is an inherent tension between the aims of clean energy and grid reliability. But continuing to rely on fossil fuels to avoid system outages will only exacerbate reliability challenges by contributing to increasingly extreme climate-related weather events. These extremes will disrupt the power supply, with impacts rippling far beyond the electricity sector.

This Article shows that much of the perceived tension between clean energy and reliability is a failure of law and governance resulting from the United States' siloed approach to regulating the electric grid. Energy regulation is, we argue, siloed across three dimensions: (1) across substantive responsibilities (clean energy versus reliability); (2) across jurisdictions (federal, regional, state, and sometimes local); and (3) across a public-private continuum of actors. This segmentation

renders the full convergence of clean-energy and reliability goals extremely difficult. Reliability-focused organizations operating within their silos routinely counteract climate policies when making decisions about how to keep the lights on. Similarly, legal silos often cause states and regional organizations to neglect valuable opportunities for collaboration.

Despite the challenges posed by this disaggregated system, conceptualizing the sphere of energy reliability as siloed across these dimensions unlocks new possibilities for reform. We do not propose upending energy law silos or making energy institutions wholly public. Rather, we argue for calibrated reforms to U.S. energy law and governance that shift authority within and among the silos to integrate the twin aims of reliability and low-carbon energy. Across the key policy areas of electricity markets, transmission planning and siting, reliability regulation, and regional grid governance, we assess changes that would integrate climate and reliability imperatives; balance state, regional, and federal jurisdiction; and reconcile public and private values. We believe this approach to energy law reform offers a holistic and realistic formula for a cleaner, more reliable grid.

Resilient Decarbonization for the United States: Lessons for Electric Systems from a Decade of Extreme Weather

MIT Center for Energy and Environmental Policy Research, Working Paper Series 2021-004, February 2021

ABSTRACT

The past decade has seen an unprecedented surge of climate change-driven extreme weather events that have wrought over $800 billion in damage and taken more than 5,200 lives across the United States — a trend that appears poised to intensify. At the same time, the need for a large-scale effort to decarbonize the U.S. electric power system has become clear, along with the growing climate risks and impacts that any such effort will face. This thesis argues that the principles of resilience can play a valuable role by enabling the decarbonization of the U.S. electric system, in the face of the escalating risks and impacts of climate-driven extreme weather. By emphasizing targeted hardening, proactive planning, graceful failure, and effective recoveries in the design, operation, and oversight of electric systems in the United States, we can both protect against growing climate risks and catalyze decarbonization efforts — an integrated process we call resilient decarbonization.

This work seeks to inform present and future resilient decarbonization efforts by examining the lessons of the past decade of extreme weather, and its impact on electric systems in the United States. To do so, we consider three cases: Hurricane Maria, which struck Puerto Rico in 2017, causing the world's second largest blackout; the 2017-2019 Northern California wildfire seasons, which sent the nation's largest investor-owned-utility into bankruptcy and remain the most devastating on record; and Superstorm Sandy, which served as a wakeup call for the New York/New Jersey area when it made a sudden left turn towards the region in 2012.

We find that resilient decarbonization, while a challenging process to set into motion, does in fact meet its dual mission of protecting electric systems against growing climate risks, while enabling their decarbonization. We also examine the ways in which electric system institutions take climate

risks into account, the strengths and weaknesses of resilience-based measures for electric systems, and overarching questions about the role of electricity and electric utilities in American society today.

Deep Decarbonization of New Buildings
48 ELR 10130, February 2018

ABSTRACT

New buildings present an especially important opportunity to advance energy efficiency and achieve decarbonization in the building sector, as compared with existing buildings, because of the ability to incorporate efficiency and decarbonization approaches directly into new building design. However, new buildings present a particular challenge to decarbonization. If energy-efficiency measures or electrification opportunities are not incorporated into the building design, it may be years before these measures are employed for the existing building. Further, carbon emissions from production of building materials become locked in. As a result, it is critical to focus now on new building design, construction, and operation to achieve decarbonization of new buildings.

This Article explores the rapidly changing landscape related to decarbonization of new buildings, and recommends ways to accelerate this effort. Part II addresses some of the current issues in building construction and design in terms of energy use and carbon intensity. Part III sets out the specific decarbonization goals for new buildings in the United States by 2050. Part IV defines and discusses zeroenergy buildings (ZEBs), as they represent an overarching concept that unites many of the steps that will need to be taken in new building design and construction to achieve decarbonization; Part V discusses passive buildings. Next, the Article considers action being taken in the United States (Part VI) and the European Union (EU) (Part VII) to facilitate new building energy performance. Part VIII discusses recommendations designed to meet the new building decarbonization goals, and Part IX concludes.

1. ARTICLE: Mobilizing Microgrids for Energy Justice, 26 Stan. Tech. L. Rev. P250

ARTICLE: Mobilizing Microgrids for Energy Justice

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Text

[*252] INTRODUCTION

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[*] Professor of Law and John A. Carver, Jr., Chair in Natural Resources Law, University of Denver, Sturm College of Law. The author wishes to thank the following for their substantive contributions to this article: Jeff Ackerman, Cameron Brooks, Conrad Geiger, Eleanor Gilbane, Jordan Kearns, Timothy Schoechle, Ron Sinton, and Noah Zedek. Also many thanks to my research assistants Jacob Barron, Emily Garlock, Travis Murphy, and Samantha Ogden and our law librarians Karina Condra, Marla Morris, and Michael Whitlow. Finally, I appreciate the input from Loyola University Chicago's Annual Environmental Law Scholars Workshop at Starved Rock State Park Kalyani Robbins, Michelle Bryan, Alex Erwin, Sarah Fox, Tracy Hester, Katrina Kuh, and Gabriel Pacyniak.

Humans are creatures of habit. They embrace the status quo and rarely accept change without fear or resistance. In the early 1800s, inhabitants of the United States burned wood for cooking and heating. Convincing them to switch to coal was tricky.[1] Authors at the time such as Harriet Beecher Stowe and Nathaniel Hawthorne denounced coal as, in modern terms, un-American.[2] The obstacles were both technological and cultural. Technologically, the metal stoves needed to burn coal were expensive, and the coal itself was difficult to light. Culturally, the new enclosed metal stoves unlike the open flames of a traditional fireplace were not conducive to social congregation, and they required changes to food preparation methods.[3] Finally, the smell of coal was offensive, and coal itself was blamed for an array of ailments.[4]

Once again, the United States is resisting new forms of energy. This time, the pushback is aimed against distributed or "grid-edge" technologies such as rooftop solar, storage, and the microgrids that combine these renewable energy sources to provide localized, self-sufficient power.[5] The resistance is not coming from consumers, however. Instead, it is coming from for-profit investor-owned monopoly utilities (IOUs). These IOUs benefit and derive their monopoly power from existing regulatory structures. The primary model for supplying electricity in the United States, for example, is through state franchises, granted exclusively to IOUs.[6] Furthermore, the most widely adopted electric rate structure cost of service incentivizes IOUs to continue investing in large, centralized electricity generation plants and to stifle innovation.[7] This utility **[*253]** model has led IOUs to weaponize state statutory definitions of "public utility" to thwart the deployment of microgrids and other grid-edge technologies.

Imagine how little innovation would have occurred if every new feature of an iPhone or a Tesla had to first be approved through a lumbering process before an agency that relishes its control and that permits competitors to challenge new technologies for any potential negative impact, even to those competitors' bottom lines. Instead, these technologies have flourished in a free market that employed other customer protection mechanisms.

IOU resistance to localized, self-sufficient power sources comes at a dangerous time. In 2022, the United States suffered over $171 billion in losses from record-breaking climate disasters including fires and storms.[8] The executive secretary of the United Nations Climate Change Secretariat recently declared that world powers are "nowhere near" the emission cuts necessary to avert or mitigate climate disaster.[9] Erratic weather and fires have resulted in record numbers of blackouts, brownouts, and preventative power shutoffs.[10]

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[1] Clive Thompson, *When Coal First Arrived, Americans Said "No Thanks,"* SMITHSONIAN MAG. (July/Aug. 2022), *https://perma.cc/CT2Z-7CTA*.

[2] *Id.*

[3] *Id.*

[4] *Id.*

[5] Another moniker for grid-edge technologies is "non-wires alternatives." Lisa Cohn, *What Are Non-Wires Alternatives*?, MICROGRID KNOWLEDGE (June 21, 2019), *https://perma.cc/2BZS-ES4M*. Utility companies' investments in these alternatives may reduce or eliminate the need for traditional utility infrastructure. *Id.*

[6] Anodyne Lindstrom & Sara Hoff, *Investor-Owned Utilities Served 72% of U.S. Electricity Customers in 2017*, U.S. ENERGY INFO. ADMIN. (Aug. 15, 2019), *https://perma.cc/RS4J-Q54X*.

[7] LEONARD S. HYMAN ET AL., AMERICA'S ELECTRIC UTILITIES: PAST, PRESENT & FUTURE 482 (8th ed. 2005) ("The [electric] industry seemed to have developed an allergic reaction to innovation: 'Why bother? If it succeeds, the regulator will appropriate the benefits for consumers. If it fails, the shareholders will lose out.' Or so it seemed. . . . The electric power industry allocates a paltry 0.3% of revenue to research and development.").

[8] *U.S. Billion-Dollar Weather and Climate Disasters*, NAT'L CTRS. FOR ENV'T INFO. (2023), *https://perma.cc/8TGG-6DTV*.

[9] Steven Mufson & Sarah Kaplan, *Climate-Warming Methane Emissions Rising Faster than Ever, Study Says*, WASH. POST (Oct. 26, 2022, 2:31 PM), *https://perma.cc/5VBZ-NA7A*.

Large utility infrastructure is not only a victim of weather but also of war. In November 2022, Russia began to strategically target Ukraine's energy infrastructure, plunging the populace into a winter of cold and darkness.[11] Ukraine, however, is not alone as a target. Hostile forces are using cyberattacks on energy infrastructure worldwide;[12] white supremacist attacks on electrical substations throughout the United States, for example, have "dramatically **[*254]** increased in frequency."[13] A successful attack of this kind on critical substations could "knock out power in half the country."[14]

In 1956, Congress passed legislation to fund the interstate highway system.[15] While the system had civilian benefits,[16] one of its goals was military: to reduce vulnerabilities from hostile strikes by dispersing critical infrastructure.[17] Corporations and the military have increasingly turned to microgrids for a similar reason; self-sufficient, decentralized, electrical infrastructure is less vulnerable to hostile interference.[18]

Corporations and the military are not alone in wanting to secure their sources of electricity. Energy, and more specifically electricity, has become "a fundamental need and the driving determinant of human progress."[19] Vulnerable communities need electricity for water, heat, and emergency services during times of disruption to the centralized grid. From Ukraine to New Jersey, microgrids have already provided life-saving electricity to communities in need.[20]

Yet communities in need often do not have the financial resources available to corporations or the military to create microgrids. Low-income individuals may have access to electricity, but they have fewer choices among utility

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[10] *See, e.g.*, Anodyne Lindstrom & Sara Hoff, *U.S. Electricity Customers Experienced Eight Hours of Power Interruptions in 2020*, U.S. ENERGY INFO. ADMIN. (Nov. 10, 2021), https://perma.cc/59G3-TSTF; Rachel Ramirez, *Power Outages Are on the Rise, Led by Texas, Michigan and California. Here's What's to Blame*, CNN (Sept. 14, 2022, 6:00 AM EDT), https://perma.cc/RQ6B-9EPH; *see also* POWEROUTAGE.US, https://perma.cc/4BHC-QAHY (showing real-time U.S. power outage data).

[11] Marc Santora, *For Ukraine, Keeping the Lights On Is One of the Biggest Battles*, N.Y. TIMES (Nov. 17, 2022), https://perma.cc/584Y-HYNW ("In a relentless and intensifying barrage of missiles fired from ships at sea, batteries on land and planes in the sky, Moscow is destroying Ukraine's critical infrastructure, depriving millions of heat, light and clean water.").

[12] *See, e.g.*, Tawfiq M. Aljohani, *Cyberattacks on Energy Infrastructures: Modern War Weapons*, ARXIV (Aug. 28, 2022, 05:19:48 UTC), https://perma.cc/3HN6-CHQ5.

[13] ILANA KRILL & BENNETT CLIFFORD, MAYHEM, MURDER, AND MISDIRECTION: VIOLENT EXTREMIST ATTACK PLOTS AGAINST CRITICAL INFRASTRUCTURE IN THE UNITED STATES, 2016-2022 (2022), https://perma.cc/2QZA-K7UR.

[14] Michael Levenson, *Attacks on Electrical Substations Raise Alarm*, N.Y. TIMES (Feb. 4, 2023), https://perma.cc/LYP5-5BJQ.

[15] Federal-Aid Highway Act of 1956, 23 U.S.C. §§ 101-301 (1956).

[16] *Interstate Highway System - The Myths*, FED. HIGHWAY ADMIN., https://perma.cc/ZFS9-T5X6 (Nov. 20, 2019).

[17] 23 U.S.C. § 108 (1956) ("Because of its primary importance to the national defense, the name of such system is hereby changed to the 'National System of Interstate and Defense Highways.'").

[18] *See* Ken Silverstein, *Microgrids Might Make Sense Especially for Remote Businesses with Limited Grid Access*, ENV'T + ENERGY LEADER (Feb. 4, 2022), https://perma.cc/47MU-W6Y3; *"Fort Renewable" Shows Benefits of Batteries and Microgrids for Military and Beyond*, NAT'L RENEWABLE ENERGY LAB'Y (July 27, 2021), https://perma.cc/6GNF-TDNA.

[19] Lakshman Guruswamy, *Energy Justice and Sustainable Development*, 21 COLO. J. INT'L ENV'T L. & POL'Y 231, 233 (2010).

[20] *See* Eliza Batchelder et al., *Ukraine's Potential Energy*, CTR. FOR STRATEGIC & INT'L STUD., https://perma.cc/J56Y-GUHH; Morgan Kelly, *Two Years After Hurricane Sandy, Recognition of Princeton's Microgrid Still Surges*, PRINCETON UNIV. (Oct. 23, 2014, 2:00 PM), https://perma.cc/67WV-FEKU.

[*255] providers and face higher energy burdens.[21] In addition, as this Article shows, many utilities have traditionally resisted microgrids or other innovative technologies.

The federal government is providing some relief for communities who previously might not have been able to make energy choices. The Biden Administration's Justice40 Initiative is providing resources to address energy insecurity in the United States and includes a number of energy-specific targets including access to reliable and clean energy and responses to climate change impacts.[22] The Inflation Reduction Act and the Infrastructure Investment and Jobs Act also provide federal funding for these initiatives.[23] However, some of this funding will expire within the next two years, and money alone will not solve the problems if the underlying system is broken as it is with electric utilities in most states.

Although microgrids as a concept have increasingly gained support, their implementation still faces obstacles. For example, the California Public Utility **[*256]** Commission's (CPUC) handling of Sunnova's recent application to operate "public utility microgrids" reflects the sources of future debate and challenges to come.

This Article proceeds in five parts. Part I explains microgrid technology and its benefits both to participants and to the centralized grid. This Part also describes community microgrids and their special attributes. Finally, it illustrates the devastating impact of the current utility regulatory structure on innovative microgrid technologies, using as an example the recent CPUC's rejection, without a hearing, of Sunnova's application to serve as a microgrid utility.

Sections II.A through II.C provide background regarding how the current investor-owned utility structure came to dominate the United States. This background is important to better understand how current structure is stifling competition and impeding the deployment and development of new technologies. Section II.D chronicles how Federal Energy Regulatory Commission (FERC) intervention was required to encourage IOUs to competitively price grid-edge technologies such as solar generation, storage, and demand-side management three of the technologies that microgrids now embrace. These efforts also illustrate federal government's limited ability to fix predominantly intrastate infrastructure systems controlled by state legislatures and public utility commissioners susceptible to industry lobbyists.

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[21] "Energy burden" refers to the portion of a household's income spent on home energy costs. U.S. DEPT. OF ENERGY, OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, LOW-INCOME HOUSEHOLD ENERGY BURDEN VARIES AMONG STATES EFFICIENCY CAN HELP IN ALL OF THEM (2018), *https://perma.cc/L6C2-URH9*. Energy justice attempts to address this inequity, much as environmental justice addresses the disproportionate burden of environmental harms on disproportionally impacted, or "overburdened," communities. *EJ 2020 Glossary*, U.S. ENV'T PROT. AGENCY, *https://perma.cc/5MQ4-5VYW* (Aug. 18, 2022). "Energy poverty" is a multidimensional concept, ranging from a complete lack of access to electricity to a lack of affordability, reliability, or environmentally sound energy sources. *See, e.g.*, SLAVICA ROBI ET AL., UNDERSTANDING ENERGY POVERTY CASE STUDY: TAJIKISTAN (2010), *https://perma.cc/D8Z7-8LL4*; WORLD ECON. F., FOSTERING EFFECTIVE ENERGY TRANSITION: 2022 EDITION (2022), *https://perma.cc/8B2E-PQ2X*. Energy justice is distinct from environmental or climate justice, although the three are closely related. K.K. DUVIVIER, ENERGY LAW BASICS 34 (2017).

[22] Soon after taking office, President Biden signed Executive Order 14,008, which announced the "Justice40 Initiative," a pledge that 40% of the overall benefits of certain federal investments flow to populations that have been marginalized and overburdened by pollution. *Justice40: A Whole-of-Government Initiative*, THE WHITE HOUSE, *https://perma.cc/BQ8N-CKZF*. The process has begun by identifying "disadvantaged communities" that will be the focus of initial efforts. *Id.* On April 21, 2023, President Biden signed a follow-up Executive Order on Revitalizing Our Nation's Commitment to Environmental Justice for All. Exec. Order No. 14,096, 88 Fed. Reg. 25251 (Apr. 26, 2023). The order creates the White House Office of Environmental Justice to encourage the consideration of environmental justice in all White House work related to state, tribal, territorial, and local governments. *Id.* In 2022, the EPA formed its own Office of Environmental Justice and External Civil Rights, merging three existing EPA programs to help administer some of the environmental justice initiatives in the Inflation Reduction Act (IRA). *EPA Launches New National Office Dedicated to Advancing Environmental Justice and Civil Rights*, U.S. ENV'T PROT. AGENCY, *https://perma.cc/8M5R-LASX* (Sept. 24, 2022).

[23] Inflation Reduction Act of 2022, ***Pub. L. No. 117-169***, ***136 Stat. 1818*** (2022); Infrastructure Investment and Jobs Act, ***Pub. L. No. 117-58***, ***135 Stat. 429*** (2021).

Part III is a comprehensive survey of state regulation of the public utility industry. Because the answers cannot come from the federal government, this Part sets out the various state statutes that define what entities qualify as "public utilities" that must be regulated by state commissions. Part IV exhibits how private utilities have weaponized these state statutory definitions to stymie the deployment of rooftop solar.

Part V chronicles the paltry efforts of the four states that have attempted to promote microgrids, arguing that even the most significant of these efforts, by California, are insufficient. Finally, this Part summarizes promising state and federal funding opportunities to promote community microgrids. These efforts, however, will have limited success if the underlying regulatory structure continues to thwart and delay their deployment.

I. MICROGRIDS

Microgrids are self-contained electricity systems that can operate independently from the macrogrid (more commonly called "the grid"). Modern **[*257]** clean microgrids are made possible by novel technologies, including (1) electricity generation from photovoltaic solar panels and wind turbines, (2) energy storage,[24] and (3) coordination of demands, also called "demand-side management," using a microgrid controller, a sophisticated energy management software system.[25] The latter is the newest and fastest evolving of these technologies. A microgrid controller enables a microgrid "to switch off from the central grid . . . and . . . direct the new flows of energy from on-site resources to meet facility load."[26]

The utility structure and regulatory problems and solutions discussed throughout this Article apply to each of these new technologies: solar and wind generation, battery storage, and microgrid coordination and control of electricity generation and consumption. The focus here, however, is on microgrids, for two reasons. First, microgrids utilize all of the previously mentioned new technologies. Second, most of the other technologies, such as solar and storage, now have a history of challenges and legislative or federal regulatory fixes for those challenges, but microgrids are facing some of the greatest grid-connection hurdles just as they are also garnering more attention and financial resources because of the role they can play for climate disaster resiliency.

This Part will begin by discussing (A) the attributes of microgrids, then (B) the special promise of community microgrids for addressing energy justice issues. Finally, this Part will recount (C) how recent efforts to introduce an innovative microgrid model by Sunnova in California has been rebuffed.

[*258] *A. Microgrid Attributes*

Before alternating current (AC) permitted a central-station model with (1) coal plants or hydropower for generation, (2) transmission, and (3) distribution to customers isolated power plants were the norm. These isolated power plants, owned by institutions and early utilities including Edison's Pearl Street Station were more similar to today's microgrids rather than the sprawling utility macrogrids that now span multiple states and millions of customers.[27] These plants often included the components of current statutory microgrid definitions: "integrated energy system[s] consisting of interconnected loads and distributed energy resources (including generators and energy storage

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[24] The DOE has created the Energy Storage Grand Challenge (ESGC) as a comprehensive program to accelerate the development, commercialization, and utilization of next-generation energy storage technologies with the goal of developing and domestically manufacturing energy storage technologies that can meet all U.S. market demands by 2030. *Energy Storage Grand Challenge*, U.S. DEP'T OF ENERGY, https://perma.cc/G3C7-ZVJW.

[25] *E.g.*, Wärtsilä's GEMS Digital Energy Platform, "a smart software platform that monitors, controls and optimises energy assets on both site and portfolio levels." *Energy Storage & Optimisation*, WÄRTSILÄ, https://perma.cc/Y8QB-T4QL. Wärtsilä's platform was used by Duke Energy in its microgrid discussed. *See infra* note 67 and accompanying text; *see also* Franco Canziani et al., *Hybrid Photovoltaic-Wind Microgrid with Battery Storage for Rural Electrification: A Case Study in Peru*, FRONTIERS IN ENERGY RSCH. (Feb. 18, 2021), https://perma.cc/3WFA-J599.

[26] Maddie Lee, *How the Inflation Reduction Act of 2022 Will Drive Energy Resilience*, ENEL: INSIGHTS (Feb. 2, 2023), https://perma.cc/9YTW-7B65.

[27] Gene Wolf, *A Short History: The Microgrid*, T&D WORLD (Oct. 24, 2017), https://perma.cc/W8GH-N96Z.

devices)."[28] In the early years of electricity generation, these systems had no larger macrogrid to which they could connect. Over the years, however, utilities abandoned the isolated-power-plant model in favor of central-station generating systems with transmission to customers.[29] It took time. For "more than thirty years after the introduction of the central station grid," independent private plants were still "the most common source of electricity consumed in the United States."[30] Eventually, institutions with independent power joined the utility macrogrids.[31]

Some institutions with isolated power plants, however, maintained their independent generation capacity. These older independent systems, as well as newer systems created specifically to act independently of the grid, recently received the moniker "microgrid."[32] In the United States, modern microgrid deployment was initially slow, with only eighty-two permit applications prior to **[*259]** 2010.[33] As of 2019, there were over 4,400 microgrids worldwide,[34] but only 687 of those in the United States as of 2022.[35] However, U.S. installations have almost doubled since 2016,[36] reaching almost ten gigawatts of capacity by the third quarter of 2022, with growth expected to exceed 20% in 2023.[37]

In 2012, the public gained new appreciation for the value of microgrids in a world experiencing rapid climate change when buildings and campuses with the capacity to generate their own power kept the lights on during the outages caused by Superstorm Sandy.[38] For example, Princeton University demonstrated the advantages of microgrids when Princeton's microgrid, fueled by the school's independent power plant, made its campus "'a place of refuge' [for] police, firefighters, paramedics and other emergency-services workers."[39] In addition, "[l]ocal residents whose

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[28] *42 U.S.C. § 17231(b)(6)*.

[29] *Electricity Explained: How Electricity Is Delivered to Consumers*, U.S. ENERGY INFO. ADMIN., *https://perma.cc/U446-SQLN* (Aug. 11, 2022).

[30] JOHN MANSHRECK, TRANSFORMATION OF THE ELECTRIC UTILITY BUSINESS MODEL: FROM EDISON TO MUSK 182 (2022).

[31] *See, e.g.*, Milan Kovacevic, *Hotel Del Coronado has Landmark History*, KPBS (Jan. 8, 2007, 8:30 PM PST), *https://perma.cc/T9CX-FP2U* (reporting that the Hotel del Coronado in San Diego had its own power plant built during 1887-1888, and the power plant provided power to both the hotel and all of Coronado up to the 1930s).

[32] Robert Lasseter and others are credited with proposing the modern microgrid concept in the late 1990s and early 2000s. *See, e.g.*, ROBERT LASSETER ET AL., INTEGRATION OF DISTRIBUTED ENERGY RESOURCES: THE CERTS MICROGRID CONCEPT (2002), *https://perma.cc/M6L6-SNA8*. *See also* Dan T. Ton & Merrill A. Smith, *The U.S. Department of Energy's Microgrid Initiative*, 25 ELEC. J. 84 (2012).

[33] *See Combined Heat and Power and Microgrid Installation Databases*, U.S. DEP'T OF ENERGY, *https://perma.cc/U8NJ-5HX6* (Apr. 1, 2023) (within the "Summary microgrid data set" file, under the "App v. Year" tab).

[34] *Navigant Research Has Identified 4,475 Microgrid Projects Representing Nearly 27 GW of Planned and Installed Power Capacity Globally Through 2Q 2019*, BUS. WIRE (July 16, 2019, 05:15 AM EDT), *https://perma.cc/H5GH-9GNX*.

[35] *See Combined Heat and Power and Microgrid Installation Databases, supra* note 33.

[36] *See id.*

[37] Elisa Wood, *Five Takeaways from Wood Mackenzie's New Analysis Showing Rapid Microgrid Growth Despite the Economy*, MICROGRID KNOWLEDGE (Feb. 6, 2023), *https://perma.cc/FWT4-XRA8*.

[38] Over eight million electricity customers from North Carolina to the Canadian border and as far inland as Ohio and Indiana lost power as a result of Superstorm Sandy, which hit the Eastern Seaboard of the United States in October 2012. David Sheppard & Scott DiSavino, *Superstorm Sandy Cuts Power to 8.1 Million Homes*, REUTERS (Oct. 30, 2012, 7:03 AM), *https://perma.cc/N22V-T6G4*.

[39] Kelly, *supra* note 20.

homes lost power also were invited to warm up, recharge phones and other electronic devices and use wireless Internet service at a hospitality center that was opened on campus."[40] Princeton's microgrid system provided critical back-up power for these emergency services.

As the Princeton example illustrates, microgrids provide a number of benefits, but the most salient is resilience.[41] Backup power for participants is **[*260]** the primary reason organizations develop microgrids.[42] Fires and extreme storms have accelerated the adoption of solar arrays and back-up personal storage.[43] Entities with financial resources, including retail stores, manufacturing facilities, and military operations, have led the way in microgrid deployment,[44] but schools and communities lag behind.[45] Overall, only a handful of the existing microgrids are connected to the macrogrid ("grid-connected") largely due to complications or resistance from IOUs and regulating agencies.[46]

Nonetheless, microgrids realize their most significant benefits when they are grid-connected. In fact, the current statutory definition for microgrid includes the ability to connect or disconnect (also known as "islanding") from the macrogrid.[47] When grid connection can be achieved, microgrids' ability to provide two-way connection both giving and receiving power from the macrogrid provides additional benefits to both the participants and the macrogrid.

While microgrids provide resilience to communities, one of their main benefits to the macrogrid is reliability. Grid-connected microgrids can benefit the macrogrid by providing ancillary services to meet reliability standards.[48] While IOUs were initially trusted to provide reliable service on their own, faith in the reliability of the macrogrid was shattered on November 2, 1965, when a small broken relay in the Ontario Hydro system triggered the Northeast **[*261]** Blackout, at that time "the worst power failure in the age of electricity," with thirty million people over 80,000

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[40] *Id.*

[41] In contrast to "reliability," which means the "ability to maintain consistent service in non-catastrophic conditions," the term "resilience" means "the ability of the electricity supplier to continue operating in the face of disaster or to quickly recover from events that cause widespread disruptions (e.g., hurricanes)." THOMAS HANCOCK ET AL., ANALYSIS OF THE MICROGRID MARKET FOR SMALL AND MEDIUM-SIZED MUNICIPALITIES AND ELECTRIC COOPERATIVES 15 (2021), *https://perma.cc/26E7-N7GV*.

[42] DANIEL SHEA, MICROGRIDS: STATE POLICIES TO BOLSTER ENERGY RESILIENCE (2022), *https://perma.cc/PA5G-DY6U*.

[43] *See, e.g.*, Justine Calma, *Elon Musk Offers Discounted Solar Panels and Batteries After California Blackouts*, VERGE (Oct. 28, 2019, 2:04 PM PDT), *https://perma.cc/9BAH-PYF6*.

[44] Wood, *supra* note 37; *see also Microgrids*, CTR. FOR CLIMATE & ENERGY SOLS., *https://perma.cc/J2H3-KDFY* (stating less than 0.2% of U.S. electricity comes from microgrids). The states with leading microgrid capacity are Texas, New York, California, Hawaii, Alaska, Georgia, Michigan, and Maryland. *Microgrid Penetration Capacity in the United States in 2020, by Select State*, STATISTA (Mar. 14, 2023), *https://perma.cc/CVZ2-C8D4*. This list is inconsistent with the Dep't of Energy, which lists fewer installations in Georgia, Michigan, and Maryland. *Combined Heat and Power and Microgrid Installation Databases, supra* note 33.

[45] *See id.; see also* Stephanie Lenhart & Kathleen Araújo, *Microgrid Decision-Making by Public Power Utilities in the United States: A Critical Assessment of Adoption and Technological Profiles*, RENEWABLE & SUSTAINABLE ENERGY REVS., Apr. 2021, at 2-4.

[46] OWEN ZINAMAN ET AL., WHITE PAPER: ENABLING REGULATORY AND BUSINESS MODELS FOR BROAD MICROGRID DEPLOYMENT 13-27 (2021), *https://perma.cc/CU34-CLAY*. *See generally* Alexandra Klass et al., *Grid Reliability Through Clean Energy*, *74 STAN. L. REV. 969 (2022)*; TOM STANTON, MICROGRIDS POLICY PROGRESS IN THE STATES (2020), *https://perma.cc/48D8-QYBR*.

[47] *See, e.g.*, *42 U.S.C. § 17231(b)(6)*.

[48] *Grid Systems*, OFF. OF ELEC., *https://perma.cc/UV73-B8K7*.

square miles losing power.[49] The federal government intervened with reliability standards.[50] Now, grid operators balance customer demand ("load") with power generation to meet these reliability standards. Sometimes there are physical delivery constraints, and the grid operator must "maintain voltage and frequency levels and other technical dimensions of grid performance" with "reserves" that they can turn on with short notice.[51]

Microgrids have "islanding" capacities that make them valuable for balancing loads on a utility's system during favorable "blue-sky" conditions. More importantly, however, microgrids can also assist reliability during "black-sky" emergencies, when the IOU's usual power sources are cut off.[52] While typical rooftop solar is uncommunicative and unresponsive, a microgrid's ability to adjust generation and load allows it to provide smart services that are more finely tuned than traditional demand response or ancillary services. Smart services can be delivered in response to real-time dispatches or market signals.[53]

A second benefit of microgrids that is closely related to reliability is their ability to shift loads. Load shifting can provide not only cost savings to customers, but also to utilities when they can "shave peak load" instead of maintaining old or building new rarely-used infrastructure.[54] As with many commodities, prices increase when demand is higher think Uber's surge pricing.[55] Similarly, IOUs have to pay a higher price per kilowatt hour for electricity they supply during peak demand, when many customers have aboveaverage electricity use.[56] Sometimes the demand can outstrip supply and cause **[*262]** outages.[57] Utilities can respond in two ways. One approach is to build infrastructure that is only used for the few peak-demand hours in a given year.[58] This is both expensive[59] and, in the case of fossil-fuel plants, results in greater environmental risks to vulnerable communities.[60] An alternative response is to try to change customer usage.

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[49] WILLIAM RODGERS, BROWN OUT: THE POWER CRISIS IN AMERICA 11 (1972).

[50] *See* Federal Power Act § 215, *16 U.S.C. § 824(o)*.

[51] C. Baird Brown, *Financing at the Grid Edge, in* LEGAL PATHWAYS TO DEEP DECARBONIZATION IN THE UNITED STATES 151-52 (Michael B. Gerrard & John C. Dernbach eds., 2019).

[52] Martha Davis, *Black Sky Hazards & Grid Resilience*, T&D WORLD (June 15, 2021), *https://perma.cc/VY7J-37MC*.

[53] Brown, *supra* note 51, at 163-64.

[54] HAW. NAT. ENERGY INST., MAUI SMART GRID DEMONSTRATION PROJECT: FINAL TECHNICAL REPORT (2014), *https://perma.cc/7L9F-V3BL*.

[55] *How Surge Pricing Works*, UBER, *https://perma.cc/37XK-GTVS*.

[56] Kathryne Cleary & Karen Palmer, *US Electricity Markets 101*, RES. FOR THE FUTURE, *https://perma.cc/X2GW-TKLW* (Mar. 17, 2022).

[57] For example, during Winter Storm Uri in Texas, the electricity supply could not meet the demand, resulting in high prices and outages. Joshua Fetcher, *Texas Energy Officials' Proposal to Overhaul the Power Grid Is Drawing Skepticism*, TEX. TRIB. (Nov. 18, 2022, 3:10 PM CST), *https://perma.cc/UG2C-E2HG*.

[58] On average, "peaker" plants in the United States are only used around 4% of the time, amounting to less than three hundred hours every year. *What is a Peaker Power Plant?*, CLEAN ENERGY GRP. (Jan. 19, 2021), *https://perma.cc/6T7J-KNES*.

[59] One peaker plant in New Jersey cost ratepayers $13 million over the year to run and maintain the facility when the plant was only used five days in 2010. Abby Gruen, *"Peakers" Plants Provide Electricity When It's Hot, but at the Highest Price*, NJ.COM (July 20, 2010, 11:00 AM), *https://perma.cc/5R3X-7LR5*.

[60] *See, e.g., Phase Out Peakers*, CLEAN ENERGY GRP., *https://perma.cc/AW66-78AR*; Rachel Ramirez, *These Dirty Power Plants Cost Billions and Only Operate in Summer. Can They Be Replaced?*, GRIST (May 8, 2020), *https://perma.cc/CY8V-JR52*.

A third benefit of microgrids addresses this concept of changing customer usage. Changing customer usage to even out demand and shave the peak load is called "demand response" or "demand-side management." To give customers signals about demand, utilities have adopted "time-of-use" rates that charge more per kilowatt hour during times of traditionally heavier demand.[61] These time-of-use rates can reflect the higher prices the utility may be paying for that peak-demand power[62] and are also designed to change customer energy use.[63] Microgrid systems can save their participants money by storing power and delivering it at a lower rate than the utilities' peak demand rate. This shifting can also help reduce overall load on the grid.[64] In addition, some microgrids send demand-response signals to customers, or directly to customer electronic devices, to determine the best times to, for example, charge electric vehicles (EVs) or run demand-heavy appliances. This, in turn, **[*263]** triggers a third benefit of microgrids: reducing emissions by integrating renewable energy and energy demand.[65]

A final benefit of microgrids is that they can offer a promising, often less expensive, solution for areas that are currently not connected to the macrogrid or where grid bottlenecks and aging infrastructure prevent the most effective deployment of renewable energy generation.[66] For example, in February 2023, Duke Energy chose to build a community microgrid in lieu of a second feeder line from the grid to Hot Springs, North Carolina, a remote mountain community of about six hundred.[67] This choice to build a microgrid over traditional wire connections to the macrogrid was newsworthy, but the more significant component of Duke's achievement in Hot Springs was that this microgrid was powered only by solar and batteries.[68] With new inverter technologies, this microgrid could "black start" after an outage without help from fossil fuel generation.[69] By comparison, past microgrid technologies often

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[61] *See, e.g., State Selector*, XCEL ENERGY, *https://perma.cc/U3T8-526F* (linking to time-of-use rates for eight states).

[62] Unfortunately, backward looking time-of-use rates do not best promote the use of renewable energy resources, which require dynamic pricing to encourage use when electricity is being generated. K.K. DuVivier & Haley Balentine, *Time of Renewables*, *28 B.U. J. SCI. & TECH. L. 63, 81-86 (2022)*.

[63] *See, e.g., Understanding the Transition to Time of Use (TOU) Rates on Xcel Energy Electric Bills*, COLO. PUB. UTILS. COMM'N, *https://perma.cc/L4DK-WZ96*.

[64] Natalie Gregus, *How Load Shifting and Peak Shaving Can Benefit Your Community*, ENERGY LINK (Oct. 19, 2021), *https://perma.cc/ZS72-5CKB*.

[65] DuVivier & Balentine, *supra* note 62, at 80-85.

[66] *See, e.g.*, GLEN ANDERSEN ET AL., MODERNIZING THE ELECTRIC GRID: STATE ROLE AND POLICY OPTIONS (2021), *https://perma.cc/EM4Q-72WH*. In addition to promoting clean energy sources and increasing reliability and resilience, other factors that drive customers and developers to pursue microgrids include (1) economic opportunities for a variety of services; (2) enhanced cybersecurity; and (3) the ability to power remote communities. KIERA ZITELMAN ET AL., NAT'L ASS'N OF REGUL. UTIL. COMM'RS, USER OBJECTIVES AND DESIGN APPROACHES FOR MICROGRIDS: OPTIONS FOR DELIVERING RELIABILITY AND RESILIENCE, CLEAN ENERGY, ENERGY SAVINGS, AND OTHER PRIORITIES (2021), *https://perma.cc/354H-G99Y*; *see also* DANIEL SHEA, MICROGRIDS: STATE POLICIES TO BOLSTER ENERGY RESILIENCE (2022), *https://perma.cc/PA5G-DY6U*; Brown, *supra* note 51, at 148 (noting participants of grid-connected microgrids can also enjoy a measure of "democratization of electricity generation and energy management"); *id*. at 150 ("The revolution arises not from a single technology, but from integration of multiple technologies that support active management and production of energy at the grid edge."); SHEA, *supra* note 42.

[67] Elisa Wood, *Did Duke Energy Just Change the Game for Community Microgrids?*, MICROGRID KNOWLEDGE (Feb. 6, 2023), *https://perma.cc/9CN7-9BMR*.

[68] *Duke Energy Places Advanced Microgrid into Service in Hot Springs, NC*, DUKE ENERGY (Feb. 2, 2023), *https://perma.cc/2M8Q-DSDZ*.

[69] *Black Start*, NAT'L RENEWABLE ENERGY LAB'Y, *https://perma.cc/9AL5-WWV3*. An inverter is "a device that converts direct current (DC) electricity, which is what a solar panel generates, to alternating current (AC) electricity, which the electrical grid uses. . . . Inverter-based generation can produce energy at any frequency and does not have the same inertial properties as

[*264] depended on diesel-powered generators,[70] which cause serious air quality[71] and noise pollution problems.[72] Emerging federal and state incentives encourage microgrids that provide resilience to climate change disasters without furthering climate degradation with fossil-fuel generators that add to damaging emissions.[73]

B. Community Microgrids

Community microgrids generally use the same technologies as commercial or military microgrids, but are intended to provide benefits to residents instead of large organizations. While there is no universally accepted definition, one bill introduced in Congress to provide tax credits restricted eligibility based on the entity that owned the microgrid.[74] Eligible persons included state and local governments, Indian tribal governments, Rural Electrification Act cooperatives (co-ops), and certain tax-exempt organizations.[75] Another proposed Congressional approach provided grants to "community-owned energy systems" defined as those owned "(A) by the local government where the system is located; (B) by a nonprofit organization that is based in the local jurisdiction where the energy system is located; (C) collectively, by community members; or (D) by a worker-owned or community- owned for-profit entity."[76] Neither of these bills passed the House.

[*265] On February 9, 2023, the CPUC published a Proposed Decision for rules to implement its Microgrid Incentive Program, which provides $200 million to California utilities to fund "community microgrids in disadvantaged vulnerable communities (DVCs) to support populations impacted by grid outages."[77] Although the eighty-two page Proposed Decision uses the term "community microgrid" twenty-six times, it never provides an explicit definition for the term. It does, however, state that it is "targeted to address the needs of DVCs" and "a portion of an eligible community microgrid is required to be geographically located in an area at a higher risk of

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steam-based generation, because there is no turbine involved." *Solar Integration: Inverters and Grid Services Basics*, OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, *https://perma.cc/97HX-KSJG*. However, inverter technologies until now had issues with "black starts." A black start is "the ability of generation to restart parts of the power system to recover from a blackout. This entails isolated power stations being started individually and gradually reconnected to one another to form an interconnected system again." *Black Start, supra* note 69; *see also* Abhishek Banerjee, *Testing Microgrid Solutions to Turn the Lights Back On*, *https://perma.cc/6ERN-95V2* (Apr. 12, 2023).

[70] *See, e.g.*, K.K. DuVivier, *The Law of Distributed Generation in the United States Conclusions, in* DISTRIBUTED GENERATION LAW 353, 355-59 (Sarah A. W. Fitts & Florence K. S. Davis eds., 2020) (noting that the use of fossil fuel generators during power shutoffs is not regulated by the California Air Resources Board or the thirty-five California air management districts, even though some research shows that a single diesel engine operating for only about ten days can increase the cancer risk to residents within one city block by 50%).

[71] *See, e.g.*, David Roberts, *Wildfires and Blackouts Mean Californians Need Solar Panels and Microgrids*, VOX (Oct. 28, 2019, 10:00 AM EDT), *https://perma.cc/TD6T-XWQG*; Erin Grizard, *Diesel Generators Are Not the Answer to Today's Energy Blackouts*, BLOOM ENERGY (Aug. 1, 2019), *https://perma.cc/2R8N-GUUB*.

[72] *See, e.g.*, Sarah Miller, *California Is Still Very Dark and Very Loud*, OUTLINE (Nov. 1, 2019, 2:00 PM EST), *https://perma.cc/46RW-Q5J7*.

[73] *See, e.g.*, S.B. 1339, 2017-2018 Leg., Reg. Sess. §§ 8371(d), 8372(a) (Cal. 2018) (enacted) (encouraging clean microgrids by exempting diesel backup from favorable tariffs).

[74] Making Imperiled Communities Resistant to Outages with Generation That Is Resilient, Islandable, and Distributed Act, H.R. 2482, 117th Cong. (2021).

[75] *Id.* § 6431(b); Rural Electrification Act of 1936, *7 U.S.C. § 901*. Generally, these co-ops do not own large electricity generation plants and transmission lines, but instead they purchase bulk power from wholesalers. *Research on the Economic Impact of Cooperatives*, U. WISC. CTR. FOR COOPERATIVES, *https://perma.cc/4Y4V-MRUX*.

[76] H.R. 448, 117th Cong. § 2 (2021).

[77] Order Instituting Rulemaking Regarding Microgrids Pursuant to Senate Bill 1339 and Resiliency Strategies 2 (Cal. Pub. Util. Comm'n Feb. 9, 2023), *https://perma.cc/BZ7V-QVTR*. In addition to funding for the community microgrids, the decision permits up to $3 million per project to the utilities in matching funds for utility infrastructure upgrades and for enabling the islanding function. *Id.* at 30-31.

electrical outages . . . ."[78] In addition, the Proposed Decision references the Community Microgrid Enablement Program of the Pacific Gas and Electric Company (PG&E), which provides this definition:

> A community microgrid is a group of customers and Distributed Energy Resources (DERs) within clearly defined electrical boundaries with the ability to disconnect from and reconnect to the grid. These microgrids are typically designed to serve the portions of communities that include community resources, such as: hospitals, police and fire stations, and gas stations and markets. . . . PG&E provides prioritized restoration, backup power evaluation, additional communications and other resources before and during power outages to critical facility customers, such as hospitals, police and fire stations, communications services and water providers, who provide services that are essential to public safety.[79]

One of the most ambitious community microgrids to date is a $41 million project to create four sustainable microgrids in Solano County, California.[80] **[*266]** After experiencing power shutoffs due to wildfires in 2020 and 2021, Solano County committed to installing microgrids to reliably supply electricity to its important community resources for vulnerable citizens.[81] The projects include installations at the Health and Social Services complex in Fairfield, the Fairfield Civic Center Library, the Juvenile Detention Center in Fairfield, the Vallejo campus, and the William J. Carroll Government Center in Vacaville.[82] In addition to providing resilience, the projects will save Solano County money. Engie, the company that is designing and installing the systems, and that will provide operations and maintenance, has guaranteed that Solano County will save $60 million on its electricity services in comparison to purchasing electricity from its current IOU over the 20-year contract. If power generation targets are not achieved, Engie will pay Solano County back.[83]

C. Challenging the Conventional Utility Structure: The Sunnova Story

Although microgrids as a concept have increasingly gained traction, their implementation still faces obstacles. For example, the CPUC's handling of Sunnova's recent application to operate "public utility microgrids" reflects some of the challenges to come.

In September 2022, Sunnova Community Microgrids California, LLC (Sunnova)[84] filed an application with the CPUC for authorization to operate "public utility microgrids."[85] With this application, Sunnova proposed to serve **[*267]** as

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[78] *Id.* at 17, 72.

[79] *Community Microgrid Enablement Program (CMEP)*, PAC. GAS & ELEC. CO., *https://perma.cc/Y9YV-WXQE*. The website also includes a link to a list of categories of services that the CPUC defines as "critical." *Id.*

[80] *Sustainability Alliance Upgrades Energy Infrastructure in Solano County*, SMART ENERGY INT'L (May 25, 2022), *https://perma.cc/5CEU-ZVE6*; *see also* Emily Goldfield & Mark Dyson, *Energy Resilience in the Roaring Fork Valley*, HOLY CROSS ENERGY, *https://perma.cc/65QL-3VS8*; Elisa Wood, *8 Communities Breaking New Ground with Microgrids*, MICROGRID KNOWLEDGE (July 27, 2021), *https://perma.cc/WP8L-HMHG*; *Community Microgrids from All Angles: NREL to Play a Major Part in Microgrid Innovation for American Communities*, NAT'L RENEWABLE ENERGY LAB'Y (Feb. 26, 2021), *https://perma.cc/6CXN-28XW*.

[81] *Sustainability Alliance Upgrades Energy Infrastructure in Solano County, supra* note 80.

[82] *Id.*

[83] *Id.*

[84] Sunnova Community Microgrids California LLC is referred to as SCMC in the pleadings. SCMC is a subsidiary of Sunnova, an energy service provider whose trademark is "Powering Energy Independence." SUNNOVA, *https://perma.cc/J2ST-JQP3*. Consequently, Sunnova is used universally for both in this Article.

[85] Application of Sunnova Community Microgrids California, LLC for a Certificate of Public Convenience and Necessity to Construct and Operate Public Utility Microgrids and to Establish Rates for Service, Sunnova Community Microgrids, A22-09002 (Cal. Pub. Util. Comm'n Sept. 6, 2022), *https://perma.cc/BH4H-C9VV*. Sunnova applied for a Certificate of Public Convenience and Necessity, which is the formal documentation used by PUCs to authorize an entity to own and operate a public utility. *See,*

the utility for newly constructed communities, creating a microgrid alternative to the traditional central-station IOU electricity delivery model.[86]

Sunnova's proposal involved only new communities "built from the ground up."[87] This would seem to avoid one of the loudest and to critics one of the most spurious arguments IOUs make against new technologies. When an existing IOU has invested in infrastructure within its service territory, IOUs will argue that alternative infrastructure will force them to charge existing customers more as fixed costs are split among a smaller number of customers. This happened to telephone customers as customers stopped paying for landline telephone service, resulting in a rise in service costs for elderly and others who did not have the resources to purchase cell phones and purchase cell phone services.[88]

However, the argument of cost-shifting to vulnerable existing customers does not hold weight when the IOU has no existing infrastructure in an area. Thus, the argument for exclusive monopoly control to protect "the public" in these new areas falls apart.

Furthermore, the opening of telecommunications to free-market competition resulted in "a host of new technologies" and "the transformation of a digitized value chain . . . new value offerings, new customer identification, and new methods of value capture."[89]

Yet California entities with vested interests in retaining the traditional large-plant monopoly structure of electric utility service piled on to challenge **[*268]** Sunnova's application, calling for its outright rejection even without a hearing.[90] As in the rooftop solar contexts discussed below, they used traditional utility regulatory mechanisms in an effort to challenge Sunnova's microgrid alternative.[91] These roadblocks included complicating Sunnova's application by arguing it must be addressed in a delayed rulemaking process.[92] However, the unfinished phase of the rulemaking addresses utility-owned microgrids and not Sunnova's proposal to serve as an independent microgrid utility.[93]

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e.g., Licensing, CAL. PUB. UTIL. COMM'N, https://perma.cc/N2YE-68U6. The certificate designates the service area as well as the type of utility service to be provided. *Certificate of Public Convenience and Necessity*, ENERGY KNOWLEDGEBASE, https://perma.cc/U5KD-2XM2.

[86] Some envision the grid of the future as changing the role of current utilities. Under this vision, the 21st century "smart" electric grid will be a matrix of microgrid "cells" interconnected by the existing transmission and distribution system. CHRISTOPHER VILLAREAL ET AL., CAL. PUB. UTILS. COMM'N, MICROGRIDS: A REGULATORY PERSPECTIVE 9 (Apr. 14, 2014), https://perma.cc/84NM-EDRV.

[87] Reply of Sunnova Community Microgrids California, LLC to Responses and Protests at 25, Sunnova Community Microgrids, A2209002 (Cal. Pub. Util. Comm'n Oct. 20, 2022), https://perma.cc/KQ99-LXP8 [hereinafter Sunnova Reply].

[88] *Price Trends for Wireless and Landline Phone Services, December 2009-September 2015*, U.S. BUREAU OF LAB. STAT.: TED: THE ECON. DAILY (Oct. 28, 2015), https://perma.cc/Q9R2-8KQU. Now it is primarily seniors who still rely on landlines. STEPHEN J. BLUMBERG & JULIAN V. LUKE, NAT'L CTR. FOR HEALTH STAT., WIRELESS SUBSTITUTION: EARLY RELEASE OF ESTIMATES BASED ON DATA FROM THE NATIONAL HEALTH INTERVIEW SURVEY, JULY-DECEMBER 2006 (2007), https://perma.cc/52SV-LLE5. As a result, seniors are facing higher costs. Jacob Vaughn, *Phasing Out Landlines Could Spell Trouble for Seniors and Businesses Both Big and Small*, DALL. OBSERVER (Jan. 17, 2023, 4:00 AM), https://perma.cc/LN8K-SSKA.

[89] MANSHRECK, *supra* note 30, at 191.

[90] Peter Maloney, *Proposed California PUC Decision Could Scuttle Sunnova's Microgrid Plans*, AM. PUB. POWER ASS'N (Feb. 21, 2023), https://perma.cc/46Z6-X8BY.

[91] *Id.*

[92] S.B. 1339, 2017-2018 Leg., Reg. Sess. § 8372(a) (Cal. 2018) (enacted); *see infra* notes 380-83 and accompanying text.

[93] Sunnova Reply, *supra* note 87, at 4-7.

Another argument against the application was that Sunnova must follow the cost-of-service rate structure used by IOUs. As discussed below, the cost-of-service rate structure has many drawbacks including an overemphasis on the construction of large new infrastructure rather than incentivizing maintenance that could prevent fires or more investment in distributed generation or other innovations such as microgrids.[94]

Sunnova proposed terms that were more favorable to customers: long-term contracts with a fixed rate over time, which would help customers avoid the frequent rate-hikes currently imposed by IOUs.[95] Sunnova's rate structure would not only have given customers a competitive alternative to traditional utilities, but also aimed to provide lower service rates and compensation during outages a benefit no IOU currently offers.[96] Thus, Sunnova's proposal appeared to provide a strong case for an alternative to the traditional monopoly IOU model in undeveloped areas where the utility's main argument doesn't apply.

Nevertheless, on April 10, 2023, the CPUC dismissed Sunnova's application without holding a hearing.[97] In addition to the California Public Advocate Office, powerful incumbents in opposition included California's three major monopoly **[*269]** IOUs PG&E, Edison International's Southern California Edison, and Sempra Energy's San Diego Gas & Electric as well as California's utility union and a consumer advocate group.[98] The result is not surprising considering that the "'notable precedent' [it might have set] threatened the existing utilities."[99] In response, Sunnova's spokesperson noted, "This proposed decision is troubling and disappointing for a state that has set such bold climate targets yet is struggling with making steady progress on them."[100] The following Part will elucidate how this entrenched IOU system came into being.

II. FOR THE SHAREHOLDER OR FOR THE PEOPLE: CREATION OF REGULATED ELECTRIC UTILITY MONOPOLIES

The electric utility model that thwarted Sunnova's innovative microgrid proposal is more than a century old. At the beginning of the twentieth century, running water and electricity became amenities in many American homes. Providing these services with the technologies available at the time required large-scale investment in massive infrastructure. Today, water service remains a largely public enterprise, with 90% of Americans receiving their water from public drinking water systems.[101] In contrast, deft maneuvering by Samuel Insull, one of Thomas Edison's deputies, and others in the early years of electricity led to the current dominant delivery system of private, for-profit, investor-owned, and regulated monopolies.[102] While the public model for the provision of critical services is not

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[94] *See infra* Section II.B.2.

[95] Sunnova Reply, *supra* note 87, at 14-16.

[96] *Id.; see also* GLEN ANDERSEN ET AL., 2020-2021 LEGISLATIVE ENERGY TRENDS (2021), *https://perma.cc/2GWJ-629S*. Connecticut, New Jersey, and Michigan all considered bills to compensate customers in some way for losses due to extended outages. None of these measures passed in 2020. *Id.*

[97] Decision Granting the Public Advocates Office of the California Public Utilities Commission Motion to Dismiss Sunnova Community Microgrids California, LLC's Application Decision 23-04-005, A22-09-022 (Cal. Pub. Util. Comm'n Apr. 10, 2023), *https://perma.cc/7P58-WUZK*.

[98] *Id.* at 3; Brian Eckhouse, *California Judge Proposes Nixing Plan for Mini-Grids (Correct)*, BLOOMBERG L. (Feb. 16, 2023, 11:05 AM), *https://perma.cc/33WF-YN3V*.

[99] Eckhouse, *supra* note 98.

[100] *Id.; see also* Emma Foehringer Merchant, *California Denies Bid from Home Solar Company to Sell Power as a "Micro-Utility,"* INSIDE CLIMATE NEWS (Apr. 12, 2023), *https://perma.cc/64XL-YN3Z*. After the decision was finalized, Sunnova also stated that it might appeal and "was evaluating the potential to implement the micro-utility model in [possibly 15] other states . . . ." *Id.*

[101] *Information About Public Water Systems*, U.S. ENV'T PROT. AGENCY, *https://perma.cc/4K47-XUR9* (Nov. 15, 2022).

[102] RYAN ELLIS, LETTERS, POWER LINES, AND OTHER DANGEROUS THINGS: THE POLITICS OF INFRASTRUCTURE SECURITY 70 (2020); Lindstrom & Hoff, *supra* note 6.

always superior,[103] privatization has created different incentives profits for shareholders over a commitment to the public. Thus, the traditional monopoly for-profit IOU electricity system has used out-of-date rationales to stifle the deployment of innovative technologies and **[*270]** solutions, such as microgrids, that have the potential to better meet the needs of the public today.

This Part will address four aspects of the evolution of the current U.S. utility model that impact this analysis: (A) the conversion of electricity from a luxury to a necessity; (B) the transition to large, centralized power plants; (C) the emerging recognition of energy justice concerns; and (D) the necessity of Federal intervention to introduce competition to counteract the stifling effect of the current monopoly structure.

A. Luxury vs. Necessity: The Early Days of Competition and Isolated Power Plants

In the area of electricity, several conditions have changed in the last century. Instead of being a luxury, electricity is now a necessity for most Americans. It provides life-saving power to medical devices. It is required for work, communication, and financial transactions. And with increasing electrification of homes, it may one day be the only source of power for heating, cooking, and charging vehicles.

From the beginning, water service was a necessity that impacted both rich and poor, and contamination could mean the difference between life and death. In 1908, Jersey City was the first U.S. city to routinely disinfect community drinking water, and thousands of other cities followed.[104] As a result, cholera and typhoid infections dropped precipitously.[105] In contrast, electricity was a luxury when first introduced used mostly by the wealthy for illumination so it was less urgent to make it public.

Many have written about the rise of regulated electric utility monopolies.[106] Some of the technological and cultural difficulties encountered **[*271]** when coal was introduced are described above. Similarly, electric lighting, when it was a new technology, also had a difficult time getting established with both technological and cultural concerns.[107] The first electric replacement for gas lighting was the arc lamp, which had its first major public demonstration at the Paris Opera in 1844.[108] An arc lamp produces light when electricity arcs between two metal electrodes the zap in Frankenstein movies. But early technologies had many drawbacks including glaring light, fumes from the burning

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[103] *See, e.g., Flint Water Crisis*, MICH. DEP'T OF ATT'Y GEN., *https://perma.cc/E95V-7QFP*.

[104] *A Century of U.S Water Chlorination and Treatment: One of the Ten Greatest Public Health Achievements of the 20th Century*, CTRS. FOR DISEASE CONTROL & PREVENTION, *https://perma.cc/4K9C-RAPD* (Nov. 26, 2012).

[105] *Id.*

[106] *See, e.g.*, THOMAS J. FLAHERTY, ROLL-UP: THE PAST, PRESENT, AND FUTURE OF UTILITIES CONSOLIDATION (2022); MANSHRECK, *supra* note 30; PETER KELLY-DETWILER, THE ENERGY SWITCH: ECONOMICS, POLICY, AND ELECTRIC UTILITIES BEFORE 1940 (2016); JOHN F. WASIK, THE MERCHANT OF POWER: SAMUEL INSULL, THOMAS EDISON, AND THE CREATION OF THE MODERN METROPOLIS (2006); HYMAN ET AL., HOW COMPANIES AND CUSTOMERS ARE TRANSFORMING THE ELECTRICAL GRID AND THE FUTURE OF POWER (2021); PETER FOXPENNER, POWER AFTER CARBON: BUILDING A CLEAN, RESILIENT GRID (2020); JOHN L. NEUFELD, SELLING POWER: ECONOMICS, POLICY, AND ELECTRIC UTILITIES BEFORE 1940 (2016); JOHN F. WASIK, THE MERCHANT OF POWER: SAMUEL INSULL, THOMAS EDISON, AND THE CREATION OF THE MODERN METROPOLIS (2006); HYMAN ET AL., *supra* note 7; JILL JONNES, EMPIRES OF LIGHT: EDISON, TESLA, WESTINGHOUSE, AND THE RACE TO ELECTRIFY THE WORLD (2003); HAROLD L. PLATT, THE ELECTRIC CITY: ENERGY AND THE GROWTH OF THE CHICAGO AREA, 1880-1930 (1991); JOHN HOGAN, A SPIRIT CAPABLE: THE STORY OF COMMONWEALTH EDISON (1986); RICHARD RUDOLPH & SCOTT RIDLEY, POWER STRUGGLE (1986).

[107] PLATT, *supra* note 106, at 30; *see, e.g.*, David Nye, *Electricity and Culture: Conceptualizing the American Case*, 2 ANNALES HISTORIQUES DE L'ÉLECTRICITÉ 125, 128-29 (2004); *Lighting a Revolution*, NAT'L MUSEUM OF AM. HIST., *https://perma.cc/7VJP-RNK9*.

[108] HYMAN ET AL., *supra* note 7, at 117.

carbon,[109] and "'man killing' wires."[110] Culturally, some localities forbade electric lights on buildings because they were considered "low class and unseemly," illuminating "semirespectable establishments."[111]

Some mark "the beginning of the [modern] electric utility industry" as September 4, 1882, when Thomas Edison's Pearl Street Station in New York's financial district illuminated its first four hundred lamps.[112] As with most emerging technologies, competition was fierce. "In the early [1880s], small electric lighting companies popped up like crocuses in spring . . . ."[113] Between 1882 and 1905, Chicago had twenty-nine different franchises, providing different types of services for different purposes, with a range of equipment varying in frequencies from block to block.[114] While some described the state of electricity services at this time as "marked by an anarchic process of polygenesis,"[115] others note that the early competition "prevented the technology of the electric industry from ossifying . . . ."[116] For example, competition sparked innovation in manufacturing and other industries that **[*272]** could replace centralized shafts with small electric motors for different pieces of equipment.[117]

In addition, many prosperous cities and households already had invested in infrastructure for gas lights. Electricity was above the means of the average consumer, something that did not change for decades.[118] The institutions that could afford to move to electricity, and increasingly needed to rely on it, built isolated power plants to fuel their own facilities say a factory or hotel.[119] Just months after the opening of Pearl Street Station, institutions had constructed 334 such localized independent power generation plants.[120]

B. Transition to Large Central Station Systems

While electricity was originally a luxury that was often independently generated, advancements in transmission systems paved the way for widespread access through regulated monopoly IOUs with centralized facilities.

First, this Section will address the role of IOUs in creating our current regulated monopoly model. Second, it will examine the role that lawmakers and regulators have played in making the regulated monopoly model stagnant and slow to respond as well as their role in fighting efforts to allow innovation outside of their regulatory control. Finally, it will address duplication or redundancy, which is often used as a justification for the monopoly structure. While it once may have been wasteful, redundancy now provides benefits and is necessary for resilience to avoid financial loss and loss of lives in responding to interruptions of power due to climate emergencies. Yet utilities and their regulators continue to devalue the resiliency benefits microgrids could provide.

1. Regulated Monopolies: Birth and Ascent to Power

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[109] *Id.*

[110] PLATT, *supra* note 106, at 30.

[111] *Id.*

[112] HYMAN ET AL., *supra* note 7, at 119.

[113] HOGAN, *supra* note 106, at 12.

[114] HYMAN ET AL., *supra* note 7, at 123.

[115] PLATT, *supra* note 106, at 29.

[116] HYMAN ET AL., *supra* note 7, at 123.

[117] *Id.* at 125-26.

[118] *Id.* at 119.

[119] *Id.; see also* HOGAN, *supra* note 106, at 13 (noting that the Edison Company for Isolated Lighting sold more than 300 isolated power plants by 1883).

[120] HYMAN ET AL., *supra* note 7, at 119; *see also* HOGAN, *supra* note 106, at 13.

With the birth of Pearl Street Station in 1882, independent power plants generated electricity that was used onsite. But advances in transmission **[*273]** systems minimized losses[121] and provided an alternative model involving three phases: generation, transmission, and distribution. Electricity generation favored building large, centralized facilities that saved resources by creating economies of scale, just as was the case for water processing.[122] The concentration of customers in urban areas also provided opportunities for avoiding duplication or redundancy of resources in delivering water or power. This concentration could avoid the financial and material waste that was passed along to customers through higher prices when different railroads, for example, built out redundant track along the most lucrative lines.[123]

Samuel Insull, an employee of Chicago Edison, masterminded the process that made Edison's central station utility model a reality. Different customers had different electricity needs at various times of day: industrial uses in the daytime, electric streetcars during rush hour, and lighting in the evening. Consolidating these loads into one large generator avoided the redundancy of having three separate small generators for these three types of customers.[124]

Once the generation plants were centralized, utilities needed to build transmission lines to carry the electricity generated at these large central stations to individual customers. Both the centralized generation stations and transmission lines required substantial financial investments. Consequently, financing for transmission and large-scale generation proved challenging to secure[125] and "the financial results [for Edison's private utilities] were unimpressive even thirty years after the pioneering era."[126]

[*274] Although exclusive for-profit franchises for utility monopolies have been the predominant American model for approximately a century, that has not always been the case, nor was this structure inevitable or natural. Initially, the solution for financing the large, centralized water processing or electrical generation facilities was through publicly owned utilities. As mentioned above, 90% of Americans still receive their water from public entities. Electric utilities also began with the public ownership approach. In the early 1920s, there were more than three thousand public municipal electric systems.[127] This, however, did not last. By 1930, that number had fallen by over a third, and currently only about 15% of Americans receive their electricity from publicly owned utilities.[128]

Governments have the ability to finance the large-scale investments that bring economies of scale, and without a profit motive, those same governments can direct cost-savings towards reduced prices or public benefits. However, municipal utilities faced debt-limits and legal obstacles to owning utilities as some needed state legislation

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[121] *See* HOGAN, *supra* note 106, at 29-30. Edison's Direct Current (or DC) technology resulted in huge power losses when transmitted over distances, so smaller localized electricity became the norm. *Id.* Samuel Westinghouse and Nikola Tesla challenged Edison's DC systems with a competing technology, Alternating Current (or AC). *Id.* Because AC transmission did not suffer from the same power losses, it ultimately won the day as the model for most electricity utility development in the United States). *Id.; see also* W. Bernard Carlson, *Edison and Tesla's Cutthroat 'Current War' Ushered in the Electric Age*, NAT'L GEOGRAPHIC (Sept. 29, 2019, 8:00 AM BST), https://perma.cc/7GA6-RNXZ.

[122] HYMAN ET AL., *supra* note 7, at 124; *see also* Andrew Loo, *Economies of Scale*, CORPORATE FIN. INST., https://perma.cc/EWB3-ZH9W (Mar. 4, 2023) (defining "economies of scale" as referring to "the cost advantage experienced by a firm when it increases its level of output.") Thus, with greater quantity of output, the per-unit fixed cost per unit decreases.

[123] *Emergence of Electrical Utilities in America*, NAT'L MUSEUM OF AM. HIST., https://perma.cc/22YL-VPNE.

[124] HYMAN ET AL., *supra* note 7, at 121, 124.

[125] *Id.* at 119.

[126] *Id.* at 126.

[127] Delia Patterson, *Public Power: A Rich History, a Bright Future*, AM. PUB. POWER ASS'N (Feb. 15, 2018), https://perma.cc/YZ5K-MPTA.

[128] Lindstrom & Hoff, *supra* note 6.

authorizing it.[129] Furthermore, the fragmented nature of the U.S. utility industry stood in the way of an interconnected grid.[130]

In the early twentieth century, IOUs saw that money could be made in the strongest markets and began arguing that regulated monopolies were a better model for electricity delivery than publicly owned utilities. Samuel Insull first floated the idea of making electric utilities regulated monopolies in an 1898 address before the National Electric Light Association, an organization over which he presided as president.[131] Richard T. Ely, an economist writing in 1911, also argued some industries constituted "natural monopolies" because they required large capital investments that rendered "effective and permanent competition" impossible.[132]

These regulated-monopoly arguments are counter-intuitive. The public is generally wary of monopoly power, and most private corporations resist regulation. In *Munn v. Illinois*, a grain elevator became the first monopoly **[*275]** regulated as a "public utility" in the United States.[133] The State of Illinois passed a statute that controlled the grain elevator prices. In response, the operators argued that Illinois had no authority to prevent them from charging high rates for grain storage because they were private companies, and thus, private operations. Illinois argued that even though the ownership of the property was private, "the use may be public in a strict, legal sense" if the operators "pursue a public employment" by holding a monopoly on grain storage.[134] The U.S. Supreme Court agreed with Illinois and summarized by saying, "[W]hen private property is devoted to a public use, it is subject to public regulation."[135]

Insull turned this argument on its head by taking an industry that was not a monopoly which electric utilities were not at the time of his advocacy and making it a monopoly through regulation.[136] About a decade and a half after Insull first floated the idea of regulating electric utilities as natural monopolies, the political stars converged to embrace the idea.[137] Unlike the situation in *Munn* where a company came under regulation because it was a monopoly[138] electric companies became monopolies as a result of becoming regulated.[139] "In other words, the utility management may have sought regulation to maintain profitability."[140]

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[129] DAVID SCHAP, MUNICIPAL OWNERSHIP IN THE ELECTRIC UTILITY INDUSTRY: A CENTENNIAL VIEW 27-28 (Praeger Publishers 1986).

[130] FLAHERTY, *supra* note 106, at 11.

[131] HOGAN, *supra* note 106, at 36-37.

[132] RICHARD T. ELY, STUDIES IN THE EVOLUTION OF INDUSTRIAL SOCIETY 225 (Macmillan 1911), *https://perma.cc/H7NM-9K2B*.

[133] *Munn v. Illinois, 94 U.S. 113 (1876)*; *see* Gustavus H. Robinson, *The Public Utility Concept in American Law*, 41 HARV. L. REV. 277, 294 (1928) ("[T]he phrase has developed a clear content since Munn's time, and is the epitome of another set of explanations upon the question what is or may be made to be a public utility.").

[134] *Munn, 94 U.S. at 122*.

[135] *Id. at 130*.

[136] Richard D. Cudahy & William D. Henderson, *From Insull to Enron: Corporate (Re)Regulation After the Rise and Fall of Two Energy Icons*, *26 ENERGY L.J. 35, 46-51 (2005)*. *See generally* WASIK, *supra* note 106.

[137] DOUGLAS D. ANDERSON, REGULATORY POLITICS AND ELECTRIC UTILITIES 56 (1981).

[138] *Munn, 94 U.S. at 127-33*.

[139] *See generally* Werner Troesken, *The Institutional Antecedents of State Utility Regulation: The Chicago Gas Industry, 1860 to 1913, in* THE REGULATED ECONOMY: A HISTORICAL APPROACH TO POLITICAL ECONOMY 55 (Claudia Goldin & Gary D. Libecap eds.,1994).

[140] HYMAN ET AL., *supra* note 7, at 130-31.

The corruption of municipal officials in receiving bribes and kickbacks for granting private franchises "at the expense of 'consumer interests'" led a coalition of reformers and industry leaders to advocate for statewide regulation of electric utilities.[141] Regulation attempted to guarantee reliability and stability through a rate structure that encouraged the buildout of large infrastructure by guaranteeing set returns on whatever a utility spent. This standard rate **[*276]** regulation is called "cost-of-service" ratemaking. In the early years, electric utilities were able to reduce rates 55% and thrive by expanding and adopting fossil-fuel technologies that were larger and more efficient at the time,[142] increasing electrical output from 5.9 million kilowatt hours (kWh) in 1907 to 75.4 million kWh in 1927.[143]

The focus on returns for investors rather than on public service grew because despite the stability of regulation, electric utilities still failed to generate impressive profits and became targets for acquisition by holding companies. Holding companies do not conduct business but are just created to buy other companies that they then control, often focusing not on the mission of the companies they hold but on the profits they can eke out of them for shareholders. While states could regulate an intrastate utility, the U.S. Supreme Court made it clear that they did not have the power to control interstate commerce conducted by the holding companies.[144] The holding companies stifled competition, as the number of operating companies decreased from 6,355 to 4,409 in just the five years between 1922 and 1927.[145] In 2021, there were only 168 operating IOUs in the United States,[146] averaging over half a million customers each and operating primarily in lucrative, densely populated regions of the country.[147]

While many of the rationales for private IOU-owned large central-station generation plants were persuasive, they alone did not result in the private IOU model that now dominates the U.S. electricity market. Instead, the industry suffered from the chaos of a non-standardized system and the corruption of legislators who might mandate some order.[148] Ultimately, it would take "negotiations with city councils . . . , bribes, and delays in sales until the system **[*277]** was completed" to make the IOU model the norm.[149] As an example of the scope of corruption, one Edison representative "set aside a $500,000 slush fund to buy the votes of state senators and representatives" in 1897.[150]

Sadly, IOUs and their trade organizations remain some of the most influential lobbying interests in the United States today, and some utilities have been found to engage in bribery.[151] In 2021, IOUs spent more than $124 million on

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[141] SCHAP, *supra* note 129, at 22.

[142] Coal-fired plants were the main technology for large power plants in the early twentieth century aside from hydropower dams, which were very limited by location near an appropriate water source. HYMAN ET AL., *supra* note 7, at 121.

[143] MATTHEW H. BROWN & RICHARD P. SEDANO, ELECTRICITY TRANSMISSION 3 (2004), *https://perma.cc/W8QT-8BY9*.

[144] *Pub. Utils. Comm'n of R.I. v. Attleboro Steam & Elec. Co., 273 U.S. 83, 89-90 (1927)*.

[145] HYMAN ET AL., *supra* note 7, at 139.

[146] *Number of Electricity Providers in the United States in 2021, by Ownership Type*, STATISTA (Jan. 25, 2023), *https://perma.cc/LFJ8-8BM2*.

[147] Kevin Randolph, *EIA: Investor-Owned Utilities Served 72 Percent of US Electricity Customers in 2017*, DAILY ENERGY INSIDER (Aug. 19, 2019), *https://perma.cc/86HG-6NZ5*. The number had dropped to less than fifty electric companies by 2023. FLAHERTY, *supra* note 106, at 10.

[148] HYMAN ET AL., *supra* note 7, at 123.

[149] *Id. at 119*.

[150] HOGAN, *supra* note 106, at 51.

[151] J. DAVID LIPPEATT ET AL., BLOCKING ROOFTOP SOLAR: THE COMPANIES, LOBBYISTS AND FRONT GROUPS UNDERMINING LOCAL CLEAN ENERGY (2021), *https://perma.cc/K3FQ-ABUX*.

lobbying, second only to oil and gas interests.[152] In contrast, the "alternative energy" sector spent about $24 million in 2021, up from only about $7 million on lobbying in 2018.[153]

In 2020, PG&E in California pled guilty to eighty-four counts of involuntary manslaughter in the Camp Fire of 2018[154] and has been accused of sparking at least 1,500 more fires because of lack of maintenance of its lines[155] when it knew about this danger for years.[156] Yet, PG&E defended prioritizing payments of $5.3 million in dividends to investors and campaign contributions to politicians over investing in desperately needed equipment maintenance or replacement and wildfire-prevention measures.[157]

ProPublica has identified at least four ways in which utilities have used their clout to promote their private interests over that of ratepayers.[158] The first category, "Secret Political Spending," involves potential criminal activity. For example, authorities in Ohio alleged that FirstEnergy contributed $60 million to an entity overseen by Ohio House Speaker Larry Householder. Householder was convicted of racketeering for taking this money in exchange for promoting **[*278]** legislation that provided a billion-dollar bailout for FirstEnergy's failing nuclear power plants as well as reducing renewable energy standards and energy efficiency programs that FirstEnergy viewed as competition.[159] Similarly, the FBI and U.S. Attorney's Office have investigated Arizona Public Service for donating millions to "dark money" organizations that helped elect two state utility regulators in 2014. These candidates won and in 2017 voted for a utility-backed rate increase.[160] Another category is "Creating the Appearance of Public Support."[161] In one egregious example, Entergy was fined $5 million for allowing one of its contractors to pay people to show up at New Orleans City Council meetings to create the appearance of community support for a new natural gas plant that Entergy wished to build.[162]

2. Legislator or Regulator Complicity

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[152] *Electric Utilities: Lobbying, 2022*, OPEN SECRETS, *https://perma.cc/P3K9-JLJD*.

[153] *Alternative Energy Production & Services: Lobbying, 2022*, OPEN SECRETS, *https://perma.cc/8EKN-8RVL*.

[154] *See, e.g.*, Dan Whitcomb, *PG&E Pleads Guilty to 84 Counts of Involuntary Manslaughter in California Wildfire*, REUTERS (June 16, 2020, 12:22 PM), *https://perma.cc/HW9A-2C4M*; *see also* Katherine Blunt, *Inside the Investigation That Secured a Guilty Plea for 84 Wildfire Deaths*, WALL ST. J. (Aug. 25, 2022, 10:00 AM ET), *https://perma.cc/8X7F-XNQB*.

[155] Russell Gold et al., *PG&E Sparked at Least 1,500 California Fires. Now the Utility Faces Collapse.*, WALL ST. J. (Jan. 13, 2019, 3:19 PM ET), *https://perma.cc/8N8S-5T25*.

[156] Katherine Blunt & Russell Gold, *PG&E Knew for Years Its Lines Could Spark Wildfires, and Didn't Fix Them*, WALL ST. J. (July 10, 2019, 10:28 AM ET), *https://perma.cc/DZ7S-WJ4Q*.

[157] *See, e.g.*, Nicholas Iovino, *PG&E Defends Spending on Investors, Politicians as Fires Sparked*, COURTHOUSE NEWS SERV. (July 31, 2019), *https://perma.cc/8KVA-W99Q*.

[158] Patrick Wilson, *Four Types of Scandals Utility Companies Get into with Money from Your Electric Bills*, PROPUBLICA (Oct. 10, 2020, 5:00 AM EDT), *https://perma.cc/4FBW-Y385*.

[159] Press Release, U.S. Att'y's Office, S. Dist. of Ohio, Jury Convicts Former Ohio House Speaker, Former Chair of Ohio Republican Party of Participating in Racketeering Conspiracy (Mar. 9, 2023), *https://perma.cc/N9GS-TSWK*.

[160] Wilson, *supra* note 158.

[161] *Id.*

[162] *Id.; see also* Sam Brasch, *Xcel Energy Played a Leading Role in a Stealthy Plan to Defend Natural Gas in Colorado*, CPR NEWS (Feb. 27, 2023, 3:55 AM), *https://perma.cc/M2DE-GRSC* (reporting that electric utility promoting itself as "green" made major contributions to a non-profit dedicated to fighting for natural gas against a growing movement toward electrification of buildings).

While the use of IOU clout and money are probably the primary drivers for stifling innovation that might threaten competition, legislators and regulators share some complicity in the outcome. On the legislator side, ProPublica's list of ways in which utilities use their clout is "Offering Jobs to Allies." As an example, it notes that Commonwealth Edison, the largest electric utility in Illinois, paid the Illinois House Speaker more than $1.3 million for subcontracts and job payments to associates of the House Speaker in return for his support on a bill that provided Commonwealth Edison with more than $150 million in benefits.[163]

ProPublica's fourth category is "Undertaking Mega Projects That Don't Pan Out." While this strategy is usually not illegal because it is justified by the cost-of-service rate structure under which most IOUs are regulated, it has probably cost ratepayers more than any of the others. For example, SCANA Corp. in South Carolina proposed to build a nuclear power plant. The project was **[*279]** canceled in 2017, but utility customers are still on the hook for $2 billion that SCANA is permitted to collect through their rates.[164]

Regulators created cost-of-service ratemaking to calculate how high rates should be to guarantee an IOU's revenue. The cost-of-service model has produced problems because it awards IOUs a guaranteed rate of return on physical assets. As a result, the process incentivizes IOU investment only in their IOU-owned assets (wires, generators, meters, software). It also disincentives any displacement of IOU assets by customer-owned or third-party non-wires resources such as rooftop solar or behind-the-meter storage.[165]

Utility reform ideas have been floated for over a decade,[166] but none have radically changed the traditional cost-of-service incentives in most markets.[167] Eventually, some of these changes might encourage a utility to embrace partnerships with third-parties for microgrid expansion, and some microgrid developers might see a utility-as-partner model as its best chance to infiltrate IOU monopoly strangleholds in certain territories.[168] However, such "if you can't beat them, join them" strategies encourage "mission creep" of utilities into areas beyond their primary role of

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[163] Wilson, *supra* note 158.

[164] *Id.*

[165] Brown, *supra* note 51, at 152.

[166] *See, e.g.*, PETER FOX-PENNER, SMART POWER: CLIMATE CHANGE, THE SMART GRID, AND THE FUTURE OF ELECTRIC UTILITIES (2010); MANSHRECK, *supra* note 30; NAT'L RENEWABLE ENERGY LAB'Y, DECOUPLING POLICIES: OPTIONS TO ENCOURAGE ENERGY EFFICIENCY POLICIES FOR UTILITIES (2009), https://perma.cc/7X9C-NHNG; SCOTT HEMPLING, REGULATING PUBLIC UTILITY PERFORMANCE: THE LAW OF MARKET STRUCTURE, PRICING AND JURISDICTION (2d ed. 2021); David J. Unger, *"Platform" Model Will Be Key for Illinois' Future Power Grid*, ENERGY NEWS NETWORK (Oct. 5, 2017), https://perma.cc/S2FU-FKBC; MEDSIS Staff Report, FORMAL CASE NO. 1130, Modernizing the Energy Delivery System for Increased Sustainability, FC 1130 (Pub. Serv Comm'n D.C. Jan. 25, 2017), FC 1130-2017-M-88, https://perma.cc/M8UL-E33P; Order on Net Energy Metering Transition, Phase One Value of Distributed Energy Resources, and Related Matters, In the Matter of the Value of Distributed Energy Resources, 15-E-0751 (N.Y. Pub. Servs. Comm'n Mar. 9, 2017); LESTER R. BROWN ET AL., THE GREAT TRANSITION: SHIFTING FROM FOSSIL FUELS TO SOLAR AND WIND ENERGY (2015).

[167] *See e.g.*, Chloe Holden, *More States Explore Performance-Based Ratemaking, but Few Incentives Are in Place*, GREENTECH MEDIA (June 13, 2019), https://perma.cc/2MU5-FQVY; *see also* Gennelle Wilson et al., *States Move Swiftly on Performance-Based Regulation to Achieve Policy Priorities*, RMI (Mar. 31, 2022), https://perma.cc/VS66-GZJV (noting that although performance-based regulation (PBR) is seen as a promising alternative and has "gained significant traction" since 2020, it is still only implemented in a minority of states (seventeen) and there is not a clear success plan as regulators and utilities are "building the plane while flying it").

[168] Sara C. Bronin & Paul R. McCary, *Peaceful Coexistence: Independent Microgrids Are Coming*, PUB. UTILS. FORT., Mar. 2013, at 40.

delivering electrons, and because the **[*280]** utilities may be picking winners and losers, can result in higher prices for customers and stifling of innovation that market competition would allow.[169]

3. Recognizing the Value of Redundancy

One example of regulator resistance towards microgrids is how the electrical system values, or fails to value, resiliency.[170] At the turn of the twentieth century, avoiding redundancy, or duplication of infrastructure, was one of the main drivers for transitioning from independent power generation plants to the large, centralized station model. To justify their "natural monopolies," IOUs argued that competition results in "wasteful duplication" of investment,[171] leading to inefficient service and high rates.[172]

These ideas are incorrect in today's world. First, they presume that redundancy is wasteful. But the climate of today is not what it was a century ago. Violent storms and fires are causing more outages.[173] Furthermore, instead of being "waste," redundancy now has become a critical positive asset due to the increased reliance on electricity for everything from payments to communication to medical devices, and electricity's growing role for transportation and home heating and cooling.[174]

[*281] Despite the increased reliance on electricity and the ability of microgrids to deliver needed backup, "reliability standards do not adequately account for the reliability of [such] sources."[175] The National Council of State Legislators has observed that energy resilience policies are "often difficult to pass."[176] This is true because "they tend to require costly investments in infrastructure."[177] In addition, "the return on investment is difficult to quantify; there is no widely accepted metric for valuing the *damage that isn't done*, or energy *services that aren't interrupted* as a result of resiliency spending."[178] The additional fallacies of the competition-as-waste arguments are that they

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169 Troy A. Rule, *Utility Mission Creep*, 56 U.C. DAVIS L. REV. 591, 599, 628 (2022); *see also* Lisa Cohn, *Solar, Microgrid Developers Say Xcel Has Monopoly Advantage in New Minnesota Resiliency Program*, MICROGRID KNOWLEDGE (May 5, 2023), https://perma.cc/RW63-BH4C.

170 THINK MICROGRID, MICROGRIDS: AN IMMEDIATE CLIMATE SOLUTION 16 (2022), https://perma.cc/GB6A-ETGZ.

171 Aditya Bamzai, Comment, *The Wasteful Duplication Thesis in Natural Monopoly Regulation*, 71 U. CHI. L. REV. 1525 (2004) (exploring the validity of the wasteful duplication thesis in the context of rent dissipation).

172 *See also* PW Ventures, Inc. v. Nichols, 533 So. 2d 281, 283 (Fla. 1988) ("[Florida law] directs the PSC to exercise its powers to avoid 'uneconomic duplication of generation, transmission, and distribution facilities.' If the proposed sale of electricity by PW Ventures is outside of PSC jurisdiction, the duplication of facilities could occur. What PW Ventures proposes is to go into an area served by a utility and take one of its major customers. Under PW Ventures' interpretation, other ventures could enter into similar contracts with other high use industrial complexes on a one-to-one basis and drastically change the regulatory scheme in this state. The effect of this practice would be that revenue that otherwise would have gone to the regulated utilities which serve the affected areas would be diverted to unregulated producers. This revenue would have to be made up by the remaining customers of the regulated utilities since the fixed costs of the regulated systems would not have been reduced.").

173 Matthew Brown et al., *Storms Batter Aging Power Grid as Climate Disasters Spread*, ASSOCIATED PRESS NEWS (Apr. 5, 2022), https://perma.cc/2FJV-BRXB.

174 *See, e.g.*, Justin Mulfati, *How Redundancy Is Key in Reducing Blackout Hours*, DCBEL (Sept. 21, 2021), https://perma.cc/CEV3-WK6N.

175 Klass et al., *supra* note 46, at 1045. One way to better value resiliency might be to assess stronger non-performance penalties for outages. Interview with Joshua Macey, Assistant Professor of L., U. Chi., in Phx., Ariz. (May 11, 2023)

176 *ANDERSEN ET AL., supra note 96*.

177 *Id.*

presume IOUs could not compete, which would result in inefficient service. These arguments also assume that IOU assets are stagnant and that costs for alternatives would therefore be borne solely by remaining customers. However, customers are currently paying for utilities to retire fossil fuel assets to build new low-carbon alternative infrastructure,[179] and in jurisdictions where customers opt out of utility service, they often must pay "exit fees" also called Power Charge Indifference Adjustment fees in California.[180]

In conclusion, a number of factors may account for a bias of state regulators for retaining the status quo, including job security for government employees and contractors, regulatory capture,[181] belief in the benefit of regulation, and lack of authority to regulate more extensively or in a different manner. Regardless of the motivation, this bias helps explain the rejection of Sunnova's microgrid utility application and the almost insurmountable powers that are preventing deployment of alternative ways to provide power for consumers. This impediment will continue to stand until legislatures and regulators can **[*282]** recognize the disproportionate influence entrenched stakeholders wield and until they can better appreciate the value of redundancy in providing reliable and resilient electric power.

C. Energy Justice: "Just the Way It's Always Been" Is Not the Way the Future Should Be

There is increased concern for the inequities of the current electricity model. Perhaps most importantly, there is an alternative to isolated coal-fired plants that emit toxic pollutants to those in the immediate vicinity. New technologies allow clean generation of electricity onsite using solar panels that provide this power silently, without the need for water or harmful byproducts.[182] The electricity generated can also be stored onsite either as electricity in batteries or as heat in appliances such as electric water heaters, both of which can later deliver that electricity or heat on demand. Sophisticated microgrid controllers can also now regulate the flow of power by making adjustments to avoid overdemand and shortages.[183] These new technologies can provide opportunities to redress both environmental and energy injustices.

In one instructive example, a non-profit church in North Carolina worked with a third-party to install solar panels on its roof to provide clean energy to offset some of the parish's soaring electricity bills.[184] Duke Energy, the IOU that held the electricity franchise for the area encompassing the church, petitioned the North Carolina Utilities Commission to issue a cease and desist order and fine the non-profit up to $1,000 per day for every day it sold power to the church.[185] When asked whether this result seemed unfair because of the energy justice concerns, Duke's communications manager responded, "I think that's just the way it has been."[186] However, "just the way it's

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[178] *Id.* (emphasis added); *see also* Joel B. Eisen et al., *Virtual Energy*, ILL. L. REV. (forthcoming 2024) (manuscript at 17-23), *https://perma.cc/UKS2-WS4M* (noting utility conflict of interest in measuring reliability and arguing for Independent Distribution System Operators).

[179] *See, e.g.*, Scott Van Voorhis, *Xcel Plans to Roll Out 10,000 MW of Renewable Energy in Minnesota, Colorado by 2030*, UTILITY DIVE (July 30, 2021), *https://perma.cc/E29P-45BC*.

[180] *See, e.g.*, Linda Dailey Paulson, *CCA Board Members Petition CPUC to Resolve Exit Fee Issues Immediately*, CAL. ENERGY MKTS., *https://perma.cc/4T6A-8ZBV* (Oct. 2, 2020).

[181] *See, e.g.*, ELIN CHERRY & ROBERT W. DANNHAUSER, CORRUPT OR COLLABORATIVE?: AN ASSESSMENT OF REGULATORY CAPTURE 1 (2016), *https://perma.cc/X9WM-6N5T* ("Regulatory capture refers to the corruption of the regulatory process such that the public good is sacrificed in favor of the commercial interests of the regulated entity.").

[182] GARVIN HEATH ET AL., ENVIRONMENTAL AND CIRCULAR ECONOMY IMPLICATIONS OF SOLAR ENERGY IN A DECARBONIZED U.S. GRID 19, 34 (2022), *https://perma.cc/99AV-FEM6*.

[183] Kevin B. Jones et al., *The Urban Microgrid: Smart Legal and Regulatory Policies to Support Electric Grid Resiliency and Climate Mitigation*, *41 FORDHAM URB. L.J. 1695, 1703-04 (2014)*.

[184] State *ex rel. Utils. Comm'n v. N.C. Waste Awareness & Reduction Network, 805 S.E.2d 712, 714 (N.C. Ct. App. 2017)*.

[185] *Id.* For more discussion of utility warfare against rooftop solar, see *infra* Part IV.

always been" does not justify the way the future should be. Energy justice has been essentially forgotten in the story of the shift from publicly owned electric utilities to for profit IOUs.

[*283] The relationship between regulated monopolies and their regulators is sometimes characterized as a "regulatory compact" even though there is no formal contract nor is the agreement generally codified into law.[187] The benefits to the IOU are exclusive service territories and rates that provide assurance of a fair rate of return on the utility's investments.[188] In exchange, the utility allows scrutiny of its finances by regulators and regulatory approval of rate increases.[189]

Another component of the compact is that an IOU has an obligation to serve all customers within its exclusive service territory. This is generally not a major imposition because IOUs have significant discretion in defining their territories and generally manage to keep the boundaries focused on the most condensed and profitable markets. This is illustrated by the fact that IOUs did not believe that providing power to remote areas of the United States was economically lucrative, and they chose not to encompass rural customers within their territories.[190] In 1936, 90% of rural Americans had no access to electricity.[191] Federal legislation was required, through the Rural Electrification and Telephone Service Act of 1936,[192] to finally bring electricity to these areas, mostly through electric co-ops, which now provide power to approximately 13% of the U.S. population.[193] The 1936 Act, which worked around the for-profit motive, resulted in a dramatic turnaround; in less than fifteen years, 80% of rural America finally had access to electricity.[194]

In addition, the large, centralized power stations created a disconnect between the benefits of electricity and the externalities of air and water pollution caused by burning coal. In the time of isolated power plants, the entities that needed the power also suffered the detriments of coal combustion adjacent to their facilities. In some ways this was especially ironic as a hospital that needed electricity was contributing to the breathing problems of its patients by having an onsite coal generation facility. Moving power generation **[*284]** to remote areas may have been justified because it lowered costs and removed the harm from more densely populated areas.

However, moving generation away from more affluent areas has resulted in a disproportionate burden of environmental harms and adverse health impacts on minority, low income, and indigenous communities.[195] Furthermore, these populations are disproportionately harmed by the upstream extraction of electrical fuel such as coal, natural gas, and uranium.[196] Ultimately, climate change has and will also cause the most harm to many of these same groups who also suffer from energy insecurity and are least able to absorb IOU rate hikes. These issues raise environmental justice concerns. Community microgrids could provide these groups with a critical

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[186] JONATHAN SCOTT'S POWER TRIP (Scott Bros. Ent. 2020).

[187] *Regulatory Compact*, ENERGY KNOWLEDGEBASE, *https://perma.cc/T6V7-JCSY*.

[188] *Id.*

[189] *Id.*

[190] Brandon McBride, *Celebrating the 80th Anniversary of the Rural Electrification Administration*, U.S. DEP'T OF AGRIC. (May 20, 2016), *https://perma.cc/8FCM-3L5K*.

[191] *Id.*

[192] Rural Electrification Act of 1936, *7 U.S.C. § 901* (2022).

[193] Lindstrom & Hoff, *supra* note 6.

[194] McBride, *supra* note 190.

[195] *Power Plants and Neighboring Communities*, U.S. ENV'T PROT. AGENCY, *https://perma.cc/H2NA-S4JZ* (May 11, 2023).

[196] Diana Hernández, *Sacrifice Along the Energy Continuum: A Call for Energy Justice*, 8 ENV'T JUST. 151, 152 (2015).

electricity safety net when the power goes out as well as an opportunity for more choice or control over the rates they pay. Microgrids have a better chance of meeting these goals in a competitive environment, something the federal government has attempted to foster in the electric utility space.

D. Federal Introduction of Competition

Due to their influence in state politics, IOUs eventually controlled every phase of electricity production from generation at a power plant to transmission over long distance wires to distribution into homes and businesses.[197] From the beginning, monopoly IOUs worked hard to stifle competition.[198] Senator George Norris of Nebraska[199] believed "[t]he power trust is the greatest monopolistic corporation that has been organized for private greed," and he accused them of "buying legislatures, clergymen, and even the Boy Scouts."[200]

[*285] While a few electric utilities voluntarily agreed to share some resources,[201] federal government intervention was required to loosen the IOU stranglehold. Public opinion turned against them when holding company securities crashed shortly after 1929, and Franklin D. Roosevelt rode the tide of public sentiment in promising to reform them in his 1932 presidential campaign.[202] FDR's administration promoted public power[203] and enacted the Public Utility Holding Company Act of 1935. This legislation not only broke up some holding companies and placed others under strict regulation by the SEC, but also required submission of financial reports and approval to issue securities.[204] As a result, over seven hundred companies were separated from holding company systems, and the overall number of holding companies dropped from 216 in 1938 to only 18 twenty years later.[205]

Things stabilized for IOUs from 1945 to 1965, but the natural monopoly construct was not without its critics even in its early years. A 1998 report by the Congressional Research Service noted, (1) "there is *nothing natural about a utility's monopoly* . . . because exclusive franchises . . . are *granted by government*," and (2) many publicly owned utilities have been able to meet their customers' needs with "*contractual arrangements, rather than unified control*."[206]

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[197] HYMAN ET AL., *supra* note 7, at 146 ("Central station generators furnished only 40% of electricity at the turn of the century . . . [but] 80% in the Great Depression. . . . [R]egulation . . . began at the behest of civic leaders and of important industry leaders.")

[198] *Id. at 136* (describing Morris Cooke's Great Power Survey scheme).

[199] Partially as a result of Senator Norris's advocacy, Nebraska is the only state that has never been served by a privately-owned electric IOU. *The Legacy of Senator George Norris*, NEB. DEP'T OF ENV'T & ENERGY Q. NEWSL., Mar. 2019, *https://perma.cc/8HVW-6C27*.

[200] HYMAN ET AL., *supra* note 7, at 146; *see also* HOGAN, *supra* note 106, at 51.

[201] In 1927, Philadelphia Electric, Pennsylvania Power and Light, and New Jersey's Public Service Electric and Gas created the first regional transmission network, the PNJ Interchange. HYMAN ET AL., *supra* note 7, at 136.

[202] Franklin D. Roosevelt declared that "the Ishmael or Insull whose hand is against every man's, declines to join in achieving an end recognized as being for the public welfare . . . ." President Franklin Delano Roosevelt, Speech at the Commonwealth Club in San Francisco, California (Sept. 23, 1932), *in Franklin Delano Roosevelt, Speech at San Francisco (1932)*, PEARSON, *https://perma.cc/X7Z4-N3H6*.

[203] The Bonneville Project Act of 1937, *16 U.S.C. § 832* (1937).

[204] Public Utility Holding Company Act of 1935, *15 U.S.C. § 79*, *repealed by* Energy Policy Act of 2005, ***Pub. L. 109-58***, Title XII, § 1263, ***119 Stat. 974***.

[205] HYMAN ET AL., *supra* note 7, at 148.

[206] AMY ABEL, ELECTRICITY RESTRUCTURING BACKGROUND: THE PUBLIC UTILITY REGULATORY POLICIES ACT OF 1978 AND THE ENERGY POLICY ACT OF 1992, at 2 (1998), *https://perma.cc/5P45-SPBG* (emphasis added).

After 1965, IOUs, which generated over 75% of customer kilowatt hours (kWh) by 1980,[207] faced pressures that were exacerbated by their choice to build "bigger and more expensive power stations that did not work as well as their predecessors."[208] The standard cost-of-service ratemaking formula, **[*286]** addressed above, allows utilities to receive a guaranteed return on investment in "rate base" infrastructure. Therefore, investing money in assets is generally a safer strategy for profits than putting effort into operating more efficiently.[209]

This rate structure for compensating regulated IOUs has been criticized for over sixty years. For example, the Averch-Johnson effect notes that utilities need not be efficient and are disincentivized to be innovative because the rate formulas primarily motivate raising the rate base by investing in more massive and expensive infrastructure.[210] One source notes, "advocates of technical improvement rarely address . . . whether the party that would have to implement the change has an economic incentive to do so, or whether politically or economically powerful stakeholders have reason to oppose implementation via the legal or regulatory processes."[211]

The Public Utility Regulatory Policies Act of 1978 (PURPA)[212] was the first federal effort to seriously challenge the independence of the traditional vertically-integrated IOU monopoly. PURPA was enacted during the Carter administration in response to U.S. energy vulnerabilities exposed by the Middle Eastern Oil Embargo of 1973-74.[213] Among its provisions, PURPA introduced competition at the generation end of the utility cycle by creating a new class of electricity generators called "qualifying facilities" (QFs).[214] PURPA required IOUs to purchase electricity from QFs.[215] IOUs fiercely challenged PURPA in the courts, but the QF provisions survived judicial scrutiny.[216]

The Reagan era brought in a wave of deregulation in several sectors, including transportation and natural gas.[217] Rising rates, caused by expensive **[*287]** and sometimes unused infrastructure,[218] as well as reliability concerns, made electric utilities a ripe target for deregulation by the 1990s. In the generation space, the Energy Policy Act of

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[207] HYMAN ET AL., *supra* note 7, at 165 tbl.19-2.

[208] *Id. at 165* ("[O]ther factors mentioned were finances and environmental concerns . . . .").

[209] *Id.* at 482-83.

[210] *See, e.g.*, 2 ALFRED E. KAHN, THE ECONOMICS OF REGULATION: PRINCIPLES AND INSTITUTIONS 106-108 (John Wiley & Sons, Inc. 1970-71).

[211] HYMAN ET AL., *supra* note 7, at 482.

[212] Public Utility Regulatory Policies, *16 U.S.C. §§ 2601-2645*.

[213] Michael Corbett, *Oil Shock of 1973-74*, FED. RESERVE HIST. (Nov. 22, 2013), *https://perma.cc/GQZ3-9R3G*.

[214] *The Public Utility Regulatory Policies Act of 1978*, SOLAR ENERGY INDUS. ASS'N (Feb. 2018), *https://perma.cc/32RD-R2WQ*.

[215] Public Utility Regulatory Policies Act of 1978, *16 U.S.C. § 824a-3* .

[216] *See Fed. Energy Regul. Comm'n v. Mississippi, 456 U.S. 742 (1982)*. However, subsequent federal legislation reduced some of the IOU requirements to purchase electricity created by QFs. *See, e.g.*, Energy Policy Act of 2005, *42 U.S.C. § 15801*; Trevor D. Stiles, *Regulatory Barriers to Clean Energy*, *41 U. TOL. L. REV. 923, 929, 935 (2010)*.

[217] J.D. Steelman Jr., *Deregulation of the Natural Gas Industry*, FOUND. FOR ECON. EDUC. (June 1, 1986), *https://perma.cc/63MW-EQ7V*.

[218] In October 1983, Cincinnati G&E announced it could not complete the Zimmer nuclear power station, which was supposedly 97% complete, without over $3 billion more of investment over two to three years. HYMAN ET AL., *supra* note 7, at 180-81. In June 1983, the Washington Public Power Supply System had to cancel two of five planned nuclear power plants and halt construction of a third when its costs for the initial two tripled. *Id.* In January 1988, the Public Service of New Hampshire filed for bankruptcy. *Id.*

1992 opened the door to additional competition by repealing restrictions in the Public Utility Holding Company Act of 1935.[219] For transmission, the 1992 Act also introduced competition by requiring utilities to make their lines available to competing generators. With respect to distribution of electricity directly to customers, the 1992 Act did not *require* states to allow wheeling of electricity directly from a generator to customers, thus bypassing a local utility.[220] However, the 1992 Act likewise did not prohibit states from permitting direct-sales competition.[221]

While IOUs and their trade organizations feared "the old electric industry would expire, to be replaced by a dynamic, new, competitive business,"[222] the prediction of IOU demise proved premature as those who created the policies to introduce more competition "underestimated the ability of the incumbents to manage the process to their advantage, of stakeholders to influence legislatures, of regulators to hold on, and of enterprising trading types and out-and-out crooks to outwit those in charge of the new markets."[223] By 1999, twenty-five states had come to, or were moving toward, restructuring their retail markets for competition.[224] However, that progress was slowed after the financial collapse of Enron. The number of states with retail choice is currently **[*288]** at only sixteen, with no additional states actively pursuing such restructuring,[225] and participation by residential customers is below 20% in seven of the sixteen deregulated states.[226]

FERC has long been aware of biases against newer technologies and attempted to address them through a number of administrative initiatives to reduce monopoly practices that discouraged competition. Before federal intervention, IOUs "pancaked" multiple charges from various monopolies onto a generation source, such as a wind farm, when using their transmission lines to reach distant customers.[227] FERC introduced non-profit Independent System Operators (ISOs)[228] and then Regional Transmission Organizations (RTOs),[229] taking away utility

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[219] Energy Policy Act of 1992, 41 U.S.C. § 13201; Public Utility Holding Company Act of 1935, *15 U.S.C. § 79*, *repealed by* Energy Policy Act of 2005, ***Pub. L. 109-58***, Title XII, § 1263, ***119 Stat. 974***; *see also* James W. Moeller, *Requiem for the Public Utility Holding Company Act of 1935: The "Old" Federalism and State Regulation of Inter-State Holding Companies*, *17 ENERGY L.J. 343 (1996)*; Nidhi Thakar, Comment, *The Urge to Merge: A Look at the Repeal of the Public Utility Holding Company Act of 1935*, *12 LEWIS & CLARK L. REV. 903 (2008)*.

[220] "Wheeling" means "[t]he movement of electricity from one system to another over transmission facilities of interconnecting systems." *Glossary*, U.S. ENERGY INFO. ADMIN., *https://perma.cc/FXV3-R57N*.

[221] *16 U.S.C. § 824(b)(1)* ("[FERC] shall have jurisdiction over all facilities for such transmission or sale of electric energy, but shall not have jurisdiction . . . over facilities used for the generation of electric energy or over facilities used in local distribution or only the transmission of electric energy in intrastate commerce . . . .")

[222] HYMAN ET AL., *supra* note 7, at 199.

[223] *Id.*

[224] *Id. at 205* (noting that thirteen states had retail access, and twelve states were pursuing).

[225] As of 2021, in addition to the District of Columbia, there were sixteen deregulated states, including California, Connecticut, Delaware, Illinois, Massachusetts, Maryland, Maine, Michigan, Montana, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, and Texas. AM. PUB. POWER ASS'N, RETAIL ELECTRIC RATES IN DEREGULATED AND REGULATED STATES: 2021 UPDATE (May 2022), *https://perma.cc/7247-XQ69*; *see also US States with Deregulated Energy in 2022*, QUICK ELECTRICITY, *https://perma.cc/M6G9-6BRG*; *Deregulated Energy States*, ELECTRICITYRATES.COM, *https://perma.cc/KA75-R4MA* (Nov. 1, 2022).

[226] *AM. PUB. POWER ASS'N, supra note 225*.

[227] HYMAN ET AL., *supra* note 7, at 206 ("If the operator had to send the power 100 miles over the line of one utility, it would pay one charge, but if it had to use the lines of three utilities to travel the same distance, it would pay three times as much" in a practice FERC called "pancaking.")

[228] *Id.*

ownership of transmission to "prevent unfair operation of the lines."[230] Eventually, FERC had to issue a third order, Order 2000, to put more pressure on utilities to "voluntarily place their transmission assets into RTOs . . . within a specified period of time, or explain why."[231] Despite these and other efforts, FERC concluded that "simply opening markets would not benefit consumers if a few producers dominated the market and used their market power to maintain high prices."[232]

[*289] More recently, FERC issued several orders supporting the integration of non-traditional technologies such as solar and storage.[233] In 2011, Order 745 mandated compensation for demand response resources that can connect and help balance loads.[234] Traditional IOUs challenged Order 745, but the Supreme Court upheld it.[235] FERC continued bolstering market competition with Order 784, which aimed to "enhance the ability of third parties to compete for the sale of certain ancillary services" to wholesale energy markets.[236] This order attempts to create more transparency among market participants by eliminating restrictions on third-party ancillary-service sales, introducing speed and accuracy as considerations for pricing, and revising accounting practices to better track the value of energy storage.[237]

Next, Order 819 targeted IOU resistance to electric storage by allowing the sale of "frequency response," a key service provided by batteries,[238] at market-based rates[239] Similarly, FERC's Order 841 encourages RTO/ISO use of

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[229] FERC Orders 888 and 889 created ISOs in addition to RTOs. FERC Open Access Same-Time Information System (formerly Real-Time Information Networks) and Standards of Conduct Order No. 889, 18 C.F.R. 37 (1996), *https://perma.cc/NU92-8PE6*. While RTOs generally cover larger territories, FERC's orders created the RTOs and ISOs as entities to provide non-utility electricity generators access to IOU transmission lines. *See* KENNETH ROSE, NATIONAL REGULATORY RESEARCH INSTITUTE, OHIO ST. U., SUMMARY OF KEY STATE ISSUES OF FERC ORDERS 888 AND 889 NRRI 97-08, at 3-10 (1997).

[230] HYMAN ET AL., *supra* note 7, at 207.

[231] *Id.*

[232] *Id. at 208*.

[233] The Energy Policy Act of 2005 included a number of policy declarations to encourage and facilitate "the deployment of technology and devices that enable electricity customers to participate in [time-based] pricing and demand response systems . . . and [eliminate] unnecessary barriers to demand response participation in energy, capacity and ancillary service markets." ***Pub. L. No. 109-58***, § 1252(f). These declarations were used to support FERC Order 745 and others. *See, e.g.*, *Fed. Energy Regul. Comm'n v. Elec. Power Supply Ass'n, 577 U.S. 260, 271 (2016)*.

[234] *Demand Response Compensation in Organized Wholesale Energy Markets, 134 FERC ¶ 61,187*, Order No. 745 at 1 (Mar. 15, 2011).

[235] *Elec. Power Supply Ass'n*, 577 U.S.

[236] *Third-Party Provision of Ancillary Services; Accounting and Financial Reporting for New Electric Storage Technologies, Order No. 784, 78 Fed. Reg. 46177, 46179* (July 18, 2013).

[237] *See, e.g.*, Stinson LLP, *Energy Insight: FERC Order 784 Accommodating The Battery; Supporting Electricity Storage* (Aug. 30, 2013), *https://perma.cc/NU4Y-P6PC*; *FERC Issues Order No. 784: Third-Party Provision of Ancillary Services; Accounting and Financial Reporting for New Electric Storage Technologies (RM11-24-000; AD10-13-000)*, WINSTON & STRAWN LLP (July 22, 2013), *https://perma.cc/28TW-BDXD*.

[238] Glenn McGrath, *Battery Storage Applications Have Shifted as More Batteries Are Added to the U.S. Grid*, U.S. ENERGY INFO. ADMIN. (Nov. 1, 2021), *https://perma.cc/TET2-GWL9*.

[239] *Third-Party Provision of Primary Frequency Response Service, Order No. 819, 80 Fed. Reg. 73965* (Nov. 20, 2015).

storage by requiring them to establish tariffs "recognizing the physical and operational characteristics of electric storage resources . . . ."[240] IOUs challenged Order 841, but the D.C. Circuit upheld it.[241]

[*290] As recently as 2022, FERC targeted industry concerns that "FERC's current Uniform System of Accounts does not adequately account for renewable assets."[242] FERC emphasized creating new production accounting for wind, solar, and other non-hydro renewable generation assets as well as energy storage and hardware, software, and communication equipment.[243]

Order 2222 elucidates how entrenched systems stymie new technologies. In the past, IOUs siloed valuations by their functions as generation, transmission, and distribution. While older technologies could only perform one function, modern energy storage technologies created a new world one where a single asset, a battery, could cross over between functions and both provide power when needed (generation) and take power when there is excess being generated (distribution).[244] To eliminate the bias against battery storage, FERC sought to consolidate generation, transmission, and distribution into one single accounting function for energy storage. This change allows batteries, and other new "grid-edge resources," the ability to receive revenues for all the services they provide.[245]

Nevertheless, FERC's regulatory authority is limited to interstate wholesale electricity. States wield power over retail sales to customers, leaving grid-edge technologies at the mercy of state regulators who are more susceptible to IOU lobbying. As a result, while "[o]ther parts of the world continue to move toward greater competition in electricity markets,"[246] IOUs have been able to maintain a controlling grip on the U.S. market and to delay innovation despite FERCs efforts. As one source concluded:

> Maxwell's Laws, after all, do not dictate that electricity must come from a vertically integrated, regulated natural monopoly. No reason remains to keep in place an early twentieth-century social concept developed in the days when massive steam turbines represented cutting-edge technology . . . especially if the concept fosters inefficiency and technological stasis. Utilities have to emerge from their cosseted place in the world of regulation in order to succeed in the real world. They have to learn to compete, to run as businesses rather than government-protected monopolies. . . . Or they can attempt to manipulate the rules in a way that disadvantages the putative competitors. The old utilities know how to play the government relations and regulatory games. Should they use those strengths to maintain their advantages? Should one expect otherwise?[247]

[*291] III. THE POWER OF PUBLIC UTILITY DEFINITIONS

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[240] 1 STEVEN FERREY, L. OF INDEP. POWER § 5:40.50 (Mar. 2023 Update).

[241] Practical Law Finance, *FERC Issues Final Rule Allowing Distributed Energy Resources to Participate in RTO and ISO Markets*, PRACTICAL LAW (Oct. 1, 2020), *https://perma.cc/2PX7-VSLU*.

[242] Mark R. Haskell et al., *Accounting for Change: Federal Energy Regulatory Commission Proposes Accounting and Financial Reporting Reforms to Address Renewable Energy Assets*, BLANK ROME LLP (Oct. 2022), *https://perma.cc/9K6X-3NAH*.

[243] *Id.*

[244] *See, e.g.*, EMANUELE TAIBI ET AL., ELECTRICITY STORAGE VALUATION FRAMEWORK: ASSESSING SYSTEM VALUE AND ENSURING PROJECT VIABILITY (Int'l Renewable Energy Agency 2020), *https://perma.cc/MB3D-TGZM*; *see also* SARA MULHAUSER, BATTERY ENERGY STORAGE TECHNOLOGY ADOPTION & ELECTRIC UTILITY STRUCTURE: ANALYZING FACTORS DRIVING STORAGE DEPLOYMENT ACROSS UTILITY OWNERSHIP STRUCTURES (Nat'l Ass'n of Regul. Util. Comm'rs 2020), *https://perma.cc/6RY4-PH95*.

[245] Brown, *supra* note 51, at 161.

[246] HYMAN ET AL., *supra* note 7, at 215.

[247] *Id.* at 485.

As the previous Part showed, federal legislators and agencies have limited ability to change the current U.S. electric utility structure. Consequently, it is up to the states to determine whether an entity falls within their definition of public utility.[248] This determination can have profound impacts on whether that entity is permitted to provide any electric services. In most states, public utilities are subject to regulation by the state PUC, and that regulation can be time-consuming, burdensome, and expensive, threatening the financial security, and ultimately the adoption of, newer technologies.[249] In addition, being designated a public utility can be a death knell in states that grant exclusive franchises to regulated IOUs because competition is prohibited in the monopoly franchise areas.[250]

Furthermore, defending the legal challenges by IOUs that view a new technology as a threat to their franchise presents an uneven playing field for deployment of new technologies. Grid-edge alternatives have to foot their own **[*292]** legal bills, while IOUs may charge their legal fees to IOU customers as a cost of doing business.

Thus, a broad, all-encompassing definition of public utility puts innovation at risk. Narrower definitions or specific exceptions can provide a more favorable environment for the development of newer technologies.[251]

No two states have identical language in their utility statutes, but there are some general trends. Some states that exert the furthest reach include in their definition of public utility any "individual"[252] or "person"[253] providing electricity, thereby not limiting regulation to larger corporations.[254] Most states require sale of the electricity to trigger utility status some by mentioning compensation specifically and others by using the term "customer."[255] A

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248 Although state terminology can vary (e.g., "electric utility"), this Article will use the terms "public utility" and "Public Utility Commission" (PUC) generically.

249 KAREN ANDERSON, STATE STATUTORY DEFINITIONS OF ELECTRIC UTILITIES 1 (2019), https://perma.cc/LY8Y-CQD9; *see also* SolarCity Corp., Ariz. Corp. Comm'n No. E-20690A-09-0346 (July 12, 2010) [hereinafter *SolarCity Corp*.] ("The record in this case reflects the strong likelihood that regulation would diminish the ability of SolarCity to secure financing leading to increased transaction costs and greater expense for customers.").

250 *See, e.g.*, State *ex rel. Utils. Comm'n v. N.C. Waste Awareness & Reduction Network, 805 S.E.2d 712, 715 (N.C. Ct. App. 2017)*.

251 Brown, *supra* note 51, at 155-57; *see also* ANDERSON, *supra* note 249, at 3-4.

252 ALASKA STAT. ANN. § 42.05.099(6) (West 2021); *DEL. CODE ANN. tit. 26 § 202(g)* (West 2021); *220 ILL. COMP. STAT. ANN. 5/3-105(a)* (West 2021); *IND. CODE ANN. § 8-1-2.3-2(b)* (West 2021); ***KAN. STAT. ANN. § 66-104(a)*** (West 2021); *MONT. CODE ANN. § 69-3-101(1)* (West 2021); *NEB. REV. STAT. ANN. § 25-21*,275 (West 2021); *N.J. STAT. ANN. § 48:2-13(a)* (West 2021); *OKLA. STAT. ANN. tit. 17 § 151* (West 2022); *OR. REV. STAT. ANN. § 757.005(1)(a)* (West 2021), 20 *R.I. GEN. LAWS § 39-20-2(5)* (West 2021); *TENN. CODE ANN. § 65-4-101(6)(A)* (West 2021), *VT. STAT. ANN. tit. 30, § 201(1)* (West 2021), ***VA. CODE ANN. § 56-232(A)(1)*** (West 2021); *WIS. STAT. ANN. § 196.01(5)(a)* (West 2021).

253 *ALA. CODE § 37-4-1(7)* (West 2021), *ARIZ. REV. STAT. ANN. § 40-201(8)* (West 2021) Arkansas, *ARK. CODE ANN. § 23-1-101(9)(B-D)* (West 2021); *CAL. PUB. UTIL. CODE § 216(a)(1)* (West 2021); *COLO. REV. STAT. ANN. § 40-1-103(1)(a)(I)* (West 2021); *D.C. CODE ANN. § 34-207* (West 2021); *FLA. STAT. ANN. § 366.02(1)* (West 2021); *GA. CODE ANN. § 46-1-1(9)*; *HAW. REV. STAT. ANN. § 269-1* (West 2021); *IDAHO CODE ANN. § 61-129(1)* (West 2021); *IOWA CODE ANN. § 476.1(3)* (West 2021); *KY. REV. STAT. ANN. § 278.010(3)* (West 2021); LA. STAT. ANN. § 45:121 (West 2021); *ME. REV. STAT. ANN. tit. 35-A, § 102(20-B)* (2021); MD. CODE ANN., PUB. UTIL. § 1-101(h)(1) (West 2021); *MICH. COMP. LAWS ANN. § 460.501* (West 2021); *MINN. STAT. ANN. § 216B.02(4)* (West 2022); MISS. CODE. ANN. § 77-3-3(d) (West 2021); *NEV. REV. STAT. ANN. § 704.020(2)(a)* (West 2021); *N.H. REV. STAT. ANN. § 362:2* (2021); *N.M. STAT. ANN. § 62-3-3(G)* (West 2021); *N.Y. PUB. SERV. LAW § 2(23)* (McKinney 2021); *N.C. GEN. STAT. ANN. § 62-3(23)(a)*; *OHIO REV. CODE ANN. § 4905.02(A)* (West 2021); ***66 PA. CONS. STAT. ANN. § 102(1)(i)*** (West 2021); *S.C. CODE ANN. § 58-27-10(7)*; *S.D. CODIFIED LAWS § 49-34A-1(12)* (2021); *TEX. UTIL. CODE ANN. § 31.002(6)*; *UTAH CODE ANN. § 54-2-1(8)(a)* (West 2021); *WASH. REV. CODE ANN. § 80.01.040(3)* (West 2021); *W. VA. CODE ANN. § 24-1-2* (West 2021); *WYO. STAT. ANN. § 37-1-101(a)(vi)* (West 2021).

254 *See generally ANDERSON, supra note 249*.

[*293] majority of states have created explicit exceptions for self-generation,[256] electricity provided by co-ops,[257] or by a landlord to tenants.[258] A handful of states have created explicit exceptions for newer technologies. Some of the most common exceptions include electric vehicle charging stations, co-generation, renewable energy facilities, small power producers, and property leased or energy sold to public utilities.

Also critical to the scope of PUC regulation is how courts have interpreted the term "public" in each state's statute. As discussed above, the concept of regulated monopolies is founded on protecting the public when a private entity provides an essential service and consumers have no other choices. At least nineteen states have judicial interpretations of the word "public" as it relates to a public utility.[259] These interpretations range broadly and have suggested that number of customers is not key; in some instances, an entity serving a single customer might still qualify as a public utility.[260] One such broad interpretation of public utility in Florida would have resulted in PUC regulation **[*294]** of a renewable energy project[261] that would have provided power to a single customer.[262]

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[255] For example, Alaska defines a "public utility" to include "every corporation, whether public, cooperative, or otherwise, company, individual, or association of individuals, their lessees, trustees, or receivers appointed by a court, that owns, operates, manages, or controls . . . any system for furnishing . . . electrical service to the public for compensation." *ALASKA STAT. ANN. § 42.05.990(6)* (West 2021); *see also* *ARIZ. REV. STAT. ANN. § 40-201(8)* (West 2021); *ARK. CODE ANN. § 23-1-101(9)(B-D)*; *CAL. PUB. UTIL. CODE § 216(a)(1)* (West 2021); *COLO. REV. STAT. ANN. § 40-1-103(1)(a)(I)* (West 2021); *DEL. CODE ANN. tit. 26 § 202(g)*; *GA. CODE ANN. § 46-1-1(9)* (West 2021); *IDAHO CODE ANN. § 61-129* (West 2021) ; *IOWA CODE ANN. § 476.1(3)* (West 2021); *220 ILL. COMP. STAT. ANN. 5/3-105(a)* (West 2021); *IND. CODE ANN. § 8-1-2.3-2(b)* (West 2021); *KY. REV. STAT. ANN. § 278.010(3)* (West 2021); MINN. STAT. ANN. § 216B.024(4) (West 2021); *MISS. CODE ANN. § 77-3-3(d)* (West 2021); *N.C. GEN. STAT. ANN. § 62-3(23)(a)* (West 2021); ***66 PA. CONS. STAT. ANN. § 102(1)(i)*** (West 2021); *S.C. CODE ANN. § 58-27-10(7)* (West 2021); *TEX. UTIL. CODE ANN. § 31.002(6)* (West 2021); *WASH. REV. CODE ANN. § 80.01.040(3)* (West 2021).

[256] *ALA. CODE § 37-6-2* (West 2021); *CAL. PUB. UTIL. CODE § 2777* (West 2021); *HAW. REV. STAT. ANN. § 269-1* (West 2021); *IDAHO CODE ANN. § 61-119* (West 2021); LA. STAT. ANN. § 45:1163(A)(3) (West 2021); *ME. REV. STAT. ANN. tit. 35-A, § 102(20-B)* (2021); MD. CODE ANN., PUB. UTIL. § 1-101(h)(2) (West 2021); *MICH. COMP. LAWS ANN. § 460.10a(4)* (West 2021); Mississippi, *infra* note 346; *MO. ANN. STAT. § 386.020(15)* (West 2021); *MONT. CODE ANN. § 69-5-107* (West 2021); *N.M. STAT. ANN. § 62-3-4(A)* (West 2021); *N.Y. PUB. SERV. LAW § 2(13)* (McKinney 2021); *N.C. GEN. STAT. ANN. § 62-3(23)(a)(1)*; *OHIO REV. CODE ANN. § 4928.01(A)(32)* (West 2021); Oklahoma, *infra* note 355; ***66 PA. CONS. STAT. ANN. § 102*** (West 2021); *S.C. CODE ANN. § 58-27-10(7)* (West 2021); *TEX. UTIL. CODE ANN. § 31.002(6)*; *UTAH CODE ANN. § 54-2-1(8)(b)* (West 2021); *VA. CODE ANN. § 56-265.1(b)*; *WYO. STAT. ANN., § 37-1-101(a)(vi)(H)*.

[257] As of 2019, these states were Alabama, Arkansas, Arizona, California, Colorado, Connecticut, Delaware, Florida, Illinois, Iowa, Kansas, Kentucky, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Mexico, New York, North Carolina, North Dakota, Oklahoma, Oregon, South Carolina, South Dakota, Tennessee, Texas, Washington, West Virginia, Wisconsin, and Wyoming. ANDERSON, *supra* note 249, at 8-15.

[258] As of 2019, these states were Alabama, Alaska, Arkansas, California, District of Columbia Idaho, Maine, Maryland, Minnesota, Mississippi, Missouri, New Mexico, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Texas, Utah, and Wyoming. *Id.*

[259] As of 2019, these states were Alabama, Arizona, Delaware, Florida, Hawaii, Idaho, Illinois, Indiana, Iowa, Missouri, New Mexico, New York, North Carolina, Oklahoma, Pennsylvania, Tennessee, West Virginia, Wisconsin, and Wyoming. *Id.*

[260] *See, e.g.*, *Unocal Cal. Pipeline Co. v. Conway, 28 Cal. Rptr. 2d 429, 431 (Cal. Ct. App. 1994)*.

[261] PW Ventures proposed a "integrated renewable energy production complex in Hendry County [Florida] that will produce ethanol, carbon dioxide, and potentially other products from renewable energy sources." Fla. Pub. Serv. Comm'n, In re: Petition for declaratory statement regarding co-ownership of electrical cogeneration facilities in Hendry County by Southeast Renewable Fuels, LLC, Order Denying Petition for Declaratory Statement. Order No. PSC-13-0652-DS-EQ at 6 (Dec. 11, 2013), https://perma.cc/VX3M-6Q3B.

[262] *PW Ventures, Inc. v. Nichols, 533 So. 2d 281, 283-84 (Fla. 1988)* (affirming PUC's denial of PW's request for declaratory judgment that it would not be subject to regulation).

Perhaps the most widely used test for making a determination of whether an entity is "clothed with a public interest" sufficient to warrant regulation to protect a "public concern" comes from the 1950 Arizona Supreme Court case *Natural Gas Service Co. v. Serv-Yu Cooperative*.[263]*Serv-Yu* looks at eight factors to determine whether the entity should be subject to regulation because it is "indispensable to large segments of our population:"[264]

1. What the corporation actually does.
2. A dedication to public use.
3. Articles of incorporation, authorization, and purposes.
4. Dealing with the service of a commodity in which the public has been generally held to have an interest.
5. Monopolizing or intending to monopolize the territory with a public service commodity.
6. Acceptance of substantially all requests for service.
7. **[*295]**

   Service under contracts and reserves the right to discriminate is not always controlling.
8. Actual or potential competition with other corporations whose business is clothed with public interest.[265]

The entity need not meet all of these criteria, just enough on a case-by-case basis depending on the facts of each individual case. As an example, a 2006 Arizona case found that a nonprofit electric transmission cooperative met both the textual definition of a "public service corporation" in Arizona's constitution[266] and a majority of the *Serv-Yu* factors.[267] Consequently, the Court found it must be regulated by the Arizona Corporation Commission (the state PUC) because it was "clothed with a public interest" to the extent contemplated by law which subjects it to governmental control,[268] and its "business and activities . . . such as to make its rates, charges and methods of operation, a matter of public concern."[269]

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[263] *Nat. Gas Serv. Co. v. Serv-Yu Coop., 219 P.2d 324, 326-28 (Ariz. 1950)*. Several states have adopted one or more of Arizona's *Serv-Yu* factors, either directly or indirectly citing *Serv-Yu*, in determining whether an entity is "clothed with public interest" sufficiently to fit within their statutes' definition of a public utility. *Id. at 326*; *see, e.g.*, *U.S. Steel Corp. v. N. Ind. Pub. Serv. Co., 482 N.E.2d 501, 505-06 (Ind. Ct. App. 1985)* ("This classification of 'public callings' or businesses 'affected with a public interest,' comprises to a large extent what are known today as public utilities. They are in most cases regulated by the state. Upon the dedication of a business to a public use, it is established that such business is under a common law duty to serve all who apply so long as facilities are available, without discrimination."); *Bridle Bit Ranch Co. v. Basin Elec. Power Co-op., 118 P.3d 996, 1009-11 (Wyo. 2005)* (*Iowa State Com. Comm'n v. N. Nat. Gas Co., 161 N.W.2d 111, 115 (Iowa 1968)* using the language "sales to sufficient of the public to clothe the operation with a public interest" to ultimately find that the company condemning a right-of-way for a transmission line was not a public utility (quoting *Iowa State Com. Comm'n v. N. Nat. Gas Co., 161 N.W.2d 111, 115 (Iowa 1968))*, where *Iowa State Com. Comm'n* quotes the *Serv-Yu* factors); *SZ Enters., LLC v. Iowa Utils. Bd., 850 N.W.2d 441, 445-48 (Iowa 2014)* (discussed *infra*). *Serv-Yu* is also cited in 73B C.J.S. *Public Utilities* § 3 (2023) and 119 A.L.R. 1012 (1939).

[264] *Petrolane-Ariz. Gas Serv. v. Ariz. Corp. Comm'n, 580 P.2d 718, 720 (Ariz. 1978)*.

[265] *Serv-Yu, 219 P.2d at 325-26*.

[266] *Sw. Transmission Coop. v. Ariz. Corp. Comm'n, 142 P.3d 1240, 1244 (Ariz. Ct. App. 2006)* (noting that meeting the statutory definition is not enough (citing *Sw. Gas Corp. v. Ariz. Corp. Comm'n, 818 P.2d 714, 721 (Ariz. Ct. App. 1991)))*.

[267] *Id. at 1245-47*.

[268] *Id. at 1246* (quoting *Sw. Gas, 818 P.2d at 721*).

[269] Finally, the court also noted that the entity's "business must be of such a nature that competition might lead to abuse detrimental to the public interest." *Id. at 1244-45*.

In contrast, a 2014 Iowa case, *SZ Enterprises, LLC v. Iowa Utilities Board*, involved the construction of a solar energy system by a company called Eagle Point on property owned by the City of Dubuque, Iowa, with an agreement that the city would purchase all of the electricity generated.[270] The Iowa Supreme Court concluded that the "provision of electric power through a 'behind the meter' solar facility was not the type of activity which required a conclusion that Eagle Point was a public utility."[271] The court further found that, "in this case, the balance of factors point away from a finding that the third-party power purchase agreement (PPA) for a behind-the-meter solar generation facility is sufficiently 'clothed with the public interest' to trigger regulation."[272] Some factors that influenced the *SZ Enterprises* court's conclusion were the **[*296]** first, fourth, and eighth *Serv-Yu* factors.[273] Referencing factor one, "what the company 'actually does,'" the Iowa Supreme Court noted that the district court had likened Eagle Point's contract with Dubuque to provide behind-the-meter solar generation to behind-the-meter energy efficiency measures such as insulation of one's home, which is not a business that provides electricity to all like an IOU.[274] The Iowa Supreme Court agreed that the first *Serv-Yu* factor favored Eagle Point because solar leasing was essentially a "method of financing" and "financing for solar activities should not draw an entity into the fly trap of public regulation."[275]

Next the district court looked to the fourth *Serv-Yu* factor, whether the activity is "dealing with the service of a commodity in which the public has been generally held to have an interest," concluding this test could have cut both ways.[276] Although the public might be interested in the essential service of electricity, the court also noted that "the electricity provided was not dependent upon any common facilities that served the public and was generated and consumed behind the meter on the customer's premises. A shutdown of Eagle Point facilities would be far less serious than the effects of a shutdown of services by electric utilities such as Interstate Power."[277] The Iowa Supreme Court agreed that behind-the-meter solar photovoltaics (PV) were simply an "option" and "not an essential commodity required by all members of the public."[278]

Finally, the eighth *Serv-Yu* factor, "[a]ctual or potential competition with other corporations whose business is clothed with public interest," the district court concluded that behind-the-meter solar provided some degree of competition, but noted that "Eagle Point was not trying to replace or sever the relationship between Interstate Power and the city."[279] The Iowa Supreme Court found this factor "most interesting" in that potentially Eagle Point might provide some competition.[280] However, the "countervailing positive impacts," and "balance of [*Serv-Yu*]

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[270] *SZ Enters., LLC v. Iowa Utils. Bd., 850 N.W.2d 441, 443-44 (Iowa 2014)*.

[271] *Id. at 444*.

[272] *Id. at 468*; *see also id. at 466* ("[W]e conclude that the proper test is to examine the facts of a particular transaction on a case-by-case basis to determine whether the transaction cries out for public regulation. We believe the *Serv-Yu* factors provide a reasoned approach when considering the question of whether the activity involved is sufficiently clothed with the public interest to justify regulation.").

[273] *Id. at 466-68*. The Iowa Supreme Court also considered the second, fifth, sixth, and seventh criteria. *Id.*

[274] *Id. at 447*.

[275] *Id. at 466-67*.

[276] *Id. at 448*.

[277] *Id.*

[278] *Id. at 467*.

[279] *Id. at 448*.

[280] *Id. at 467*.

factors point[ed the Iowa Supreme Court] away" from **[*297]** finding that Eagle Point should be regulated as a public utility.[281] Additional utility challenges to third-party solar will be discussed in Part IV below.

Several states apply just one or more of the factors without acknowledging *Serv-Yu*, which, if known by the court in that jurisdiction, would have persuasive rather than precedential authority. This includes states that seem to embrace tests similar to the first three *Serv-Yu* criteria: "1. What the corporation actually does. 2. A dedication to public use. 3. Articles of incorporation, authorization, and purposes."[282] Alternatively, courts in Hawai'i,[283] Idaho,[284] Missouri,[285] Pennsylvania,[286] Tennessee,[287] West Virginia,[288] and Wisconsin[289] have chosen an intends-public-use approach to determine whether an entity should be subject to PUC regulation. In these states, the number of customers is not dispositive as to whether the facility serves the public. Instead, the courts look to the intent of the facility and whether it holds itself out as devoted to use by the public.

Most of the jurisdictions above have reduced the scope of public utility regulation through a narrow judicial interpretation. In contrast, the following have interpreted their statutes broadly to include more entities within the definition of a "public utility." Using a test similar to the sixth *Serv-Yu*, "Acceptance of substantially all requests for service,"[290] has perhaps received the most criticism. For example, a 1988 Alabama case held that selling and distributing energy products alone does not make all purveyors of energy **[*298]** commodities "public utilities."[291] The Alabama Supreme Court quoted Black's Law Dictionary as stating that, "[t]o constitute a true 'public utility,' the devotion to public use must be of such character that the public generally, or that part of it which has been served and which has accepted the service, has the legal right to demand that the service shall be conducted . . . ."[292]

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[281] *Id. at 468*. Some of these measures include helping to meet peak demand and furthering "one of the goals of regulated electric companies, namely, the use of energy efficient and renewable energy sources." *Id.*

[282] *Nat. Gas Serv. Co. v. Serv-Yu Coop., 219 P.2d 324, 325 (Ariz. 1950)*.

[283] *In re Wind Power Pac. Invs.-III, 686 P.2d 831, 834 (Haw. 1984)* ("The test is, therefore, whether or not such person holds himself out, expressly or impliedly, as engaged in the business of supplying his product or service to the public, as a class, or to any limited portion of it, as contradistinguished from holding himself out as serving or ready to serve only particular individuals." (quoting 73B C.J.S. *Public Utilities* § 3)).

[284] *Humbird Lumber Co. v. Pub. Utils. Comm'n., 228 P. 271, 273 (Idaho 1924)*.

[285] *Hurricane Deck Holding Co. v. Pub. Serv. Comm'n, 289 S.W.3d 260, 264 (Mo. Ct. App. 2009)* (citing State *ex rel. M. O. Danciger & Co. v. Pub. Serv. Comm'n, 205 S.W. 36, 38 (Mo. 1918))*.

[286] *Bethlehem Steel Corp. v. Pub. Serv. Comm'n, 713 A.2d 1110, 1114-15 (Pa. 1998)*.

[287] *Memphis Nat. Gas Co. v. McCanless, 194 S.W.2d 476, 479-80 (Tenn. 1946)*.

[288] *Preston Cnty. Light & Power Co. v. Renick, 113 S.E.2d 378, 385 (W. Va. 1960)*.

[289] *City of Sun Prairie v. Pub. Serv. Comm'n, 154 N.W.2d 360, 362 (Wis. 1967)*.

[290] *Nat. Gas Serv. Co. v. Serv-Yu Coop., 219 P.2d 324, 325-26 (Ariz. 1950)*.

[291] *Coastal States Gas Transmission Co. v. Ala. Pub. Serv. Comm'n, 524 So. 2d 357, 359-60 (Ala. 1988)*; *see also* Generic Proceeding to Determine the Commission's Jurisdiction Over Electric Vehicle Charging Stations, Docket No. 32694 (Ala. P.S.C. June 22, 2018), 2018 WL 3208563, at *3 (finding Electric Vehicle Charging Stations are not public utilities apparently adopting the Attorney General's rationale that they "do not engage in supplying the public necessary services and do not service all inhabitants within the area they operate. Instead, EVCS provide a convenient service of charging electric vehicle batteries to a limited number of consumers who have chosen to invest in an electric vehicle.").

[292] *Coastal States, 524 So. 2d at 361* (emphasis added) (quoting *Public Utility*, BLACK'S LAW DICTIONARY (5th ed. 1979)).

In contrast, Kansas seemed to apply a similar test, but with opposite results, in *Cities Service Gas Co. v. State Corporation Commission*.[293] The court here focused on the statutory language "except for private use" to define a public utility and then held that "there is nothing in the Kansas statutory definition of a public utility which requires it to hold itself out as serving the public generally."[294]

Likewise, in an unpublished decision, a district-level court in Delaware applied a public interest test to determine that a water service was a public utility.[295] Public utility status was triggered by "sale of a regulated commodity to independent third parties" even if the "company sells to less than the general public."[296] The test requires a two-part determination: (1) "whether there is a sale of a regulated commodity to independent third parties" and (2) "whether such sales affect the public interest in a significant manner."[297]

Similarly, the federal government has declared the transport and sale of natural gas a "public interest,"[298] and "[i]n accordance with this statutory declaration, a majority of states have chosen to reject the 'indiscriminate-service-to-an-indefinite-public' **[*299]** test."[299] Instead, these states "choose to emphasize the public nature of a company's activities in relation to that public interest."[300] Delaware,[301] Iowa,[302] Ohio,[303] Minnesota,[304] and New Jersey[305] all seem to have reached a similar conclusion. One reason this criterion is suspect is because it can be manipulated by the party wishing to enter the market avoiding PUC regulation "by simply stating it would not sell to certain customers."[306]

The final *Serv-Yu* factor, "[a]ctual or potential competition with other corporations whose business is clothed with public interest,"[307] can swing for or against a party attempting to enter a market depending upon how protectionist the PUC is of the existing utility[308] or its own authority.[309] It is ironic, but not surprising, that companies with as much

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[293] *Cities Serv. Gas Co. v. State Corp. Comm'n, 567 P.2d 1343, 1352 (Kan. 1977)*.

[294] *Id.*

[295] *E. Shore Nat. Gas Co. v. Del. Pub. Serv. Comm'n, 637 A.2d 10, 17 (Del. 1994)*, *overruled in part on other grounds by Pub. Water Supply Co. v. DiPasquale, 735 A.2d 378 (Del. 1999)* (discussing *In re* Bayview Improvement Co., PSC Docket No. 288 (May 4, 1960)).

[296] *Id.*

[297] Rsrvs. Dev. Corp. v. State Pub. Serv. Comm'n., No. Civ.A. 02A-07-001 HD, 2003 WL 139777, at *3 (Del. Super. Ct. Jan. 17, 2003), *aff'd*, ***830 A.2d 409 (Del. 2003)***.

[298] *15 U.S.C. § 717a* (2005).

[299] *E. Shore Nat. Gas Co., 637 A.2d at 18*.

[300] *Id.*

[301] *Id.*

[302] *Iowa State Com. Comm'n v. N. Nat. Gas Co., 161 N.W.2d 111, 116-17 (Iowa 1968)*.

[303] *Indus. Gas Co. v. Pub. Utils. Comm'n, 21 N.E.2d 166, 168-69 (Ohio 1939)*.

[304] *N. Nat. Gas Co. v. Minn. Pub. Serv. Comm'n, 292 N.W.2d 759, 763 (Minn. 1980)*.

[305] *In re S. Jersey Gas Co., 561 A.2d 561, 568-69 (N.J. 1989)*.

[306] *E. Shore Nat. Gas Co., 637 A.2d at 18*.

[307] *SZ Enters., LLC v. Iowa Utils. Bd., 850 N.W.2d 441, 448 (Iowa 2014)* (quoting *Sw. Transmission Coop. v. Ariz. Corp. Comm'n, 142 P.3d 1240, 1244 (Ariz. Ct. App. 2006)*).

financial and political clout as IOUs would be sure that statutes explicitly include language to protect their bottom lines from competition. Public utility commissions were "remedial in nature," intended to restrict "unchecked competition between the utilities and to provide a redress for wrongs inflicted upon persons dependent upon a utility's services."[310] Regulation was needed where "rates for and extent of their services could not be privately determined."[311] Commissions justify regulation if "destructive competition" would have "adverse consequences for **[*300]** the existing utility and its customers."[312] A 1991 natural gas case in Arizona stated the concerns as follows:

> [T]he purposes of regulation are to preserve and promote those services which are indispensable to large segments of our population, and to prevent excessive and discriminatory rates and inferior service where the nature of the facilities used in providing the service and the disparity in the relative bargaining power of a utility ratepayer are such as to prevent the ratepayer from demanding a high level of service at a fair price without the assistance of governmental intervention on his behalf.[313]

However, in the context of solar generation, the Arizona Corporation Commission applied the eight *Serv-Yu* factors to determine whether a solar company designing, installing, maintaining, and financing solar panels for non-profit entities should be considered a public utility.[314] In concluding that the solar company did not need PUC regulation, the commission noted:

> It would run counter to the public interest to unnecessarily throw up hurdles to an important sector of the solar market being able to participate in meeting the very RES that this Commission created, and it would be an unfortunate result for schools, which appear ready and eager to implement solar energy systems for the benefit of taxpayers and students. The ratepayers, taxpayers and the public as a whole benefit when schools, governmental entities, and other non-profits are able to lower their operating costs by purchasing lower priced electricity through SSAs.[315]

[*301] Significantly, the Arizona commission further noted that its oversight was not the exclusive remedy for any consumer concerns: "other avenues are available where the Registrar of Contractors oversees construction practices, the Attorney General addresses consumer fraud concerns and civil remedies remain available to SolarCity customers."[316] While the cases and tests in this Part have addressed the definition of public utility in a

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[308] In some situations, PUC employees may have biases toward or improper ties with the IOUs, which can be called "regulatory capture." *See, e.g.*, Tony Kovaleski et al., *Former Top CPUC Director "Disgusted" by Behavior of Leadership*, NBC BAY AREA, (Apr. 5, 2016, 3:30 PM), *https://perma.cc/HJR2-64F2*.

[309] Even if PUCs do not favor the utilities they regulate, they have a self-interest in preserving their need and status as a regulatory body. *See, e.g., Coastal States, 524 So. 2d at 364-65* (disagreeing with utility commission's overreach of authority under the statute and rejecting the commission's finding that its regulation would be just a "sham" if it allowed entities "to take business away from public utilities regulated by the Commission.").

[310] *E. Shore Nat. Gas Co., 637 A.2d at 11-12*.

[311] *Id. at 17*.

[312] *Id. at 22-23*. ("It is impossible for the Public Service Commission to monitor and effectively control the extent of competition in the provision of traditionally regulated commodities if an unregulated firm with no obligation to serve all similarly situated customers and without a general obligation to provide service to all who require it in a specific territory can essentially enter the public utility business and 'cherry pick' or 'cream skim' away the existing utility's highest volume customers. . . . The absence of such ability to regulate the extent of competition creates the potential for 'destructive competition' with resulting adverse consequences for the existing utility and its customers." (quoting In re E. Shore Nat. Gas Co., PSC Docket No. 92-2, Order No. 3372, at 22-23 (Feb. 11, 1992))).

[313] *Sw. Gas, 818 P.2d at 721* (quoting *Petrolane-Ariz. Gas Serv. v. Ariz. Corp. Comm'n, 580 P.2d 718, 720 (Ariz. 1978))*.

[314] *SolarCity Corp., supra* note 249, at 2.

[315] *Id. at 48*.

number of contexts, the following Part will focus on how these definitions played a significant role in the suppression of rooftop solar.

IV. SUPPRESSION OF ROOFTOP SOLAR

Deregulation has not significantly changed the regulated monopoly status of electricity suppliers for most residential customers. Similarly, other efforts to loosen IOU control of the distribution of electricity at the local level have met vehement utility and regulatory agency pushback against any infringement on the IOU exclusive service territory tradition.[317] This Part will address IOU pushback against rooftop solar as a case study.

One of the "primary driver[s] of rooftop solar expansion"[318] was third-party leasing of solar panels. Photovoltaic solar panels have decreased dramatically in price from $7.53/Watts of direct current (WDC) in 2010 to $2.71/WDC in 2020 for a residential twenty-two panel system.[319] Until recently, however, the high up-front costs to purchase and install a solar array proved to be a deterrent for many homeowners.[320] Companies such as SunRun[321] and Eagle Point[322] stepped in to fill the gap by providing third-party agreements. These companies **[*302]** install and maintain solar panels on a customer's property[323] and provide the electricity produced by the panels to the customer.[324]

Customers benefit with access to electricity that is not generated from a fossil-fuel source at prices below those of its regular public utility.[325] IOUs felt threatened because if more customers own and manage their own power, "less political and economic power remains for the utility."[326] Some IOUs weaponized their regulated monopoly status to prevent third-party providers from serving customers within their territories.[327] If a third-party provider is classified as a "public utility," this deters solar deployment because it adds time, cost, and regulatory uncertainty, including the possibility that third-party agreements would be prohibited entirely as an infringement on the territory granted exclusively to the IOU that holds the franchise for a particular location.[328]

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316 *Id.*

317 Brown, *supra* note 51, at 182.

318 *Id. at 176*; *see also* Cameron Walker, *Power Purchase Agreements Expand Solar Development*, STATE & LOC. ENERGY REP. (Nov. 7, 2012), *https://perma.cc/32FK-X5DE*.

319 DAVID FELDMAN ET AL., NAT'L RENEWABLE ENERGY LAB'Y, U.S. SOLAR PHOTOVOLTAIC SYSTEM AND ENERGY STORAGE COST BENCHMARK: Q1 2020 (2021), *https://perma.cc/LG84-QYMQ*.

320 KATHARINE KOLLINS ET AL., SOLAR PV PROJECT FINANCING: REGULATORY AND LEGISLATIVE CHALLENGES FOR THIRD-PARTY PPA SYSTEM OWNERS, at v (2010), *https://perma.cc/BN2C-83QC*.

321 Justin J. Larson, *House of the Rising Sun:* SolarCity Corp. v. Arizona Department of Revenue *and the Taxation of Leased Solar Panels*, 59 JURIMETRICS 375, 375 (2019).

322 *See* EAGLE POINT SOLAR, *https://perma.cc/DJ6N-CVFL*.

323 The installation may also be on a business or other entity such as a school or church. This arrangement may be especially appealing to entities that do not pay taxes as the third party can then take the tax deduction.

324 *See* KOLLINS ET AL., *supra* note 320, at 3.

325 *Id.*

326 SHALANDA H. BAKER, REVOLUTIONARY POWER: AN ACTIVIST'S GUIDE TO THE ENERGY TRANSITION 53 (2021).

327 *See* KOLLINS ET AL., *supra* note 320, at 7.

328 *Id.*

Although attacks by IOUs against third-party solar arrangements came later, pushback against alternative innovative power generation dates back to the late 1980s.[329] The Florida Supreme Court sided with the state utility commission to find that providing alternative power to a single customer under a third-party arrangement fell within the meaning of the "public utility" definition because that entity was providing power "to the public."[330] Thus, any supplier that provided power to even one customer was a regulated utility.[331] The court's rationale hinged upon the traditional assumption that duplication or redundancy was wasteful.[332]

In a 2016 North Carolina case,[333] the non-profit North Carolina Waste Awareness and Reduction Network (NCWARN) sold PV-generated electricity to **[*303]** a church through a PPA, raising the issue of whether the sale of electricity by NCWARN to the church "cause[d] it to be regarded as a 'public utility' pursuant to the Public Utilities Act . . . ."[334] The ruling cited *section 62-3(23)(a)(1) of the North Carolina General Statutes*, which explicitly stated self-generation of electricity was an exception to the definition of a public utility.[335]

However, the court concluded that the omission of an explicit financing exception within the statute indicated a legislative intent that financing through third-party compensation was *not* intended to fit within the self-generation exception.[336] Therefore, the court concluded NCWARN's PPA made it a public utility in direct competition with those IOUs holding franchises for the territory.[337]

Even though NCWARN was a non-profit providing services to a single church, the judge felt a need to provide protection for the monopoly utility and determined that the competition NCWARN represented "if [left unchecked,] . . . stands to upset the balance of the marketplace."[338]

Both of these lawsuits backfired. One year after the NCWARN ruling, the North Carolina legislature passed H.B. 589, which explicitly exempted third-parties providing electricity through a lease from the definition of public utility.[339] Also, in response to the ruling in *PW Ventures, Inc.*, Florida created a distinction between fixed-payment solar leases and variable-payment PPAs.[340] The key distinction appears to be the difference in payment structure under a lease versus a PPA; a solar electricity lease requires a fixed monthly payment from the consumer, effectively leasing the equipment to supply solar electricity.[341] In contrast, a PPA involves a sale because the third-party is

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[329] *See PW Ventures, Inc. v. Nichols, 533 So. 2d 281 (Fla. 1988)*.

[330] *Id. at 284*.

[331] Samuel Farkas, *Third-Party PPAs: Unleashing America's Solar Potential*, 28 J. LAND USE & ENV'T L. 91, 102 (2012).

[332] *PW Ventures, 533 So. 2d at 283* (discussing concept of "uneconomic duplication"); *see also* discussion *infra* notes 171-78.

[333] *See also* brief discussion *supra* Section II.C.

[334] State *ex rel. Utils. Comm'n v. N.C. Waste Awareness & Reduction Network, 805 S.E.2d 712, 715 (N.C. Ct. App. 2017)*.

[335] *Id. at 714*.

[336] *Id. at 715*.

[337] *Id. at 714*.

[338] *Id. at 715* ("North Carolina law precludes retail electric competition and establishes regional monopolies on the sale of electricity based on the premise that the provision of electricity to the public is imperative and that competition within the marketplace results in duplication of investment, economic waste, inefficient service, and high rates.").

[339] H.B. 589, 2017-2018 Gen. Assemb., Reg. Sess. (N.C. 2017) (enacted); *N.C. GEN. STAT. § 62-126.3(5)* (2017).

[340] *In re* Petition by Sunrun Inc. for declaratory statement concerning leasing of solar equipment, Declaratory Statement, Docket No. 20170273-EQ, Order No. 0251 (Fla. Pub. Serv. Comm'n, May 17, 2018).

selling the solar-generated electricity directly to the customer and charging a variable **[*304]** rate dependent upon the amount of electricity generated, thus "selling electricity," which is the function of the IOU.[342] Under this distinction, PPAs that did not use a fixed rate were prohibited as infringing on the territory granted exclusively to the IOU.[343]

Louisiana,[344] Kansas,[345] Mississippi,[346] Oklahoma,[347] and South Carolina[348] all follow the distinction that North Carolina and Florida have made that allows solar leases but bans third-party PPAs. Other states, like Kentucky, have detailed public utility definitions, rendering it difficult to support services such as third-party solar, either as PPAs or solar leases.[349]

A 2021 report, *Blocking Rooftop Solar*, lists examples of IOU pushback against solar in six states: Ohio, Florida, Illinois, Kansas, South Carolina, and California.[350] This report primarily lists lobbying efforts to change compensation paid to rooftop generators. The most recent victory of IOUs over rooftop solar is California's adoption of Net Energy Metering 3.0, which is projected to reduce demand for residential solar by 30% in 2023.[351]

Other states have had more favorable regulatory outcomes for rooftop solar. As discussed in Section III, the Iowa Supreme Court used the eight *Serv-Yu* factors to conclude in *SZ Enterprises* that Eagle Point's PPA providing rooftop solar electricity to the City of Dubuque did not require PUC regulation as a **[*305]** public utility.[352] Additional states have codified allowances; Colorado, Nevada, and Texas statutes provide that solar PPA providers are not

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[341] KOLLINS ET AL., *supra* note 320, at 17.

[342] *See, e.g., In re*: Petition of Monsanto Company for a declaratory statement concerning the lease financing of a cogeneration facility (Monsanto), Docket No. 860725-EU, Order No.17009 (Fla. Pub. Serv. Comm'n Dec. 22, 1986). ("Monsanto's lessor would be supplying a means of producing electricity, not 'supplying electricity . . . to or for the public within this state' pursuant to *FLA. STAT. ANN § 366.02(1)*.").

[343] KOLLINS ET AL., *supra* note 320, at 4.

[344] LA. STAT. ANN. § 45:121 (West 2021).

[345] KAN. STAT. ANN. § 66-1 (2022); Kan. Dept. of Revenue, Opinion Letter 0-2016-001 on Kansas Retailers' Sales Tax and Solar Power Purchase Agreements (Jan. 25, 2016).

[346] THIRD PARTY SOLAR PV POWER PURCHASE AGREEMENT (PPA), DSIRE INSIGHT (Aug. 2021), *https://perma.cc/8GZH-8HKN* ("Any entity selling electricity is subject to public utility regulations stipulated in MS code § 77-3-3, but MS net metering rules explicitly allow leasing of solar equipment.").

[347] *See* Okla. Op. Att'y Gen. 2018-5 (explaining that PPAs are prohibited in unincorporated sections of the state, but leases may be allowed depending on terms. A PPA disguised as a lease would be prohibited by the Act. Incorporated areas of the state allow both PPAs and leases, assuming a municipal franchise agreement is not required to install or maintain equipment in streets or public rights-of-way).

[348] THIRD PARTY SOLAR PV POWER PURCHASE AGREEMENT (PPA), *supra* note 346.

[349] *KY. REV. STAT. ANN. § 278.010(3)* (West 2021).

[350] LIPPEATT ET AL., *supra* note 151, at 2-3.

[351] Ryan Kennedy, *Retaining Value for Solar Customers Under California NEM 3.0 Rule Change*, PV MAG. (Feb. 20, 2023), *https://perma.cc/M4LV-7GU5*.

[352] *SZ Enters., LLC v. Iowa Utils. Bd., 850 N.W.2d 441, 458 (Iowa 2014)*.

"public utilities" if system size limitations are met.[353] Other states allow PPAs, but only for certain entities, such as public service corporations in Arizona[354] and tax-exempt organizations in Arkansas.[355]

Finally, at least three states have completely exempted third-party solar generators from their regulation of public utilities, allowing both PPAs and leases, through explicit statutes: Oregon,[356] Hawai'i,[357] and California.[358] However, California's statute also states that the power generated by a third-party provider must be "used solely on the property where it is generated."[359] This last restriction limiting use to the property where solar power is generated is an impediment to microgrids which require sharing among resources within the microgrid.

V. MOBILIZING MICROGRIDS

Microgrids are just now entering the battle that rooftop solar has been fighting for almost two decades. Across the country, little has changed to encourage an IOU to accept competition or to embrace infrastructure other than its own for the best cost-of-service returns. In fact, the last decades have taught IOUs to employ "mission creep," using the advantages they have from their monopoly status (such as a captive customer base) and impatience on the part of legislators about the slow progress of climate-friendly solutions (often caused by resistance of the IOU itself), to elbow in on previously competitive collateral markets such as rooftop solar installation or the build out of EV charging stations.[360]

[*306] As the sections above illustrated, designation as a public utility can destroy a project. Under the public utility system, an existing IOU can prevent competitors from conducting business within its exclusive franchise territory. Even when alternative, grid-edge technologies are allowed within an IOU territory, the delay and added cost of connecting to the grid can threaten project viability.[361]

Complete avoidance of PUC regulation would be the best solution to allow the microgrid market to flourish. As noted above, technologies such as the iPhone and Tesla EVs would not be where they are today if every new feature had first to be approved through an arduous process before an agency that permits existing monopolies to challenge them for any potential negative impact to the competitors, including to competitors' bottom lines. Instead, these technologies have flourished in a free market that employed other customer protection mechanisms. As the

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[353] *See, e.g.*, COLO. REV. STAT. § 40-2-124(1)(c)(II)(D) (2022); THIRD PARTY SOLAR PV POWER PURCHASE AGREEMENT (PPA), *supra* note 346 (illustrating restrictions in Nevada and Texas).

[354] *SolarCity Corp., supra* note 249, at 5.

[355] *ARK. CODE ANN. § 23-18-603(7)(C)* (2019).

[356] *OR. REV. STAT. § 757.005* (2003) ("Nothing in subsection (1)(b)(C) of this section shall prohibit third party financing of acquisition or development by a utility customer of energy resources to meet the heat, light or power requirements of that customer.").

[357] *HAW. REV. STAT. § 269-1(2)(M)(i)* (2022).

[358] Farkas, *supra* note 331, at 111-12 (citing *CAL. PUB. UTIL. CODE § 2868(b)* (2008)).

[359] KOLLINS ET AL., *supra* note 320, at 8.

[360] *See* Rule, *supra* note 169.

[361] *See, e.g.*, Gwen Brown, *Interconnection Is Broken: Radical Rethinking Is Needed to Achieve Clean Energy Goals*, INTERSTATE RENEWABLE ENERGY COUNCIL (June 3, 2021), https://perma.cc/5ASM-2LBW; Elizabeth McGowan, *Utility's Interconnection Demands Stall Virginia Community Solar Project*, ENERGY NEWS NETWORK (Dec. 12, 2022), https://perma.cc/Q8CS-6A2N (reporting developer's prediction that Dominion Energy's demands will increase costs by about 50%); CLEAN COAL., VALENCIA GARDENS ENERGY STORAGE (VGES) PROJECT (DRAFT FINAL): TASK 8.3: FRONT-OF-METER (FOM) ENERGY STORAGE INTERCONNECTION CASE STUDY 15-16 (2021), https://perma.cc/U4M4-YKBE (noting that Valencia Gardens Energy Storage Project stalled when the actual time and cost for the project exceeded four times the original estimates).

Arizona Corporation Commission observed in the *SolarCity Corp*. case discussed in Section III, regulatory oversight is not the only solution. The federal government and states have agencies that protect consumers from threats to health, fraud, and other concerns.[362] In addition, if there is no protection agency, civil suits are a remedy.[363]

[*307] However, no state currently has free market entry for microgrids, and there was substantial pushback against even Sunnova's unobtrusive proposal, which sought CPUC regulation as a microgrid utility in markets that did not overlap with an existing IOU franchise.[364]

This Section will first describe the mechanisms used in the four states and territories that have attempted to develop actual microgrid deployment strategies in their public utility statutes.[365] California, Hawai'i, and Puerto Rico seek to provide standardized guidelines and cost tariffs so that microgrid proposals can avoid project-by-project uncertainties, while Maine appears to be promoting microgrids, but its process does not seem to streamline the case-by-case PUC process.

Finally, this Section addresses opportunities specifically open to community microgrids. While it is encouraging that policymakers appreciate the role community microgrids can play for energy justice, the measures provided will have limited impact if the more fundamental problem addressed in this article is not resolved how to overcome the forces that cling to a traditional model that thwarts most microgrid deployment.

A. Microgrid Deployment: Four Stories

Three states and territories that had already experienced climate disasters learned the hard way to appreciate the value of resiliency. The year 2018 was the deadliest and most destructive season for wildfires in California until 2020 and 2021 surpassed that year's record.[366] Partially as a result, California passed S.B. 1399 in 2018. This act mandated "action to help transition the microgrid from its current status as a promising emerging technology solution to a **[*308]** successful, cost-effective, safe, and reliable commercial product . . . ."[367] S.B. 1399 tasked the

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[362] In February 2023, the U.S. National Highway Traffic Safety Administration issued new standards that required the recall of nearly 1.1 million vehicles sold by Tesla, Nissan, Ram and others. *See* Jordan Mendoza, *Over 1 Million Nissan, Tesla, and Ram Vehicles Recalled: Check Latest Car Recalls Here*, USA TODAY (Feb. 20, 2023, 7:06 AM ET), https://perma.cc/J4SU-GVW6. Studies by the U.S. National Toxicology Program found "clear evidence" that exposure to cell phone radiation caused heart and brain tumors in male rats. *First time Ever, a Smartphone Is Recalled Because of Excessive Levels of Hazardous RF Radiation*, RF SAFE, https://perma.cc/JU2A-Z3YM. The U.S. Federal Communications Commission limits cell phone radiation to 1.6 W/kg. *Id.*

[363] *See, e.g.*, CTIA - The Wireless Ass'n v. City of Berkeley, 928 F.3d 832 (9th Cir. 2019) (holding that City of Berkeley's ordinance requiring cell phone retailers to inform prospective cell phone purchasers that carrying a cell phone in certain ways may cause them to exceed Federal Communications Commission guidelines for exposure to radio-frequency radiation survived request for a preliminary injunction).

[364] Elisa Wood, *Microutility Plan Down but Not Out in California*, MICROGRID KNOWLEDGE (Feb. 17, 2023), https://perma.cc/Y3L6-76LX ("Microgrid developers typically shy away from becoming utilities because of the Byzantine regulations utilities face. But that's beginning to change. In Ohio, a county formed its own utility to more easily pursue microgrid development within its borders. And in Washington, D.C., a microgrid developer has decided to pursue utility status under a state plan to create 'lightened regulation' for those who do.").

[365] While eighteen states have some mention of microgrids in their statutes, most are "roadmap" studies that have not risen to the level of actual deployment mechanisms. *See* Lenhart & Araújo, *supra* note 45, at 10-11 app. A.

[366] *Statistics*, NAT'L INTERAGENCY FIRE CTR., https://perma.cc/X757-ZDVQ.

[367] S.B. 1339, 2017-2018 Leg., Reg. Sess. § 1(e) (Cal. 2018) (enacted) ("The Public Utilities Commission, Independent System Operator, and State Energy Resources Conservation and Development Commission must take action to help transition the microgrid from its current status as a promising emerging technology solution to a successful, cost-effective, safe, and reliable commercial product that helps California meet its future energy goals and provides end-use electricity customers new ways to manage their individual energy needs.").

CPUC with developing standards that, among other things, would "reduce barriers for microgrid deployment"[368] and "streamline the interconnection process and lower interconnection costs for direct current microgrid applications."[369]

Also in 2018, Hawaiians were forced to prepare for two category four hurricanes. First, Hurricane Hector barely missed the islands and caused minor damage. Then just two weeks later, Hurricane Lane flooded the island with the second highest rainfall total for a tropical cyclone since 1950.[370] That same year, Hawai'i passed H.B. 2110, described as "an act relating to resiliency."[371] In 2014, Hawai'i's PUC had rejected the IOU's resource plan and "chastis[ed] the utility for its self-serving efforts to slow-walk the state's renewable energy transition."[372]

Hurricane Maria hit Puerto Rico in 2017,[373] and it took "roughly 11 months for the island to restore power to all of the customers . . . ."[374] This was "the longest blackout in U.S. history."[375] In 2019, Puerto Rico enacted the Puerto Rico Energy Public Policy Act.[376] This act passed a little over a month after Puerto Rico's main utility submitted a proposal to divide the island into "eight connected regional 'mini-grids'" that would be "further broken down into smaller microgrids."[377] Both the mini-grids and the community-level microgrids could function independently in a disaster.

[*309] All three of these entities took similar approaches charging their PUCs to minimize regulation and avoid the need for rate setting hearings by creating tariffs, or fixed prices, to standardize compensation for services microgrids can provide.[378] Unfortunately, almost five years later, neither the Hawai'i act nor Puerto Rico's has produced any usable results.

California legislators recognized that time was of the essence. Delay creates uncertainty that can jeopardize project financing, thus killing a project.[379] Delay is also a problem due to the urgency of addressing emission and reliability issues caused by climate emergencies. S.B. 1399 gave the CPUC a deadline for creating the standards and

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[368] *CAL. PUB. UTIL. CODE § 8371(b)* (West 2021).

[369] *CAL. PUB. UTIL. CODE § 8371(f)* (West 2021)

[370] Susannah Cullinane, *Hurricane Lane Dumped 52 Inches of Rain on Hawaii and There Might Be More on the Way*, CNN (Aug. 28, 2018, 6:25 AM EDT), *https://perma.cc/5WN3-H6SP*.

[371] H. B. 2110, 29th Legis. § 1 (2018).

[372] BAKER, *supra* note 326, at 43.

[373] *Puerto Rico Hurricane Maria*, FED. EMERGENCY MGMT. AGENCY, *https://perma.cc/B2PU-VZ3G* (Dec. 20, 2022).

[374] Max Zahn, *Puerto Rico's Power Grid Is Struggling 5 Years After Hurricane Maria. Here's Why.*, ABC NEWS (Sept. 22, 2022, 8:55 AM), *https://perma.cc/ZA8K-4DWP*.

[375] *Id.*

[376] S.B. 1121, 18th Assembly, 5th Sess. (P.R. 2019) (enacted).

[377] James Ellsmoor, *Puerto Rico's Utility PREPA Plans to Divide Island into Renewable Energy Microgrids*, FORBES (Feb. 12, 2019, 7:15 AM EST), *https://perma.cc/7WBR-XUPF*.

[378] SHEA, *supra* note 42 ("These legal agreements establish the services that microgrids can provide to the utility and the prices that microgrid operators will receive for those services. They are also designed to support strategic policy or system-level goals, such as enhanced reliability and resilience. In practical terms, tariffs attempt to provide microgrid owners and operators with fair and predictable compensation for electricity, electric services and other benefits that a microgrid provides to the electric utility. These policies have also directed state agencies to streamline and standardize the processes and requirements for microgrids to interconnect with the larger gr*id.*").

[379] Brown, *supra* note 51, at 157.

achieving the legislative goal of speeding up microgrid deployment: December 1, 2020.[380] Publicly owned electric utilities were only given six months.[381]

Sadly, the cumbersome regulatory process was not able to meet the time goals in the legislation. Although some progress has been made,[382] the CPUC is still mired in its tariff rulemaking and review process years past the deadlines.[383] One commentator places blame squarely with the regulators:

> The commission is saying that there need to be rules put in place for this kind of microgrid [Sunnova], but they are the ones who refuse to create those rules. They say that there should be more information, but they refuse to create a forum to present that same information, . . . The tragedy is that the citizens are the ones who suffer and are increasingly vulnerable to an unstable and dangerously aging electric grid. This is not a story about utility monopoly. It's a story about a state agency that refuses to comply with a law created five years ago to drive the commercialization of microgrids.[384]

[*310] Despite the delays, the California approach appears promising in that, once rulemaking is finally complete, microgrid participants should have clear guidelines about costs as well as what is required for interconnection. Furthermore, the rules may force utilities to provide faster interconnections and entry into their markets.[385]

2020 was another record year; the United States experienced the most billion-dollar disasters since 1980. Consequently, at least one more state took legislative action to promote microgrids.[386] In 2021, Maine passed legislation specifically attempting to take steps to integrate small-scale microgrids into the existing macrogrid. The Maine approach is to exempt these small microgrids from the statutory definition of public utility.[387] This exemption should allow microgrids to avoid the expensive and time-consuming uncertainty of PUC regulation for approval of projects and rates. Although Maine's 2021 statute appears well intended, Maine's approach of requiring case-by-case approval of each project, without imposing any timelines, may be too time consuming for individual projects. In

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[380] S.B. 1339, 2017-2018 Leg., Reg. Sess. § 8371 (Cal. 2018) (enacted) ("The commission, in consultation with the Energy Commission and the Independent System Operator, *shall take all of the following actions by December 1, 2020*, to facilitate the commercialization of microgrids for distribution customers of large electrical corporations . . . ." (emphasis added)).

[381] S.B. 1339, 2017-2018 Leg., Reg. Sess. § 8372(a) (Cal. 2018) (enacted) ("Within 180 days of the first request from a customer or developer to establish a microgrid, the governing board of a local publicly owned electric *utility shall develop and make available a standardized process for the interconnection* of a customer-supported microgrid, including separate electrical rates and tariffs, as necessary." (emphasis added)).

[382] In early 2021, the CPUC approved tariffs for microgrids that are binding on the state's three large IOUs. *Resiliency and Microgrids*, PUB. UTILS. COMM'N, *https://perma.cc/8F72-T7X5*.

[383] *Id.*

[384] Wood, *supra* note 364.

[385] Some of the most promising areas for market entry may already be identified. The CPUC requires regulated distribution companies to provide system maps showing where distributed local generation or storage could relieve congestion or improve reliability. *See* Herman K. Trabish, *How California's Utilities Are Mapping Their Grids for Distributed Resources*, UTIL. DIVE (Feb. 27, 2017), *https://perma.cc/49CE-ASC4*. New York state is also investigating similar options. *See* Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision, Order Adopting a Ratemaking and Utility Revenue Model Policy Framework, Matter No. 14-M-0101, Docket No. 1373 (N.Y. Publ. Serv. Comm'n May 19, 2016). Once such zones are identified, states should open these zones up for full-on competition and innovation without any traditional franchise limitations.

[386] ANDERSEN ET AL., *supra* note 96, at 6.

[387] *ME. REV. STAT. tit. 35-A, § 3351(2)* (2021) ("A person that constructs, maintains or operates a new microgrid . . . does not . . . become a public utility").

addition, the approval process set out in the Maine statute contains a long checklist of vague criteria, all of which must be met for **[*311]** approval, and that may prove cumbersome at best, and at worst, impossible to satisfy.[388]

B. New Focus on Community Microgrids

Corporations and the military have long recognized the value of resilience. New technologies, such as solar PV and battery storage, give those with the financial resources the choice of determining what resilience is worth to them and the option to purchase back-up power systems.[389] Those suffering energy insecurity do not have these options.[390] They have been forced to rely on monopoly IOUs and a system that often places those IOU profits ahead of the best interests of their community.[391] As rates go up, reliability has gone down, which is especially frustrating as the IOUs block innovations, such as microgrids, which could address these problems because they threaten the entrenched IOU business model. Given the benefits and fairness of providing these resources to those most in need, legislators should make changing the system to embrace microgrids in general and community microgrids in particular.[392]

A handful of states have legislation promoting grid-connected community grants and pilot programs. For example, in 2022, Colorado passed H.B. 22-1013, which provided grants to co-ops and municipally owned utilities to invest in **[*312]** microgrids.[393] Unlike IOUs, co-ops and government utilities are not afraid of competition and thus, are not motivated to preserve the status quo to enhance profits for shareholders.[394] As a result, most progress on deploying community microgrids has come in areas served by these entities instead of IOUs.[395]

Consequently, providing funding to these co-ops and government utilities for community microgrids should be the low hanging fruit for legislators. Areas that receive electric service from these entities do not threaten IOU's monopoly territories.[396] The IOU's primary reason for resistance to such programs is fear they will demonstrate the

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[388] *ME. REV. STAT. tit. 35-A, § 3351 (3)(A)(5)*-(3)(A)(8) (2021) (Some conditions include: "The person proposing the new microgrid demonstrates that the person has secured the financial capacity to operate the proposed new microgrid; (6) The person proposing the new microgrid demonstrates that the person has secured the technical capability to operate the proposed new microgrid; . . . and (8) The proposed new microgrid will not negatively affect the reliability and security of the electric gr*id.*"); *see also* L.D. 1053, 129th Leg., Reg. Sess. (Me. 2021) (enacted) (amending the state's rights-of-way law to make it easier for microgrids to have access.)

[389] *See, e.g.*, Sophie Alexande, *Rich Californians Shelling Out $30,000 to Ease PG&E Blackout Pain*, THE MERCURY NEWS, *https://perma.cc/RQ6W-GRVE* (Dec. 2, 2019, 6:25 AM).

[390] *See, e.g.*, Jackie Botts,*"We Need the Food That We Lost." Low-Income Families Still Reeling from Blackouts*, CAL MATTERS, *https://perma.cc/E8S7-8KWJ* (Feb. 27, 2020).

[391] BAKER, *supra* note 326, at 52-54.

[392] Some commentators have identified hurdles to community microgrids including: (1) limited availability of capital, (2) regulatory uncertainty, (3) microgrid falling with the definition of a public utility, and thus subject to PUC regulation and possibly its rate structures, (4) uncertain utility support, and (5) perceived high technical risk. *See* STEVE HOFFMAN & CHARLES CARMICHAEL, HOFFMAN POWER CONSULTING, SIX BARRIERS TO COMMUNITY MICROGRIDS . . . AND POTENTIAL WAYS DEVELOPERS CAN SURMOUNT THEM (Sept. 30, 2020), *https://perma.cc/DL3T-6NT7*.

[393] H.B. 22-1013, 2022 Leg., Reg. Sess. (Colo. 2022) (enacted). The Grid Resilience Grant Program provides $2.5 billion in formula grants to states and tribes to fund improvements to electric grids through the purchase of microgrids. DRAFT PROGRAM NARRATIVE OF BIPARTISAN INFRASTRUCTURE LAW - SECTION 40101(D) (State of Colo. 2023), *https://perma.cc/GT5G-34K8*. Colorado is estimated to receive approximately $8.6 million annually, or approximately $43 million, over the next five years from the Department of Energy's formula program used to disperse funds from the Infrastructure Investment and Jobs Act; this funding will be used to facilitate microgrid projects and other energy-related projects. *Id.*

[394] *See, e.g.*, Lenhart & Araújo, *supra* note 45, at 4.

[395] Although IOU involvement in microgrid projects quadrupled between 2014 and 2018, IOU projects still accounted for fewer than half (42%) of active microgrid projects in 2018 despite IOUs being the primary suppliers of electricity to U.S. customers. *Id.*

benefits of microgrids and other new technologies.[397] The Colorado statute recognized the outsized role that microgrids could play to provide energy justice by focusing on "communities . . . that are at significant risk of severe weather or natural disaster events."[398] As might be expected where the IOU is one of the largest lobbying forces in the state, the legislation was restricted to "eligible rural communities" in co-op or municipally owned utility territories to avoid funding any IOU competition.[399]

[*313] While some states have enacted limited legislation addressing microgrids or funding microgrid pilot projects,[400] the next step moving forward is to facilitate community microgrids in IOU territories. This legislation or regulation should include exceptions to the state public utility definition or create mandates for IOUs to facilitate, rather than obstruct, microgrid development and to speed up and guarantee interconnection of these microgrids with the macrogrid. Even within its discussion of how its Community Microgrid Enablement Program will help promote microgrids, PG&E warns, "The interconnection process is handled separately and independently from the microgrid development process, and can take significant time."[401]

California appears to be in the lead with its upcoming Microgrid Incentive Program.[402] But the CPUC still faces criticism for the delays in implementing it and for refusing to provide upfront grants to benefit the most disadvantaged communities.[403]

Furthermore, legislation to promote microgrids should increase across the country because the Infrastructure Investment and Jobs Act is providing funding for electric resilience projects.[404] The Inflation Reduction Act provides tax credits of up to 30% for microgrid controllers and other components of a **[*314]** microgrid system.[405] In addition

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[396] Because the monopoly territory of an IOU is established and would not overlap with an existing muni or coop, there is no threat in those areas. However, IOUs are concerned about some of their customers switching to a muni model. *See, e.g.*, Herman K. Trabish, *California IOU Rates Found to Be Twice the Cost of Muni Power*, UTIL. DIVE (June 17, 2015), https://perma.cc/CM2Z-Z3UV; Allen Best, *As Costs Rack Up in Boulder's Push to Split with Xcel, Voters to Have the Final Say*, ENERGY NEWS NETWORK (Oct. 27, 2020), https://perma.cc/7XB5-MJUL.

[397] Best, *supra* note 396.

[398] H.B. 22-1013, 2022 Leg., Reg. Sess. (Colo. 2022) (enacted).

[399] *Id.* Congress is considering similar bills promoting microgrids for vulnerable communities or infrastructure. *See, e.g.*, MICROGRID Act, H.R. 2482, 117th Cong. (2021); Energy Resilient Communities Act, H.R. 448, 117th Cong. (2021); Airport Energy Resiliency and Renewable Energy Act, H.R. 9434, 117th Cong. (2021).

[400] *See, e.g.*, H.B. 1249, 2022 Leg., Reg. Sess. (Colo. 2022) (enacted) (charging the Colorado Energy Office to create a "Microgrid Roadmap"); H.B. 227, 32d Leg., Reg. Sess. (Alaska 2022) (enacted) (relating to municipal energy and resilience improvement assessment programs and amending *section 29.10.200 of the Alaska Statutes*); *ANDERSEN ET AL., supra note 96* (noting that in 2020, Illinois, New York, and Pennsylvania funded the creation of specific microgrid projects; Minnesota and New Hampshire held studies to evaluate microgrid potential; and Maine and Michigan considered legislation that would allow non-utilities to develop microgrids, with Maine passing its law in 2021). While Colorado's "Microgrid Roadmap" report will provide valuable information, the legislation does not mandate any implementation, and the process of deploying any microgrids as a result will probably take years. H.B. 1249. The deadline for the roadmap is July 1, 2024, but there is no penalty for not meeting that date. *Id.*; *COLO. REV. STAT. § 24-38.5-113*.

[401] *Community Microgrid Enablement Program (CMEP), supra* note 79.

[402] *See* discussion *supra* Section I.B.

[403] Stephanie Doyle & Shina Robinson, *California PUC's Delay of Microgrids Program Harms Disadvantaged Communities*, UTIL. DIVE (Jan. 18, 2023), https://perma.cc/W3YC-ZRQX ("The commission has dragged out the timeline and gone along with the IOUs' plans, despite environmental justice advocates repeatedly submitting program design recommendations that center on equity and justice to the commission.").

[404] Infrastructure Investment and Jobs Act, ***Pub. L. No. 117-58***, § 40103, ***135 Stat. 429***, 928-29 (2021).

to tax credits, the IRA is providing financial incentives of $415 billion into the clean energy economy over the next decade. This legislation recognizes the urgency of climate change, and some of the federal benefits will expire as soon as 2024.[406] Consequently, delay is costly both in terms of financing and in providing now the relief that energy insecure communities could glean from community microgrids.

CONCLUSION

Vulnerable communities are hardest hit when climate induced fires, floods, and storms as well as cyber and physical threats challenge the conventional grid. Community microgrids can combine new technologies to provide local, self-sufficient access to power in these communities during grid outages.

This Article provides a history of how the state-regulated for-profit monopoly utility structure came to dominate the U.S. electricity industry, and how, despite federal efforts to introduce more competition, this structure thwarts mobilization of microgrids and other innovative technologies. Utilities see these technologies as competition, and most public utility commissions do not incentivize utilities to embrace them under the predominate cost of service rate structure. A free-market system might be the best way to foster innovations for microgrids and other grid-edge technologies such as solar and storage, but resistance does not come from IOUs alone. Legislators and regulators also perpetuate a more stifling regulatory environment sometimes out of bias and sometimes simply to justify their existence as regulators.

[*315] Because U.S. utility regulation at distribution, or grid-edge, is primarily controlled by states, state statutory definitions of what entities qualify as "public utilities" subject to regulation are critical. The author conducted a comprehensive review of state statutory definitions and categorized them, explaining some of the tests employed through illustrative cases. Next, the article explores how these statutory public utility definitions slowed the deployment of rooftop solar electricity generation in some states by prohibiting or regulating contracts with third-party solar providers. In states that were more supportive of promoting roof-top solar, the most effective solution was to allow free-market competition by explicitly excluding at least smaller arrays from the statutory definition of a public utility, and thus exempting them from regulation.

Finally, this Article examined statutes in all fifty states to determine which ones might explicitly exempt microgrids from public utility status or otherwise promote them. Although several states and territories are beginning to research or create microgrid roadmaps, only four have taken more concrete steps toward microgrid deployment. California, Hawai'i, and Puerto Rico have statutes that would minimize regulation and avoid the need for rate-setting by creating standardized pricing through tariffs. Only CPUC has made much progress on setting these tariffs, and yet even this agency is moving too slowly, years behind the statutory deadline. The fourth state to have a specific microgrid statute is Maine, but its case-by-case approach for approvals does not improve on what appears to be a cumbersome time-consuming process.

The good news is that federal financial assistance from the Inflation Reduction Act and other sources is pouring into the states to promote microgrids and related innovative climate-friendly technologies. Up to 40% of these funds are targeted to vulnerable communities through the Justice40 Initiative. In addition, states are also providing funding, such as California's Microgrid Incentive Program. Consequently, it is a promising time for the deployment of

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[405] *See, e.g.*, Lee, *supra* note 26 ("Microgrid controller tax credits start with a base credit of 6% and increase to 30% when apprenticeship and prevailing wage requirements are met, with room for additional bonus credits [if they meet] siting conditions or domestic content targets.").

[406] To receive the 30% credit, a microgrid controller must be constructed before Jan. 1, 2025. Inflation Reduction Act of 2022, ***Pub. L. No. 117-169***, § 13102, ***136 Stat. 1818***, 1913-21 (2022). Note also that the Infrastructure Investment and Jobs Act mentions "microgrids" five times in the contexts of (1) providing grants; (2) federal funding for research; (3) defining an "eligible project"; and (4) & (5) funding for the Federal Highway Administration Highway Infrastructure Program. Infrastructure Investment and Jobs Act, ***Pub. L. No. 117-58***, §40101(1)(H)(i), ***135 Stat. 429***, 926 (2021) (within § 40101 on "Preventing Outages and Enhancing the Resilience of the Electric Grid"); *id.* § 40103(c)(3)(E), 135 Stat. at 929 (within § 40103 on "Electric Grid Reliability and Resiliance Research, Development, and Demonstration"); *id.* § 40106, 135 Stat. at 935 (defining "eligible project" as one "to connect an isolated microgrid to an existing transmission, transportation, or telecommunications infrastructure corridor" within § 40106 on "Transmission Facilitation Program"); *id.* at tit. VIII, 135 Stat. at 1425-26.

community microgrids. As this Article illustrates, however, unless the underlying regulatory incentives are corrected, these vital microgrids will be delayed, if not stymied completely, and their benefits both to the communities seeking them and to the planet may be lost.

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1. *ARTICLE: Grid Reliability Through Clean Energy, 74 Stan. L. Rev. 969*

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Highlight

Abstract. In the wake of recent high-profile power failures, policymakers and politicians have asserted that there is an inherent tension between the aims of clean energy and grid reliability. But continuing to rely on fossil fuels to avoid system outages will only exacerbate reliability challenges by contributing to increasingly extreme climate-related weather events. These extremes will disrupt the power supply, with impacts rippling far beyond the electricity sector.

This Article shows that much of the perceived tension between clean energy and reliability is a failure of law and governance resulting from the United States' siloed approach to regulating the electric grid. Energy regulation is, we argue, siloed across three dimensions: (1) across substantive responsibilities (clean energy versus reliability); (2) across jurisdictions (federal, regional, state, and sometimes local); and (3) across a public-private continuum of actors. This segmentation renders the full convergence of clean-energy and reliability goals extremely difficult. Reliability-focused organizations operating within their silos routinely counteract climate policies when making decisions about how to keep the lights on. Similarly, legal silos often cause states and regional organizations to neglect valuable opportunities for collaboration.

Despite the challenges posed by this disaggregated system, conceptualizing the sphere of energy reliability as siloed across these dimensions unlocks new possibilities for reform. We do not propose upending energy law silos or making energy institutions wholly public. Rather, we argue for calibrated reforms to U.S. energy law and governance that shift authority within and among the silos to integrate the twin aims of reliability and low-carbon energy. Across the key policy areas of electricity markets, transmission planning and siting, reliability regulation, and regional grid governance, we assess changes that would integrate climate and reliability imperatives; balance state, regional, and federal jurisdiction; and reconcile public and private values. We believe this approach to energy law reform offers a holistic and realistic formula for a cleaner, more reliable grid.

Text

[*974] Introduction

To avoid the most catastrophic effects of climate change, the United States must rapidly decrease fossil fuel dependence while keeping the lights, heat, and air conditioning on--an increasingly difficult task due to extreme weather events intensified by climate change. [1]Many have cast these dual imperatives as dueling imperatives, arguing that there is an inherent tension between climate policy and the regulations needed to keep the lights on. In 2011, for example, the North American Electric Reliability Corporation (NERC)--the U.S. agency responsible for electric-grid reliability--claimed that "[e]nvironmental regulations are shown to be the number one risk to reliability over the next one to five years." [2]More recently, in 2021, the same agency expressed concern that the shift to increased renewable energy resources had the potential to threaten grid reliability. [3]

One high-profile example that has drawn attention to the perceived conflict between a clean-energy transition and grid reliability took place in the aftermath of Winter Storm Uri. In mid-February of 2021, an unusual yet increasingly common type of storm pummeled the lower Midwest, causing a prolonged cold snap in Texas and neighboring states. In Texas alone, millions of people were without power and water for days. [4]Texans huddled in freezing homes, trying to stay warm and find backup power for essential medical equipment--all while water pipes burst and city water-delivery systems faltered. [5]This loss of electricity to 69% of Texans had cascading effects. [6]Many areas experienced cell phone-service disruptions, which made it more difficult **[*975]** for pipeline and power-plant workers to address rapidly developing emergencies. [7]The pumps and other electrical equipment needed to run natural gas wells, pipelines, and power plants to support the skyrocketing demand for home heating failed. [8]Residents in neighboring states suffered as well: In Jackson, Mississippi, the storm caused a power outage and damaged the

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[1] *See* N. AM. ELEC. RELIABILITY CORP., 2019 STATE OF RELIABILITY, at viii (2019) (observing that all of the worst grid failures in 2018 were caused by extreme weather events); *see also* Miranda Willson, *Cost of Climate Change to the Grid? $ 4B*, POLITICO PRO: ENERGYWIRE (Jan. 12, 2022, 7:09 AM EST), *https://perma.cc/J2CE-57UN* (to locate, select "View the live page") (discussing a report showing that extreme weather events due to climate change may cost utilities over $ 4 billion each year).

[2] Opinion, *More Green Blackouts Ahead*, WALL ST. J. (Feb. 23, 2021, 7:04 PM ET), *https://perma.cc/sR9MX-TNHK* (to locate, select "View the live page").

[3] Robert Walton, *NERC Sees Potential Summer Energy Shortfalls, Says Energy Transition "Pace" May Threaten Reliability*, UTIL. DIVE (May 27, 2021), *https://perma.cc/7R86-2JNB*.

[4] UNIV. OF HOUS. HOBBY SCH. OF PUB. AFFS., THE WINTER STORM OF 2021, at 1 (2021), *https://perma.cc/K42N-3LSF*.

[5] *See* Reese Oxner & Juan Pablo Garnham, *Over a Million Texans Are Still Without Drinking Water. Smaller Communities and Apartments Are Facing the Biggest Challenges.*, TEX. TRIB. (Feb. 24, 2021, 6:00 PM CT), *https://perma.cc/2T7C-95AV* (describing how "a peak of about 14.9 million Texans faced water disruptions"); Mike Hixenbaugh & Perla Trevizo, *Texans Recovering from COVID-19 Relied on Machines to Help Them Breathe. Then the Power Went Out.*, TEX. TRIB. (Mar. 9, 2021, 6:00 AM CT), *https://perma.cc/5TWL-2MHJ* (describing medical-equipment failures).

[6] UNIV. OF HOUS. HOBBY SCH. OF PUB. AFFS., *supra* note 4, at 6, 12.

[7] *See id.* at 12 (noting that approximately 47% of Texans lost cell phone service).

[8] *See* UNIV. OF TEX. AT AUSTIN ENERGY INST., THE TIMELINE AND EVENTS OF THE FEBRUARY 2021 TEXAS ELECTRIC GRID BLACKOUTS 9, 44-45 (2021), *https://perma.cc/* 4N7Y-TN3G (suggesting that electrical outages were a partial cause of natural gas production declines and pipeline problems).

city's drinking-water plant, causing a monthlong water crisis. [9]Estimates place the number of deaths from the storm and the electric grid and related infrastructure failure at between 150 and 700, with damages totaling hundreds of billions of dollars. [10]

State officials were quick to blame these outages on renewable energy, pointing to wind turbines that froze during the storm. [11]After the disaster, Sid Miller, Texas's Agriculture Commissioner, asserted that "[w]e should never build another wind turbine in Texas." [12]Expert analyses, however, just as quickly concluded that outages at fossil fuel plants, not wind farms, were the central cause of the blackouts. [13]But even with this information in hand, Texas **[*976]** lawmakers responded with reforms that harden the existing, fossil fuel-centric system, requiring stronger equipment at natural gas wells and pipelines and natural gas-fired plants. [14]These types of actions are important but nearsighted responses to the root causes of recent reliability failures: They fail to fully account for potential alternative investments in clean-energy resources that could ensure reliability while avoiding the entrenchment of fossil fuels. [15]

The perceived tension between a clean-energy transition and a reliable electric grid is not only a political talking point. For at least a century, the American legal system has treated energy and the environment as distinct policy concerns. In the 1930s, Congress charged the Federal Power Commission, later renamed the Federal Energy Regulatory Commission (FERC), with regulating the country's interstate natural gas and electricity systems--several decades before President Nixon created the Environmental Protection Agency (EPA) to regulate the environment. [16]This distribution of authority endures, as the EPA is primarily responsible for regulating the environment, including

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[9] *See* Ellen Ann Fentress & Richard Fausset, *"You Can't Bathe. You Can't Wash." Water Crisis Hobbles Jackson, Miss., for Weeks*, N.Y. TIMES (Mar. 22, 2021), *https://perma.cc/S7PZ-E42E* (noting that "[n]early one month" after Winter Storm Uri, "more than 70 percent of the city's water customers remained under a notice to boil water").

[10] Peter Aldhous, Stephanie M. Lee & Zahra Hirji, *The Texas Winter Storm and Power Outages Killed Hundreds More People than the State Says*, BUZZFEED NEWS (May 26, 2021, 6:09 PM ET), *https://perma.cc/85LA-55RQ* (reporting on an independent investigation estimating that 702 people were killed during the week of Winter Storm Uri, as compared to the state's official tally of 151); PERRYMAN GRP., PRELIMINARY ESTIMATES OF ECONOMIC COSTS OF THE FEBRUARY 2021 TEXAS WINTER STORM 1 (2021), *https://perma.cc/F75M-T7KE* (estimating "projected long-term losses in gross product over time" as "between $ 85.8 and $ 128.7 billion").

[11] Bryan Mena, *Gov. Greg Abbott and Other Republicans Blamed Green Energy for Texas' Power Woes. But the State Runs on Fossil Fuels.*, TEX. TRIB. (Feb. 17, 2021, 7:00 PM CT), *https://perma.cc/6GLM-HVJF*; *see Lessons Learned from the Texas Blackouts: Research Needs for a Secure and Resilient Grid: Hearing Before the H. Comm. on Sci., Space, & Tech.*, 117th Cong. 4 (2021) (statement of Jesse D. Jenkins, Assistant Professor, Princeton University) (stating that "2,000 MW of wind turbines were forced offline by the cold").

[12] Erin Douglas & Ross Ramsey, *No, Frozen Wind Turbines Aren't the Main Culprit for Texas' Power Outages*, TEX. TRIB. (Feb. 17, 2021), *https://perma.cc/78SN-ERUP*.

[13] *See, e.g.*, Bill Magness, Review of February 2021 Extreme Cold Weather Event--ERCOT Presentation 14 (2021), *https://perma.cc/3C75-ZYCJ* (showing that natural gas in Texas experienced greater reduction in generation capacity than any other fuel type); FERC ET AL., THE FEBRUARY 2021 COLD WEATHER OUTAGES IN TEXAS AND THE SOUTH CENTRAL UNITED STATES 15 (2021), *https://perma.cc/KP33-Q56F* (showing that 27% of wind-generating units and 58% of natural gas-fired units experience "outages, derates, or failures to start"); *see also* Jacob Mays, Michael T. Craig, Lynne Kiesling, Joshua C. Macey, Blake Shaffer & Han Shu, *Private Risk and Social Resilience in Liberalized Electricity Markets*, 6 JOULE 369, 370 (2022) (arguing that market incompleteness contributed to the February 2021 blackouts in Texas).

[14] *See, e.g.*, H.R. 11, 87th Leg., Reg. Sess. (Tex. 2021) (mandating that the Texas Public Utility Commission require each utility to "prepare generation facilities to provide adequate electric generation service during an extreme weather emergency").

[15] *See infra* notes 356-58 and accompanying text.

the reduction of greenhouse-gas (GHG) emissions from energy use, and FERC is primarily responsible for regulating the energy grid.

Today, energy and environmental goals have converged to some degree, particularly through states adopting aggressive clean-energy laws to tackle climate change. [17]Nonetheless, the energy regulatory system is disaggregated in ways that exacerbate the failure of energy policy to support both a reliable and **[*977]** low-carbon electric grid. [18]States control many decisions about the construction and siting of electric generating plants and the location of virtually all electric transmission lines--even those that extend across multiple states. [19]These transmission lines are critical to supporting the large amounts of new renewable energy infrastructure that will be necessary to meaningfully reduce U.S. carbon emissions. [20]Meanwhile, the federal government oversees wholesale electricity markets and regional planning and financing of electric transmission lines. [21]These markets, too, are essential to the expansion of renewable energy resources because they determine which types of generation win out in the competition for supplying electricity. And planning and paying for new transmission lines is a necessary precondition for a clean grid. [22]

The governance of this disaggregated system is complex. In some parts of the United States, regional institutions called regional transmission organizations (RTOs) are responsible for implementing these policies under the supervision of FERC. These RTOs sometimes work in concert with the states in which they operate, and sometimes directly against the wishes of the states. [23]In other regions, utilities and states have opposed the formation of RTOs and therefore rely on more balkanized approaches to wholesale energy procurement and planning for and financing transmission lines. [24]And throughout the entire country, regional institutions called "regional entities" manage the direct regulation of electric-grid reliability under federal oversight. [25]

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[16] Federal Power Act (FPA), ch. 687, *49 Stat. 803*, 839-41 (1935) (codified as amended at *16 U.S.C. §§ 797-799*); Natural Gas Act, ch. 556, ***52 Stat. 821*** (1938) (codified as amended at *15 U.S.C. §§ 717-717w*); Reorganization Plan No. 3 of 1970, 3 C.F.R. 199 (1971); Clean Air Amendments of 1970, *Pub. L. No. 91-604*, *84 Stat. 1676* (1970) (codified as amended in scattered sections of 42 U.S.C.).

[17] *See generally* Lincoln L. Davies, *Alternative Energy and the Energy-Environment Disconnect*, *46 IDAHO L. REV. 473 (2010)* (advocating for legal reform that aligns the energy and environmental law fields to address climate change, enhance electric-grid reliability, and promote renewable energy); Alexandra B. Klass, *Climate Change and the Convergence of Environmental and Energy Law*, 24 FORDHAM ENV'T L. REV. 180 (2013) (discussing how climate change has brought the two fields closer together); Jody Freeman, *The Uncomfortable Convergence of Energy and Environmental Law*, 41 HARV. ENV'T L. REV. 339 (2017) (discussing continuing barriers to the integration of environmental law and energy law).

[18] Earlier works explored disaggregation outside of the carbon context and painted it primarily as a regulatory-commons problem. They focused on three jurisdictional "dislocations"--several federal agencies operating in the energy space, sharing jurisdiction with states, and operating within the shadow of judicial review. *See, e.g.*, Peter Huber, *Electricity and the Environment: In Search of Regulatory Authority*, *100 HARV. L. REV. 1002, 1003 (1987)*.

[19] *See infra* Part I.

[20] *See infra* Part IV.

[21] *See infra* Part I.

[22] *See infra* Part IV.

[23] *See infra* Part III.B.1.

[24] *See* William Boyd & Ann E. Carlson, *Accidents of Federalism: Ratemaking and Policy Innovation in Public Utility Law*, *63 UCLA L. Rev. 810, 836-37 (2016)* (describing the "[t]raditional [m]odel" that prevails in these states); Conor Harrison & Shelley Welton, *The States That Opted Out: Politics, Power, and Exceptionalism in the Quest for Electricity Deregulation in the United States South*, ENERGY RES. & SOC. SCI., Sept. 2021, at 1, 7-9 (elucidating state opposition to RTOs).

To further complicate matters, a curious mix of public and private institutions governs the energy sector. Some institutions are wholly public, such as FERC and the state utility commissions that govern electric generation **[*978]** choices and the approval (or "siting") of transmission lines. But RTOs and regional entities are private, nonprofit institutions, as is NERC, the organization that oversees the reliability of the electric grid as a whole. [26]The energy sector's substantial reliance on private governing institutions creates an additional layer of challenges that at times compounds jurisdictional and subject-matter divisions, even as these organizations' technical expertise at times provides a distinct benefit. [27]

We believe that this segmentation of energy policy--a phenomenon that renders the true convergence of energy and environmental policy extremely difficult--is an underdiagnosed cause of the perceived clash between clean energy and grid reliability. The siloed approach to energy regulation creates significant impediments to clean-energy policies, as reliability organizations often counteract clean-energy policies--often inadvertently, but sometimes more deliberately--when making decisions about how to keep the lights on. Similarly, legal silos often cause states and regional organizations to neglect valuable opportunities for collaboration. We view overcoming this structural separation that prevents the establishment of a clean, reliable grid as a crucial precondition to substantial progress on climate change mitigation in the United States.

To be sure, a grid that runs on dramatically different sources of energy will require different strategies to ensure its reliability. But the need to *reconceptualize* and enhance reliability should not detract from the fact that the only way to secure a reliable grid under conditions of climate change is to rapidly engage in a clean-energy transition in the electricity sector. [28]We need an institutional framework for energy in the United States that embraces this critical challenge.

Scholars often identify federalism as a central impediment to a clean, reliable grid, leading to the politically fraught but diagnostically simple cure of federalizing more energy policy. [29]We argue that the diagnosis is more **[*979]** complex than jurisdictional mismatch. In fact, the commonly proposed antidote of federalizing energy policy would fail to harmonize reliability and climate policy, since many of the most significant impediments to climate action occur within entities subject to FERC jurisdiction that are charged with maintaining grid reliability. We show that energy policy is better understood as siloed along three separate planes: (1) across environmental and reliability goals; (2) among jurisdictions (federal, regional, state, and sometimes local); and (3) along a public-private continuum of actors. These silos are largely responsible for the failure of energy policy to adequately harmonize climate change and reliability concerns.

Conceptualizing the sphere of energy-reliability governance as siloed across multiple planes unlocks new possibilities for governance reforms that shift authority not only across jurisdictional scales but across the public-private continuum. This Article highlights these silos within four core areas of U.S. energy policy and governance:

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[25] *See infra* Part V.

[26] *See, e.g., About MISO*, MIDCONTINENT INDEP. SYS. OPERATOR, *https://perma.cc/8ESX-5UTU* (archived Mar. 24, 2022); *About NERC*, N. AM. ELEC. RELIABILITY CORP., *https://perma.cc/SXZ6-P7L5* (archived Mar. 24, 2022).

[27] *See infra* Parts IV-V.

[28] *See infra* Part I.A.

[29] *See, e.g.*, Alexandra B. Klass & Jim Rossi, *Reconstituting the Federalism Battle in Energy Transportation*, 41 HARV. ENV'T L. REV. 423, 428 (2017) (arguing for a greater federal role in transmission-line siting); Lincoln L. Davies, *Power Forward: The Argument for a National RPS*, *42 CONN. L. REV. 1339, 1341, 1343-44 (2010)* (arguing for a federal renewable energy requirement). *But see* David E. Adelman & Kirsten H. Engel, *Reorienting State Climate Change Policies to Induce Technological Change*, *50 ARIZ. L. REV. 835, 852 (2008)* (arguing that states play an important role in climate-policy innovation); Felix Mormann, *Clean Energy Federalism*, *67 FLA. L. REV. 1621, 1628 (2015)* (arguing for a split national-state approach). For a defense of the FPA's distribution of jurisdiction, see Matthew R. Christiansen & Joshua C. Macey, *Long Live the Federal Power Act's Bright Line*, *134 HARV. L. REV. 1360, 1365-67 (2021)*.

(1) decisionmaking about the type and amount of electricity generation; (2) planning for, financing, and siting electric transmission lines; (3) directly regulating electric-grid reliability; and (4) regionally governing the grid. In each of these areas, we evaluate the structure of governance and substance of policy that impedes a cleaner, more reliable grid, and we assess how this policy and structure must change.

The changes that we propose are transformative, but they do not wholly upend U.S. energy policy. For reasons of both theory and political economy, we partially embrace the disaggregation of energy governance within these core areas. [30]We explore how to effectively navigate the current siloed system by reconfiguring the balance of authority and rewriting or expanding the substance of policies. To date, energy regulators have at times operated within their silos without fully considering how their regulations interact with--and often conflict with--approaches adopted by other regulators. Our proposed solutions focus on how targeted shifts in energy governance and policy responsibilities could encourage a systematic embrace of policies that are simultaneously assigned to disparate regulators. Doing so, we argue, would better reflect the spirit of the applicable federal laws governing the electric grid, which create federal and state spheres of responsibility. It would also eliminate tensions between policies designed to promote grid reliability and those designed to reduce GHG emissions. And finally, we evaluate the extent to which congressional action will be necessary--if at all--to enable this new institutional balance.

[*980] Several of the policy suggestions that we explore here are not new; a growing literature on clean-energy governance has advocated for many of these reforms. [31]Our novel contributions are threefold. First, policymakers and scholars have advocated for these changes nearly exclusively in the sphere of clean energy. We view these necessary modifications through a new lens, exploring how the proposed policies would enhance both clean energy and reliability. Second, most proposals for modifying energy policy to support clean energy are themselves disaggregated, usually resting within the transmission or RTO sphere. We propose a comprehensive suite of policy and institutional changes--modifications that will be necessary through all parts of the energy system that intertwine with climate mandates. Third, we emphasize how substantive policy changes will fall flat without substantial *governance* modifications that allow siloed actors to effectively create and implement new policies. For example, a truly interregional transmission-planning process--essential to the nationally connected grid that must support expanded renewables--likely requires a new FERC or Department of Energy (DOE) office that does the planning or coordinates regional organizations to conduct the planning.

The project of creating a clean, reliable grid is often treated as a technical challenge, dependent predominantly on the emergence of technological breakthroughs or engineering feats. [32]We show that it is equally--or largely--a challenge of law and governance. The siloed institutions and rules that dictate the configuration of the electric grid--the generation plants, transmission lines, and distribution lines that carry electricity to customers--substantially impede the rapid grid transformations necessary to tackle climate change.

These impediments create not only substantial economic costs, but also real human costs--and unequal ones at that. Black, brown, and low-income communities shoulder the bulk of the burdens caused by fossil fuel energy in the United States (and in many other countries). They inhale the air pollution from fossil fuel-fired power plants and toil in the dangerous conditions of fossil fuel-production industries. [33]Low-income communities and

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[30] *See infra* Part II (explaining the potential virtues of silos).

[31] *See, e.g., infra* Part IV.C (discussing transmission-siting reforms).

[32] *See, e.g.*, ANALYSIS GRP., ELECTRICITY MARKETS, RELIABILITY AND THE EVOLVING U.S. POWER SYSTEM 48-65 (2017); Semich Impram, Secil Varbak Nese & Bülent Oral, *Challenges of Renewable Energy Penetration on Power System Flexibility: A Survey*, ENERGY STRATEGY REVS., Sept. 2020, at 1, 3-10 (collecting technical sources). *See generally* NAT'L RENEWABLE ENERGY LAB'Y, RENEWABLE ELECTRICITY FUTURES STUDY (2012) (focusing on the technical aspects of a high-renewables grid).

[33] *See* Shalanda H. Baker, *Anti-resilience: A Roadmap for Transformational Justice Within the Energy System*, *54 HARV. C.R.-C.L L. REV. 1, 4-6, 13, 15 (2019)*; Maninder P.S. Thind, Christopher W. Tessum, Inês L. Azevedo & Julian D. Marshall, *Fine Particulate Air Pollution from Electricity Generation in the US: Health Impacts by Race, Income, and Geography*, 53 ENV'T SCI.

[*981] communities of color are disproportionately burdened by blackouts and other reliability issues, and are also hit hardest by severe climate events, because they lack many of the resources needed to weather these events. [34]Although infrequently discussed or justified on equity grounds, it is worth emphasizing that the reforms we propose would make the grid cleaner and more reliable and would reduce costly redundancies between climate and reliability policies, thereby charting a course toward a safer and more equitable climate and energy future.

Part I of this Article explores the critical nexus between the low-carbonenergy imperative and a reliable grid and analyzes the disaggregated structure of U.S. energy policy and governance. This Part foreshadows how the policy and governance system impedes the contribution of renewable energy--the key zero-carbon energy source in the United States--to grid reliability and frames our approach to policy solutions. In the Parts that follow, we assess necessary reconfigurations of authority in four key areas of energy policy. Part II explores how silos in governance--not just energy--can be both **[*982]** beneficial and problematic. The Parts that follow then consider how energy governance silos can be leveraged, partially knocked down, or integrated to create a cleaner, more reliable U.S. electric grid. Part III proposes changes to the regulated state and regional markets that dictate the electricity generation mix. Part IV explores policies for expanding long-distance, high-voltage electric transmission lines and more localized, distributed resources that will be essential for the creation of a low-carbon energy economy. Part V then analyzes the multilevel, direct regulation of grid reliability in the generation and transmission sectors as well as its recent failures, proposing policy and governance changes needed to enhance reliability while incorporating large amounts of renewable generation. Part VI highlights the modifications needed to allow regional institutions--particularly RTOs--to strike an essential balance between state, federal, public, and private silos in grid policy and governance. Finally, Part VII summarizes our policy and governance proposals.

I. Climate Change, Grid Reliability, and Energy Policy

U.S. energy policy is a poster child of complex systems. It is the product of more than a century of incremental institutional additions and changes. Utilities originally controlled the system, then states intervened, [35]and later, the federal government began to "intrude" in areas once dominated by the states, in part due to Supreme Court

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& TECH. 14,010, 14,013 (2019) (finding that Black Americans' exposure to PM2.5 emissions from power plants exceeds that of all other races); Ann E. Carlson, *The Clean Air Act's Blind Spot: Microclimates and Hotspot Pollution*, *65 UCLA L. REV. 1036, 1046-47 (2018)* (tracing how the Clean Air Act fails to regulate microclimates of heavy pollution, which disproportionately occur in low-income communities of color); Rachel Morello-Frosch, Miriam Zuk, Michael Jerrett, Bhavna Shamasunder & Amy D. Kyle, *Understanding the Cumulative Impacts of Inequalities in Environmental Health: Implications for Policy*, 30 HEALTH AFFS. 879, 881 & nn.24-26 (2011); Christopher W. Tessum et al., *Inequity in Consumption of Goods and Services Adds to Racial-Ethnic Disparities in Air Pollution Exposure*, 116 PNAS 6001, 6001-03 (2019) (finding that Black and Hispanic populations bear a pollution burden far exceeding the amount of pollution that their consumption actually causes).

[34] *See* James Dobbins & Hiroko Tabuchi, *Texas Blackouts Hit Minority Neighborhoods Especially Hard*, N.Y. TIMES (updated Feb. 18, 2021), *https://perma.cc/79E7-JUL2*; Robert R.M. Verchick, *Disaster Justice: The Geography of Human Capability*, 23 DUKE ENV'T L. & POL'Y 23, 25, 42 (2012) (describing how the United States has created a "disaster underclass" by neglecting certain places and peoples); Jonathan P. Hooks & Trisha B. Miller, *The Continuing Storm: How Disaster Recovery Excludes Those Most in Need*, *43 CAL. W. L. REV. 21, 23-25 (2006)* (focusing on the class and race dimensions of disaster recovery after Hurricane Katrina); Daniel Farber, *Symposium Introduction: Navigating the Intersection of Environmental Law and Disaster Law*, *2011 BYU L. REV. 1783, 1810* (discussing how environmental disasters highlight not only unequal exposure to risks, but also differential abilities to cope with such risks); Michel Masozera, Melissa Bailey & Charles Kerchner, *Distribution of Impacts of Natural Disasters Across Income Groups: A Case Study of New Orleans*, 63 ECOLOGICAL ECON. 299, 304 (2007) (examining why "lower income groups were more vulnerable to Hurricane Katrina during the response and recovery phases"); Ian P. Davies, Ryan D. Haugo, James C. Robertson & Phillip S. Levin, *The Unequal Vulnerability of Communities of Color to Wildfire*, 13 PLOS ONE, No. 11, Nov. 2018, at 1, 6; Wil Lieberman-Cribbin, Christina Gillezeau, Rebecca M. Schwartz & Emanuela Taioli, *Unequal Social Vulnerability to Hurricane Sandy Flood Exposure*, 31 J. EXPOSURE SCI. & ENV'T EPIDEMIOLOGY 804, 804-05, 807 (2020) (finding disparate impacts by class and race related to flooding after Hurricane Sandy).

[35] Richard J. Cudahy & William D. Henderson, *From Insull to Enron: Corporate (Re)regulation After the Rise and Fall of Two Energy Icons*, *26 ENERGY L.J. 35, 45-48 (2005)*.

directives. [36]The result is a menagerie of institutional actors often fighting for authority within a given policy space. A slew of recent high-profile Supreme Court cases highlights the ongoing tensions among state, regional, and federal actors in energy-governance spheres. [37]

[*983] This system poses challenges to the development of a clean, reliable grid. Yet it is within this system that these challenges must be overcome. This Part explains why the pursuit of grid reliability and clean energy are complementary, mutually reinforcing goals for energy governance--thereby counteracting the chorus of skeptics asserting their incompatibility. It highlights the existing U.S. energy policies and governance structures that impede the important contribution that renewable energy-generation sources can make to reliability, and it introduces our comprehensive approach to energy-policy transformation to overcome these hurdles.

A. Why a Decarbonized Grid Is a More Reliable Grid

The U.S. electric grid transmits electricity to homes, businesses, and industries over an enormous, interconnected network of power plants and other generation facilities; long-distance, high-voltage transmission lines; and low-voltage distribution lines. [38]These generation facilities are predominantly powered by fossil fuels, but that is rapidly changing--and must change even more quickly--to address the climate crisis. It is this endeavor that worries skeptics, who increasingly argue that we cannot transition to a clean energy grid while maintaining reliability. [39]

Grid reliability has three distinct elements. First, reliability refers to the process of ensuring that there is enough generation at all points on the grid to meet electricity demand at all times of day. [40]A failure to exactly match electricity supply and demand (or "load") on an instantaneous basis can lead to over- or under-voltages in the wires and, ultimately, a blackout--the complete loss of power to customers. [41]However, short-term planning can only go so far. Ensuring reliability requires both very short-term and long-term planning and decisionmaking, from instantaneously dispatching additional energygeneration reserves to address unexpectedly high demand to building additional transmission lines that reduce congestion in existing wires. [42]

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[36] *See, e.g.*, *Pub. Util. Comm'n v. Attleboro Steam & Elec. Co., 273 U.S. 83, 89-90 (1927)* (holding that states could not assert jurisdiction over wholesale electricity sold in interstate commerce), *abrogated by* *Ark. Elec. Coop. Corp. v. Ark. Pub. Serv. Comm'n, 461 U.S. 375 (1983)*; *Otter Tail Power Co. v. United States, 410 U.S. 366, 374-75 (1973)* (finding that federal antitrust principles applied to utility activity that blocked competition).

[37] *See, e.g.*, *PennEast Pipeline Co. v. New Jersey, 141 S. Ct. 2244, 2257 (2021)* (holding that private utilities exercising FERC-granted eminent domain authority may condemn state-owned lands); *Hughes v. Talen Energy Mktg., LLC, 136 S. Ct. 1288, 1297 (2016)* (finding that a state program designed to incentivize new generation capacity was preempted under the FPA); *FERC v. Elec. Power Supply Ass'n, 577 U.S. 260, 276-77 (2016)* (finding that FERC had the authority to regulate demand-response resources--which also operate in the state-regulated retail space--within federally regulated wholesale markets).

[38] U.S. DEP'T OF ENERGY, STAFF REPORT TO THE SECRETARY ON ELECTRICITY MARKETS AND RELIABILITY 1 (2017).

[39] *See, e.g., supra* text accompanying notes 11-14.

[40] *See* N. AM. ELEC. RELIABILITY CORP., DEFINITION OF "ADEQUATE LEVEL OF RELIABILITY" 5 (2007), *https://perma.cc/W6PA-QKKM*.

[41] *Electricity Explained: How Electricity Is Delivered to Consumers*, U.S. ENERGY INFO. ADMIN. (Nov. 3, 2021), *https://perma.cc/7LZW-WFGB*.

[42] N. AM. ELEC. RELIABILITY CORP., *supra* note 40, at 5 (defining reliability to cover both "adequacy," which is the "ability of the electric system to supply the aggregate electric power and energy requirements of the electricity consumers at all times," and "operating reliability," which is "the ability of the electric system to withstand sudden disturbances").

[*984] Resource adequacy--an important second element of reliability--involves long-term planning for new generation infrastructure to ensure that demand for electricity will be covered in the future. [43] In the United States, regulators define an acceptable degree of resource adequacy as allowing only a day's loss of power every ten years. [44] Finally, for the purposes of this Article, we also intend for grid reliability to encompass the third related concept of "resilience," or the ability of the grid to bounce back after power disruptions caused by weather or other emergencies, and to prevent blackouts during these emergencies. [45]

It is important to acknowledge up front that a grid fueled by clean energy--and in particular, by substantial quantities of renewable energy--poses *different* reliability challenges than fossil fuel generation. [46] Whereas fossil fuel generators can often increase and decrease production (or "ramp," in industry terminology) on command, [47] wind and solar generation are available only when the wind is blowing or the sun is shining. Many politicians and incumbent fossil fuel generators equate this intermittency with unreliability. [48] **[*985]** But that is misleading. No resource runs all of the time. In fact, in the past few years, gas generation and, to a lesser degree, coal generation have played prominent roles in weather-related system failures. [49]

At the same time, numerous studies have confirmed that we already have the technology necessary to maintain grid reliability under conditions of substantial renewable energy penetration. [50] What renewable resources require to

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[43] *See, e.g.*, Cal. ISO, Resource Adequacy: The Need for Sufficient Energy Supplies 1 (2021), *https://perma.cc/484N-R96B* ("Resource adequacy ensures that there is enough capacity and reserves for the California Independent System Operator . to maintain a balanced supply and demand across the grid.").

[44] *See, e.g.*, ReliabilityFirst, Planning Resource Adequacy Analysis 1 (2016), *https://perma.cc/9Z4Z-EB9T* (noting the " 'one day in ten year' loss of load expectation principles" (capitalization altered)).

[45] There has been increased discussion of grid resilience in recent years, but it remains unclear whether the concept of resiliency is best treated as a separate end for the electricity system or should be encompassed within the concept of reliability. We follow the lead of former FERC chair Cheryl LaFleur in considering the grid's ability to recover from disasters quickly as an element of reliability. *See* *Grid Reliability & Resilience Pricing, 162 FERC P 61,012*, at para. 1 (Jan. 8, 2018) (LaFleur, Comm'r, concurring) ("[R]esilience--the ability to withstand or recover from disruptive events and keep serving customers--is unquestionably an element of reliability."); *cf*. Andy Ott, *Reliability and Resilience: Different Concepts, Common Goals*, PJM: INSIDE LINES (Dec. 17, 2018), *https://perma.cc/H248-AHB3* ("Resilience is directly linked to the concept of reliability; you cannot be resilient if you are not first reliable. Resilience encompasses additional concepts--preparing for, operating through and recovering from significant disruptions, no matter what the cause.").

[46] We use the term "clean energy" to refer to all zero-carbon energy sources, including nuclear power. It is worth noting, though, that because of its low costs, renewable energy is projected to play a particularly large role in most future low-carbon energy scenarios. *See* ERIC LARSON ET AL., NET-ZERO AMERICA: POTENTIAL PATHWAYS, INFRASTRUCTURE, AND IMPACTS 88 (2021), *https://perma.cc/W7W7-HZVG* (stating that "[w]ind and solar power have dominant roles in all pathways"). We therefore focus on renewable energy resources in this Article.

[47] Contingent on, of course, fuel supply and adequate weatherization. *See supra* note 13 and accompanying text.

[48] *See, e.g., supra* text accompanying notes 11-14; Mena, *supra* note 11.

[49] *See* Sonal Patel, *Polar Vortex Tests Resiliency of U.S. Power System*, POWER MAG. (Jan. 31, 2019), *https://perma.cc/73AA-QJBD* (describing how nuclear energy underperformed during a New England polar vortex); Mike O'Boyle & Silvio Marcacci, *As Extreme Weather Forces Coal to Falter, Where Will Resilience Come From*?, GREENTECH MEDIA (Mar. 7, 2019), *https://perma.cc/29WP-Y8B3* (discussing coal's underperformance in the polar vortex); UNIV. OF TEX. AT AUSTIN ENERGY INST., *supra* note 8, at 8, 34 (describing and illustrating the scope of these resources' failures after Winter Storm Uri).

[50] LARSON ET AL., *supra* note 46, at 6 (outlining "five distinct technological pathways, each of which achieves the 2050 goal" and accelerates "deployment at scale of technologies and solutions that are mature and affordable today . ."). GOLDMAN SCH. OF PUB. POL'Y, UNIV. OF CAL. BERKELEY, 2035 REPORT 4 (2020); NAT'L RENEWABLE ENERGY LAB'Y, *supra* note 32, at

ensure reliability are complementary resources that balance out over time and can rapidly offer flexible back-up power. These can include energy storage; other forms of renewable energy; and renewable energy in different geographic locales, with different weather conditions, connected by longdistance transmission lines. [51]Moreover, clean-energy resources often offer superior performance when it comes to the provision of certain traditional reliability services. [52]For these reasons, the clean-energy transition may ultimately prove cost saving, although expensive in the interim: A 2020 study by the University of California Berkeley's Goldman School of Public Policy projects that wholesale electricity costs will be 10% lower than they are today under a 90% clean-energy scenario in 2035. [53]

It is time, then, to dispense with the myth that a cleaner grid--one that relies on substantially larger percentages of renewable generation--is not possible from a reliability standpoint. As we argue below, it is not only possible but *advisable* to do so, for three reasons. First, although atmospheric change will be slow, a clean energy grid will, over time, reduce climate impacts that **[*986]** currently stress the grid and human systems more generally. Second, a cleanenergy transition will induce the construction of both a nationally interconnected transmission grid and numerous localized, self-sufficient microgrids that will operate when the larger grid inevitably experiences problems. Finally, renewable energy sources offer enhanced technical grid benefits compared to fossil fuel-fired power--benefits that will make the grid more reliable.

1. Mitigating climate impacts on the U.S. energy system

The effects of climate change pose increasingly serious threats to the U.S. energy system, including hurricanes, wildfires, extreme heat, and extreme cold. These weather-related threats are expected to become more frequent, which in turn will require a significant increase in electric-grid resilience and reliability. [54]

The strategy for mitigating these harms can be summarized in six words: electrify everything and decarbonize the grid. In 2019, electricity ranked as the second largest sectoral source of carbon pollution in the United States (25%), just below transportation (29%) and trailed by industry (23%), commercial and residential (13%), and agriculture (10%). [55]But electricity's role in addressing climate change is outsized: It has been described as the "linchpin" of decarbonization because the central strategy for decarbonizing most other sectors is to transition them to run on electricity. [56]Of course, electrification only works as a decarbonization strategy if the grid also cleans up as it grows in size. Thus, to facilitate U.S. decarbonization on pace with planetary imperatives, the U.S. electricity system will need to approximately triple in size by 2050 at the latest, while reducing its emissions by 95-100%. [57]

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iii ("[R]enewable electricity generation from technologies that are commercially available today, in combination with a more flexible electric system, is more than adequate to supply 80% of total U.S. electricity generation in 2050 while meeting electricity demand on an hourly basis in every region of the United States.").

[51] NAT'L RENEWABLE ENERGY LAB'Y, *supra* note 32, at viii-xi.

[52] *See infra* Part I.A.3.

[53] GOLDMAN SCH. OF PUB. POL'Y, *supra* note 50, at 4; Dan Shreve, *Deep Decarbonisation: The Multi-trillion-Dollar Question*, WOOD MACKENZIE (June 27, 2019), https://perma.cc/4W7K-DKPQ ("We estimate the cost of full decarbonisation of the US power grid at US$ 4.5 trillion, given the current state of technology. That's nearly as much as what the country has spent, since 2001, on the war on terror.").

[54] *See, e.g.*, NAT'L COMM'N ON GRID RESILIENCE, GRID RESILIENCE: PRIORITIES FOR THE NEXT ADMINISTRATION 5 (2020).

[55] *See Sources of Greenhouse Gas Emissions*, EPA, https://perma.cc/AM64-UWKC (archived Mar. 25, 2022).

[56] *See* Jesse D. Jenkins, Max Luke & Samuel Thernstrom, *Getting to Zero Carbon Emissions in the Electric Power Sector*, 2 JOULE 2498, 2498 (2018) (identifying electric power as the "linchpin of efforts" to limit greenhouse-gas emissions).

[57] *See* Joeri Rogelj et al., *Mitigation Pathways Compatible with 1.5 °C in the Context of Sustainable Development, in* GLOBAL WARMING OF 1.5°C, at 93, 95 (2019) (establishing 2050 as the latest date around which net-zero emissions should be

As electricity becomes central to powering our economy, grid reliability will assume even greater importance. Fortunately, though, a decarbonized grid will ultimately prove stabilizing in this regard: A transition away from fossil **[*987]** fuels will be essential to slowing the rise of extreme weather events that increasingly disrupt the grid--not to mention the impact on human well-being as a whole. To be sure, unilateral decarbonization by the United States would not itself avert increases in global average temperatures and extreme weather events. But the United States, as the world's largest historical emitter, is widely understood to play a key geopolitical role within international climate negotiations, such that leadership on domestic decarbonization is critical for spurring global ambition. [58]Conversely, if the United States does not pursue rapid decarbonization, it is unlikely to be achieved on a global scale, and we will miss a critical window for stemming the rising frequency and degree of extreme weather events that are significant causes of blackouts. [59]Or, to frame this in reverse, if we do not transition to clean energy, we can expect a devastating, spiraling positive feedback loop: We will spend more money to shore up less reliable fossil fuel generation, which leads to CO2 emissions that exacerbate reliability events, which in turn require even more investment into adaptive reliability measures for an ultimately untenable technology.

2. Enhancing grid stability and energy equity through national interconnection and localized networks

In addition to mitigating some of the effects of climate change, decarbonization can also immediately improve grid reliability and resilience. At the local level, microgrids already have been a key component of reliability and resilience. Microgrids are energy systems that power a neighborhood, university campus, or similarly small area and that can be islanded (disconnected) from the larger grid. [60]For instance, during and after Hurricane Sandy in New York in 2012, several university campuses and other microgrids kept the lights on while the rest of the city remained in the dark. [61]Although microgrids are not all zero carbon, they can be designed to run on a combination of small-scale renewables, energy storage, or green hydrogen **[*988]** made with renewable energy. [62]An expansion of green microgrids would substantially improve reliability and reduce carbon emissions. [63]

At the opposite end of the spectrum, deep decarbonization will require a massive build-out of utility-scale wind and solar farms. [64]This, in turn, will necessitate the construction of a large, nationally connected system of transmission lines to deliver electricity from remote, rural areas to "load centers"--high-population areas that consume a greater

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achieved to limit warming to 1.5 degrees Celsius); STEPHEN NAIMOLI & SARAH LADISLAW, CTR. FOR STRATEGIC & INT'L STUDIES, DEEP DECARBONIZATION PATHWAYS 2 (2020), https://perma.cc/ZKC8-LHQA; *see also* Jenkins et al., *supra* note 56, at 2506.

[58] *See, e.g.*, Jennifer A. Dlouhy & Justin Sink, Bloomberg, *"A Very Weak Hand": Biden Set to Head to COP26 Summit Without Congressional Support for His Climate Pledges*, FORTUNE (Oct. 14, 2021, 4:13 AM PST), https://perma.cc/FN49-JMHS (describing why robust U.S. domestic action on climate change is critical to the success of international climate negotiations).

[59] N. AM. ELEC. RELIABILITY CORP., 2019 ERO RELIABILITY RISK PRIORITIES REPORT 18 (2019).

[60] Sara C. Bronin, *Curbing Energy Sprawl with Microgrids*, 43 CONN. L. REV. 547, 549-50 (2010).

[61] James M. Van Nostrand, *Keeping the Lights on During Superstorm Sandy: Climate Change Adaptation and the Resiliency Benefits of Distributed Generation*, N.Y.U. ENV'T L.J. 92, 96-97 (2015).

[62] *See Microgrids*, CTR. FOR ENERGY & CLIMATE SOLS., https://perma.cc/8BBU-UTSE (archived Mar. 25, 2022) ("Historically, microgrids generated power using fossil fuel-fired combined heat and power . and reciprocating engine generators. Today, however, projects are increasingly leveraging more sustainable resources like solar power and energy storage. Microgrids can run on renewables, natural gas-fueled combustion turbines, or emerging sources such as fuel cells or even small modular nuclear reactors, when they become commercially available.").

[63] *The Role of Microgrids in Helping to Advance the Nation's Energy System*, U.S. DEP'T ENERGY OFF. ELEC., https://perma.cc/8KFA-EGYQ (archived Mar. 25, 2022).

[64] All of the reports describing pathways to a zero-carbon grid assume such a build-out. *See* LARSON ET AL., *supra* note 46, at 27, 88.

amount of electricity. [65]A national transmission system has inherent reliability benefits because it allows utilities to draw from a broader, more diverse pool of power. [66]Indeed, many argue that one central cause of Texas's 2021 blackout during Winter Storm Uri was the state's decision decades earlier to refuse to interconnect with out-of-state transmission networks. [67]

Enhanced interconnections and expanded microgrids could, if designed properly, also substantially enhance the equity of the grid. A nationally interconnected grid will bring cheaper, cleaner renewable energy to more people, helping to alleviate the crushing burden of energy poverty that plagues nearly one-third of U.S. households. [68]Furthermore, clean microgrid development targeted toward low-income, marginalized communities--which have the fewest resources to fall back on during grid emergencies--will enhance reliability in communities disproportionately burdened by outages.

[*989] 3. Diversifying fuel supply

Beyond inducing the construction of a nationally interconnected grid, it is important to highlight another characteristic of renewable energy in the wake of Winter Storm Uri in 2021: its natural availability at the point of generation. Natural gas-plant outages were the primary cause of the crisis precipitated by Uri, in part because natural gas generates so much power in the state, and these outages arose largely from fuel-supply issues caused by frozen parts on gas wells and pipelines. [69]Many natural gas plants--like some wind turbines in Texas--also simply froze because they had not been properly weatherized. [70]

Certainly, fossil fuel infrastructure can be weatherized, and many power plants in the northern United States regularly operate in conditions that are far colder than those experienced in Texas. [71]Even then, however, this infrastructure remains vulnerable to geopolitical and physical supply shocks. [72]Moreover, spending billions of dollars to weatherize natural gas wells, pipelines, and power plants might not be the most efficient or practical approach to reliability, given the links between this infrastructure and climate change. Allocating some of these

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[65] *See, e.g.*, Gregory Brinkman, Joshua Novacheck, Aaron Bloom & James McCalley, Nat'l Renewable Energy Lab'y, Interconnections Seam Study 33 (2020) (describing the importance of this type of interconnection).

[66] *See [Ill. Com. Comm'n v. FERC, 721 F.3d 764, 774 (7th Cir. 2013)](https://)* (noting the need for fewer reserve margins due to a transmission-line expansion).

[67] *See, e.g., After Texas, A New Spotlight on Long-Distance Transmission in MISO*, SUSTAINABLE FERC PROJECT (Mar. 5, 2021), *https://perma.cc/7QHZ-9Z4U* (noting the currently unfilled need to import electricity to Texas during grid emergencies).

[68] *See* Sasha Ingber, *31 Percent of U.S. Households Have Trouble Paying Energy Bills*, NPR (Sept. 19, 2018, 8:12 PM ET), *https://perma.cc/S2ND-A4MM*.

[69] *See supra* note 8 and accompanying text.

[70] Elec. Reliability Council of Tex., Update to April 6, 2021 Preliminary Report on Causes of Generator Outages and Derates During the February 2021 Extreme Cold Weather Event 9, 18 (2021), *https://perma.cc/5MBJ-F6EF* (showing weather-related issues, including the freezing of intake lines and other problems associated with a lack of winterization, as the leading cause of natural gas-plant outages in Texas during Winter Storm Uri); UNIV. OF TEX. AT AUSTIN ENERGY INST., *supra* note 8, at 30-31 (describing the weather-related issues at the 167 generation units that stopped generating as a result of freezing equipment rather than fuel-supply issues or other outage causes).

[71] *See, e.g.*, Chris Hubbuch, *Built for Cold, Wisconsin Grid Hums Along in Temperatures that Crippled Texas*, MADISON.COM (Feb. 19, 2021), *https://perma.cc/T5TR-PYB5* (discussing how power plants and related energy-producing equipment in northern U.S. states are designed for "frigid" temperatures as cold as "40 degrees below zero").

[72] *See, e.g.*, David E. Sanger, Clifford Krauss & Nicole Perlroth, *Cyberattack Forces a Shutdown of a Top U.S. Pipeline*, N.Y. TIMES (updated May 13, 2021), *https://perma.cc/6V6T-ZR5X* (describing a cyberattack on Colonial Pipeline that caused significant gas shortages throughout the eastern United States).

funds toward geographically diverse renewables, which simply need to access wind or sunlight and do not require wells, pumps, compressors, and pipelines, could be a more efficient path toward reliability.

Wind turbines and solar panels also can be, and often are, weatherized to avoid freezing. [73]And although renewable generation sources lack a constant **[*990]** fuel supply--since the strength and frequency of wind and sunlight varies--intermittencies can be smoothed out when wind turbines and solar panels are geographically diversified, adequately interconnected through transmission lines, and supported by storage.

B. How Siloed Grid Policy and Governance Impede a Clean, Reliable Grid

Thus far, we have made the case that integrating renewable energy is central to a reliable electric grid. In this Subpart, we turn to the legal and institutional context in which a clean, reliable grid must be achieved, focusing on the ways in which the system is currently disaggregated across jurisdictional scales and the public-private continuum.

The history of electricity explains much of energy law's disaggregation. When the grid was first constructed, power generation was highly localized, with cities like Chicago authorizing around forty-five companies to build power plants. [74]Gradually, ambitious companies took over and consolidated this generation, reducing the number of power plants and vertically integrating their operation. [75]These investor-owned utilities (IOUs) began to build, own, and operate generation, the transmission lines that connected generation to load centers, and the distribution lines that carried electricity to retail customers. [76]IOUs successfully lobbied states to regulate electric utilities so that utilities could act as monopolies within established service territories. [77]As a consequence of states providing IOUs with exclusive service territories, state legislatures granted public-utility commissions (PUCs) the power to set the rates utilities charged their customers. [78]But as IOUs increasingly transacted across state lines, states began to compete for regulatory control over these interstate enterprises. These efforts by state regulators to set rates for interstate electricity sales led to a Supreme Court case prohibiting this state competition and, ultimately, to the Federal Power Act of 1935 (FPA). [79]

[*991] The FPA draws a dividing line between federal and state jurisdiction over electricity. [80]This law authorizes FERC to regulate the selling of electricity at wholesale in interstate commerce; the transmission of electricity in

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[73] *See, e.g.*, XCEL ENERGY, RENEWABLE ENERGY 8 (2020), *https://perma.cc/JN7J-7PX7* ("All the wind turbines that Xcel Energy owns across its three regions are outfitted with cold weather turbine packages that support operations down to -22 F (-30 C)."); Sonal Patel, *Prepare Your Renewable Plant for Cold Weather Operations*, POWER MAG. (Oct. 1, 2014), *https://perma.cc/E4FX-A7DG*.

[74] Robert L. Bradley, Jr., *The Origins and Development of Electric Power Regulation, in* THE END OF A NATURAL MONOPOLY: DEREGULATION AND COMPETITION IN THE ELECTRIC POWER INDUSTRY 43, 73 n.4 (Peter Z. Grossman & Daniel H. Cole eds., 2003).

[75] *See id.* at 46-47; *see also* *New York v. FERC, 535 U.S. 1, 5-6 (2002)* (discussing the growth of public utilities).

[76] See Boyd & Carlson, *supra* note 24, at 820-22, 824; *New York v. FERC, 535 U.S. at 5-6*.

[77] Cudahy & Henderson, *supra* note 35, at 49; *see, e.g.*, Bradley, *supra* note 74, at 46-48.

[78] Some states utilize the term PUC; other states use the analogous title public-service commission (PSC) and, occasionally, corporation commission.

[79] *Pub. Util. Comm'n v. Attleboro Steam & Elec. Co., 273 U.S. 83, 90 (1927)*, *abrogated by* *Ark. Elec. Coop. Corp. v. Ark. Pub. Serv. Comm'n, 461 U.S. 375 (1983)*.

[80] *See* Christiansen & Macey, *supra* note 29, at 1367. The relevant authority of FERC under the FPA was supplemented by the Energy Policy Act of 2005 (EPAct 2005). *See* Energy Policy Act of 2005, ***Pub. L. No. 109-58***, § 1211, ***119 Stat. 594***, 941-46 (codified as amended at *16 U.S.C. § 824o*); *see also infra* Part III.

interstate commerce (the rates charged for transmission, and the service that must be offered); and the reliability of the U.S. electric grid. [81]The FPA left intact state authority over electricity generation, retail sales, and other electricity-related matters not expressly regulated by FERC, including the siting of transmission lines within states' jurisdictions. [82]

Today, some states continue to rely upon PUCs to regulate all aspects of the electricity system not subject to FERC jurisdiction. [83]They allow IOUs to act as regulated monopolies, with the PUC approving how much and what type of generation the IOUs may build and determining the rates that IOUs may charge retail customers. [84]Other states have restructured by separating the enterprise of generating electricity from the enterprise of delivering electricity to customers. [85]In these states, independent generators sell electricity at wholesale either directly to IOUs or through competitive energy markets. [86]In states like Texas--the most restructured state--even the retail side of the business is competitive. In most parts of the state, businesses called retail electric providers (REPs) compete to offer customers different packages of electricity at different rates. [87]But even in Texas, the transmission and distribution aspects of electricity remain a state-regulated monopoly, with **[*992]** regulators determining which projects utilities can build and the rates to be charged for use of the wires. [88]

States affect the carbon intensity and reliability of the electric grid in several ways. In states that have restructured, competition has increased the amount of renewable generation on the grid because wind and solar (and hydroelectric) generation are now often cheaper than most fossil-fired resources. [89]Across restructured and non-restructured states, many PUCs and PSCs operate under legislative directives to increase renewable generation. [90]Other states have blocked utility proposals to build this generation. [91]Furthermore, through siting decisions, states have at times enabled or, in many cases, blocked the construction of transmission lines required for renewable

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[81] *16 U.S.C. § 824* (establishing federal regulatory authority over interstate transmission and wholesale electricity sales in interstate commerce); EPAct 2005 § 1211, 119 Stat. at 941-46 (authorizing FERC to issue reliability standards in some circumstances).

[82] The federal government regulates the safety of nuclear power plants and licenses hydroelectric dams, but states can still block these projects by refusing ratepayer funding.

[83] James W. Coleman & Alexandra B. Klass, *Energy and Eminent Domain*, *104 MINN. L. REV. 659, 696-97, 700 (2019)*.

[84] *See* David B. Spence, *Can Law Manage Competitive Energy Markets*?, *93 CORNELL L. REV. 765, 769-72 (2008)* (describing the traditional regulation of utilities).

[85] *See* Boyd & Carlson, *supra* note 24, at 837.

[86] *See* Spence, *supra* note 84, at 772-74; Boyd & Carlson, *supra* note 24, at 837-39 (describing the regulatory models in which independent generators operate).

[87] *REP--Retail Electric Providers Certification and Reporting*, PUB. UTIL. COMM'N TEX., *https://perma.cc/UK2Z-X43F* (archived Mar. 26, 2022).

[88] *See Transmission/Distribution Service Providers*, ELEC. RELIABILITY COUNCIL TEX., *https://perma.cc/NVW8-BQAS* (archived Mar. 26, 2022) (explaining that transmission and distribution service providers continue to be regulated by Texas's PUC).

[89] *See* U.S. ENERGY INFO. ADMIN., LEVELIZED COSTS OF NEW GENERATION RESOURCES IN THE *ANNUAL ENERGY OUTLOOK 2021*, at 4 (2021).

[90] *See* GLEN ANDERSON, KRISTY HARTMAN, DANIEL SHEA & LAURA SHIELDS, NAT'L CONF. OF STATE LEGISLATURES, STATE RENEWABLE PORTFOLIO STANDARDS AND GOALS 7-9 (2021), *https://perma.cc/977N-WNAS*.

[91] *See infra* Part III.B.

energy integration. [92]And states have approved massive utility build-out of fossil-fired power plants, citing reliability concerns. [93]

Many states rely not only on IOUs but also on rural electric cooperatives and publicly owned municipal utilities to supply power to a portion of consumers. [94]Rural electric cooperatives, which are nonprofit, member-owned organizations, are prevalent in areas of the country that IOUs chose not to serve in the early twentieth century because their low density creates higher **[*993]** interconnection costs. [95]Today, cooperatives and municipal utilities collectively continue to serve over 27% of the U.S. population, [96]and cooperatives own and manage approximately 40% of electricity distribution lines. [97]Because cooperatives and municipalities are often exempt from state and federal regulation, we do not focus on them here. [98]Nevertheless, one could conceptualize their continued prevalence and relative insulation from regulation as another form of "siloization" in energy law--one that requires a different set of strategies for transitioning to a clean, reliable system. [99]

Federal and regional authorities also make decisions that affect the carbon intensity and reliability of the electric grid. Two years after the electric-grid failure that led to a large 2003 Northeast blackout, Congress required FERC to certify a national electric reliability organization (ERO) to govern electric reliability and directed FERC to oversee this organization. [100]Until 2005, the United States had relied wholly on a private organization with no enforcement

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[92] JULIE COHN & OLIVERA JANKOVSKA, CTR. FOR ENERGY STUD. AT THE BAKER INST. FOR PUB. POL'Y, RICE UNIV., TEXAS CREZ LINES: HOW STAKEHOLDERS SHAPE MAJOR ENERGY INFRASTRUCTURE PROJECTS 3-4 (2020); LIZA REED, NISKANEN CTR., TRANSMISSION STALLED: SITING CHALLENGES FOR INTERREGIONAL TRANSMISSION 4-5 (2021) (discussing state siting hurdles for transmission).

[93] *See, e.g., Building Capacity for a Clean Energy Future*, MCLEAN ENERGY, *https://perma.cc/Z54C-MKM7* (archived Mar. 26, 2022) (describing California's resource-adequacy requirements and noting that "[t]raditionally, reserve capacity requirements have been met by gas plants").

[94] *See* Alexandra B. Klass & Gabriel Chan, *Cooperative Clean Energy*, *100 N.C. L. REV. 1, 4, 10-30 (2021)* (discussing the history of rural electric cooperatives and the customers they currently serve); Alexandra B. Klass & Rebecca Wilton, *Local Power*, *75 VAND. L. REV. 93, 100-01, 112-14, 123-25 (2022)* (describing role of municipal utilities in providing electricity in the United States); Shelley Welton, *Public Energy*, *92 N.Y.U. L. REV. 267, 290 (2017)*; *Investor-Owned Utilities Served 72% of U.S. Electricity Customers in 2017*, U.S. ENERGY INFO. ADMIN., *https://perma.cc/MNK7-AWQY* ("Co-ops are located in 47 states but are most prevalent in the Midwest and Southeast.").

[95] Klass & Chan, *supra* note 94, at 8, 11-14.

[96] PUB. POWER ASS'N, 2021 STATISTICAL REPORT 10 (2021), *https://perma.cc/YWT2-V3L4* (archived Mar. 26, 2022) (reporting that cooperatives cover 13.2% of customers and publicly owned utilities cover 14.5%).

[97] Klass & Chan, *supra* note 94, at 6.

[98] *Id.* at 8.

[99] For analysis focusing on cooperatives and municipal utilities, see generally Gabriel Pacyniak, *Greening the Old New Deal: Strengthening Rural Electric Cooperative Supports and Oversight to Combat Climate Change*, *85 MO. L. REV. 409 (2020)* (considering ways to support a clean-energy transition in electric cooperatives); Klass & Chan, *supra* note 94 (discussing how cooperative principles might empower cooperatives to transition to clean energy); Klass & Wilton, *supra* note 94 (considering how localities' proprietary control over energy can act as an antidote to preemption challenges); Welton, *supra* note 94 (arguing that the challenges posed by climate change make public control over the electricity grid more appealing); and HEATHER PAYNE, JONAS MONAST, HANNAH WISEMAN & NICOLAS EASON, CTR. FOR CLIMATE, ENERGY, ENV'T & ECON., UNIV. OF N.C., TRANSITIONING TO A LOWER-CARBON ENERGY FUTURE: CHALLENGES AND OPPORTUNITIES FOR MUNICIPAL UTILITIES AND ELECTRIC COOPERATIVES (2019) (setting forth three case studies considering how municipalities and electric cooperatives are confronting the energy transition).

[100] EPAct 2005, ***Pub. L. No. 109-58***, § 1211, ***119 Stat. 594***, 941-46 (codified at *16 U.S.C. § 824o*).

authority--the North American Electric Reliability Council, now called the North American Electric Reliability Corporation (NERC)--to ensure the reliability of the nation's grid. [101]FERC approved NERC as the nation's ERO in 2006. [102]Today, NERC sets national and regional reliability standards for the electric grid that are subject to FERC oversight and approval. [103]Many of these **[*994]** standards are drafted and ultimately implemented by regional subunits of NERC called "regional entities." [104]

Reliability standards centrally affect the carbon intensity of the grid in addition to reliability. For example, one key reliability standard for "resource adequacy" requires all utilities within the geographic footprint of a regional entity to plan for adequate generation capacity: building up electricity-generation infrastructure and other resources (such as demand reductions) to ensure that there will be enough electricity to avoid blackouts. [105]As introduced in Part I.A above, utilities within regional entities are supposed to operate at a resource adequacy level that only allows one blackout every ten years. [106]As discussed below, this standard can affect--and might even determine--the type and amount of generation that utilities build or procure from other sources.

NERC's regional entities often work closely with and in some cases have territories that are identical to the territories of RTOs and independent system operators (ISOs). [107]RTOs are nonprofit entities under FERC oversight that manage and operate the electric transmission system, run regional energy markets, and plan and finance transmission within their regional footprint. [108]These organizations serve about two-thirds of the country as measured by population, but are notably absent in the Pacific Northwest and the South. [109]

In areas of the country without RTOs, private organizations or electric utilities themselves serve as "balancing authorities" responsible for ensuring adequate electricity supplies and grid reliability for customers within their jurisdictions pursuant to FERC, NERC, and state regulatory commission oversight. [110]Outside of RTOs, balancing authorities typically obtain capacity, energy, and ancillary services (such as the last-minute balancing of electricity supply and demand and the managing of other conditions that could cause **[*995]** blackouts) through contracts with utilities or with other balancing authorities. However, some balancing authorities operate limited markets for a few of these services. [111]As discussed in more detail in Part IV below, some balancing authorities have begun to

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[101] *See* [*N. Am. Elec. Reliability Corp., 116 FERC P 61,062, at 7-8 (July 20, 2006)*].

[102] *Id.* at 4.

[103] *About NERC, supra* note 26; FERC, STRATEGIC PLAN FY 2018-2022, at 13 (2018).

[104] *See infra* Part V.

[105] See *infra* Part III. NERC does not, however, establish the specific amount of capacity that must be in reserve. *See infra* note 332 and accompanying text.

[106] *See, e.g.*, ReliabilityFirst, *supra* note 44, at 1 (establishing "common criteria, based on 'one day in ten year' loss of load expectation principles, for . . . resource adequacy for load" in one NERC region (capitalization altered)).

[107] We refer to RTOs and ISOs simply as RTOs in this paper because they are virtually identical.

[108] Coleman & Klass, *supra* note 83, at 695-96; *see also infra* Parts III.A (markets); *infra* Part IV.B.1 (transmission); *infra* Part VI.A (RTO structure).

[109] Coleman & Klass, *supra* note 83, at 695-96; *see The IRC: Shaping Our Energy Future*, ISO/RTO COUNCIL, *https://perma.cc/24YH-RYVS* (archived Mar. 27, 2022).

[110] *See* P. DENHOLM & J. COCHRAN, NAT'L RENEWABLE ENERGY LAB'Y, BALANCING AREA COORDINATION: EFFICIENTLY INTEGRATING RENEWABLE ENERGY INTO THE GRID 5 (2015); Sarah Hoff, *U.S. Electric System Is Made Up of Interconnections and Balancing Authorities*, U.S. ENERGY INFO. ADMIN. (July 20, 2016), *https://perma.cc/3C7P-KD3Y*.

[111] DENHOLM & COCHRAN, *supra* note 110, at 3.

coordinate planning for new cross-state transmission lines needed to carry renewable energy to load centers. Such enhanced interconnections reduce utilities' need to maintain their own generation reserves for reliability, since utilities can call upon a more diverse pool of generation. Some balancing authorities outside of RTOs have also developed creative mechanisms for coordinating the services and rates charged for electricity crossing transmission lines operated by numerous utilities, thus easing the transport of renewable energy to customers. [112]Other non-RTO areas remain heavily balkanized, however, thus making it more difficult for renewable generators to transport energy. Despite these impediments, areas without RTOs, such as the Western Electricity Coordinating Council region, have some of the highest percentages of renewable energy generation. [113]

A final fragmentation that underscores the divides in clean energy, reliability, jurisdiction, and public-private governance is time. State utility commissions, RTOs, FERC, and NERC all have considerable interest in the day-to-day project of keeping the lights on, which involves rerouting electricity in congested wires, dispatching dirty "peaker" plants to meet unusually high demand, and making other rapid decisions needed to maintain voltage in the grid. [114]Yet this short-term imperative also demands long-term planning to site, finance, and construct new energy generation or generation alternatives, as well as the transmission and distribution infrastructure necessary to support them. To further complicate matters, a rapid transition to clean energy on the scale necessary to abate potentially cataclysmic climate impacts will likely require the abandonment of many otherwise economically viable generation resources. [115]These time-scale mismatches create a further compelling reason to break down energy governance silos where possible, to facilitate the integration of short-term and long-term grid management.

[*996] Figure 1 Siloed Actors in Energy Policy

II. The Promise and Peril of Silos

We do not propose a wholesale modification of energy policy silos because within a given policy area--in our case, regulating the electric grid to be both clean and reliable--the siloing of regulation can present both benefits and obstacles. "Siloing," as we use it here, involves the division of authority over a policy area among different federal agencies, different levels of government, or private and public agencies. In some cases, the division of authority involves different agencies addressing the same policy issue. Take the example of the direct regulation of the reliability of the grid. As discussed in more detail in Part V, both NERC and FERC have the task of developing the substance of **[*997]** reliability standards and enforcing these standards, with FERC reviewing all proposed standards and every enforcement action taken by NERC or a NERC agent.

In other cases, the siloing of a policy issue assigns different aspects of a policy area to different entities. For example, under the FPA, states regulate the construction and operation of power plants (aside from nuclear plants), the sale of retail electricity, and the siting of electric transmission lines, and FERC regulates wholesale power sales and the operation of electric transmission lines. [116]For both power generation and transmission lines, the "sub-areas" assigned to states and the federal government influence each other substantially. Decisions about *retail* power inevitably affect wholesale power provision, and vice versa--decisions about the wholesale markets also affect retail power. [117]Thus, if a state requires its retailers to purchase a certain kind of generation--say, renewable

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[112] *See id.* at 2-3 (explaining reserve-sharing and coordinated-scheduling practices among some balancing authorities).

[113] U.S. DEP'T OF ENERGY, OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, 2018 RENEWABLE ENERGY GRID INTEGRATION HANDBOOK 4 (2018).

[114] *See, e.g., Ancillary Services Market*, PJM, https://perma.cc/R4RP-E3UY (archived Mar. 27, 2022) (describing some of these functions).

[115] *See* Emily Hammond & Jim Rossi, *Stranded Costs and Grid Decarbonization*, 82 BROOK. L. REV. 645, 646-47 (2017).

[116] 16 U.S.C. § 824(b).

energy generation--and FERC-regulated wholesale markets impede the participation of that generation in markets, the result is interference with state policy, as we discuss in Part III below. Additionally, as discussed in Part IV, whether or not a transmission line can be *sited* and built clearly affects the operation of that line, giving states and utilities considerable influence over federal transmission policy.

In the Subparts that follow, we contend that regulatory silos provide a critical unifying foundation to our analysis for four reasons. First, and most importantly, they substantially affect regulatory outcomes. Congress's selection of a combination of agencies (sometimes at different jurisdictional levels, and sometimes involving both public and private entities) to implement a particular command has a powerful effect on the substantive focus of the resulting regulations. Second, siloing influences the accountability of agencies to various stakeholders. Third, siloing shapes the efficiency of regulatory processes and thus the speed at which regulatory action occurs. Finally, siloing impacts the political economy of new laws and regulations--in our case, a particularly important consideration in light of the short window of time for averting potentially cataclysmic climate impacts.

A. Substantive Outcomes

To highlight the importance of siloing to the content of regulation, take the case of the enormous task of ensuring the reliability of the electric grid. Reliability requires the provision of a constant supply of electricity regardless of the level of demand, and it increasingly also demands consideration of **[*998]** resilience, which involves bringing the grid back online quickly after disruptions. [118]If the EPA and Federal Emergency Management Agency (FEMA) were primarily tasked with this order, reliability standards would likely look quite different than the actual standards produced by FERC and NERC. Those standards might place more emphasis on reliability resources with lower air pollution emissions and on generation resources that would be more resistant to flooding and extreme weather, for example. And in some cases, the EPA and FEMA would likely clash, with FEMA potentially arguing for more highly durable yet environmentally impactful infrastructure and the EPA taking an opposite stance. The result could be inaction, or compromise policies with relatively weak assurances of reliability. Alternatively, the result could be a *better* one. Theories of the separation of powers among agencies posit that friction among agencies can improve decisionmaking, as agencies with "differing missions and objectives" have to "convince each other of why their view is right." [119]Overlap can thus at times promote innovation by encouraging deliberation and enhancing expertise. [120]

Overlap can also induce cooperation, causing siloed agencies to take joint action on certain issues. Such cooperation occurred, for example, when the EPA and National Highway Traffic Safety Administration jointly wrote fuel-efficiency standards for vehicles to address greenhouse gases. [121]Joint action by separate agencies can ensure that rules are more technically accurate and best address the substantive policy issue at hand. Indeed, NERC and FERC sometimes jointly act on reliability issues, as they did after the winter storm of 2021 revealed the inadequacies of weatherization standards. [122]On the flip side, a toxic combination of agencies--all with some responsibility in a particular policy area--can result in conflict, gridlock, and subpar policies. To take a recent example, the Trump Administration's Department of Energy (DOE) blocked release of a National Renewable

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[117] For a discussion of the interrelationship of the wholesale and retail systems, see *FERC v. Electric Power Supply Ass'n, 136 S. Ct. 760, 776-77 (2016)*.

[118] *See supra* note 45.

[119] Neal Kumar Katyal, *Internal Separation of Powers: Checking Today's Most Dangerous Branch from Within*, *115 YALE L.J. 2314, 2317 (2006)*.

[120] *Id.* at 2325; Jody Freeman & Jim Rossi, *Agency Coordination in Shared Regulatory Space*, *125 HARV. L. REV. 1131, 1135 (2012)*.

[121] Daphna Ranan, *Pooling Powers*, *115 COLUM. L. REV. 211, 227-28 (2015)*.

[122] *See infra* Part V.

Energy Laboratory study of the importance of building out a national transmission grid, allegedly because it conflicted with the DOE's agenda to promote fossil fuels. [123]

Assigning several agencies to one policy issue can also address lapses by individual agencies--refusals to act, or inadequate action, for example. As Sarah **[*999]** Light notes, splitting up policy authority among multiple agencies can have the effect of creating *Harry Potter*-esque horcruxes: Even if one agency refuses to regulate, a policy goal can remain alive when another agency with regulatory responsibility takes up the task. [124]

There is also merit in the cross-pollination of policy ideas among state and regional silos. For example, in the area of electric-grid-reliability regulation, utilities within some states and regions have weatherized their assets either voluntarily or in response to state mandates--avoiding some of the problems experienced during Winter Storm Uri. [125]These approaches help color the debate regarding the advisability of nationally uniform weatherization standards under conditions of climate change, which is inducing more rapid swings in temperature and more severe storms across regions. [126]The interplay of federal, regional, and state authorities may well improve policy outcomes, especially in the uncharted terrain of rapid and massive electrification and grid decarbonization. [127]

Despite the substantive benefits of siloing, assigning different entities responsibility over different aspects of a policy issue, or assigning the same issue to multiple entities, can also result in a regulatory anticommons. A regulatory anticommons arises when too many entities have at least partial say over the property rights or regulatory permits necessary to see a project to fruition. [128]The result is an inefficiently low level of activity, [129]as illustrated by the transmission line development conundrum we discuss in Part IV below. Alternatively, overlapping responsibilities can result in free-rider problems within the regulatory common space: individual entities may wait for others to act first, thus externalizing the costs of action but gaining some of the benefits **[*1000]** none may be motivated to act. [130]Take again the example of the direct regulation of grid reliability, discussed in detail in Part V. Agents of NERC, called regional entities, are largely responsible for proposing reliability standards and implementing them--with NERC and FERC reviewing their actions. As explored in Part V, FERC and NERC have been slow to mandate

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[123] *See* Peter Behr, *DOE Study Details "Supergrid" for High Levels of Renewables*, E&E NEWS: ENERGYWIRE (Oct. 25, 2021, 7:11 AM EST), https://perma.cc/2MHW-YJBH.

[124] Sarah E. Light, *Regulatory Horcruxes*, 67 DUKE L.J. 1647, 1655-72 (2018); *see also* Katyal, *supra* note 119, at 2324 ("Redundancy has practical benefits as well because reliance on just one agency is risky. . . . 'When one bulb blows, everything goes.' " (quoting Martin Landau, *Redundancy, Rationality, and the Problem of Duplication and Overlap*, 29 PUB. ADMIN. REV. 346, 354 (1969))).

[125] *See supra* note 70; Hubbuch, *supra* note 71.

[126] U.S. NAT'L CLIMATE ASSESSMENT, CLIMATE CHANGE IMPACTS IN THE UNITED STATES 14 (2014), https://perma.cc/APK2-YNJD. *See generally* DONALD J. WUEBBLES ET AL., U.S. GLOB. CHANGE RSCH. PROGRAM, CLIMATE SCIENCE SPECIAL REPORT 185-222 (2017), https://perma.cc/DGH7-G728 (charting the major consequences of climate change).

[127] Sarah E. Light, *Advisory Nonpreemption*, 95 WASH. U. L. REV. 327, 330-31 (2017) (exploring the benefits of maintaining fluid jurisdictional authority in nascent regulatory areas).

[128] Michael A. Heller, *The Tragedy of the Anticommons: Property in the Transition from Marx to Markets*, 111 HARV. L. REV. 621, 624 (1998).

[129] *Id.* at 637-40, 684-87 (illustrating anticommons in Moscow storefronts, fractional property rights owned by Native Americans, and the division of real estate in Japan, among other examples).

[130] William W. Buzbee, *Recognizing the Regulatory Commons: A Theory of Regulatory Gaps*, 89 IOWA L. REV. 1, 6, 9 (2003) (noting the problems of partial jurisdiction in the context of aquaculture); *id.* at 28 (noting that an individual regulator within a regulatory commons "cannot stop others from free riding on the regulator's investment in investigating the social ill and designing a regulatory response").

national weatherization requirements, incorrectly assuming that regions were appropriately tailoring standards to evolving regional needs. Extensive weatherization is not necessarily the most efficient approach to addressing growing weather extremes, given that it further entrenches fossil fuels and potentially uses up funds better spent on microgrids and other, cleaner reliability measures. But given more common weather extremes--and the fact that weatherization can prevent outages at both renewable and fossil fuel-fired plants--weatherization should have at least been more seriously considered at an earlier date, as discussed in more detail in Part V. More coordination among silos is essential to address these types of anticommons and regulatory-commons problems.

B. Agency Accountability

The siloing of regulatory responsibility for a clean, reliable grid does not only affect the content of energy regulations: It also has profound effects on the extent to which regulatory processes account for stakeholder concerns. As we explore below, these effects are again sometimes beneficial and sometimes problematic.

In the context of siloing among federal agencies, certain agencies may be more adept than others at soliciting input from diverse stakeholders. [131]For example, in the reliability context, FERC has been working hard to expand the quality of its stakeholder outreach in ways that could potentially offset the relatively closed, industry-led reliability process within NERC. [132]NERC, too, is working to expand stakeholder engagement, but is largely focused on **[*1001]** expanding industry stakeholder participation on NERC committees. [133]In an ideal scenario, different federal agencies might even compete to offer a superior participatory process. Indeed, there is some evidence of this occurring among regional actors in the reliability space, with the Southwest Power Pool (SPP) and California ISO (CAISO) competing to attract utilities to participate in specially designed markets offered by these RTOs. These RTOs appear to be competing specifically on accountability grounds: They have each emphasized the extent and type of stakeholder input in governance that will be available to utilities that join their markets. [134]

Siloing policies for clean and reliable energy between states and the federal government poses potential accountability benefits and challenges, too. The federalism literature tends to identify states as more accountable to individual residents than to the federal government, as they are "closer to the people." [135]Compelling accounts have challenged this assumption, yet it remains relatively fixed within the literature. [136]Our discussion of

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[131] *Cf*. Katyal, *supra* note 119, at 2325 (observing that "to the extent that particular agencies are captured by interest groups, overlapping jurisdiction can mitigate the harm").

[132] In particular, Congress has instructed FERC to create a new Office of Public Participation, and the agency has embraced this task with a focus on including long-marginalized voices in its proceedings. *See* FERC, THE OFFICE OF PUBLIC PARTICIPATION 4, 10 (2021), *https://perma.cc/X8QP-V9VW*.

[133] *See, e.g., Stakeholder-Engagement-Team*, N. AM. ELEC. RELIABILITY CORP., *https://perma.cc/9YFQ-GJJ3* (archived Mar. 28, 2022) (noting that a stakeholder-engagement team formed with the goal of "optimizing the value of industry stakeholder participation," among other values, which resulted in a "comprehensive review" of how existing technical committees could be restructured).

[134] CAL. ISO, EIM GOVERNANCE REVIEW COMMITTEE 1 (2020), *https://perma.cc/Q4EF-59G7* (noting that the energy imbalance market (EIM) governing body and CAISO's board asked an advisory committee "to lead a public stakeholder process on EIM governance that will culminate in a proposal" for the board's consideration); *Western Energy Imbalance Service Market*, SW. POWER POOL, *https://perma.cc/K9M3-YHB4* (archived Mar. 28, 2022) (asserting that "[f]or more than 75 years, SPP has distinguished itself as a stakeholder-driven organization that achieves its business objectives through consensus-building," and describing the ways in which stakeholders can participate in the development of the energy imbalance market).

[135] For a summary of the literature and cases asserting the common assumption that states are "closer to the people," see Miriam Seifter, *Further from the People? The Puzzle of State Administration*, *93 N.Y.U. L. REV. 107, 146 (2018)*.

[136] *See id.* (noting overall agreement on the assumption in scholarship); Dave Owen, *Regional Federal Administration*, *63 UCLA L. REV. 58, 63-64 (2016)* (observing that the federal government, through regional subunits, can and does act at a very local

transmission policy in Part V below embodies these dueling accounts: On the one hand, states' authority over transmission line siting allows them to respond to residents' aesthetic and environmental concerns. [137]On the other hand, this accountability may **[*1002]** represent a response to a relatively small group of voters--those who can see the transmission lines from their property, for example--while ignoring the growing demand of other voters for clean energy, which would require thousands of miles of new transmission lines. [138]Shifting more authority to the federal level in the area of transmission siting might better respond to these broader voices. Indeed, as we discuss in Part V, there could be federal transmission-siting processes with meaningful state input. The power of state transmission-siting silos will likely need to diminish substantially, however, for large-scale renewable energy to expand to the extent necessary to address climate change.

Conversely, as we explore in Parts III and V below, jurisdictional and public-private siloing within energy market structure has led to a somewhat opposite dynamic, in which federal and regional entities sometimes overshadow state preferences for renewable energy policy. The regional processes resulting in these outcomes diverge considerably in terms of stakeholder and state participation, and the literature has demonstrated that these different voting schemes affect regulatory outcomes. [139]

When substantial regulatory authority in a policy area resides within private institutions, there is also a threat that the powerful voice of a limited set of industry stakeholders will be further amplified due to siloing. This potentially occurs within RTOs and NERC, as we explore in more detail in **[*1003]** Parts V and VI. It is remarkable to think that until 2005, the United States relied solely on a private organization of utilities (that is, NERC) to prevent a cascading grid blackout. [140]And it is equally remarkable that two-thirds of the U.S. population currently lives in areas where private regional entities (that is, RTOs) are responsible for how much and what type of electricity flow through the grid at any given time. [141]FERC reviews both NERC's and RTOs' decisions, thus infusing an element of

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level); Hannah J. Wiseman & Dave Owen, *Federal Laboratories of Democracy*, *52 U.C. DAVIS L. REV. 1119, 1123-24 (2018)* (exploring federal agencies' highly local policy experiments). *But cf., e.g.*, CHRISTOPHER L. EISGRUBER, CONSTITUTIONAL SELF-GOVERNMENT 191-94 (2001) (disagreeing with the "closer to the people" assumption).

[137] *See, e.g.*, Alexandra B. Klass, *Takings and Transmission*, *91 N.C. L. REV. 1079, 1107-08 (2013)* (noting that state courts have denied eminent domain authority for proposed transmission lines that would run through the state but would only benefit out-of-state customers); *id.* at 1084 (noting the "environmental and aesthetic objections that form the basis of regular opposition" to transmission lines). For a discussion of the importance of maintaining a balance between state and federal control in the land-use context, see, for example, Erin Ryan, *Federalism and the Tug of War Within: Seeking Checks and Balance in the Interjurisdictional Gray Area*, *66 MD. L. REV. 503, 509-10 (2007)* (arguing that "some regulatory targets are better understood within a separate, interjurisdictional sphere that legitimately implicates both local and national responsibility").

[138] The extent to which voters prefer renewable energy depends on how one poses the survey question. Indeed, when residents were asked whether they would support renewable energy if it were located in their backyard, the positive responses declined substantially. *See, e.g.*, SAMANTHA GROSS, RENEWABLES, LAND USE, AND LOCAL OPPOSITION IN THE UNITED STATES 9 (2020), *https://perma.cc/NCC4-P9GU* ("Nationally, 82% of Americans would support tax rebates for energy-efficient vehicles or solar panels. However, public perception can turn negative, even among those generally in favor of renewable energy, when people believe that a renewable development will cause them economic or health problems or when they dislike the aesthetics of the project."). Still, it is fair to say that a large number of U.S. voters indicate support for renewable energy. *See, e.g.*, ALEC TYSON & BRIAN KENNEDY, PEW RSCH. CTR., TWO-THIRDS OF AMERICANS THINK GOVERNMENT SHOULD DO MORE ON CLIMATE 5 (2020), *https://perma.cc/7CH5-4EH2* ("To shift consumption patterns toward renewables, a majority of the public (58%) says government regulations will be necessary to encourage businesses and individuals to rely more on renewable energy . . . .").

[139] Seth Blumsack & Kyungjin Yoo, *RTO Governance Structures Can Affect Capacity Market Outcomes*, 53 PROC. HAW. INT'L CONF. ON SYS. SCIS. 3087, 3087-88 (2020).

[140] DAVID NEVIUS, N. AM. ELEC. RELIABILITY CORP., THE HISTORY OF THE NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION 3-5 (2020), *https://perma.cc/XR7Z-ZXPG* (describing how, in the wake of several blackouts in the 1960s, industry executives lobbied key lawmakers to maintain private control over reliability); *id.* at 85 (describing the passage of EPAct 2005, which was the first piece of legislation to require formal government oversight of NERC).

"publicness" into grid governance, but its authority to shape or contradict these decisions is in some cases surprisingly limited. [142]Again, the key point is that silos *matter* when it comes to participatory possibilities within government.

C. Efficiency

In addition to affecting both agency substance and agency accountability, silos can also either enhance or impede the efficiency of governance. With effective coordination, different government agencies with partial jurisdiction over a given policy area can divide and conquer, efficiently splitting up tasks, leveraging the expertise of individual agencies, and creating better end products more quickly than if one agency took on the same task. This may be the case, for example, with environmental impact statements under the National Environmental Policy Act, where an agency lead collaborates with other agencies with related expertise to complete the necessary evaluations. [143]On the other hand, multiple government actors or private agencies with policy-type authority acting within the same policy space can create duplication and delay. [144]

D. Political Economy

A final undercurrent running through this Part's evaluation of silos is the consideration of political economy--that is, the ways in which the distribution **[*1004]** of legal authority among relevant actors influences politics and power dynamics within a field. [145]Consideration of how silos inform political power is particularly important when it comes to reliable decarbonization, given the transformative nature of the project for the grid.

Here, again, there is some value to jurisdictional silos. States have been at the forefront of U.S. climate policy, while the federal government has been inconsistent and largely ineffectual, with a few notable exceptions. [146]Thus, aggrandizing federal power in this sphere may not lead to a "rationalization" of energy policy, due to the complex politics of climate action at the federal level. [147]In many cases, states have been able to overcome the myriad political hurdles to action on climate change much better than regional or national entities have. [148]But while states

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[141] *See The IRC: Shaping Our Energy Future, supra* note 109.

[142] Shelley Welton, *Rethinking Grid Governance for the Climate Change Era*, 109 CALIF. L. REV. 209, 221-22, 222 n.66 (2021).

[143] *See, e.g.*, 1 C.F.R. § 601.5 (2022) (describing agency-lead obligations).

[144] *See, e.g.*, Hannah J. Wiseman, *Regional Cooperative Federalism and the U.S. Electric Grid*, 90 GEO. WASH. L. REV. 147, 203-04 (2022) (discussing the potential for duplication and overlap); Welton, *supra* note 142, at 241-46 (discussing RTO "heel dragging" in response to FERC orders to amend market rules).

[145] *See* Jedediah Britton-Purdy, David Singh Grewal, Amy Kapczynski & K. Sabeel Rahman, *Building a Law-and-Political-Economy Framework: Beyond the Twentieth-Century Synthesis*, 129 YALE L.J. 1784, 1791-92 (2020).

[146] *See* Shannon Osaka, *Is the U.S. Uniquely Bad at Tackling Climate Change?*, YALE CLIMATE CONNECTIONS (Jan. 12, 2022), https://perma.cc/T8WA-9CZK (discussing the disappointments and challenges of federal climate action); Adelman & Engel, *supra* note 29, at 837-39 (noting the distinct benefits of state and local climate action); Garrick B. Pursley & Hannah J. Wiseman, *Local Energy*, 60 EMORY L.J. 877, 879-82 (2010) (describing the important role of local governments in the clean-energy transition). *But see, e.g.*, MOLLY F. SHERLOCK, CONG. RSCH. SERV., R43453, THE RENEWABLE ELECTRICITY PRODUCTION TAX CREDIT IN BRIEF 1 (rev. 2020), https://perma.cc/D4DE-4JMN (noting the importance of the federal production tax credit to wind-energy development).

[147] On hurdles, see Richard J. Lazarus, *Super Wicked Problems and Climate Change: Restraining the Present to Liberate the Future*, 94 CORNELL L. REV. 1153, 1159 (2009) (defining a "wicked problem" as one "that defies resolution because of the enormous interdependencies, uncertainties, circularities, and conflicting stakeholders implicated by any effort to develop a solution" and including climate change in that category (quoting Horst W.J. Rittel & Melvin M. Webber, *Dilemmas in a General Theory of Planning*, 4 POL'Y SCIS. 155, 160 (1973))).

have paved the way in some respects, some broad-based initiatives are clearly better situated at the federal level, as discussed in Part IV below with respect to the parochialism plaguing transmission siting.

Similarly, the power dynamics within private silos--and their relationship to public-oversight agencies--shape their potential as agents of reform. In the energy sphere, some utilities jealously guard their transmission territories, opposing any efforts for needed interstate transmission lines that would enhance access to renewable generation. [149]Many also oppose new-entrant technologies, fearing they will dangerously cut their customer base. [150]At the **[*1005]** same time, some utilities have been leaders on the renewable energy and reliability fronts--meaningfully changing their practices in response to consumer demand or state policies. [151]Thus, a nuanced approach to public-private silos is also advisable. Attempts to force institutions such as NERC and RTOs to be wholly public would face major political hurdles and might eliminate some of the nimbleness that often accompanies privatized, less bureaucratic forms of decisionmaking. But respect for institutional expertise should not foreclose inquiry into the ways in which their current allocation of authority might impede a rapid, reliable clean-energy transition.

E. An Overview of Our Reforms to Silos in Energy Governance

In this Part, we have sketched the ways in which silos as a governance concept offer both opportunities and challenges. Our goal in the Parts that follow is to reimagine the siloed regulatory system that has evolved over the past century in energy governance to make its multiplicity work for, rather than against, a transition to a clean and reliable power grid. Because we see political and practical value in preserving elements of these silos, our reform proposals are nuanced and issue specific. In the Parts below, we discuss how best to recalibrate silos and accelerate a reliable transition to clean energy across four key issue areas: electricity market structure (Part III), transmission (Part IV), reliability regulation (Part V), and regional governance (Part VI). To assist readers in tracking and synthesizing these proposals, we provide here an overview chart of key reforms within each sector.

[*1006] Table 1

Policy and Governance Reforms for a Clean, Reliable Grid

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[148] On state action, see *State Climate Policy Maps*, CTR. FOR CLIMATE & ENERGY SOLS., *https://perma.cc/T6F4-VKZR* (archived Mar. 29, 2022).

[149] Ari Peskoe, *Is the Utility Transmission Syndicate Forever?*, *42 ENERGY L.J. 1, 58 (2021)*.

[150] *See, e.g.*, Mary Ellen Klas, *Insider Reveals Deceptive Strategy Behind Florida's Solar Amendment*, MIA. HERALD (updated Oct. 19, 2016, 6:20 PM), *https://perma.cc/5V88-ZXJA* (describing utility support for an initiative that would have constitutionally enshrined Florida's judicial ban on third-party-financed rooftop solar).

[151] Scott Carpenter, *U.S. Utility Companies Rush to Declare Net-Zero Targets*, FORBES (Oct. 15, 2020, 6:00 AM EDT), *https://perma.cc/25J5-GCSU*; Klass & Chan, *supra* note 94, at 38-40 (discussing investor-owned utilities' clean-energy commitments and the associated financial benefits); Harman K. Trabish, *As 100% Renewables Goals Proliferate, What Role for Utilities?*, UTIL. DIVE (Apr. 2, 2019), *https://perma.cc/XAV6-M7T2* (discussing large and small electric retail customer demand for renewable energy and response of utilities).

Energy Policy Area	**Broad Reform**	**Specific Reforms**
Market structure	Leverage competitive markets	Competitively solicit "reliability must run" resources--those critical to preventing blackouts.
		Limit the state-regulated generation self-scheduling and "reliability must run" market avoidance.
		Reduce constraints on generators' bids into markets (for example, MOPR).
	Properly value reliability	Recognize the value of short-term energy resources, such as batteries.
		Require contracting parties to honor commitments (for example, promises to pay for reliability).
	Accommodate state and federal policies	Implement fixed-resource requirements; procure clean-energy resources, then run capacity auction or forward clean-energy capacity markets; run one auction for clean and reliable capacity and a second traditional capacity auction.
Transmission planning, siting, and	Create a national transmission-planning process	Empower FERC to initiate a top-down, national process or form a planning authority to lead RTOs in multiregional planning.
		Form interregional planning boards.
		Prohibit local exemptions from interregional planning.
		Rely more on federal power-marketing administrations to build transmission;

Energy Policy Area	Broad Reform	Specific Reforms
financing		streamline the process.
	Enhance federal siting authority	Provide DOE grants to federal power-marketing administrations to identify needed transmission projects.
		Congressional reforms (for example, give FERC or RTOs siting authority, constrain states' ability to delay and deny transmission lines).

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Energy Policy Area	**Broad Reform**	**Specific Reforms**
Energy Policy Area	Broad Reform	Specific Reforms
Reliability regulation	Identify gaps and weak reliability standards	Focus on standards addressing extreme weather events and intermittent generation. Form a NERC reliability and clean-energy technical committee.
	Broaden reliability standards	Incorporate the reliability benefits of clean energy into standards.
	Enhance public input into reliability standards	Require at least two members of regional entity or NERC boards of directors/trustees to represent the public at large.
RTO governance	Enhance public voice in RTO decisionmaking	Increase transparency: Allow public representatives to attend all RTO meetings. Give states larger role in RTO internal governance and/or oversight. Issue a FERC Notice of Inquiry revisiting the adequacy of RTO independence and responsiveness. Congressional reforms: Override court decisions mandating FERC deference to RTO decisions; possibly reconsider voluntary nature of RTOs.

III. Market Structure

One of the most difficult challenges energy regulators face is ensuring that enough resources enter and remain in the market to meet demand--a challenge referred to within the field as "resource adequacy." This Part describes how siloed energy governance impedes a thoughtful, integrated approach to resource adequacy and suggests ways that the goals of clean and adequate resources can be co-realized through more calibrated market signals. We focus primarily on regions of the country with RTOs, including California, Texas, the Midwest, Mid-Atlantic, and Northeast. These regions have the most sophisticated energy markets, which even utilities outside of historic RTO **[*1008]** regions now seem increasingly inclined to join. [152] It bears noting, however, that the lack of organized wholesale markets for energy in non-RTO areas--particularly those that have not joined RTO energy markets--creates perhaps even greater impediments to renewable energy development and reliability. The lack of a market makes it more difficult for utilities to acquire backup capacity and last-minute generation support, as well as renewable generation, from other sources. [153]

A. Resource Adequacy

Resource adequacy is the project of ensuring that there will be enough electricity generated to cover the amount of electricity demanded by customers. Ensuring adequate resources involves resource management over multiple time horizons--from second-to-second balancing of voltage vacillations to distinct long-term decisions about what energy supply is necessary to meet future projected demand. [154] In the analysis below, we discuss how current approaches to resource adequacy impede the transition to a clean, reliable grid. Here, too, resource adequacy is treated as its own silo. That, in turn, prevents regulators from harmonizing resource adequacy and climate goals. We focus on resource adequacy in RTOs because this policy area has shown both the most promise (and, perhaps, peril) with respect to achieving a cleaner, more reliable grid. [155]

In market-driven RTO regions, one central resource adequacy challenge is ensuring that resources necessary to meet future demand earn enough revenue to incentivize their continued participation in the bulk electric system. One **[*1009]** way these resources earn money is through participating in energy markets, in which they sell electricity either one day ahead or in real time. [156] In these markets, grid operators receive bids from suppliers that are willing and able to sell electricity in a given time period. [157] Some customers also bid energy non-use--a promise

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[152] *See* W. ELEC. COORDINATING COUNCIL, TECHNICAL SESSION POWER MARKET EXPANSION IN THE WEST 1 (2021), *https://perma.cc/AN89-B6AR* (noting that entities in the western United States "continue to join" RTO EIMs).

[153] *Cf. id.* at 14 (noting that participation by areas of the western United States in the Western EIM "appears to have contributed to enhanced grid reliability, decreased energy costs, and improved integration of renewable energy"). For additional discussion, see Part V.B below.

[154] *See supra* note 40 and accompanying text; *Wholesale Electricity Markets*, PROTOGEN (Jan. 1, 2016), *https://perma.cc/4SJU-BW4K* (illustrating the varying time scales of energy markets).

[155] Outside of RTOs, as well as in many traditionally regulated states within RTOs, resource adequacy is predominantly ensured through a state-mandated integrated resource planning (IRP) process, where state regulators work with their utilities to determine what resources should be built. *See* RACHEL WILSON & BRUCE BIEWALD, SYNAPSE ENERGY ECON., INC., BEST PRACTICES IN ELECTRIC UTILITY INTEGRATED RESOURCE PLANNING 3-6 (2013), *https://perma.cc/JTJ2-JP73*. Although state IRP practices differ considerably, with some states integrating the goals of clean and reliable energy more successfully than others, we set these issues aside because they do not involve the siloization of reliability from clean-energy goals--the central theme of our analysis.

[156] *See Electric Power Markets: National Overview*, FERC, *https://perma.cc/8AUB-DR65* (last updated July 20, 2021).

to reduce demand and thus displace the need for generation--into these markets. [158]This is called "demand response." [159]RTOs determine how much energy is required to meet total demand on the system and clear--or dispatch--the resources needed at that moment. [160]In determining which resources to clear, RTOs start with the cheapest bid and move up in a process called merit-order dispatch. [161]All resources that clear receive the price bid by the highest-priced resource that clears the market. [162]This process centrally affects the carbon intensity of the grid because it dictates the type of generation infrastructure built and dispatched. If not designed properly, it can also support the construction of too much generation infrastructure--including fossil fuel-fired infrastructure.

Merit-order dispatch incentivizes generators to bid at their marginal costs. [163]Imagine it costs a generator $ 20 per megawatt-hour (MWh) to operate. If it bids more than $ 20, it risks losing out to a competitor and not clearing, even though it would be profitable for the generator to operate at that moment. And if it bids less than $ 20 per MWh, it risks being forced to sell electricity even when the generator's cost of producing that amount of energy is higher than the revenue it receives from the wholesale market. Merit-order **[*1010]** dispatch is thus excellent at disciplining generators to bid their true costs, but it presents an attendant resource-adequacy challenge: How does a grid operator ensure that occasionally needed but high-cost generators remain in the market, especially if they will only be dispatched a few times a year--likely during severe weather events such as winter storms or heat waves? [164]

At least three solutions are possible to solve this problem: energy-only markets, resource-adequacy requirements, and centralized capacity markets. The first approach, an energy-only market, has been adopted in Texas. This involves letting energy prices reach extremely high levels at times of peak demand, thus effectively privatizing the resource-adequacy decision by leaving it in the hands of potential generation developers. [165]While most generators

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[157] *See* FERC, ENERGY PRIMER: A HANDBOOK FOR ENERGY MARKET BASICS 36, 39, 55-56 (2020), *https://perma.cc/Y5MH-9GNZ*.

[158] *See Demand Response Comp. in Organized Wholesale Energy Mkts., 134 FERC P 61,187, at 2 n.2 (Mar. 15, 2011)*.

[159] *Id.*; *see Demand Response*, U.S. DEP'T ENERGY OFF. ELEC., *https://perma.cc/X9LQ-A65P* (archived Mar. 29, 2022) ("Demand response provides an opportunity for consumers to play a significant role in the operation of the electric grid by reducing or shifting their electricity usage during peak periods in response to time-based rates or other forms of financial incentives.").

[160] *See* DIV. OF ENERGY MKT. OVERSIGHT OFF. OF ENF'T, FERC, ENERGY PRIMER: A HANDBOOK OF ENERGY MARKET BASICS 95 (2015), *https://perma.cc/WN6R-3A5Q*.

[161] *See id.* at 95-96. For example, if four generators bid into a market and one bids $ 10 per megawatt-hour (MWh), another bids $ 20 per MWh, another bids $ 30 per MWh, and another bids $ 40 per MWh, then all four generators receive $ 40 when all four clear. When demand declines and only three generators are needed to meet demand, then the first three generators all receive $ 30 and the fourth does not clear and does not sell electricity during that time period. *See id.* at 95.

[162] *See id.* at 95.

[163] *See* Joshua C. Macey & Jackson Salovaara, *Rate Regulation Redux*, *168 U. PA. L. REV. 1181, 1186 (2020)*.

[164] Bethel Afework, Jordan Hanania, Kailyn Stenhouse & Jason Donev, *Peaking Power*, ENERGY EDUC., *https://perma.cc/D38U-8NAF* (last updated Sept. 3, 2018); *Electric Generators' Roles Vary Due to Daily and Seasonal Variation in Demand*, U.S. ENERGY INFO. ADMIN. (June 8, 2011), *https://perma.cc/AF84-25XG* ("Peaking capacity runs a few times a year for short periods to help electricity systems meet peak demand.").

[165] *See* Gavin Bade, *The Great Capacity Market Debate: Which Model Can Best Handle the Energy Transition?*, UTIL. DIVE (Apr. 18, 2017), *https://perma.cc/PTR3-DDU5* ("In Texas, regulators ensure reliability through . . . scarcity pricing, which allows real-time electricity prices to reach as high as $ 9000/MWh . . . . Instead of guaranteeing generation revenue through a capacity market, the promise of high prices is supposed to incentivize generators to build new plants and keep them ready to operate.").

will bid their marginal prices, "peaker plants," or generators that are only dispatched during peak demand, are able to submit extremely high bids that earn them a profit even if they operate only a few times a year. [166]

The second approach, used in California, is to create a resource adequacy requirement and mandate that all customer-serving utilities--often referred to as load-serving entities (LSEs)--procure sufficient reserves to meet projected demand. [167]The regulator requires that LSEs procure enough reserves to meet peak demand but gives LSEs discretion to procure those reserves for themselves. [168]

The third approach, used by the East Coast grid operators, is centralized capacity markets. [169]Capacity markets compensate generators for making **[*1011]** themselves available to sell electricity--not for actually selling it. [170]Generators that do not make enough money in energy markets (those involving the sale of electricity on a real-time or similarly short-term basis) rely on capacity markets to make up the revenue shortfall. Capacity markets also contain a resource adequacy requirement, since the grid operator requires that LSEs procure from this market sufficient resources to meet peak demand. [171]The difference is that in central capacity markets, the regulator oversees the auction that determines which generators meet the region's capacity needs, whereas in markets like California that rely on resource adequacy requirements, the LSE is free to determine how to comply with the requirement (in collaboration with state regulators). [172]

Among these three approaches, central capacity markets are the most prescriptive approach to resource adequacy. A regulator both determines the level of reserves needed to meet peak demand and creates an administrative process to determine which resources will provide those reserves and how to value those resources' reliability benefit. Energy-only markets used in Texas are the least prescriptive because, while the regulator sets prices designed to procure sufficient reserves, it does not determine which resources are needed. Resource-adequacy requirements like those in California occupy a middle position--regulators determine the level of reserves necessary (similar to the integrated resource planning process used in traditionally regulated states) but permit LSEs to procure those reserves in whatever manner they think is best. [173]

The cap is now $ 5,000 per MWh. *See* Robert Walton, *Texas Power Plants "Ready for Winter" Following Weatherization Assessment, ERCOT Says*, UTIL. DIVE (updated Jan. 5, 2021), *https://perma.cc/X5DS-D3FJ*.

[166] *See* Bade, *supra* note 165; Paul L. Joskow, *Challenges for Wholesale Electricity Markets with Intermittent Renewable Generation at Scale: The U.S. Experience*, 35 OXFORD REV. ECON. POL'Y 291, 302-03 (2019) (describing conditions in which scarcity pricing supports resource adequacy).

[167] *CAL. PUB. UTIL. CODE § 380(c)* (West 2022).

[168] *See id.* § 380(d).

[169] THOMAS JENKIN, PHILIPP BEITER & ROBERT MARGOLIS, NAT'L RENEWABLE ENERGY LAB'Y, CAPACITY PAYMENTS IN RESTRUCTURED MARKETS UNDER LOW AND HIGH PENETRATION LEVELS OF RENEWABLE ENERGY 4 (2016), *https://perma.cc/8KGC-GC7L*.

[170] *See Capacity Market (RPM)*, PJM: LEARNING CTR., *https://perma.cc/6XGX-2V5J* (archived Mar. 29, 2022).

[171] *See, e.g.*, 2 MONITORING ANALYTICS, LLC, 2018 STATE OF THE MARKET REPORT FOR PJM: DETAILED ANALYSIS 49 (2019), *https://perma.cc/V29D-EZ7Y* ("Energy market revenues alone were not sufficient to cover total costs in any scenario, which demonstrates the critical role of capacity market revenue in covering total costs."); *id.* at 29 ("The PJM Capacity Market is explicitly designed to provide revenue adequacy and the resultant reliability.").

[172] *See PUB. UTIL. § 380(c)*.

[173] *See supra* note 155 (discussing integrated resource planning); Kathleen Spees, Samuel A. Newell & Johannes P. Pfeifenberger, *Capacity Markets--Lessons Learned from the First Decade*, ECON. ENERGY & ENV'T POL'Y, Mar. 2013, at 1, 4 (describing the common use of integrated resource planning in traditionally regulated--that is, noncompetitive--electricity markets to ensure adequate generation capacity).

B. Principles for a Reliable, Clean Grid

A reliable and clean energy grid requires that reliability regulators harmonize--not counteract--other policy goals, such as state clean-energy standards, when designing resource procurement markets. We contend that **[*1012]** best practices in this regard include (1) eliminating barriers to entry such that market participants--not regulatory fiat--determine the particular resources that provide the needed level of reserves; (2) correctly pricing reliability so that market participants actually bear the costs imposed by those price signals; and (3) accommodating state and federal clean-energy policies.

All three of these approaches are necessary to bridge silos between resource adequacy requirements (such as those drafted by RTOs and approved by FERC) and policies at other jurisdictional levels, such as federal tax incentives and state mandates for renewables. These three principles should guide market design regardless of the resource adequacy approach the regulator adopts. The challenges of adhering to these principles, however, differ depending on the approach to resource adequacy. All approaches create some hurdles to clean energy. We explore these hurdles here and propose ways of overcoming them.

1. Eliminating barriers to entry

Failure to adhere to the first principle and erecting barriers to entry in resource adequacy markets has been a problem for RTOs across the country and has exacerbated tensions between federal and regional resource adequacy policy and state clean-energy standards. The use of competitive markets or performance standards to select future generation capacity has a natural smoothing function that is essential to integrating the many policy silos that drive generation capacity. [174] Bidders come to the table with a variety of factors influencing the price that they offer, including, for example, state and federal subsidization of certain types of generation. [175] By ignoring these many background factors and simply accepting bids on their face (within careful market-design limits), [176] competitive markets for generation resources **[*1013]** naturally accommodate the many silos that shape generators' bids. Those bidders that have not benefited from these silos--such as coal-fired power plants or natural gas currently disfavored by state clean-energy policies or federal tax incentives--argue that competitive resource adequacy markets do the opposite of "smoothing" and create an unlevel playing field. [177] Yet efforts to place these disfavored entities on equal footing simply place different thumbs on the scales, and often in a way that artificially elevates certain policy silos over others. [178]

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[174] A performance standard requires regulated entities to meet specific outcomes but does not specify how entities should comply. *See* Cary Coglianese, Opinion, *On the Pitfalls of Performance Standards*, REGUL. REV. (Nov. 20, 2017), https://perma.cc/G3N6-2J6Z. A design standard, by contrast, involves a regulatory decision about how to achieve compliance. *See* Laura Montgomery, Patrick McLaughlin, Tyler Richards & Mark Febrizio, Performance Standards vs. Design Standards: Facilitating a Shift Toward Best Practices 6 (June 2019) (unpublished manuscript), https://perma.cc/BQ3D-KNK5.

[175] *See, e.g.*, Joshua C. Macey & Robert Ward, *MOPR Madness*, 42 ENERGY L.J. 67, 72-73 (2021) (discussing bidder incentives).

[176] The bids within "competitive" capacity markets are carefully regulated and are thus not wholly representative of free markets. RTOs design capacity markets following a variety of FERC-approved parameters that affect the market, including, for example, the amount of capacity that generators are required to acquire within the auction. *See, e.g.*, Spees et al., *supra* note 173, at 9-12 (describing the complex formation of administrative demand curves, including price caps and other features that depart from a purely competitive model, in some capacity auctions).

[177] *See* Calpine Corp., 169 FERC P 61,239, at 5-6 (Dec. 19, 2019) (stating that an administratively-set minimum bid amount for state-subsidized resources "is necessary" to protect "the competitiveness of the PJM capacity market," and that state clean-energy policies are "disruptive to competitive wholesale market outcomes"); Calpine Corp., 171 FERC P 61,035, at 48 (Apr. 16, 2020) (asserting that administrative interventions "protect the integrity of federally-regulated markets against state policies").

[178] The classic example of this is the minimum-offer-price rule (MOPR) of the Pennsylvania--Jersey--Maryland (PJM) RTO, which we discuss in further detail below. This much-maligned rule attempts to place natural gas and other fossil generators on more

When administrators become more prescriptive about how to comply with regulatory policies by selecting certain resources, they can directly contradict the policies emanating from certain silos. One such practice is the "reliability-must-run" (RMR) agreement. Faced with a pressing reliability need, grid operators will guarantee generators a certain amount of revenue regardless of the wholesale price of electricity. [179]RMR agreements are often responses to genuine reliability concerns. [180]For example, transmission constraints sometimes mean that certain generators play a critical role in keeping the lights on. [181]When such generators threaten to retire, regulators are understandably willing to pay a premium to keep them in the market.

Our concern with RMR agreements is not that they pay an above-market price to essential facilities, but rather the process by which grid operators **[*1014]** determine that the generator is needed and the system of compensating such generators. The first problem is that grid operators and FERC rarely consider competitive solicitations before determining that the generator is in fact needed for system reliability. For example, Exelon's Mystic Generating Station, a large natural gas facility in Massachusetts, received a highly lucrative contract to keep it in the market from 2018 to 2022. [182]In approving this contract, FERC and ISO-New England (ISO-NE) ignored objections from Connecticut that these reliability needs could be met at lower cost. [183]Since ISO-NE did not solicit bids to determine whether alternative solutions were available, it is difficult to assess whether Mystic was in fact an essential facility.

California, by contrast, has relied on competitive solicitations before entering into RMR agreements. [184]While in some situations, the state has approved cost-of-service treatment for facilities that threaten to retire, in other cases, it has found cheaper and less carbon-intensive solutions. [185]One structural element that allows California's RTO to incorporate California's aggressive clean-energy policy is the fact that the RTO covers California only. The silos in this case are relatively simple: a state legislature and energy commission that push aggressively for renewable energy, and a "regional" transmission organization that operates the grid supporting this energy, the boundaries of which only cover California. This has allowed some cities to replace gas-fired power plants with solar-plus storage

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equal footing with subsidized renewable energy and nuclear resources by requiring state-subsidized resources to bid in at a minimum price, thus preventing them from creating what FERC previously viewed as artificially low prices. But the MOPR does not account for federal subsidies, such as federal tax credits for wind energy, and thus favors federally subsidized resources while disfavoring statesubsidized resources. Indeed, FERC Commissioner Glick--dissenting from the FERC order approving the MOPR--criticized the Commission's claim that it could not nullify federal subsidies (and thus could not include them within the MOPR) while the MOPR somehow avoided nullifying state subsidies. Framed in our terms, the MOPR validates federal silos while knocking down state silos. *Calpine Corp., 171 FERC P 61,035, at 20 (Apr. 16, 2020)* (Glick, Comm'r, dissenting).

179 *See* ERCOT, Reliability-Must-Run Procedures 1 (2016), *https://perma.cc/C4UB-SBJZ*.

180 *See* *N.Y. Ind. Sys. Operator, 150 FERC P 61,116, at 1-3 (Feb. 19, 2015)* (directing the New York ISO to develop RMR agreements).

181 *See id.* at 4.

182 *See* Gavin Bade, *FERC Approves Cost Recovery for Exelon's Mystic Gas Plant*, UTIL. DIVE (Dec. 21, 2018), *https://perma.cc/88UP-LGGK*.

183 *See* *Constellation Mystic Power, LLC, 165 FERC P 61,267, at 11-12 (Dec. 20, 2018)* (describing Connecticut's objection that Mystic would receive the cost-of-service rate, not a market rate).

184 *See* *Cal. Indep. Sys. Operator Corp., 168 FERC P 61,199, at 24 (Sept. 27, 2019)* (approving a CAISO tariff-policy revision that requires RMRs to "submit market bids at specified, marginal cost-based prices").

185 *See* Robert Walton, *CAISO: Changes to RMR Procurement Could Keep Generators from Gaming the System*, UTIL. DIVE (updated Mar. 22, 2019), *https://perma.cc/E87R-WDHA*.

facilities, which in turn has helped California navigate the thorny process of achieving both federal and state mandates in generation capacity decisions. [186]

In contrast with California, central capacity markets, too, have become increasingly prescriptive in determining which resources are eligible to provide reliability services. For example, the three RTOs that rely on central capacity markets--Pennsylvania--Jersey--Maryland (PJM, the mid-Atlantic **[*1015]** RTO), ISO-NE, and New York ISO (NYISO)--have expanded the scope of regulatory tools called minimum-offer-price rules (MOPRs) [187]to determine the terms and conditions on which generators are permitted to offer to sell capacity. MOPRs set a minimum price at which generators are eligible to bid into capacity markets. Utility-scale solar that would be willing to offer to sell capacity at a low price--say $ 5 per MW--will be unable to do so if it is subject to a MOPR. If the minimum price the array company is allowed to bid is $ 40 per MW, and if the market clears at $ 20 per MW, then the firm will not clear the capacity market and will not receive capacity revenues even though it supports resource adequacy.

Though developed in the mid-2000s as limited devices designed to curb market power abuses, MOPRs have expanded significantly since then. [188]Though PJM recently narrowed the scope of its MOPR rule, and a split Commission allowed PJM's focused MOPR to go into effect by operation of law, MOPRs have threatened to prevent some renewable resources that receive a state subsidy in the eastern states from participating in capacity markets. [189]Because capacity markets can account for 30% of generator revenues in these regions, [190]the expansion of these mitigation rules means that regulations that are ostensibly designed to maintain a sufficient level of reserves also prevent the inclusion of some renewables in the RTO's procurement of resources needed to support the region's reliability needs. [191]Thus, the siloed approach to **[*1016]** reliability adopted in PJM, ISO-NE, and NYISO means that the markets those regions have developed to maintain resource adequacy also make it harder for state-subsidized renewables to be compensated even if they provide significant reliability benefits. As introduced above, such rules cause resource adequacy markets to counteract rather than knock down silos associated with clean-energy goals. The result is that resource adequacy silos prevent generation resources from coming to the table with their own price--a price influenced by a variety of background policy factors.

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[186] *See* Cecilia Keating, " *Breakthrough" California Solar-Plus-Storage Project Bought by Capital Dynamics*, ENERGY STORAGE NEWS (Jan. 24, 2020), https://perma.cc/VVT8-WE9G; Andy Colthorpe, *Local Capacity Contract for 600MWh of California Battery Storage Signed by Recurrent Energy, PG&E*, ENERGY STORAGE NEWS (Aug. 11, 2021), https://perma.cc/7KXK-NSHY (describing how solar-plus-storage resources are being used to satisfy California resource-adequacy requirements and support state climate policies).

[187] While PJM calls the tools MOPRs, NYISO calls them "buyer-side mitigation" and ISONE uses the phrase "alternative price rule." *See* Macey & Ward, *supra* note 175, at 72-83, 90, 97. In response to political pushback, PJM has indicated that it will scale back its MOPR. *See* Catherine Morehouse, *PJM Proposes to End FERC MOPR Policy that Raised Prices for State-Subsidized Resources*, UTIL. DIVE (Apr. 29, 2021), https://perma.cc/4C8F-79E8.

[188] *See* Macey & Ward, *supra* note 175, at 73-101 (providing a history of buyer-side mitigation rules in PJM, NYISO, and ISO-NE). PJM recently narrowed the scope of its MOPR. *See Joint Statement of Chairman Glick and Commissioner Clements Regarding the Fair Rates Act on PJM MOPR*, FERC, https://perma.cc/7TCU-V5N2 (last updated Oct. 19, 2021).

[189] *See* Calpine Corp., 169 FERC P 61,239, at 2 (D ec. 19, 2019); Kathryne Cleary, *What the Minimum Offer Price Rule (MOPR) Means for Clean Energy in PJM*, RESOURCES (Jan. 21, 2020), https://perma.cc/9PCN-PQNJ ("[T]he MOPR . . . will likely significantly restrict the participation of new renewables in the capacity market.").

[190] MONITORING ANALYTICS, LLC, *supra* note 171, at 16, 286 (stating that capacity markets accounted for $ 10.3 billion of generator revenues in 2018, while total generator revenues amounted to $ 49.29 billion); INTERNAL MKT. MONITOR, ISO NEW ENG. INC., 2018 ANNUAL MARKETS REPORT 4-5 (2019) (showing that 30% of revenues come from capacity markets in ISO-NE).

[191] PJM Interconnection, L.L.C., 117 FERC P 61,331, at 4 (Dec. 22, 2006) ("[PJM's capacity-market ruleset] is expected to provide greater incentives for new generation, transmission, and demand response, while also providing sufficient revenues to retain existing resources that are needed."); *see* Macey & Ward, *supra* note 175, at 110-11.

A separate problem of policy segregation pervades RTOs where there has been less structural separation of generation and transmission assets--most notably, the Midwest ISO (MISO) and SPP. Substantial numbers of rateregulated utilities participate in these markets. RTOs allow these generators to "self-schedule," or provide generation "out of merit" with least-cost dispatch practices. [192]When a generator self-schedules, it determines the hours that it will run instead of leaving such decisions to the RTO and its dispatch algorithms. [193]In practice, self-scheduling tends to benefit rate-regulated coal resources, which recover the costs of operating from ratepayers even when the energy market would not select them as a least-cost resource. A recent study by the Union of Concerned Scientists has found that this practice costs ratepayers billions of dollars a year. [194]

Self-scheduling provides another example of how the siloed nature of federal and state resource-adequacy decisions can impede the transition to a low-carbon grid. [195]No matter what state and federal regulators do to encourage renewables to enter the grid, such policies will not reduce output from a coal-fired power plant if that plant is guaranteed a profit from its captive ratepayers. The disaggregation here is particularly warped: A historic utility-driven, state-commission-sanctioned resource-procurement decision to allow the construction of a fossil fuel--fired plant prevents RTO wholesale markets from accommodating low-carbon resources prioritized by many state legislatures in the region.

When energy regulators presumptively favor fossil fuel resources to meet reliability requirements--whether that be through misguided MOPRs or RMR **[*1017]** agreements--they make it impossible to determine whether those resources are in fact critical. They also prevent renewable generators from being compensated for supporting reliability when they are capable of doing so--thereby potentially slowing the clean-energy transition and impeding reliability at the same time.

2. Correctly pricing and parameterizing reliability services

Even when federal and regional energy regulators rely on competition, the inability to correctly identify and value reliability further impedes attempts--many of them state led--to shift to a clean and reliable grid. This challenge is endemic to all three approaches to resource adequacy.

One issue is that regulators misvalue resources that provide reliability benefits. For example, for years, the RTO PJM, which operates in much of the Mid-Atlantic region, required that resources be able to operate for a minimum of ten hours in order to be dispatched in energy markets and participate in capacity markets. [196]This rule was justified on the ground that duration requirements supported the reliability of the bulk power system. [197]

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[192] JEREMY FISHER, AL ARMENDARIZ, MATTHEW MILLER, BRENDAN PIERPONT, CASEY ROBERTS, JOSH SMITH & GREG WANNIER, SIERRA CLUB, PLAYING WITH OTHER PEOPLE'S MONEY: HOW NON-ECONOMIC COAL OPERATIONS DISTORT ENERGY MARKETS 8 (2019), *https://perma.cc/56V2-UY5V*.

[193] *Id.*

[194] *See id.* at 4.

[195] *See id.* at 22 ("The decoupled responsibility of utility regulators and RTOs has had the consequence of allowing non-economic dispatch by regulated utilities to go relatively unchecked, at the expense of captive ratepayers and competitive independent generators.").

[196] *See* Jeff St. John, *Taking Aim at PJM's 10-Hour Performance Duration Capacity Rule for Energy Storage*, GREENTECH MEDIA (July 22, 2019), *https://perma.cc/MR2R-LKJA*.

[197] *See id.*

The problem with this justification is that resources that operate for much shorter periods of time have substantial reliability benefits. Many batteries, for example, can store energy for only four hours. [198]Peak demand, however, is usually four hours, and so battery storage has significant benefits at this time. [199]Yet PJM's duration requirements kept batteries from participating in markets even though they could provide the precise service needed to support reliability.

PJM's performance-duration requirements are only one example of how RTOs' overly prescriptive reliability rules prevent clean-energy resources from contributing to a reliable grid. FERC recently found that similar rules also "limit customer participation in demand response programs." [200]Properly pricing and parameterizing the reliability benefits of energy resources is essential to overcoming these mismatched incentives. If renewables and storage resources support a region's reliability needs, they should be compensated for doing so. But when regulators charged with ensuring **[*1018]** resource-adequacy design rules do not accommodate such resources, they create an unlevel playing field that favors fossil resources.

3. Accommodating state and federal clean-energy policies

Central to the two challenges discussed thus far--eliminating barriers to entry to ensure low-carbon, economic resource adequacy and properly valuing reliability--is the premise that a clean and reliable grid requires wholesale energy markets to accommodate, not counteract, state and federal clean-energy policies. In this case, the federal and state silos would be quite difficult to knock down--and likely should not be erased. Congress's decision to give FERC authority over wholesale power transactions and states authority over retail sales served to avoid conflicting state rate regulation of interstate transactions while still allowing states to respond to the values of their constituents. The challenge, though, is that wholesale policies centrally affect retail ones, and vice versa, because retail utilities build their own generation and purchase wholesale electricity to supply retail customers. A great deal of accommodation of state policies by federal agencies, and vice versa, is accordingly necessary. This challenge is perhaps best highlighted by comparing federal and regional policies with the zero-carbon energy mandates of state policies.

Certain approaches to resource adequacy work relatively well to accommodate state policy goals. For example, California's approach to resource adequacy, which imposes resource-adequacy requirements on LSEs, organically incorporates state policy goals. The LSE can simply balance its federal resource-adequacy goals with state clean-energy goals when procuring resources. Thus, if offshore wind supports both reliability and climate policy, the LSE can count offshore wind resources toward both its clean energy and resource obligations.

Energy-only markets are also relatively well suited to accommodating state policy goals. An LSE that needs to procure a certain percentage of supply from renewables can enter into bilateral contracts to do so. The grid operator simply needs to accommodate carbon prices and other renewable policies by letting the price signals generated by such policies pass through to energy markets.

But here, too, regulators ignore how other policy priorities impede the transition to a low-carbon grid. States that participate in RTOs need the RTO's blessing to pass an effective carbon tax. [201]If the RTO does not develop rules

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[198] *See* THOMAS BOWEN, ILYA CHERNYAKHOVSKIY & PAUL DENHOLM, NAT'L RENEWABLE ENERGY LAB'Y, GRID-SCALE BATTERY STORAGE 2 (2019), *https://perma.cc/3AUX-932D*.

[199] *See id.* at 4.

[200] FERC, 2020 ASSESSMENT OF DEMAND RESPONSE AND ADVANCED METERING 46 (2020), *https://perma.cc/S7Q2-LSHL*.

[201] In August 2020, FERC organized a panel to "explore general legal issues that may arise under the Federal Power Act when the Commission is presented with a proposal to integrate a carbon price set by a state (or group of states) into an RTO/ISO market design." Supplemental Notice of Technical Conference at 1, 3, Carbon Pricing in Organized Wholesale Elec. Mkts., Docket No. AD20-14-000 (FERC Aug. 28, 2020), *https://perma.cc/ET88-L37M*. RTOs have successfully incorporated emissions

[*1019] for incorporating the state carbon tax into energy markets, then the state cannot tax all electricity-related emissions. The state could still tax in-state generators, but that has little effect on out-of-state generators that participate in the RTO's energy market. Generators in neighboring states will be unaffected, and carbon-intensive generators built in those states will still be able to sell energy into the RTOs' energy market. This issue is known as leakage. [202]An effective carbon tax therefore requires either that states coordinate with each other or that the RTO develop rules to address leakage concerns. [203]

Accommodating such policies is not particularly difficult, as RTOs have frequently incorporated federal and state rules that incorporate the costs of complying with environmental regulations. [204]But RTOs are still trying to figure out whether--and how--they should incorporate potential future carbon taxes. [205]As a result, a state cannot unilaterally impose an effective carbon tax--or, more specifically, a carbon tax that addresses leakage concerns--but must instead hope that its RTO develops a mechanism for integrating the carbon tax into wholesale markets.

Yet perhaps the most difficult tensions between resource adequacy and state policies occur in regions that rely on capacity markets. Capacity markets procure resources needed to meet expected load. [206]As discussed, the problem is that some resources will enter the energy market even if they don't clear the **[*1020]** capacity market. [207]Some will enter because they are needed to satisfy a state renewable policy. [208]In other circumstances, a resource will enter the market because the underlying economics have changed and it operates at a profit even if it receives all of its revenues from energy markets and none from capacity markets. [209]The dramatic decline in the costs of lithium-ion batteries, for example, have made storage cost effective even if it does not clear the capacity

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fees in energy markets. San Diego Gas & Elec. Co., 95 FERC P 61,418, at 35 (June 19, 2001) (noting that "mitigation fees associated with [nitrous oxide] emissions are a legitimate cost of producing energy" and instructing CAISO to "to submit tariff modifications incorporating an emission allowance administrative charge"); Cal. Indep. Sys. Operator Corp., 153 FERC P 61,087, at 26 (Oct. 26, 2015) (approving proposed "greenhouse gas bid adder enhancements" to the energy imbalance market that "allow[] a resource to recover its greenhouse gas compliance costs" imposed by California's CO2 cap-andtrade program).

202 *See* Carbon Pricing Senior Task Force, PJM, PJM Study of Carbon Pricing & Potential Leakage Mitigation Mechanisms 13 (2020), https://perma.cc/82QC-U59M.

203 *See* id. at 8, 27-32.

204 *See, e.g.*, Policy Statement and Interim Rule Regarding Ratemaking Treatment of the Cost of Emissions Allowances in Coordination Rates, 59 Fed. Reg. 65,930, 65,935 (Dec. 22, 1994) (to be codified at 18 C.F.R. pts. 2, 35) (allowing "the recovery of incremental costs of emission allowances in coordination rates" under defined circumstances); San Diego Gas & Elec. Co., 95 FERC P 61,418, at 35 (instructing CAISO "to submit tariff modifications incorporating an emission allowance administrative charge"); Cal. Indep. Sys. Operator Corp., 153 FERC P 61,087, at 26 (approving proposed "greenhouse gas bid adder enhancements" that "allow[] a resource to recover its greenhouse gas compliance costs").

205 *See* PJM, FERC Technical Conference on Carbon Pricing in Organized Wholesale Electricity Markets 1 (2020), https://perma.cc/3X85-R8QP.

206 *See Capacity Market (RPM), supra* note 170.

207 *See, e.g.*, ISO New Eng. Inc., 158 FERC P 61,138, at 5 (Feb. 3, 2017) (Bay, Comm'r, concurring) ("Instead, the MOPR not only frustrates state policy initiatives, but also likely requires load to pay twice--once through the cost of enacting the state policy itself and then through the capacity market.").

208 *See* ROB GRAMLICH & MICHAEL GOGGIN, GRID STRATEGIES, TOO MUCH OF THE WRONG THING: THE NEED FOR CAPACITY MARKET REPLACEMENT OR REFORM 10-11 (2019); Macey & Ward, *supra* note 175, at 104.

209 *See* Macey & Ward, *supra* note 175, at 104-09.

auction. [210]Because capacity markets do not count these resources that are nevertheless participating in the energy market, they procure more capacity than is needed.

But grid operators can structure capacity markets to account for the capacity benefits of such resources--an elegant way of redesigning market policy to accommodate state silos without needing to fundamentally change the structure of governance. One market-design option is to permit LSEs to procure the resources needed to comply with state clean-energy policies and then run the capacity market after the LSE has done so. This proposal has been dubbed the "fixed resource requirement." [211]Doing so would ensure that renewables that enter the market as a result of state clean-energy policies count toward a particular region's needed reserves.

Another solution is to run capacity auctions such that they align with clean-energy policies. One option is to develop a forward clean-energy market or an integrated clean-capacity market. [212]A forward clean-energy market would allow states that have developed clean-energy standards to procure a certain percentage of their capacity obligations from resources that also support their clean-energy policies. They could fulfill the rest of their capacity obligation in the ordinary capacity market, as could states that do not have **[*1021]** clean-energy policies. [213]An integrated clean-capacity market would operate similarly. [214]The auction would simultaneously procure capacity and clean-energy attributes such that participants can purchase clean attributes such as renewable energy credits (RECs). [215]The price paid for those clean-energy attributes would help determine which resources clear the capacity market. [216]This, too, would allow regions that rely on capacity markets to avoid procuring excess capacity.

None of these options would require congressional action. The FPA (Federal Power Act) clearly grants FERC jurisdiction over wholesale transactions in interstate commerce and states jurisdiction over retail decisions. [217]The Supreme Court has explicitly noted that FERC has authority to police these tensions. [218]FERC may do this policing under its explicit FPA authority to regulate practices "affecting" wholesale rates. [219]

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[210] *See* John Fitzgerald Weaver, *Solar Price Declines Slowing, Energy Storage in the Money*, PV MAG. (Nov. 8, 2019), *https://perma.cc/E374-9Y7Y*.

[211] *See* Catherine Morehouse, *States Ask FERC To Eliminate MOPR, Grant More Flexibility in Pursuing Alternatives to PJM Capacity Market*, UTIL. DIVE (Apr. 26, 2021), *https://perma.cc/7ZVC-HG7H*.

[212] This concept seems to have been developed by economists working for the Brattle Group, an energy consulting organization. *See* KATHLEEN SPEES, SAMUEL A. NEWELL, WALTER GRAF & EMILY SHORIN, BRATTLE GRP., HOW STATES, CITIES, AND CUSTOMERS CAN HARNESS COMPETITIVE MARKETS TO MEET AMBITIOUS CARBON GOALS, at ii (2019).

[213] The Supreme Court has said that states may not directly regulate wholesale markets. *See* *Hughes v. Talen Energy Mktg., LLC, 136 S. Ct. 1288, 1298 (2016)*. But so long as states act within the policy designed by FERC and RTOs, rather than against it, they should be free and clear to act.

[214] This concept was described in detail in a New Jersey Board of Public Utilities report investigating alternatives to PJM's capacity market. *See* ABRAHAM SILVERMAN, KIRA LAWRENCE & JOSEPH DELOSA, N.J. BD. OF PUB. UTILS., ALTERNATIVE RESOURCE ADEQUACY STRUCTURES FOR NEW JERSEY 36-39 (2021), *https://perma.cc/H6WS-GXMP*.

[215] *See id.*

[216] *See id.*

[217] *See* *16 U.S.C. § 824(a)*-(b).

[218] See *FERC v. Elec. Power Supply Ass'n, 136 S. Ct. 760, 780 (2016)* ("The Act makes federal and state powers 'complementary' and 'comprehensive,' so that 'there [will] be no "gaps" for private interests to subvert the public welfare.' Or said otherwise, the statute prevents the creation of any regulatory 'no man's land.' Some entity must have jurisdiction to regulate each and every practice that takes place in the electricity markets, demand response no less than any other." (alteration in original)

In fact, the reforms we suggest here would be consistent with the spirit of the FPA--even if they are not required by it. The Supreme Court has long held that the FPA was "drawn with meticulous regard for the continued exercise of state power." [220]Reconstructing resource-adequacy markets in a manner that accommodates state policies would prevent reliability goals from operating at cross-purposes with clean-energy goals. That, in turn, would preserve for states the matters that the FPA left to their control.

[*1022] IV. Transmission Planning, Financing, and Siting

Beyond energy markets, new electric transmission lines are essential to enabling a clean, more reliable grid. This will involve planning for a new, nationally interconnected network of transmission lines across existing "seams" that divide the U.S. transmission network, deciding how to allocate costs among utilities for these new lines, and determining where these lines should be sited. As we explain below, this project will require the most federalization of institutional authority, given the inherently national scope of the project. But this is not to say that all authority should shift from the state and regional to the federal level. Rather, we explore here how federal, topdown authority must grow, while still leaving room for the expertise of state and regional actors.

A. The Need for a Nationally Interconnected Transmission Grid

An expanded, nationally interconnected transmission grid, or "macrogrid," is a prerequisite to a decarbonized, more reliable U.S. energy system. As stated in a 2021 National Academies report entitled *The Future of Electric Power in the United States*, a successful clean-energy transition will require "expand[ing] the system's ability to generate and move power so as to make abundant electricity available to support the deep decarbonization of all parts of the economy." [221]Proponents of a macrogrid build-out argue that to increase grid reliability through a decarbonized electricity sector, we must pursue a massive investment in our existing long-distance electric transmission system. [222]This strategy will involve both reinvesting in existing transmission capacity and expanding the transmission system itself. Necessary expansions include a new network of long-distance, high-voltage direct current (HVDC) transmission lines and more long-distance alternating current (AC) lines.

The map below from the National Renewable Energy Laboratory's *Interconnected Seams Study* illustrates one scenario for accomplishing this. [223]This map explains how large amounts of wind and solar energy can move between the RTOs and interconnections to accommodate demand at different **[*1023]** times of day through new HVDC lines (shown in red) that connect with existing AC lines.

Figure 2 Proposed "Macrogrid" (Design 3)

Source: Brinkman et al., *supra* note 65, at 22.

(citation omitted) (first quoting *Fed. Power Comm'n v. La. Power & Light Co., 406 U.S. 621, 631 (1972)*; and then quoting *Fed. Power Comm'n v. Transcon. Gas Pipe Line Corp., 365 U.S. 1, 19 (1961))*.

[219] *See id. at 767*.

[220] *Panhandle E. Pipe Line Co. v. Pub. Serv. Comm'n, 332 U.S. 507, 517-18 (1947)*.

[221] NAT'L ACADS. OF SCIS., ENG'G, & MED., THE FUTURE OF ELECTRIC POWER IN THE UNITED STATES 14 (2021).

[222] ROB GRAMLICH & JAY CASPARY, AMS. FOR A CLEAN ENERGY GRID, PLANNING FOR THE FUTURE: FERC'S OPPORTUNITY TO SPUR MORE COST-EFFECTIVE TRANSMISSION INFRASTRUCTURE app. A at 89-95 (2021) (citing and describing numerous studies).

[223] Aaron Bloom et al., *The Value of Increased HVDC Capacity Between Eastern and Western U.S. Grids: The Interconnections Seam Study*, 37 IEEE TRANSACTIONS ON POWER SYS. 1760, 1764-68 (2022) (describing how the construction of seven HVDC facilities between the Western and Eastern Interconnections could increase the efficiency and resilience of the entire energy system).

The source describes Design 3 as follows: "Macrogrid (a nationwide HVDC transmission network) is built and additional AC transmission and generation are co-optimized to minimize system costs." *Id.*

An expanded transmission grid along the red lines will not only facilitate greater penetration of renewable energy across the country, but will also make the grid more reliable and resilient, all while providing significantly lower electricity costs for consumers. [224]If it sounds too good to be true, there is a **[*1024]** catch: The current siloization of legal authority around transmission makes it exceedingly hard to accomplish this necessary expansion, as we explain below.

B. Transmission Planning and Cost Allocation

Historically, vertically integrated utilities built most of the transmission lines in the United States. These lines connect generators to utilities and utilities to each other to enable wholesale trades. Utilities built transmission to meet their obligations to provide electricity to the communities they served. This was a local process designed to serve local needs. But over the decades, the transmission grid has become gradually ever more interconnected. As this has occurred, FERC has recognized that transmission has significant benefits outside of the communities in which the line is built, and it has tried to reform transmission planning and cost allocation rules to reflect those benefits.

Yet despite FERC's efforts, transmission planning continues to be done primarily at the local level, and cost allocation does not reflect the full benefits of HVDC lines. The result is that we are not investing enough in transmission, and the transmission built primarily serves local reliability needs. This parochial approach to transmission planning and cost allocation also impedes the construction and siting of the many interstate transmission lines that will be needed to support a large amount of new renewable generation. This Subpart explains why the process FERC has developed for transmission planning and cost allocation fails to realize FERC's goal of building a reliable, robust national power grid capable of facilitating the country's changing resource mix.

1. Current transmission planning and cost-allocation policy

FERC's early transmission reforms were part of the Commission's campaign to support competitive wholesale energy markets--reforms that continue today and that have been an essential component of renewable energy growth. In landmark orders issued between 1996 and 2000, FERC sought to accomplish two goals. First, it wanted to ensure that independent merchant generators were able to access electricity markets so that they could compete with vertically integrated, investor-owned utilities that controlled and operated generation, transmission, and distribution lines. [225]Second, it **[*1025]** wanted to encourage utilities to join RTOs and delegate the operation of their lines to these organizations. [226]

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[224] *See, e.g.*, *id. at 30, 33*; Alexandra B. Klass, *Transmission, Distribution and Storage: Grid Integration, in* LEGAL PATHWAYS TO DEEP DECARBONIZATION IN THE UNITED STATES 527, 529-31 (Michael B. Gerrard & John C. Dernbach eds., 2019) (detailing expert studies showing the need for expanded transmission infrastructure and the benefits of such expansion); GRAMLICH & CASPARY, *supra* note 222, app. A at 89-95 (summarizing numerous studies showing the need for "large regional and interregional transmission"). *But see* Steve Huntoon, *Counterflow: Big Transmission--Still Not the Right Stuff*, RTO INSIDER (May 17, 2021), *https://perma.cc/2W35-W33C* (to locate, select "View the live page"); (contending that proposed long-distance HVDC lines have little chance of being built and are not cost-effective investments, while supporting more modest regional transmission projects).

[225] *See* Promoting Wholesale Competition Through Open Access Non-discriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities, *61 Fed. Reg. 21,540, 21,541* (May 10, 1996) (codified at 18 C.F.R. pts. 35, 385); *see also* Open Access Same-Time Information System (Formerly Real-Time Information Networks) and Standards of Conduct, *61 Fed. Reg. 21,737, 21,737* (May 10, 1996) (codified at 18 C.F.R. pt. 37).

[226] *See* Regional Transmission Organizations, *65 Fed. Reg. 810, 810* (Jan. 6, 2000) (codified at 18 C.F.R. pt. 35).

The early reforms related to open grid access and a more regionalized electric grid had a significant effect on the operation and control of the transmission system. But FERC's primary goal in these early orders was to make sure that the sale of electric energy was subject to competitive forces. Transmission was at most a secondary goal.

FERC's emphasis shifted more directly to transmission over the next decade. In the Energy Policy Act of 2005 (EPAct 2005), Congress instructed the Commission to incentivize the further development of transmission to reduce costs and improve reliability. As a result, FERC issued the putatively landmark Order No. 1000 in 2011, which attempted to create a more regional focus for grid development. [227]In Order No. 1000, FERC acknowledged that the benefits of transmission were not concentrated in the locale where the transmission line was being built. [228]Yet utilities outside these locales--and their state regulators, at times--had every incentive to resist helping to pay for transmission benefits they reaped. [229]In effect, this infighting caused regionally beneficial transmission lines to fail to advance through planning processes--yet another example of the energy law silo at work. Recognizing that transmission creates reliability, cost, and climate benefits in a broad geographic area, FERC, in Order No. 1000, attempted to make transmission planning and cost allocation reflect those nonlocal benefits. [230]

To remediate these deficiencies, Order No. 1000 made four reforms to transmission planning and cost allocation: It (1) required RTOs to develop regional transmission plans; (2) instructed RTOs to develop systems of coordinating with each other to develop *interregional* plans, which were more efficient than region-by-region plans; (3) directed utilities to adopt a "beneficiary pays" approach to cost allocation to require that the costs of building new transmission be spread out among the entities that benefit from the new infrastructure and not be concentrated in the region where the transmission line is built; and (4) mandated that merchant transmission operators be given an opportunity to participate in the regional planning **[*1026]** process to allow transmission-line development to be subject to competitive forces. [231]

These reforms were intended to wrest control over transmission out of the hands of vertically integrated utilities and make sure that transmission development reflected its geographically broad benefits. [232]Regional planning, for example, recognized that transmission lines often generate substantial nonlocal benefits. A transmission line near Philadelphia may support reliability or lower electricity costs in Cleveland by allowing Cleveland to import electricity from generators located in a wider array of areas. If generators located near Philadelphia shut down, perhaps as a result of a polar vortex, the transmission line may prevent Philadelphia from losing power since it can now import electricity from Ohio. That is why Order No. 1000 instructed RTOs "to create a regional transmission plan that identifies transmission facilities needed to meet reliability, economic and Public Policy Requirements." [233]

Similarly, utility-scale solar will provide only moderate benefits if the electricity it generates is cabined by state borders. For example, demand for electricity in Arizona is relatively moderate compared to some of the state's more

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[227] Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, 76 Fed. Reg. 49,842, 49,842 (Aug. 11, 2011) (codified at 18 C.F.R. pt. 35).

[228] *See id.* at 49,845.

[229] *See id.* at 49,846 (describing the free-rider problem in transmission planning).

[230] *See id.* at 49,845.

[231] *See id.* at 49,845-46.

[232] *See* Preventing Undue Discrimination and Preference in Transmission Service, *72 Fed. Reg. 12,266, 12,268* (Mar. 15, 2007) (codified at 18 C.F.R. pts. 35, 37) ("In the first few decades after enactment of the [FPA] in 1935, the industry was characterized mostly by self-sufficient, vertically integrated electric utilities, in which generation, transmission, and distribution facilities were owned by a single entity and sold as part of a bundled service to wholesale and retail customers.").

[233] *See* Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, 76 Fed. Reg. at 49,851.

populous neighbors. [234]But if Arizona can export solar to California and **[*1027]** Texas, then solar energy produced in Arizona will be able to provide electric power to populations that consume massive amounts of energy. [235]

The interregional planning requirement reflected the same concerns. The idea behind interregional planning was that the benefits of transmission do not stop at an RTO's borders and that bigger is better: Joining utilities and connection regions is both more cost-effective and more reliable. Interregional benefits were apparent during Winter Storm Uri. As it did for the Electric Reliability Council of Texas (ERCOT), the storm put MISO and SPP under extreme strain. [236]However, these regions experienced far lower rates of blackouts, in large part because those RTOs were able to import a large amount of energy from PJM in the east. [237]

Additional interconnections would have provided even more significant reliability benefits during Winter Storm Uri. More transmission connecting MISO and PJM (as well as more transmission connecting northern and southern MISO) would have allowed additional electricity to be exported to resource-constrained areas, further reducing the number of blackouts in those regions. [238]FERC foresaw these kinds of benefits in its interregional requirements--even if, as we describe below, its efforts in this regard have not proven successful.

In sum, Order No. 1000 recognized that a region can meet its transmission needs more cost effectively through regional projects than through individual utilities developing their own transmission plan in isolation. In this way, transmission creates benefits outside the location of any single transmission line, and FERC took ambitious steps to make sure that planning and cost allocation reflects those benefits.

[*1028] 2. Problems with transmission planning and cost allocation: silos, exit, and coordination challenges

Order No. 1000 remains FERC's most aggressive, well-intended effort to break down energy silos in transmission planning and cost allocation. But at least four deficiencies remain. Some of these shortcomings are a direct result of the strategy adopted in the Order. Others have arisen because of how RTOs perform regional planning and because of "beneficiary pays" cost allocation. First, because RTOs and utilities allow a bottom-up approach to planning, RTOs or individual transmission owners often undertake haphazard, localized transmission upgrades

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[234] Paul L. Joskow, *Facilitating Transmission Expansion to Support Efficient Decarbonization of the Electricity Sector*, ECON. ENERGY & ENV'T POL'Y, Sept. 2021, at 57, 58 ("[T]he best sources of wind and solar resources are typically located in areas that are different from the locations of the legacy stock of thermal generating plants. They are also often more remote from demand centers."); Matthew L. Wald, *Wind Energy Bumps into Power Grid's Limits*, N.Y. TIMES (Aug. 26, 2008), *https://perma.cc/BY5J-4AMA* ("The dirty secret of clean energy is that while generating it is getting easier, moving it to market is not. . . . Achieving [the possibility of getting 20% of U.S. electricity from wind turbines] would require moving large amounts of power over long distances, from the windy, lightly populated plains in the middle of the country to the coasts where many people live. . . . The grid's limitations are putting a damper on such projects already."); *see also Arizona State Energy Profile*, U.S. ENERGY INFO. ADMIN., *https://perma.cc/3BPT-3CDE* (last updated Apr. 21, 2022) (providing details on Arizona's energy generation and consumption and stating that "Arizona power plants typically generate more electricity than the state consumes, and, in 2019, more than one-fourth of the electricity generated in-state was sent to consumers outside of Arizona").

[235] *See Arizona State Energy Profile, supra* note 234 (discussing efforts by Arizona to export carbon-free energy resources to neighboring states and noting that "[i]nterstate transmission lines have become congested in peak demand periods, and Arizona continues to work with other states and stakeholders to improve transmission capacity").

[236] *See* N. AM. ELEC. RELIABILITY CORP., FEBRUARY 2021 COLD WEATHER GRID OPERATIONS: PRELIMINARY FINDINGS AND RECOMMENDATIONS 8-9 (2021), *https://perma.cc/P7E2-DZ62*.

[237] *See, e.g., id. at 10* (noting that during Winter Storm Uri, "MISO's and SPP's ability to transfer power through their many transmission ties with adjacent Balancing Authorities in the Eastern Interconnection helped to alleviate their generation shortfalls," unlike ERCOT in Texas, which "did not have the ability to import many thousands of MW from the Eastern Interconnection"). There are limits, however, to relying on geographic diversity for reliability. *See, e.g., id.* ("Had ERCOT been able to import more power, it would have decreased the amount that MISO and SPP would have been able to import.").

[238] *See id.*

rather than more cost-effective regional and interregional solutions. [239]Second, RTOs use different methodologies to calculate the benefits of transmission, which makes interregional planning extremely difficult. [240]Third, RTOs generally define the benefits of transmission narrowly and discount (or ignore entirely) many environmental and reliability benefits, which can be difficult to quantify. [241]Fourth, utilities may be able to escape cost allocation by leaving (or threatening to leave) the market. [242]As a result, planning and cost allocation remain parochial processes that continue to be dominated by incumbent utilities.

a. Bottom-up planning

The bottom-up approach to planning adopted in response to Order No. 1000 has impeded the development of regional and interregional transmission infrastructure. In practice, local transmission development often precedes regional planning and Order No. 1000 incentivized utilities to embrace local planning. [243]While Order No. 1000 required IOUs to compete with merchant transmission developers when they are participating in the **[*1029]** regional planning process, Order No. 1000 did nothing to upset the traditional monopoly that IOUs held on transmission built to serve local reliability needs--instead encouraging local projects rather than regional projects. [244]

For example, since 2008, PJM has developed separate processes for evaluating regional and local transmission projects. Regional projects must participate in competitive solicitations, are subject to beneficiary pays cost allocation, and must be approved by the PJM board. [245]Local plans, by contrast, need not meet all of these requirements. [246]For example, "end-of-life" projects, which are those needed to "maintain, repair, or replace transmission facilities," are generally exempt from the requirements of the regional planning process. [247]Similarly,

[239] *See* Johannes Pfeifenberger, Brattle Grp., Transmission Planning and Benefit-Cost Analyses 3 (2021), *https://perma.cc/999Y-ZHMN* ("Most projects are build [sic] solely to address reliability and local needs; the substantial recent investments in these types of projects now make it more difficult to justify valuable new transmission that could more cost-effectively address economic and public policy needs.").

[240] SW. POWER POOL ENG'G, 2020 INTEGRATED TRANSMISSION PLANNING: ASSESSMENT REPORT 80 (2020), *https://perma.cc/MUH2-7MSC*.

[241] *See* Pfeifenberger, *supra* note 239, at 3 ("Planners and policy makers do not consider the full range of benefits that transmission investments can provide.").

[242] For example, state regulators and utilities in Louisiana have threatened to leave MISO to avoid paying for costs of regional transmission build-out, since Louisiana utility customers receive less benefit than utility customers in the northern part of MISO. *See* Mark Ballard, *Louisiana to Stay in MISO After State Regulators Put Off Vote to Leave Transmission Authority*, ADVOCATE (Nov. 17, 2021, 3:47 PM), *https://perma.cc/2RRC-49KP*.

[243] *See* Pfeifenberger, *supra* note 239, at 3.

[244] Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, 76 Fed. Reg. 49,842, 49,887 (Aug. 11, 2011) (codified at 18 C.F.R. pt. 35) ("[O]ur actions today are not intended to diminish the significance of an incumbent transmission provider's reliability needs or service obligations.").

[245] *PJM Interconnection, L.L.C., 123 FERC P 61,163, at 35 (May 15, 2008)*.

[246] *See* Building Through the Future for Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection, *87 Fed. Reg. 26,504, 26,570-76* (May 4, 2022) (to be codified at 18 C.F.R. pt. 35).

[247] Letter from Kenneth G. Jaffe, Couns., Alston & Bird LLP & Donald A. Kaplan, Couns., K&L Gates LLP, to Kimberly D. Bose, Sec'y, FERC 3 (June 12, 2020), *https://perma.cc/5QG6-VHG8*.

projects that need to be built within three years to support reliability goals, known as "Immediate-need Reliability Projects," need not be part of the regional plan. [248]

The predictable result of these exceptions, as Ari Peskoe has shown in detail, is that local transmission developments are now responsible for most of the new transmission built in RTOs. [249]These local projects have rendered regional planning little more than gap-filling. Local spending in PJM has tripled since Order No. 1000 went into effect and is approximately two times greater than regional spending. [250]This suggests that PJM is allowing **[*1030]** transmission needs to be addressed in a haphazard process without requiring serious consideration of whether those needs could be dealt with more cost-effectively through a regional process. [251]

PJM is not unique. The other RTOs have also seen local exceptions eat into regional transmission planning. MISO, for example, exempts "Baseline Reliability Projects," which are network upgrades required to maintain compliance with applicable national electric reliability standards, [252]from many of the obligations Order No. 1000 places on projects that go through the regional planning process. [253]MISO, PJM, ISO-NE, and SPP also exempt immediate-need reliability projects from these obligations. [254]Competitive solicitations in ISO-NE and NYISO have been stymied by such exemptions. [255]

A similar problem plagues the interregional planning process. Just as local development reduces the need for regional planning, so too does regional planning reduce the need for interregional planning. Order No. 1000 required RTOs to coordinate and share the results of their regional transmission plans and identify interregional facilities that would more efficiently and cost-effectively address regional transmission needs. [256]The regional

[248] *PJM Interconnection, L.L.C., 142 FERC P 61,214, at 107-11 (Mar. 22, 2013)*.

[249] *See* Peskoe, *supra* note 149, at 50; JOHANNES P. PFEIFENBERGER, JUDY CHANG, AKARSH SHEILENDRANATH, J. MICHAEL HAGERTY, SIMON LEVIN & WREN JIANG, BRATTLE GRP., COST SAVINGS OFFERED BY COMPETITION IN ELECTRIC TRANSMISSION: EXPERIENCE TO DATE AND THE POTENTIAL FOR ADDITIONAL CUSTOMER VALUE 6-7 (2019), *https://perma.cc/BLJ7-8XUN* (noting that between 2013 and 2017, "about one-half of the approximately $ 70 billion of aggregate transmission investments by FERC-jurisdictional transmission owners in ISO/RTO regions are approved outside the regional planning processes or with limited ISO/RTO and stakeholder engagement").

[250] Transmission Expansion Advisory Comm., PJM, 2019 Project Statistics 3 (2020), *https://perma.cc/NR77-9HVY*. Annual spending on supplemental projects ballooned in the aftermath of Order No. 1000. Between 2005 and 2013, spending on supplemental projects was $ 1.25 billion a year. That number increased to $ 3.73 billion a year from 2014 to 2019. At the same time, spending on regional projects declined from $ 2.76 billion to $ 1.86 billion per year. *Id.*

[251] GRAMLICH & CASPARY, *supra* note 222, at 25-26 (explaining that "the majority of [transmission] investment has been in local transmission and low-voltage projects, planned without a full regional assessment that examines their cost-effectiveness relative to regional alternatives, or in regional infrastructure that is planned to meet reliability needs without assessing how to maximize other types of benefits, or that simply rebuilds or replaces existing infrastructure").

[252] MIDCONTINENT INDEP. SYS. OPERATOR, FERC ELECTRIC TARIFF, module A at 1.B (2013).

[253] MIDCONTINENT INDEP. SYS. OPERATOR, FERC ELECTRIC TARIFF, attach. FF PP A.c-.d. (2021).

[254] *See* Tom Marshall & Elizabeth McCormick, *FERC Rejects MISO Tariff Revisions Regarding Cost Allocation for Regional and Local Economic Transmission Projects*, TROUTMAN PEPPER: WASH. ENERGY REP. (July 18, 2019), *https://perma.cc/8ZNP-FJVT*; Tom Marshall & Miles Kiger, *FERC Finds PJM Not in Compliance with Order No. 1000 Immediate Need Reliability Project Exemption*, TROUTMAN PEPPER: WASH. ENERGY REP. (June 24, 2020), *https://perma.cc/V68V-FAVQ*; *see also* Troutman Pepper, Tom Marshall & Elizabeth McCormick, *FERC Sustains PJM and ISO-NE Immediate Need Reliability Project Exemption Orders*, JD SUPRA (Oct. 9, 2020), *https://perma.cc/YC7K-JF98*.

[255] *See* ISO NEW ENG., NEW YORK ISO & PJM, 2019 NORTHEASTERN COORDINATED SYSTEM PLAN 3 (2020), *https://perma.cc/A3JQ-EKUG*; Peskoe, *supra* note 149, at 44-46.

process can thus render interregional planning redundant. Regions identify their reliability needs. [257]Only then do the RTOs determine if those needs can be **[*1031]** better resolved through interregional seams. [258]As a result, an RTO that moves forward with a regional plan may resolve its regional needs before determining whether the need could be better addressed through a coordinated transmission plan. [259]In addition, interregional transmission planning has to successfully navigate the regional transmission--planning processes of all of the transmission-planning region in which the new facility will be built. Thus, if one RTO disagrees about how the interregional need can be addressed, or about how to calculate the regional benefits of the interregional project, it can veto an interregional transmission plan. [260]

The result is that virtually no interregional planning occurs today. This is in part because IOUs have financial incentives to pursue those bottom-up, local transmission lines that they know they do not have to compete for. As Ari Peskoe has explained, "In general, IOUs build all transmission projects located in their retail service territories, including segments of projects that span across more than one IOU territory." [261]

Entities' varied incentives also create a timing challenge. Even though regions are in theory supposed to use interregional plans when doing so is more cost-effective than regional planning, [262]the reality is that local and regional planning often occurs before an interregional plan can be evaluated. That, in turn, obviates the need for interregional planning, which makes it more difficult to install the HVDC lines needed to bring electricity generated from renewable-rich regions to population centers that consume a large amount of electricity.

[*1032] b. Methodological differences

Methodological differences compound the difficulties of interregional planning. Each RTO uses its own internal models when valuing transmission. Because these models differ, RTOs often disagree about whether transmission is needed, how much transmission is needed, and where it is needed. [263]Even if the RTOs agree to build transmission, modeling can raise further challenges when it leads to disagreements about who will pay for the new transmission.

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[256] Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, 76 Fed. Reg. 49,842, 49,846 (Aug. 11, 2011) (codified at 18 C.F.R. pt. 35).

[257] *See* Pfeifenberger, *supra* note 239, at 35 (describing a MISO study that "[did] not address any interregional opportunities" and explaining that the regional solution is "likely far from optimal for the broader grid").

[258] *Id. at 34* ("Regional planning will tend to pre-empt more valuable and cost effective interregional solutions.").

[259] *See id.*

[260] *See* Ben Stearney, PJM, Joint and Common Market: Interregional Planning Update 2 (2020), *https://perma.cc/6XPY-W4XA*; Building Through the Future for Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection, *87 Fed. Reg. 26,504, 26,576* (May 4, 2022) (to be codified at 18 C.F.R. pt. 35) ("The Commission clarified that the developer of an interregional transmission facility must first propose its transmission facility in the regional transmission planning processes of each of the neighboring transmission planning regions in which the transmission facility is proposed to be located. The submission of the interregional transmission facility in each regional transmission planning process triggers the procedure under which the public utility transmission providers, acting through their regional transmission planning process, jointly evaluate the proposed transmission project.").

[261] Peskoe, *supra* note 149, at 40.

[262] *See* Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, 76 Fed. Reg. 49,842, 49,907 (Aug. 11, 2011) (codified at 18 C.F.R. pt. 35) (noting that the order's requirements "obligate public utility transmission providers to identify and jointly evaluate interregional transmission facilities that may more efficiently or cost-effectively address the individual needs identified in their respective local and regional transmission planning processes").

[263] Pfeifenberger, *supra* note 239, at 37-39 (describing barriers to transmission planning created by "divergent criteria").

These methodological differences are partly responsible for situations in which renewable energy is stranded in a region. For example, wind capacity in SPP is often greater than load, and a significant amount of additional wind is currently sitting in SPP's interconnection queue. [264]However, transmission operators in SPP refuse to build--and pay for--transmission that will be used to export energy to other regions. [265]To fully take advantage of this energy, the RTOs need to coordinate with each other to develop transmission. To do so, however, they must figure out a way to allocate the costs of building transmission so that regions that benefit from transmission pay. Modeling disputes have made it difficult for RTOs to accomplish this. [266]

The RTOs are aware of the need for better coordination, yet they remain unable to reconcile these modeling differences. For example, in 2020, MISO and SPP agreed to jointly evaluate transmission upgrades, in recognition that congestion between the north and south of the two regions was leading to higher energy prices. [267]They failed, however, to move forward on any projects. The RTOs explained that, "[d]ue to differing methodologies between MISO and SPP when calculating benefits and project costs, the two RTOs decided not to pursue any projects in this area as part of the 2020 [Integrated Transmission Plan]." [268]

c. Calculating the benefits of transmission

A third problem is that RTOs "calculate the benefits of transmission narrowly and often consider distinct needs in separate processes. Regional **[*1033]** planning typically begins by running a model to determine whether the region has violated any NERC reliability requirements." [269]The RTOs apply NERC transmission system planning performance requirements. Under these requirements, transmission planners must evaluate the region's long-term reliability issues. [270]RTOs often compartmentalize--or silo--a region's reliability needs from the region's economic and policy needs. [271]In doing so, RTOs consider future scenarios that are supposed to analyze how electric demand and the mix of resources could change going forward.

Although reliability projects are usually selected based on cost, [272]economic and policy projects are selected based on the benefit-to-cost ratio. [273]"Those projects that create the most sizable benefits compared to their costs are

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[264] *See GI Active Requests*, SW. POWER POOL, https://perma.cc/YZB9-4ZQQ (last updated Mar. 31, 2022) (showing projects in SPP's interconnection queue to be dominated by wind).

[265] JULIE LIEBERMAN, CONCENTRIC ENERGY ADVISORS, HOW TRANSMISSION PLANNING & COST ALLOCATION PROCESSES ARE INHIBITING WIND & SOLAR DEVELOPMENT IN SPP, MISO, & PJM 6 (2021), https://perma.cc/N9AC-L8PL.

[266] SW. POWER POOL ENG'G, *supra* note 240, at 3, 79-80.

[267] *Id. at 79-80*.

[268] *Id. at 80*.

[269] Pub. Int. Orgs., Comment Letter on Building for the Future Through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection 119 (Oct. 12, 2021) [hereinafter Public Interest Comment Letter], https://perma.cc/6RM4-VMWK; *see infra* Part V.

[270] STAFF OF THE FERC, REPORT ON BARRIERS AND OPPORTUNITIES FOR HIGH VOLTAGE TRANSMISSION 25 (2020), https://perma.cc/JH55-6U23.

[271] Pfeifenberger, *supra* note 239, at 37-39; *see also* *id. at 39* (describing how interregional planning compartmentalizes the benefits of new transmission).

[272] *See* *id. at 7-11*.

chosen, and regulators often require a benefit-to-cost ratio of 1.25--meaning that the benefits of a new transmission line should be 25% greater than the costs of building it." [274]

But many RTOs narrowly calculate the benefits of transmission. Most RTOs calculate the benefits using a metric called the adjusted production cost (APC). [275]APC "compares the costs of operating a generation fleet with and without the proposed transmission upgrade." [276]APC further "allows the RTO to identify the monetary savings of operating under normal conditions." [277]Doing so, however, excludes substantial reliability and climate benefits. A resource mix that is geographically diffuse and diversified can (1) improve resilience against extreme weather events; (2) allow grid operators to better respond to transmission outages; and (3) support integration of renewable **[*1034]** energy which provides climate benefits. "These are all quantifiable benefits, but in many cases, RTOs do not count them when calculating the benefits of proposed transmission upgrades." [278]

Again, the siloed approach to energy regulation makes it difficult to build the type of transmission needed to allow renewables to support grid reliability. Here, RTOs' refusal to consider the benefits of such resources causes grid operators to develop transmission plans that do not accommodate an interregional, reliable macrogrid. [279]

d. Utility exit and cost allocation

Finally, the ability of utilities to exit RTOs discourages RTOs from imposing costs that the utilities do not want to bear. [280]This became apparent in the immediate aftermath of Order No. 1000, when MISO tried to adopt a series of ambitious transmission upgrades. [281]Consumers in the eastern part of MISO were expected to experience substantial benefits from these new lines. [282]As a result, MISO planned to impose some of the costs on Duke Power and FirstEnergy. [283]

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[273] *See* Johannes Pfeifenberger, Brattle Grp., Improving Transmission Planning: Benefits, Risks, and Cost Allocation 38 (2019), https://perma.cc/A3CG-YKEE. To calculate the benefit-to-cost ratio, RTOs quantify the expected benefits of a proposed project and compare those benefits to the costs of building the transmission line.

[274] Public Interest Comment Letter, *supra* note 269, at 119; *see* Pfeifenberger, *supra* note 273, at 47.

[275] *See, e.g.*, Midcontinent Indep. Sys. Operator, MISO Adjusted Production Cost Calculator White Paper (2021), https://perma.cc/8U5D-6ZSV.

[276] Public Interest Comment Letter, *supra* note 269, at 120; *see* Midcontinent Indep. Sys. Operator, *supra* note 275.

[277] Public Interest Comment Letter, *supra* note 269, at 120.

[278] Public Interest Comment Letter, *supra* note 269, at 120; *see* GRAMLICH & CASPARY, *supra* note 222, at 8-9.

[279] For one heartening counterexample, see the text accompanying notes 415-17 below.

[280] As noted in Part I above, RTOs are *voluntary* regional organizations. Part VI below discusses the possibility of making RTO membership mandatory.

[281] *See Midwest Indep. Transmission Sys. Operator, Inc., 135 FERC P 61,204, at 3-4 (May 31, 2011)*.

[282] MISO allocated costs of new transmission across the entire service territory in part based on the benefits of the new line. *See MISO Transmission Owners v. FERC, 860 F.3d 837, 841 (6th Cir. 2017)* ("[T]he [MISO] Tariff allocates twenty percent of the total 'Project Cost' 'on a system-wide basis to all Transmission Customers and recovered through a system-wide rate.' . . . It allocates the remaining eighty percent of the costs to designated pricing zones and sub-regions, with utilities in those zones paying annual charges calculated under a formula set forth in the Tariff.").

[283] *See id*.

But before those costs could be allocated to Duke and FirstEnergy, the two utilities decided to leave MISO and join PJM. [284] In doing so, they were able to escape the requirement that they pay for many of the transmission upgrades MISO had proposed. [285]

Utilities have all sorts of reasons to oppose new transmission lines. In some cases, utilities may be concerned that a more integrated grid will create **[*1035]** economic challenges for their generation assets as cheaper or cleaner options are now able to compete with their extant generation facilities. [286] In other situations, the utility may want to build transmission itself and not pay a utility located in a different service territory. [287] Utilities' decisions to embrace local projects likely reflect an attempt by those utilities to ensure that they--not a utility located in another part of the RTO--build the transmission infrastructure that supports reliability in that utility's service territory.

Regardless of Duke and FirstEnergy's motivations, the threat of exit makes it difficult for RTOs to impose costs on utilities that do not want to pay for the transmission upgrade or to pursue transmission projects that their IOU members don't want because they facilitate competition against them.

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Virtually no interregional projects have been constructed in the decade since Order No. 1000 went into effect. A more ambitious transformation of transmission planning and financing will be necessary to achieve the macrogrid necessary for a cleaner, more reliable energy system. And in this case, the state, regional, and federal silos must actually be broken down, not accommodated. A national grid requires a federalized planning process that includes local and state stakeholders but does not allow them full veto authority.

3. Toward national planning and cost allocation

FERC, RTOs, and states must make further reforms to realize Order No. 1000's laudable goals of interregional transmission planning and cost allocation. While Order No. 1000 did not lead to regional transmission planning marked by competitive solicitations, FERC should continue to pursue those goals. [288] Transmission planning and cost allocation should be national and mandatory. Utilities should not be able to avoid regional and interregional planning by relying on the local process. Nor should they be able to escape cost allocation by leaving RTOs to avoid costs they do not want to **[*1036]** bear. There are a variety of ways to accomplish these goals of breaking down jurisdictional and parochial silos in transmission policy, all of which would appear to be well within FERC's jurisdictional authority, thus requiring little congressional action.

Since 2011, courts have routinely upheld transmission planning that adopts a broad understanding of the benefits of transmission and FERC's authority to promote it. The most important in the line of FERC transmission cases is *South Carolina Public Service Administration v. FERC*, in which the U.S. Court of Appeals for the D.C. Circuit in 2014 broadly upheld the Commission's authority in Order No. 1000 to regulate transmission planning and mandate

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284 *See* MISO Transmission Owners, 860 F.3d at 841. This may not have been the only reason for their departure. *See* Rich Heidorn Jr., *MISO Defectors Deny Moves to PJM Are Evidence of Barriers*, RTO INSIDER (July 2, 2013), https://perma.cc/6NJ7-UK6E (to locate, select "View the live page").

285 *See* MISO Transmission Owners, 860 F.3d at 841.

286 Inquiry Concerning the Commission's Merger Policy Under the Federal Power Act; Policy Statement, 61 Fed. Reg. 68,595, 68,610 (Dec. 30, 1996) (codified at 18 C.F.R. pt. 2) ("Limitations on available transmission capability that prevent competitors from participating in a market can give substantial market power to incumbents in the market."); New York v. FERC, 535 U.S. 1, 8-9 (2002) ("The utilities' control of transmission facilities gives them the power either to refuse to deliver energy produced by competitors or to deliver competitors' power on terms and conditions less favorable than those they apply to their own transmissions.").

287 *See* Peskoe, *supra* note 149, at 29-34.

288 In our view, though, regional planning and cost allocation should be prioritized over competition.

beneficiary pays cost allocation. [289]Also significant are two Seventh Circuit cases on cost allocation, both called *Illinois Commerce Commission v. FERC* (*ICC II* and *ICC III*, respectively). [290]In *ICC II*, the court upheld MISO's approach to cost allocation. [291]Judge Posner wrote that FERC and the RTOs did not have to precisely quantify all of the benefits and costs of transmission; they just had to make a good faith effort to allocate the costs based on the benefits created by transmission. [292]In *ICC III*, Judge Posner invalidated a PJM transmission plan on the ground that PJM ignored evidence that the east would benefit disproportionately. [293]Read together, these two cases suggest that courts will defer to RTO and FERC determinations of how to allocate costs but will overturn transmission plans that ignore evidence about the costs and benefits of a transmission plan.

These decisions plausibly suggest that FERC and the RTOs are now legally compelled to reform transmission planning and cost allocation to better reflect transmission's scale economies. There is immense evidence that national transmission corridors would improve reliability and reduce electricity costs. [294]Under the logic of these decisions, a just and reasonable transmission-planning process would require that FERC and RTOs develop transmission plans that consider those benefits.

Perhaps the most direct route to developing the necessary macrogrid would be for FERC to create a national transmission-planning authority that **[*1037]** coordinates transmission and allocates the costs of building it. [295]It is unclear, however, whether FERC has jurisdiction to do this. Under the FPA, only utilities can file tariffs with FERC, [296]and transmission utilities are defined as firms that own or operate transmission infrastructure. [297]If utilities do not voluntarily give filing rights to the national planning authority, it is possible that the planning authority would not be able to allocate the costs of new transmission to developers.

This legal interpretation is far from certain. It is also possible that, simply by virtue of participating in one of the interconnections, utilities have engaged in the type of coordination needed to satisfy the FPA's definition of "public utility." [298]If that is the case, then the planning authority would have filing rights. Alternatively, FERC may be able to

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289 *762 F.3d 41, 48-49 (D.C. Cir. 2014)*.

290 Ill. Com. Comm'n v. FERC (*ICC II), 721 F.3d 764 (7th Cir. 2013)*; Ill. Com. Comm'n v. FERC (*ICC III), 756 F.3d 556 (7th Cir. 2014)*.

291 *ICC II, 721 F.3d at 780*.

292 *See id. at 775* (quoting Ill. Com. Comm'n v. FERC (*ICC I), 576 F.3d 470, 477 (7th Cir. 2009))*.

293 *See ICC III, 756 F.3d at 564-65*.

294 Patrick R. Brown & Audun Botterud, *The Value of Inter-regional Coordination and Transmission in Decarbonizing the US Electricity System*, 5 JOULE 115, 130 (2021); LARSON ET AL., *supra* note 46, at 103, 108.

295 *See* BOB ZAVADIL & ALISON SILVERSTEIN, BLUEPRINT FOR A NATIONAL ELECTRIC TRANSMISSION AUTHORITY 1-2 (2021), *https://perma.cc/AFV8-YZVG*.

296 *16 U.S.C. § 824d*. Tariffs are "compilation[s] of all effective rate schedules of a particular company or utility." *Glossary*, FERC, *https://perma.cc/LC7B-FW39* (archived Apr. 4, 2022).

297 *16 U.S.C. § 824(e)*.

298 There is considerable uncertainty about when a firm "operates" a transmission facility such that it receives filing rights under the FPA. *See* FPA, ch. 687, sec. 213, § 201(e), *49 Stat. 803*, 848 (1935) (codified as amended at *16 U.S.C. § 824*). The D.C. Circuit has clarified that FERC can exercise its section 205 authority to order RTOs that have filing rights to participate in regional planning. *See S.C. Pub. Serv. Auth. v. FERC, 762 F.3d 41, 55 (D.C. Cir. 2014)*. FERC cannot, however, order utilities to give up their filing rights. *See Atl. City Elec. Co. v. FERC, 295 F.3d 1, 9-11 (D.C. Cir. 2002)*. To our knowledge, no court has clarified what, precisely, constitutes the operation of a transmission facility. *See* FPA sec. 213, § 201(e), 49 Stat. at 848; *cf. Atl.*

force all utilities to join RTOs and mandate robust interregional planning. [299]But because FERC's jurisdiction here is speculative, pursuing this route could lead to a protracted legal fight that would itself delay transmission developments.

Alternatively, FERC could work with the RTOs to make sure that they engage in multiregional transmission planning and cost allocation. To do this, we recommend that FERC create a national transmission-planning authority to develop transmission plans. This authority would not need to have filing rights. FERC could therefore develop this planning authority internally or do it through RTOs or NERC. If it relies on RTOs, the Commission should require that the planning authority be independent, as it did in Order **[*1038]** No. 2000. [300]The studies the planning authority conducts would provide a baseline from which to assess the plans submitted by the RTOs.

In addition to the planning authority, FERC should require robust interregional and multiregional planning. Specifically, the Commission should prohibit local exemptions that have undermined regional and interregional planning and mandate that RTOs begin with the multiregional plan. Because FERC and RTOs are required to consider the full costs and benefits of their transmission plan under *ICC II* and *ICC III*, FERC has legal authority to declare the current approach to be unjust and unreasonable on the ground that they fail to consider the full benefits of transmission.

The formation of new interregional planning boards is one way to accomplish this goal. [301]These boards would not have authority to make section 205 filings to FERC, but they would not have to since the RTOs would file the plans the boards developed. Of course, RTOs could try to file alternative plans, but given the massive benefits of multiregional transmission developments, any RTO plan that did not consider those benefits would be unjust and unreasonable--and thus would be rejected by FERC. Thus, while this approach would go through the RTOs (and the RTOs would retain filing rights), it would result in much more interregional and multiregional transmission planning.

This approach would resolve the problems that currently plague transmission planning and cost allocation. A multiregional process would not have inconsistent modeling assumptions, since FERC would require that participants agree on the same methodologies. Moreover, utilities would be unable to escape cost allocation by exiting an RTO, since all of the RTOs would be subject to the planning process. Finally, it is worth mentioning that FERC should require that the plans developed by RTOs and planning boards account for the full benefits of transmission and consider whether a transmission plan will support state policy goals. This way, FERC could avoid completely restructuring today's siloed transmission-planning process while making sure that these silos do not undermine grid reliability or impede the transition to a low-carbon economy.

C. Transmission Siting

To build the interconnected, national macrogrid that will be required to enhance reliability everywhere--not just in pockets of the country--and to **[*1039]** support a decarbonized grid, policy reforms in transmission planning and financing will not be enough. The states, which exercise exclusive jurisdiction over the siting of intrastate and interstate transmission lines, have been one of the primarily obstacles to a clean, reliable grid. As with planning, enhanced federal authority in this policy area will be required. The literature has extensively analyzed the issue of

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City Elec. Co., 295 F.3d at 9-11 (concluding that section 205 bars FERC from ordering utilities to give up their filing rights without addressing the threshold question of whether FERC has jurisdiction under section 201(e)).

[299] *See infra* Part VI.

[300] For additional discussion on governance, see Part VI below. *See also* Regional Transmission Organizations, 65 Fed. Reg. 810, 810 (Jan. 6, 2000) (codified at 18 C.F.R. pt. 35) (listing independence as a required RTO characteristic).

[301] *See* GRAMLICH & CASPARY, *supra* note 222, at 14 (suggesting such boards); LIEBERMAN, *supra* note 265, at 8.

siloed transmission-siting authority and potential solutions to it. [302]Here, we build from this foundation to briefly explore a variety of options for supporting a clean, reliable grid through existing or enhanced federal authority.

1. Working within existing law to site interstate lines

As explained in Part I above, FERC has jurisdiction over the transmission of electricity in interstate commerce and the wholesale sale of electricity in interstate commerce. Unlike with interstate natural gas pipelines, there is (with limited exceptions) no general federal authority over interstate electric transmission lines. Thus, electric utilities and other actors who wish to build transmission lines, including interstate lines spanning several states, must obtain a siting certificate from each state's PUC and navigate the vagaries of divergent state laws--many of which actively impede reliability and clean-energy goals. [303]

In the mid-2000s, Congress attempted to shift some regulatory authority over the approval of interstate electric transmission lines from the states to the federal government to address these concerns, but it was largely unsuccessful. [304]EPAct 2005 created an enhanced role for DOE and FERC in transmission line siting to provide a more national scope of review for transmission lines needed for grid reliability. [305]First, under section 1221 of EPAct 2005, Congress granted DOE authority to designate national interest electric transmission corridors (NIETCs) for regions of the country with documented transmission congestion. [306]It then authorized FERC to use "backstop siting authority" to approve the siting of transmission lines in **[*1040]** NIETCs, and grant transmission companies the power of eminent domain to build them, if states failed to approve those lines. [307]

Not surprisingly, this transfer of regulatory authority from the states to the federal government was strongly opposed by states. In the Ninth Circuit, states quickly and successfully challenged DOE's first efforts to designate NIETCs. [308]States also obtained a Fourth Circuit victory invalidating FERC's rulemaking regarding standards for approving transmission lines in an NIETC. [309]

In 2021, Congress passed the Infrastructure Investment and Jobs Act, [310]which overturned the Fourth Circuit's decision by expressly granting FERC backstop siting authority for transmission lines in NIETCs even in cases where a state had denied a permit. Notably, even prior to that legislation, experts had argued that DOE and FERC could try to employ this authority again elsewhere, given the procedural postures and somewhat narrow application of these holdings. [311]We are skeptical, however, of the viability of using section 1221 to build new long-distance

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[302] *See infra* Part IV.C.2.

[303] *See* U.S. DEP'T OF ENERGY, SUMMARY OF FINDINGS IN RE APPLICATION OF CLEAN ENERGY PARTNERS LLC PURSUANT TO SECTION 1222 OF THE ENERGY POLICY ACT OF 2005, at 5-6 (2016), https://perma.cc/V7SL-NKZU (describing an example of state impediments to merchant transmission); Klass, *supra* note 137, at 1144-47 (describing state-based barriers to interstate transmission); Klass & Rossi, *supra* note 29, at 424-25 (same); ARK. CODE ANN. § 23-3-205 (2021) (expressly prohibiting merchant transmission lines from obtaining a certificate of public convenience and necessity to foreclose efforts by the Plains & Eastern Clean Line project to obtain one).

[304] Klass & Rossi, *supra* note 29, at 452-55.

[305] *Id*.

[306] *Id*. (quoting 16 U.S.C. § 824p(a)).

[307] *Id*.

[308] *Cal. Wilderness Coal. v. U.S. Dep't of Energy, 631 F.3d 1072, 1079 (9th Cir. 2011)*.

[309] *Piedmont Env't Council v. FERC, 558 F.3d 305, 310 (4th Cir. 2009)*.

[310] Infrastructure Investment and Jobs Act, ***Pub. L. No. 117-58***, ***135 Stat. 429*** (2021) (to be codified in scattered sections of the U.S. Code).

lines, even with the new Congressional authorization to override state permit denials in NIETCs. Apart from the federalism concerns associated with taking such actions, with FERC only acting as a "backstop" siting authority, the process is a clunky one at best. [312]

Another provision of EPAct 2005--section 1222--provides an alternative method for the federal government to facilitate electric-grid expansion, but in a proprietary rather than a regulatory capacity. That section provides new authority to two federal power-marketing authorities to "design, develop, construct, operate, maintain, or own . . . an electric power transmission facility and related facilities . . . needed to upgrade existing transmission facilities" either in partnership with a private transmission line company or **[*1041]** independently. [313]As federal actors, these entities need not obtain state siting permits nor rely on state eminent domain authority.

During the Obama Administration, DOE developed regulations to operationalize section 1222 and ultimately granted an application from Clean Line Energy Partners to build the Plains and Eastern Clean Line project to support wind energy. Arkansas had previously denied this line. [314]During the Trump Administration, DOE withdrew from the partnership and the project was sold to NextEra. [315]Nevertheless, authority under section 1222 still exists, and could be used by DOE for projects in the future. [316]

A renewed focus on section 1222 and the federal power-marketing administrations appears more promising than enhancing backstop siting authority under section 1221, for several reasons. First, DOE has already gone through that process once with the Plains and Eastern Clean Line. [317]Second, because it is a public-private partnership, the state law barriers are political, but not legal. Any line built pursuant to section 1222 does not need any state siting permits. [318]Third, even though the power-marketing authorities authorized to use section 1222 do not cover the entire United States, they cover most of the areas in the western and central United States with access to the strongest onshore wind and solar resources, and thus are in areas of the country where long distance, multi-state

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[311] *See* AVI ZEVIN, SAM WALSH, JUSTIN GUNDLACH & ISABEL CAREY, BUILDING A NEW GRID WITHOUT NEW LEGISLATION: A PATH TO REVITALIZING FEDERAL TRANSMISSION AUTHORITIES 37-46 (2020) (recommending a pathway forward under section 1221 authority).

[312] *See, e.g.*, Benjamin Storrow, *Power Lines are Infrastructure Bill's Big Climate Win*, E&E NEWS: CLIMATEWIRE (Nov. 9, 2021, 6:31 AM EST), *https://perma.cc/YSW8-5DQ5* (discussing provisions of the infrastructure law that overturned Fourth Circuit decision but cautioning that barriers to new transmission remain); John Decker & Andrew DeVore, *President Biden Signs the Bipartisan Infrastructure Bill into Law, Certain to Fuel Long Standing Debates at FERC*, VINSON & ELKINS: ENERGY UPDATE (Nov. 16, 2021), *https://perma.cc/686J-UQNQ* (discussing FERC's new legislative authority over transmission and the implementation difficulties FERC may encounter).

[313] 2 U.S.C. § 16421(a).

[314] *See supra* note 303 and accompanying text (citing and discussing Arkansas legislation).

[315] For a detailed discussion of the Plains & Eastern Clean Line and its demise, see RUSSELL GOLD, SUPERPOWER 127-42 (2019); and Ros Davidson, *Ambitious Clean Line Energy "Wrapping Up*, *"* WINDPOWER MONTHLY (Feb. 1, 2019), *https://perma.cc/MFJ7-NYUU*.

[316] *See* ZEVIN ET AL., *supra* note 311, at 47-50 (recommending a streamlined section 1222 process for public-private partnerships and more resources for federal power-marketing administrations to pursue transmission investments).

[317] *Id. at 46-49*.

[318] *Id*. (citing Downwind LLC v. U.S. Dep't of Energy, No. 16-cv-00207, *2017 WL 6542747, at *2-3 (E.D. Ark. Dec. 21, 2017)*, *vacated as moot*, No. 18-1399, 2018 WL 3648283 (8th Cir. Apr. 18, 2018)).

HVDC and AC lines are most feasible. [319]By contrast, the integration of more renewable energy into the regional grids further east may soon hinge on offshore wind resources, which do not require multistate transmission lines.

Finally, DOE has indicated that it intends to play an enhanced role in supporting the construction of new, regional transmission lines both through **[*1042]** its prior authority under EPAct 2005 and its new authority and funding under the Infrastructure Investment and Jobs Act. As part of its Building a Better Grid initiative announced in early 2022, the DOE expressed its intent to spend approximately $ 20 billion in new funding for transmission through grants, financing, and direct expenditures for new transmission to expand renewable energy integration across the country; engage in enhanced coordination with states, tribes, local governments, utilities, and RTOs to facilitate the development of new transmission lines; support research and development for new transmission technologies; and create new NIETCs in areas of the country with transmission congestion. [320]Thus, even if FERC does not play a major role in direct permitting of interstate lines, the DOE has the opportunity to do so through its own authority and funding, and can partner with FERC, states, RTOs, and utilities in doing so. [321]

2. Permitting and eminent domain reforms that can build a reliable, decarbonized grid

A full build-out of the necessary macrogrid is also likely to require enhanced federal or regional permitting authority. Experts have long proposed siting and permitting reforms to address the mismatch between state authority over transmission line siting and the regional and national scope of the nation's electric grid. [322]Proposals include (1) Congress granting additional siting authority to FERC, as was done in the early part of the twentieth century for interstate natural gas pipelines [323]; (2) Congress granting greater authority to RTOs to approve transmission lines that focus on more regional permitting while matching existing regional grid planning [324]; and (3) Congress creating federal standards regarding process and timing for states to implement--similar to what Congress did through the Telecommunications Act of 1996 to ease local siting barriers for telecommunication towers. [325]

[*1043] We believe that all of these reforms would be a significant improvement over the status quo. They would realign transmission-line-siting authority with both transmission-planning reforms and the need for a national macrogrid to maintain grid reliability. Since many of these reforms require congressional action, we recommend that Congress and the Biden Administration seriously consider such proposals--going beyond what Congress enacted in the 2021 Infrastructure Investment and Jobs Act--despite the potential backlash from states. For reforms to be

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[319] ZEVIN ET AL., *supra* note 311, at 13, 24-25 (providing a map showing the strongest U.S. wind- and solar-energy resources and a map showing the footprint of power-marketing authorities subject to section 1222 of EPAct 2005); *Interconnection Seams Study*, NAT'L RENEWABLE ENERGY LAB'Y, *https://perma.cc/SN4V-AZ9H* (archived Apr. 5, 2022) (to locate, select "View the live page") (showing a map of regions of the United States with the strongest wind and solar resources).

[320] *See Fact Sheet: Biden-Harris Administration Races to Deploy Clean Energy That Creates Jobs and Lowers Costs*, WHITE HOUSE (Jan. 12, 2022), *https://perma.cc/DHM3-6UG2*; Peter Behr & Miranda Willson, *Details Emerge About DOE, FERC Grid Plans for Clean Energy*, E&E NEWS: ENERGYWIRE (Jan. 13, 2022, 7:22 AM EST), *https://perma.cc/DN59-XTF9* (to locate, select "View the live page").

[321] *See, e.g.*, Behr & Willson, *supra* note 320 (considering this potential outcome and discussing state opposition to federal agency encroachment on state siting authority).

[322] Joshua C. Macey, *Zombie Energy Laws*, *73 VAND. L. REV. 1077, 1122-25 (2020)*; Alexandra B. Klass & Elizabeth J. Wilson, *Interstate Transmission Challenges for Renewable Energy: A Federalism Mismatch*, *65 VAND. L. REV. 1801, 1858-69 (2012)*.

[323] *See* Klass & Wilson, *supra* note 322, at 1858-65; Klass, *supra* note 224, at 540-42.

[324] *See, e.g.*, Alexandra B. Klass, *The Electric Grid at a Crossroads: A Regional Approach to Siting Transmission Lines*, *48 U.C. DAVIS L. REV. 1895, 1948-51 (2015)*.

[325] *See id*. at 1951-52 (discussing federal siting provisions in the Telecommunications Act of 1996).

feasible, the federal government will have to reach across the current silos and work with the willing states while developing strategies to overcome other states' intransigence.

FERC has indicated an interest in doing just that. In June 2021, it announced a joint federal-state task force on electric transmission. [326]We are hopeful that this will realize the Commission's goal of "secur[ing] the benefits that transmission can provide . . . in the public interest." [327]Given states' historical reluctance to build transmission, however, we are also skeptical that it will achieve the necessary large-scale reform.

For this reason, we continue to support shifting some siting authority from the states to either RTOs or FERC along the lines described above. Commissioner Christie recently pointed out that there has been "an increasing divergence of public policies in states that are members of multi-state RTOs/ISOs, over such fundamental issues as mandated resource mixes, compensation in capacity markets, transmission-planning criteria and cost allocation, and carbon taxes." [328]States that control siting decisions are able to effectively veto the type of large-scale transmission projects needed to connect renewables to large load areas. This is one area where siloing is fatal to a clean and reliable power grid, and where some centralization of the permitting process is needed to break the states' authority to veto developments that are critical to grid reliability.

V. Reliability Regulation: NERC Reforms

A final key area of U.S. energy policy and governance that requires transformation is, predictably, the direct regulation of reliability--a serious **[*1044]** task shouldered by NERC (the North American Electric Reliability Corporation). [329]

The reliability of the electric grid centrally depends on a complex set of policies pertaining to markets for energy capacity and generation, as well as transmission planning, financing, and construction, as explored above. Another central piece of the reliability puzzle is the direct regulation of the reliability of all the grid components introduced above and more. NERC writes and administers standards with extensive assistance from regional subsets of NERC called regional entities, and with oversight from FERC. [330]Owners and operators of power plants, transmission lines, transformers, and other grid components, which collectively form the "bulk electric system," are required by reliability regulations to comply with these standards.

Reliability regulations, which are called "reliability standards," cover most facets of the grid. They address everything from properly training workers who install and maintain bulk electric system components to requiring tree trimming around transmission lines to ensuring adequate capacity. [331]Indeed, the approaches to securing capacity that we discussed in Part III above--capacity markets, minimum capacity thresholds, and price-based systems such as those in Texas--are partially designed to meet federal reliability standards for capacity. [332]

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[326] *See* *Joint Fed.-State Task Force on Elec. Transmission, 175 FERC P 61,224, at 1 (June 17, 2021)*.

[327] *Id. at 1-2*.

[328] *State Voluntary Agreements to Plan and Pay for Transmission Facilities, 175 FERC P 61,225, at 2-3 (June 17, 2021)* (Christie, Comm'r, concurring).

[329] *See About NERC, supra* note 26 (explaining that "NERC is the [ERO] for North America").

[330] *16 U.S.C. § 824o(a)*, (d).

[331] *See United States Mandatory Standards Subject to Enforcement*, N. AM. ELEC. RELIABILITY CORP., *https://perma.cc/RH65-6DWR* (archived Apr. 5, 2022).

[332] NERC itself does not prescribe minimum generation capacity that must be maintained by grid operators. However, NERC publishes criteria that must be included in capacity planning and regularly compares capacity (planning reserves) with NERC's ideal levels of reserves. NERC's regular assessments of planning-reserve margins, which analyze the adequacy of capacity, aim

In covering nearly all grid components and operations, reliability standards implicate the three sets of silos introduced above. First, they centrally affect both the reliability and the amount of clean energy installed on **[*1045]** the grid. For example, NERC's requirement that grid operators plan for and report adequate generation capacity--an assurance that there will be enough operable generation infrastructure to meet all demand--aims to limit a major electrical outage to only one day every ten years. [333]This standard requires the entity responsible for regulating capacity--an RTO or balancing authority--to model the adequacy of capacity and to describe the model's assumptions regarding intermittent generation resources, such as wind. [334]Capacity models that overestimate the risk that renewable energy capacity poses to reliability undervalue this capacity and could discourage its construction. And as explored here, current reliability standards do not adequately account for the reliability attributes of sources that can operate on clean energy, such as microgrids.

Second, reliability standards cross jurisdictional silos because of their universal nature. For example, utilities must obtain permission from a state regulatory commission or municipal officials to recover the costs of complying with a variety of NERC mandates. [335]Reliability standards also apply at the regional level and affect regional decisionmaking. RTOs regularly request permission to recover costs associated with NERC compliance through the rates for transmission line service charged by RTOs. [336]At the federal level, FERC reviews all NERC reliability standards and the enforcement of those standards. FERC and NERC sometimes work together to address the cause of reliability problems and to draft new standards in response.

[*1046] Reliability standards also centrally involve public and private silos. NERC itself is a 501(c)(6) nonprofit corporation, and the regional entities that propose reliability standards to NERC and enforce these standards are 501(c)(3) organizations. Indeed, the regulation of the reliability of the U.S. grid was entirely in private hands until 2005. As noted in Part I above, from the 1960s through 2005, the North American Electric Reliability Council--NERC's predecessor, which was an association of electric utilities--was solely responsible for assuring grid reliability through privately administered standards. [337]NERC, with input from its regional entities, now writes

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to influence grid-operator decisions and policymakers who control generators and grid operators. *See* N. AM. ELEC. RELIABILITY CORP., 2020 LONG-TERM RELIABILITY ASSESSMENT 8 (2020) [hereinafter 2020 LONG-TERM RELIABILITY ASSESSMENT], *https://perma.cc/3MXQ-K3VU* (assessing the adequacy of capacity in all regions governed by NERC and noting that "[w]hile NERC does not have authority to set Reliability Standards for resource adequacy . . . NERC independently evaluates where reliability issues may arise"); N. Am. Elec. Reliability Corp., Standard BAL-502-RF-03, at 1 (n.d.) [hereinafter Standard BAL-502-RF-03], *https://perma.cc/UJL6-LKMZ* (requiring regulated NERC entities to conduct annual resource-adequacy analyses with specific requirements, including a planning-reserve margin, to address NERC's reliability standard, but not setting a specific numerical requirement for resource adequacy or planning-reserve margin).

[333] Standard BAL-502-RF-03, *supra* note 332, at 1 (describing the required resource-adequacy analysis for the " 'one day in ten year' loss of load expectation principles" (capitalization altered)).

[334] *Id. at 1-2*.

[335] *See* PAUL W. PARFOMAK, CONG. RSCH. SERV., R45135, NERC STANDARDS FOR BULK POWER PHYSICAL SECURITY: IS THE GRID MORE SECURE? 18 (2018) (discussing "state public utility commissions which regulate the rates grid owners may charge for electric transmission and distribution service" and noting that these commissions "must be convinced that any new grid security capital costs and expenses are necessary and prudent before they will allow them to be passedthrough to ratepayers"); *id. at 13* (noting that for changes in utility capital and operational spending, including spending on efforts to comply with NERC requirements, "[p]ublicly owned utilities may need approval from cooperative boards, or municipal or federal officials").

[336] *See, e.g.*, *Midwest Indep. Transmission Sys. Operator, Inc., 135 FERC P 61,118, at 1-2 (May 6, 2011)* (approving MISO's recovery of NERC compliance penalties through rates); Letter from Monica Gonzalez, Couns., ISO New England, Inc., to Kimberly D. Bose, Sec'y, FERC (Jan. 6, 2020), *https://perma.cc/7CB9-UJT7* (including a filing that requests cost recovery for compliance with NERC standards); *cf*. Rules Concerning Certification of the Electric Reliability Organization; and Procedures for the Establishment, Approval, and Enforcement of Electric Reliability Standards, *71 Fed. Reg. 8662, 8686* (Feb. 17, 2006) (codified at 18 C.F.R. pt. 39) (noting that FERC "will allow recovery of all costs prudently incurred to comply with the Reliability Standards").

reliability standards for approval by FERC and, with the help of regional entities, enforces these standards--also with FERC approval. Regional entities, in turn, write and enforce *regional* reliability standards that only apply within their territories. [338]

The clean energy-reliability, jurisdictional, and public-private silos present both challenges and opportunities for regulating the reliability of the U.S. grid while expanding clean-energy generation. Specifically, the silos impede or enhance two specific challenges of reliability regulation. First, as highlighted by the events in the U.S. South in 2021, all types of power plants, both conventional and clean, and their fuel supplies, require better reliability standards that address weather extremes and other emergencies, many of which are at least partially caused by climate change. Second, in improving reliability standards, NERC and FERC must better recognize and leverage the value that clean-energy resources can offer in terms of enhancing reliability. Siloed reliability regulation makes these two efforts challenging, but it can also pose opportunities for incorporating clean-energy resources solidly within clean-energy standards. This Part uses Winter Storm Uri and historical approaches to regulating reliability for extreme cold-weather events to illustrate the broader challenges associated with updating reliability regulations and incorporating clean energy into these standards. It explores the weaknesses of some modern reliability regulations and then analyzes the challenges and opportunities posed by silos when it comes to updating these regulations to address modern extremes and clean-energy values.

[*1047] A. Weaknesses of Current Reliability Regulation: The Case of Cold Weather

The U.S. electricity grid faces a growing number of threats. [339]One such threat, which regulators have repeatedly studied yet failed to fully address, is the loss of generation capacity from extreme weather, such as extreme cold. [340]This does not always result in the loss of power to customers. Grid operators often manage to cobble together adequate backup reserves--particularly when they can draw from generation capacity in regions that are not experiencing the extreme weather. But Winter Storm Uri in 2021 involved major capacity losses and outages in Texas and neighboring states.

The winter events of 2021 that caused these outages were not entirely an anomaly. Indeed, similar cold-weather events in 2018, 2014, 2011, and earlier years had caused NERC, FERC, RTOs, and regional entities to investigate the events and associated outages and propose changes. In 2011, following "unusually cold and windy weather" and associated outages in the Southwest, NERC, FERC, and the regional entities affected by the cold--including the Texas Reliability Entity--analyzed the causes of capacity outages during the cold snap. [341]In the individual states affected by the cold, utility regulatory commissions and legislatures also initiated investigations and inquiries. [342]

The joint NERC-FERC 2011 report examined past winter events and individual state responses to those events as well, examining similar "cold weather events in 1983, 1989, 2003, 2006, 2008, and 2010" in the Southwest,

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[337] NEVIUS, *supra* note 140, at 5-9, 85.

[338] *See, e.g., Standards*, RELIABILITYFIRST, https://perma.cc/7KF4-ZM6F (archived Apr. 5, 2022) ("ReliabilityFirst also maintains Regional Reliability Standards as needed to provide for the reliable regional and sub-regional planning and operation of the Bulk Power System.").

[339] *See, e.g.*, N. AM. ELEC. RELIABILITY CORP., 2021 ERO RELIABILITY RISK PRIORITIES REPORT 17, 22-34 (2021), https://perma.cc/KBY9-SG9M (identifying "grid transformation," "extreme events" such as wildfires, pandemics, flooding, and drought, "security risks," and "critical infrastructure dependencies" as the greatest reliability threats in 2021).

[340] *See* id. at 26-28.

[341] FERC & N. AM. ELEC. RELIABILITY CORP., REPORT ON OUTAGES AND CURTAILMENTS DURING THE SOUTHWEST COLD WEATHER EVENT OF FEBRUARY 1-5, 2011: CAUSES AND RECOMMENDATIONS 1-2 (2011).

[342] *Id. at 2*.

including two events that involved colder weather than that experienced in 2011. [343] After exploring the causes and consequences of power outages in 2011 and previous years, FERC and NERC identified needed changes, including, for example, (1) avoiding scheduled power-plant outages for maintenance and other reasons during projected cold-weather events; (2) designating natural gas facilities that supply power plants as "critical and essential loads" that should continue to receive electricity even during events causing shortages; and **[*1048]** (3) requiring "generators to perform winterization." [344] Regional entities and states did not consistently implement these recommendations, however, as evidenced by the fact that the same shortcomings were some of the primary causes of the extensive outages in Texas in 2021. [345]

Similarly, after extreme cold in the form of a "polar vortex" enveloped the "Midwest, South Central, and East Coast regions of North America" in 2014, regional entities such as ReliabilityFirst, with the assistance of the two RTOs in which it operates--MISO and PJM--investigated the causes of capacity losses and suggested "areas for improvement." [346] These suggestions included a recommendation that the entities subject to reliability standards, such as operators of power plants and transmission lines, "review their power plant weatherization programs." [347] NERC also conducted a "Polar Vortex Review" in 2014, recommending that power plants review their ability to maintain natural gas supply and transport through pipelines even in the face of cold weather and "[r]eview and update power plant weatherization programs." [348] Also in 2014, FERC--citing to the 2011 and 2014 cold-weather events--required all RTOs affected by the polar vortex to provide data on the causes of frozen equipment and "policy and procedural changes" to address RTOs' awareness of "generators' ability to run at extreme ambient temperatures," among other data. [349] Yet again in 2019, FERC and NERC issued a report on outages in the South Central United States after a 2018 cold-weather event, noting that **[*1049]** "[m]ore than one-third" of the generators that stopped generating electricity during the cold weather "did not have a winterization plan." [350]

In short, the panoply of actors responsible for writing and implementing reliability standards repeatedly identified the causes of power outages during extreme cold and proposed solutions. Yet many of these solutions--particularly mandatory winterization--were not consistently implemented. [351] And repeatedly, regional entities, FERC, and

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[343] *See id*. at 169-87.

[344] *See id*. at 195-96; *see also* *id. at 90-91* (defining critical-load customers as those that are "either exempt from rolling outages or are given a higher priority for preservation of service").

[345] UNIV. OF TEX. AT AUSTIN ENERGY INST., *supra* note 8, at 8-9 ("Some power generators were inadequately weatherized; they reported a level of winter preparedness that turned out to be inadequate to the actual conditions experienced."); *id. at 9* (noting that some critical power plants supplying natural gas infrastructure were not identified as critical load and had even been identified as the opposite--infrastructure that could be shut down during periods of peak demand); *see also* *FERC ET AL., supra note 13, at 17* ("Despite multiple prior recommendations by FERC and NERC, as well as annual reminders via Regional Entity workshops, that generating units take action to prepare for the winter (and providing detailed suggestions for winterization), 49 generating units in SPP (15 percent, 1,944 MW of nameplate capacity), 26 in ERCOT (7 percent, 3,675 MW), and three units in MISO South (four percent, 854 MW), still did not have any winterization plans.").

[346] RELIABILITYFIRST, RELIABILITYFIRST'S REVIEW OF WINTER PREPAREDNESS FOLLOWING THE POLAR VORTEX, at iii, 1 (2015), *https://perma.cc/3G4M-T8V6*.

[347] *Id. at 7*.

[348] N. AM. ELEC. RELIABILITY CORP., POLAR VORTEX REVIEW, at iii (2014), *https://perma.cc/WB55-KLNJ*.

[349] Letter from Michael Bardee, Dir., FERC Off. of Energy Reliability, to Ne. Power Coordinating Council, Inc. et al. 2-4 (Sept. 26, 2014), *https://perma.cc/3MWK-886B*.

[350] FERC & N. AM. ELEC. RELIABILITY CORP., THE SOUTH CENTRAL UNITED STATES COLD WEATHER BULK ELECTRIC SYSTEM EVENT OF JANUARY 17, 2018, at 10 (2019), *https://perma.cc/SP6V-U8GS*.

NERC only *recommended* solutions such as winterization of power plants, despite having the power to mandate winterization. [352]After the 2014 polar-vortex event, ReliabilityFirst emphasized that its recommendations "are not, and should in no way be construed as, directives to industry to undertake any actions." [353]Likewise, NERC recommended that entities "continue or *consider* implementing a program of periodic site reviews of generation facilities' winter preparation." [354]NERC did not formally consider mandatory weather-readiness standards until 2019, when it published proposed standards for comment. Following Winter Storm Uri in 2021, the NERC Board of Trustees voted to "direct the completion" of cold-weather reliability standards first proposed in 2019 by June 2021. [355]

Equally important, it appears that none of the many reports addressing the semi-regular occurrences of "unusually" cold weather in the South have assessed the substantial costs of continuing to rely on winterization of utility-scale power plants--and particularly fossil fuel-fired power plants--as compared to expanding microgrids. Nor have they compared these costs to the benefits and costs of expanding microgrids and other distributed (small-scale) resources such as home batteries paired with rooftop solar. [356]Indeed, one **[*1050]** report noted the expense of using a distributed solar-powered unit at a natural gas-well site to ensure continued production of natural gas for power plants even during cold weather--ignoring the value that such generation could provide elsewhere. [357]Distributed solar, batteries, and microgrids could provide substantial reliability benefits without locking in fossil fuel-fired infrastructure that will continue exacerbating the very climatic conditions that are contributing to weather extremes. [358]

Cold-weather events, of course, are not the only causes of reliability failures. In part due to climate change, other extreme events such as wildfires and droughts have also caused electricity outages. [359]But they provide an example of the challenges that reliability regulators have faced in ensuring that reliability standards keep pace with modern events. As catastrophes at least partially induced by climate change continue to wreak havoc on the grid, and as we move toward more clean-energy infrastructure, it is important to examine the challenges of updating reliability standards for both clean and conventional infrastructure. Given the expansion of clean energy and its

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[351] *See supra* note 345 and accompanying text.

[352] *See, e.g.*, FERC & N. AM. ELEC. RELIABILITY CORP., *supra* note 341, at 203-04; N. AM. ELEC. RELIABILITY CORP., *supra* note 348, at 19-20. NERC presumably has this authority (at least in its own view) because its staff, along with the staff of FERC and regional entities, have now recommended federal reliability standards that mandate winterization plans and actions. *See* *FERC ET AL., supra note 13, at 18*.

[353] RELIABILITYFIRST, *supra* note 346, at iii.

[354] N. AM. ELEC. RELIABILITY CORP., *supra* note 348, at 20 (emphasis added).

[355] *Project 2019-06 Cold Weather*, N. AM. ELEC. RELIABILITY CORP., *https://perma.cc/F9Z4-58ZR* (archived Apr. 6, 2022).

[356] N. AM. ELEC. RELIABILITY CORP., *supra* note 348, at 19-20 (recommending improved weatherization programs but not discussing distributed solar or microgrids); FERC & N. AM. ELEC. RELIABILITY CORP., *supra* note 341, app. at 34 (discussing the costs of weatherization but not comparing these with the costs of microgrids or distributed solar); FERC & N. AM. ELEC. RELIABILITY CORP., *supra* note 350, at 166-67 (recommending winterization but not assessing the value of microgrids or distributed solar).

[357] FERC & N. AM. ELEC. RELIABILITY CORP., *supra* note 341, app. at 36 (describing winterization expenses for a solar-powered pump under a gas well).

[358] *See, e.g.*, I. Waseem, M. Pipattanasomporn & S. Rahman, Reliability Benefits of Distributed Generation as a Backup Source 7 (2009) (unpublished manuscript), *https://perma.cc/L2JH-MQKA* (noting that when distributed generation resources are located on portions of the grid that can be disconnected from the larger grid, they "can supply the loads cut off from the substation" in the event of certain grid failures).

[359] *See* N. AM. ELEC. RELIABILITY CORP., *supra* note 339, at 27.

potential to enhance reliability, reliability regulators must better incorporate the reliability attributes of clean energy into standards rather than focusing so heavily on the risks. The three planes of siloed energy regulation can impede or enhance these efforts, as explored below.

B. Crossing Substantive Silos

In the sphere of substantive silos between clean energy and reliability, all actors responsible for writing and implementing reliability standards need to better integrate the current divide between the mission of reliability regulation and clean-energy mandates. For example, most of the reports following the outages associated with the cold-weather events in the U.S. South tend to focus on the direct causes of those outages, such as frozen electricity-generation infrastructure and frozen fuel-supply components. [360]This is important, but additional reports should examine how to replace some parts of the existing system rather than simply weatherizing it. For example, in some cases, **[*1051]** expanding the amount of solar and wind energy on the grid could address the fuel-supply issues that arise for sources like natural gas during cold weather, when wells and pipeline components freeze. Wind and sun are also sometimes scarce during and immediately following a cold-weather event, but they could help to fill in some fuel-supply gaps given that fuel in the form of sunlight and wind does not freeze--provided the wind- and solar-generation infrastructure is also adequately winterized. Furthermore, recommendations following cold weather and other extreme events should focus more heavily on the value of geographic diversity in grid operations. When one part of the country is enveloped in cold or heat, for example, a well-connected grid would allow the importation of electricity--from either clean or conventional sources--from regions experiencing different conditions. [361]

Additionally, very local generation supply can be key during widespread outages, whether these are caused by drought (and associated unavailability of water for conventional power plants or hydroelectricity), wildfires, extreme temperatures, or severe storms. NERC, FERC, and regional entities should more consistently recognize the value of small energy resources such as rooftop solar coupled with storage, and microgrids--including microgrids that can run on green hydrogen--in helping to fill supply gaps during reliability incidents. Some states have begun to do this, requiring the consideration of non-wires (non-transmission) alternatives in transmission planning. [362]

FERC, too, has taken several initiatives to incorporate renewable energy and other alternatives to conventional generation into wholesale markets, despite grid operators' concerns about the intermittency of renewable energy. For example, FERC developed uniform standards for the interconnection of renewable energy to the grid, thus preventing grid operators from using arbitrary or inconsistent data and excuses for refusing interconnection. [363]FERC also required RTO wholesale markets to allow energy nonuse in lieu of generation to maintain a balance of supply and demand during periods of peak **[*1052]** demand. [364]Further, FERC required that distributed resources, such as rooftop solar, have the opportunity to participate in RTO and ISO markets. [365]In so doing, it

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[360] *See, e.g., supra* text accompanying notes 344, 347-50.

[361] *See supra* note 237 and accompanying text.

[362] *See, e.g.*, TOM STANTON, NAT'L REGUL. RSCH. INST., GETTING THE SIGNALS STRAIGHT: MODELING, PLANNING, AND IMPLEMENTING NON-TRANSMISSION ALTERNATIVES STUDY 9-13 (2015) (describing state guidelines, policies, and regulations for non-transmission alternatives).

[363] Interconnection for Wind Energy, *70 Fed. Reg. 34,993, 34,995-96* (June 16, 2005) (codified at 18 C.F.R. pt. 35); Standardization of Small Generator Interconnection Agreements and Procedures, *68 Fed. Reg. 49,974, 49,974-75* (Aug. 19, 2003) (to be codified at 18 C.F.R. pt. 35); Standardization of Small Generator Interconnection Agreements and Procedures, *70 Fed. Reg. 34,190, 34,190-92* (June 13, 2005) (codified at 18 C.F.R. pt. 35); Reform of Generator Interconnection Procedures and Agreements, *83 Fed. Reg. 21,342, 21,343* (May 9, 2018) (codified at 18 C.F.R. pt. 37).

[364] Wholesale Competition in Regions with Organized Electric Markets, *73 Fed. Reg. 64,100, 64,101-02* (Oct. 28, 2008) (codified at 18 C.F.R. pt. 35); Demand Response Compensation in Organized Wholesale Energy Markets, *76 Fed. Reg. 16,658, 16,658-59* (Mar. 24, 2011) (codified at 18 C.F.R. pt. 35).

emphasized the reliability benefits of these resources. For example, FERC noted the small lead time needed to build distributed energy resources, thus allowing these resources to "respond rapidly to near-term generation or transmission reliability-related requirements" and to enhance reliability. [366]But these policies do not directly regulate reliability, and NERC has been slow to incorporate clean energy into reliability standards.

NERC has made some progress toward including clean-energy considerations into its regular reviews of grid reliability. For example, in 2017, NERC wrote a report on distributed energy resources that focused on how modeling and projections for the reliability of the grid needed to change in order to address the growing use of these resources. [367]But this report primarily addressed the reliability risks posed by distributed energy resources, leaving for another day the agency's observation that some of these resources "have the capability to ride through [grid] disturbances" and "contribute reliability services." [368]In the report, NERC also listed the existing reliability standards that addressed the extent to which transmission operators could obtain information from distributed resources so as to accurately predict their impact on reliability. [369]But again, it did not suggest how standards could be modified or added to capture the reliability benefits of distributed energy. Further, NERC has only addressed renewables in fits and starts within other **[*1053]** reliability reviews. For example, in its assessment of reliability and reliability challenges for summer 2021--when heat waves taxed the electric grid--NERC noted that in Texas, "generator performance . . . is optimized for summer conditions" even though there is not a great deal of generation capacity in excess of demand. [370]This optimization is due to the "diverse mix of fuel types, including natural gas, nuclear, on-shore and coastal wind, solar, and a small amount of coal-fired generation." [371]Given U.S. clean-energy and reliability imperatives, NERC should comprehensively identify the potential for clean-energy resources to enhance reliability and incorporate this knowledge into standards and guidelines, through a newly established technical committee or task force.

The jurisdictional silos in the area of reliability regulation could both enhance and impede this effort to meld reliability and clean-energy values while strengthening reliability standards, as explored below.

C. Leveraging Jurisdictional Silos

The complex web of actors involved in reliability regulations poses both opportunities and hurdles with respect to enhancing reliability standards to address modern problems, such as more extreme weather, and incorporating clean-energy benefits into these standards. On the upside, the fact that reliability regulation involves regional actors

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[365] Participation of Distributed Energy Resource Aggregations in Markets Operated by Regional Transmission Organizations and Independent System Operators, *85 Fed. Reg. 67,094, 67,095-96* (Oct. 21, 2020) (codified at 18 C.F.R. pt. 35).

[366] *Id.* at 67,096.

[367] N. AM. ELEC. RELIABILITY CORP., DISTRIBUTED ENERGY RESOURCES: CONNECTION, MODELING, & RELIABILITY CONSIDERATIONS, at iv-v (2017), *https://perma.cc/R63JH2LV*.

[368] *Id.* (omitting from discussion the dispatch of distributed energy resources to provide these sorts of benefits to the power system); *id.* at iv (specifying that the "report discusses the potential reliability *risks* and mitigation approaches for increased levels of " distributed energy resources on the bulk power system (emphasis added)). NERC also wrote a report on renewable energy and distributed resources in 2015, which similarly focused on reliability risks. *See* N. AM. ELEC. RELIABILITY CORP., ESSENTIAL RELIABILITY SERVICES TASK FORCE MEASURES FRAMEWORK REPORT, at iv-v (2015), *https://perma.cc/UC7X-N8CP* (noting that variable generation (the retirement of coal-fired power plants and the increase in renewables), as well as distributed generation and demand response (the reduction of energy use during peak demand), "will challenge system planners and operators to maintain reliability").

[369] N. AM. ELEC. RELIABILITY CORP., *supra* note 367, at 25-26, 37-38. *Grid Reliability Through Clean Energy*

[370] N. AM. ELEC. RELIABILITY CORP., 2021 SUMMER RELIABILITY ASSESSMENT 9 (2021), *https://perma.cc/4P2A-6UX4*.

[371] *Id.*

that cross state and other regional lines, in addition to a federal agency and national organization, means that innovations in regulation that embrace the reliability attributes of clean energy could trickle up to the federal level.

Take the example of ReliabilityFirst--one of NERC's six regional entities. This corporation is responsible for implementing NERC standards in all or parts of thirteen states and the District of Columbia, [372]and its territory covers parts of two RTOs--PJM and MISO. [373]ReliabilityFirst and the five other regional entities can and sometimes do bring important reliability issues to the attention of NERC or make direct recommendations to the grid operators and owners that they regulate. For example, as noted above, following the 2014 polar vortex, ReliabilityFirst recommended several best practices that would have prevented some of the problems experienced in Texas in 2021, including, for example, limiting planned outages of generation when cold weather was forecasted, securing natural gas and alternative fuel supplies even in the face of **[*1054]** cold weather, and winterizing equipment. [374]Texas's regional entity took similar action, recommending improvements and conducting "spot checks" of utilities; this resulted in several power plants implementing weatherization recommendations, such as replacing thermostats and other equipment that measured ambient air temperature at power plants. [375]But as shown by the events in Texas, especially, in 2021, these measures were not enough. Not all plants had winterized, and fuel-supply issues caused major capacity outages. These challenges highlight the downside of jurisdictional silos in the reliability regulation space.

Although regional subunits of NERC have the potential to recommend innovative or more effective reliability approaches, the presence of regional entities, NERC, and FERC in the reliability space poses several silo-based problems. First, FERC, NERC, and regional entities lack jurisdiction over many facets of fuel supply--one of the main problems that contributed to the 2021 blackout in Texas. [376]States primarily regulate natural gas wells, gathering lines that collect gas from those wells, intrastate natural gas pipelines, and natural gas distribution lines. Therefore, although NERC can (and has) recommended mandatory winterization of power plants, it lacks the authority to mandate winterization of these state-regulated fuel-supply components for power plants. This leaves NERC in the relatively weak position of recommending that "Congress, state legislators, and regulators with jurisdiction over [these] facilities . . . should require those gas facilities to have cold weather preparedness plans" and that these facilities "should consider implementing measures to protect against freezing and other cold-related limitations." [377]

A second limitation posed by jurisdictional silos in the area of reliability regulation is the free-riding threat. As noted above, several regional entities--including the Texas regional entity--had recommended winterization of plants prior to the 2021 crisis, as had NERC and FERC. [378]But the numerous actors operating in the reliability space, at different jurisdictional levels, might **[*1055]** have created a false sense of complacency, with NERC and FERC potentially assuming that regional entities and RTOs were doing enough, or vice versa. This is similar to the

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[372] *About Us*, RELIABILITYFIRST, *https://perma.cc/KK4B-X2PX* (archived Apr. 7, 2022).

[373] ReliabilityFirst, ReliabilityFirst Newsletter 10 (Nov./Dec. 2021), *https://perma.cc/B4R3-KJRM*.

[374] RELIABILITYFIRST, *supra* note 346, at 5-7.

[375] *See, e.g.*, ReliabilityFirst, RF 2020-2021 Outreach Approach, Lessons Learned, Best Practices & Cold Weather SAR Update 6-11 (n.d.), *https://perma.cc/79ZP-CF96* (noting winterization responses by utilities such as replacing plant equipment that measures ambient temperature and thermometers on transmitter boxes).

[376] *See, e.g.*, N. AM. ELEC. RELIABILITY CORP., *supra* note 236, at 5 (noting that "[d]uring the Event, [well] shut-ins," or closures to make wells nonproducing, "and unplanned outages of natural gas wellheads, as well as unplanned outages of gathering and processing facilities, resulted in a decline of natural gas available for supply and transportation to many natural gas-fired generating units in the south-central U.S.").

[377] *Id. at 24*.

[378] *See supra* notes 374-75 and accompanying text.

regulatory gaps that emerge in a regulatory commons as discussed in Part II above, in which numerous actors have partial regulatory authority and may assume that the other actors have addressed a problem. Indeed, the remarks of American Electric Power (AEP)--a large utility--on proposed mandatory winter reliability standards are illustrative. AEP argued against mandatory standards in part because it believed that numerous organizations had already adequately addressed the risks. It pointed to NERC's guidelines and guidance documents from RTOs and regional entities and argued that "ERCOT already has a suitable mechanism in place, which has proven itself in practice." [379]Here, FERC--as the umbrella organization overseeing all reliability standards and thus benefitting from a bird's-eye view--could have done more to identify and recognize regulatory gaps that remain despite (and in part due to) multiple actors operating in the reliability space.

The weaknesses of some reliability standards and NERC's failure to adequately incorporate the reliability benefits of clean energy into reliability standards might also arise from public-private silos in the reliability regulation space. Here again, however, there are some benefits to these silos, which could enhance reliability standards for clean energy and protect against overly weak standards.

D. Bridging Public-Private Values in Public-Private Energy Silos

The status of NERC as an organization that relies centrally on private entities to draft and enforce standards (with government oversight) is beneficial in part. Utilities are keenly aware of the nuanced and technical requirements for maintaining a reliable grid--more so, perhaps, than anyone else. Additionally, the structure of NERC and its regional entities may protect against undue political influence of the relatively wealthy, well-resourced utilities subject to reliability standards. This potentially helps to support adequately protective standards and innovative standards that recognize the value of relatively new entrants to the market, including, for example, small-scale renewables. In drawing together public and private members from a variety of geographies, from areas governed by RTOs and not governed by RTOs, and from areas with competitive and noncompetitive state markets, NERC's regional entities may serve as entities that the political-science literature describes as "boundary organizations." These are organizations that can transcend typical political (and other) divisions by shaking up traditional **[*1056]** authority structures. [380]Indeed, ReliabilityFirst provides a good example of this, with its leadership team alternating between members from different RTOs and explicitly including representatives from different geographies and markets. [381]Boundary organizations can create innovative, effective policies by overcoming traditional divisions and assumed limitations to policy reform. But NERC and its regional entities have not yet realized the full potential of boundary organizations, as evidenced by recent reliability crises and the overall failure of reliability standards to capitalize on the reliability benefits offered by clean energy.

These weaknesses of reliability standards suggest that the opportunity to shake up traditional political power within regional entities and NERC has not been realized. Utilities, like any rational economic actor, understandably tend to resist mandates that constrain their operations and add costs. And these utilities have a powerful voice, particularly within private organizations such as regional entities and NERC governed by individuals who were previously or currently are in the utility industry. For example, the board of directors of ReliabilityFirst is chaired by the vice president of the largest transmission-only company in the United States. [382]The vice chair is the Senior Vice President of Transmission Ventures, Strategy, and Policy at AEP--one of the nation's largest utilities, and most of

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[379] N. AM. ELEC. RELIABILITY CORP., COMMENT REPORT ON 2019-06 COLD WEATHER STANDARD AUTHORIZATION REQUEST (2019), https://perma.cc/Z4MF-VDZ9.

[380] Stephanie Lenhart, Natalie Nelson-Marsh, Elizabeth J. Wilson & David Solan, *Electricity Governance and the Western Energy Imbalance Market in the United States: The Necessity of Interorganizational Collaboration*, ENERGY RSCH. & SOC. SCI., Sept. 2016, at 94, 95.

[381] *Governance*, RELIABILITYFIRST, https://perma.cc/HHN4-G85S (archived Apr. 7, 2022).

[382] *Board of Directors*, RELIABILITYFIRST, https://perma.cc/LM6T-YPTB (archived May 20, 2022); *About Us*, ITC HOLDINGS CORP., https://perma.cc/6RT3-89BT (archived Apr. 7, 2022).

the other members also represent large utilities and transmission companies. [383]NERC's governing body, its board of trustees, includes former or current utility CEOs and members of utility boards of directors, utility consultants, vice presidents of commercial energy users, and a former president and CEO of the American Public Power Association--an association of government-owned and -operated utilities--among other trustees. [384]So membership is diverse, but utilities are well represented on the board.

Large utilities are in some cases incentivized to argue against national mandatory standards, such as power-plant winterization, that will increase their expense. As AEP commented on NERC's proposed 2019 standards for cold weather, "[W]e believe entities need the flexibility of engineering judgement to **[*1057]** design and implement their own procedures to prepare for cold weather outside of prescriptive obligations." [385]Additionally, some utilities have resisted recognizing the value of resources such as distributed solar. For example, when FERC issued a rule requiring that distributed energy resources (including collections of these resources bundled together, or "aggregated") be able to participate in wholesale markets, some utilities voiced "concerns about the cost, and operational and reliability impacts, of distributed energy resource aggregations on distribution utilities and the distribution system." [386]This is in part because utilities do sometimes have to shoulder the costs of enhancing the distribution grid to accommodate more solar energy--albeit typically with ratepayer support. But some large utilities also oppose distributed solar because they view it a problematic competition. [387]Ultimately, the challenges of updating reliability standards and incorporating clean-energy benefits into these standards might not arise directly from the silos themselves, but partially from powerful players who are able to leverage these silos to their advantage.

The relatively strong utility presence within private regional entities and NERC could potentially push back against values that the broader public increasing demands, including a more reliable and cleaner grid. FERC, a public agency with review authority over NERC, should do more in reviewing NERC's proposed reliability standards to require incorporation of clean-energy benefits. More public participation within NERC and NERC's regional entities could also potentially help to incorporate public values into reliability regulation. Including at least two members on regional entity boards of directors from nonprofit groups that advocate for reliability and low-carbon generation would go a long way toward helping to balance private and public values within the standard setting and enforcement process.

VI. Public-Private Regional Governance: Improving RTOs

As FERC and the states have sought means to improve market design, transmission planning and financing, and reliability services, they have consistently converged on the regional level as a preferred scale of **[*1058]** coordination. [388]Regional-governance structures--in particular RTOs--dominate each of the critical energy-policy areas that we have discussed. RTOs design capacity markets, plan for transmission (often across state

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[383] *Board of Directors, supra* note 382.

[384] *Board of Trustees*, N. AM. ELEC. RELIABILITY CORP., https://perma.cc/YF84-UTAX (archived Apr. 7, 2022).

[385] *See* N. AM. ELEC. RELIABILITY CORP., *supra* note 379.

[386] Participation of Distributed Energy Res. Aggregations in Mkts. Operated by Reg'l Transmission Orgs. & Indep. Sys. Operators, 172 FERC P 61,247, at 39-51 (Sept. 17, 2020).

[387] *See, e.g.*, Joby Warrick, *Utilities Wage Campaign Against Rooftop Solar*, WASH. POST (Mar. 7, 2015), https://perma.cc/6R8Q-MEWC (noting utilities' concerns, voiced in a private meeting, ranging from " 'declining retail sales' and a 'loss of customers' to 'potential obsolescence' " (quoting DAVID K. OWENS, EDISON ELEC. INST., FACING THE CHALLENGES OF A DISTRIBUTION SYSTEM IN TRANSITION 3, 7 (2012))).

[388] *See* Wiseman, *supra* note 144, at 151-52, 166-167; *see also supra* Part III (discussing capacity markets); *supra* Part IV (discussing transmission-planning reforms); *supra* Part V (discussing NERC regions).

lines), and establish structures for financing new transmission needed for renewable energy and reliability, all under FERC oversight.

The appeal of regional governing entities stems from their ability to mediate among energy governance's jurisdictional silos. RTOs, at their best, are technically skilled grid managers that advance the objectives of both FERC and the states in their region. They can reduce policy conflicts among private utilities and transmission owners, states, the federal government, and other stakeholders by providing a forum in which constituents hash out state and federal and public and private values to reach a compromise. Regional governing entities can also fill gaps that occur when neither federal nor state entities fully address an issue--as, for example, RTOs with capacity markets have attempted to do with respect to resource adequacy. [389]

But the potential for regional organizations to effectively serve as these kind of mediating institutions hinges on their design. The regional format can only succeed only if utilities, states, public federal regulators, and public stakeholders view these organizations' systems of governance as appropriately balancing federal authority with state authority and private expertise with public values. Recent challenges in RTOs' management of clean energy and reliability suggest that this balance is presently off, throwing into question the choice to silo predominant control of regional grids and electricity markets within private membership organizations.

This Part discusses why RTOs, the privatized, regional institutions we have charged with managing the grid, too often fail to facilitate the transition to a clean, reliable grid. As this analysis shows, before we can champion regionalization as a mode of achieving a clean, reliable grid, we will need to also reform the oversight or structure of the regional institutions in charge of this project.

A. RTOs in Depth

As discussed in Parts I and II above, RTOs and ISOs manage the grid and electricity markets in most areas in the United States. From a governance perspective, these RTOs are unique institutional constructs: They are membership organizations, comprised primarily of industry insiders along with others with sufficient stake in industry outcomes to register as members **[*1059]** and pay annual membership dues. [390]States and consumer advocates have limited voting authority in most RTOs and ISOs. [391]To ensure efficient regional dispatch of electricity, transmission-owning members of RTOs agree to give the RTO operational control over their transmission assets. [392]Individual transmission owners, however, retain ownership, which gives them a distinct interest in what gets built where and how the grid is run. [393]In most RTOs, membership voting processes--in collaboration with RTO Boards--establish the rules for how transmission owners are compensated, how utilities share the costs of regional transmission upgrades, and what resources are eligible to participate in energy, capacity, and ancillary service

[389] *See supra* Part III.

[390] Each RTO has internally established membership and participation rules. *See, e.g.*, RTOGov Researchers, Comment Letter on the Office of Public Participation 11-12 (May 10, 2021), *https://perma.cc/N927-89BB*; *Membership Enrollment*, PJM *https://perma.cc/PJL3-Z6MS* (archived Apr. 7, 2022) (listing membership fees to join largest RTO).

[391] *See* JENNIFER CHEN & GABRIELLE MURNAN, STATE PARTICIPATION IN RESOURCE ADEQUACY DECISIONS IN MULTISTATE REGIONAL TRANSMISSION ORGANIZATIONS 7-15 (2019) (documenting the role of states across various RTOs); CHRISTOPHER A. PARENT, KATHERINE S. FISHER, WILLIAM R. COTTON & CALI C. CLARK, GOVERNANCE STRUCTURE AND PRACTICES IN THE FERC-JURISDICTIONAL ISOS/RTOS, at ES-2 to ES-3 (2021), *https://perma.cc/XP58-K8N2* (comparing state and stakeholder roles across RTOs).

[392] *See* Regional Transmission Organizations, *65 Fed. Reg. 810, 811* (Jan. 6, 2000) (codified at 18 C.F.R. pt. 35).

[393] *See* Michael H. Dworkin & Rachel Aslin Goldwasser, *Ensuring Consideration of the Public Interest in the Governance and Accountability of Regional Transmission Organizations*, *28 ENERGY L.J. 543, 552-53, 552 n.43 (2007)*.

markets. [394]FERC reviews these proposed rules under a deferential standard, rejecting them only if they will clearly produce unjust or unreasonable rates. [395]

This governance structure creates a range of competing--and often perverse--incentives when it comes to achieving a clean, reliable grid. [396]RTOs **[*1060]** are deeply invested in grid reliability. First, they are typically charged to act as the Balancing Authorities and Reliability Coordinators for their respective territories to ensure a steady match between electricity supply and demand. [397]Second, they oversee transmission planning to ensure necessary expansions to guard the reliability of the grid. [398]Third, in several regions, they also run markets to ensure resource adequacy. [399]Politically and practically, RTO members and boards have every incentive to avoid major blackouts or other reliability events--if the lights go out in their region, they are likely to shoulder much of the blame. [400]

In contrast, RTOs have no clear mandate to promote renewable energy, given that the primary legal authority under which they operate is the assurance of "just and reasonable rates." [401]Instead, RTOs proclaim themselves to be resource-neutral organizations, in charge of making the grid function reliably and cost-effectively in light of whatever resource priorities state and federal regulators establish for their respective jurisdictions. [402]

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[394] *See* Welton, *supra* note 142, at 237-52 (describing RTOs' roles in market rulemaking); Klass & Wilson, *supra* note 322, at 1869-72 (describing RTOs' role in cost allocation). There is considerable complexity to how various RTOs structure membership voting, and regions also differ in the issues that are determined through membership voting, as compared to direct board control. For details on RTO-governance processes, see, for example, Stephanie Lenhart & Dalten Fox, *Participatory Democracy in Dynamic Contexts: A Review of Regional Transmission Organization Governance in the United States*, ENERGY RSCH. & SOC. SCI., Jan. 2022, at 1, 2.

[395] *See* Welton, *supra* note 142, at 221-22; *Morgan Stanley Cap. Grp. v. Pub. Util. Dist. No. 1, 554 U.S. 527, 530 (2008)*; *NRG Power Mktg., LLC v. FERC, 862 F.3d 108, 114 (D.C. Cir. 2017)* (observing that "[s]ection 205 puts FERC in a 'passive and reactive role' " (quoting *Advanced Energy Mgmt. All. v. FERC, 860 F.3d 656, 662 (D.C. Cir. 2017)))*.

[396] *See* MARK JAMES, KEVIN B. JONES, ASHLEIGH H. KRICK & RIKAELA R. GREANE, HOW THE RTO STAKEHOLDER PROCESS AFFECTS MARKET EFFICIENCY 15 (2017) (observing incumbency power and bias); Kyungjin Yoo & Seth Blumsack, *The Political Complexity of Regional Electricity Policy Formation*, COMPLEXITY, Dec. 2018, at 1, 2 (modeling political power structures within RTOs); Blumsack & Yoo, *supra* note 139, at 3087; Welton, *supra* note 142, at 213-14, 241-43, 245-47, 252-53; Christina E. Simeone, *Reforming FERC's RTO/ISO Stakeholder Governance Principles*, ELEC. J., June 2021, at 1, 1 ("The RTO/ISO governance system has the potential to influence almost every aspect of the organization's functioning.").

[397] ASHLEY J. LAWSON, CONG. RSCH. SERV., R45764, MAINTAINING ELECTRIC RELIABILITY WITH WIND AND SOLAR RESOURCES: BACKGROUND AND ISSUES FOR CONGRESS 9 (2019) (noting that RTOs act as balancing authorities in their regions); FERC, RELIABILITY PRIMER 27 (2020), *https://perma.cc/6BLR-E646* (describing how reliability coordinators have broader regional authority over reliability).

[398] LIEBERMAN, *supra* note 265, at 3 (describing how regional transmission-planning processes "begin with a reliability model designed to identify and determine a means to resolve any violations of . . . reliability requirements or applicable regional or local reliability requirements").

[399] *See supra* Part III.

[400] *See* Dworkin & Goldwasser, *supra* note 393, at 562.

[401] *See* 16 U.S.C. §§ 824d-824e. Some argue that this language provides a mandate to pursue clean energy, but regulators have not yet agreed. *Compare* Christopher J. Bateman & James T.B. Tripp, *Toward Greener FERC Regulation of the Power Industry*, 38 HARV. ENV'T L. REV. 275, 278 (2014) (urging FERC to incorporate environmental considerations into market design), *with* Rich Glick & Matthew Christiansen, *FERC and Climate Change*, *40 ENERGY L.J. 1, 5, 32-33 (2019)* (explaining FERC's role as a fuel-neutral regulator).

[402] *See* Benjamin A. Stafford & Elizabeth J. Wilson, *Winds of Change in Energy Systems: Policy Implementation, Technology Deployment, and Regional Transmission Organizations*, ENERGY RSCH. & SOC. SCI., Nov. 2016, at 222, 229 ("We are a taker

But in application, RTO rules and policies often veer far from neutrality in ways that favor incumbent members and punish new-entrant technologies **[*1061]** that are critical for decarbonization. Consider a few examples. When it comes to interconnection queues, most resources now wanting to connect to the grid are renewables and battery-storage projects that can support renewables. [403]But interconnecting resources face high transmission-related costs, including the full cost of network upgrades associated with interconnection (such as expanded transmission capacity to support the new interconnecting generation), even though these upgrades typically offer reliability and economic benefits to load across the region. [404]In application, these rules mean that incumbent utilities reap free grid-reliability improvements financed by renewable energy generators, while competition from new entrants is tamped down through the imposition of often unaffordable network-upgrade costs. [405]

Another example of RTOs acting in a resource-biased manner when confronting the twin aims of reliability and clean energy comes from transmission planning. As discussed in Part IV.B above, Order No. 1000 requires regions to take into account "public policy requirements" when planning for future regional transmission expansion, including, for example, state requirements for renewable energy generation. [406]But RTO transmission planners, under pressure from transmission owners, employ renewable forecast scenarios, or "Futures," that vastly underestimate the amount of renewable energy that both changing economics and policies cause to enter the grid. [407]This, in turn, causes planners not to solicit or select regional transmission projects that facilitate renewable energy development, with rare yet notable exceptions. [408]

[*1062] A similar dynamic is at work in the energy-market design challenges discussed in Part II, where incumbent nonrenewable generators pushed market changes that penalized renewable energy competitors. And this dynamic also emerges in the self-scheduling practices discussed in Part II. [409]What do these examples have in common? They all highlight instances in which RTOs fail to embrace the potential of new resources that could contribute to a clean, reliable energy future but threaten the bottom line of incumbents. [410]

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of policy not a maker of policy . . . . We don't create policy. We attempt to interpret policy as handed to us." (quoting an RTO employee)); MIDCONTINENT INDEP. SYS. OPERATOR, MISO'S RESPONSE TO THE RELIABILITY IMPERATIVE 2 (2021) (describing the organization as "policy-neutral" on renewable energy's growth and thus interested only in the challenges rising levels of renewables pose for grid management).

[403] *See* Miranda Wilson, *FERC Complaint Highlights "Structural Problem" for Renewables*, POLITICO PRO: ENERGYWIRE (May 25, 2021, 7:13 AM EDT), https://perma.cc/D5M4-B4UF (to locate, select "View the live page"); *Berkeley Lab Data Products Summarise Proposed US Projects in Interconnection Queue*, RENEWABLES NOW (May 25, 2021, 8:56 AM CEST), https://perma.cc/MG6V-R5TX (showing graphs of queues dominated by wind and solar projects).

[404] *See* LIEBERMAN, *supra* note 265, at xii ("Currently, in each RTO the generator is charged for all or nearly all of the upgrade even though the upgrade will have benefits to other generators or load.").

[405] *See id.* at vi, xii (reporting that these costs are "sometimes in the hundreds of millions of dollars").

[406] *See* Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, 76 Fed. Reg. 49,842, 49,855 (Aug. 11, 2011) (codified at 18 C.F.R. pt. 35) (capitalization altered).

[407] LIEBERMAN, *supra* note 265, at vii, x, 10 (noting transmission owners' "significant influence[]" in these planning processes and the problematic use of signed interconnection agreements as a forecast for renewables' growth); GRAMLICH & CASPARY, *supra* note 222, at 10-11.

[408] LIEBERMAN, *supra* note 265, at 19. For discussion of exceptions, see notes 415-18 and the accompanying text below.

[409] *See supra* notes 192-94 and accompanying text.

[410] For a longer discussion, see Welton, *supra* note 142, at 241-46. *See also* SONIA AGGARWAL & MIKE O'BOYLE, ENERGY INNOVATION LLC, REWIRING THE U.S. FOR ECONOMIC RECOVERY 22 (2020) ("As new technologies emerge and request to participate in the market, RTOs/ISOs have often reacted by imposing restrictions on the types of connections and services those technologies can offer.").

The key problem here is that RTO governance, focused as it is on amalgamating member preferences, often fails to facilitate forward-looking reforms that would ensure the reliability of a transformed, clean energy grid. Experts widely agree that the key to integrating high levels of variable renewable energy generation into the grid while maintaining reliability is to seek out complementary resources that offer *flexibility* to balance out temporal variations in renewables' output. [411]To date, most RTOs have proven resistant to updating their conceptions of reliability to embrace flexibility as a key grid characteristic that regions should be procuring. [412]Indeed, many RTOs have actively resisted incorporating a host of more flexible resources into their energy, capacity, and ancillary service markets. [413]

Thus, behind many of the current laws, tariffs, and practices that impede a clean, reliable energy future lies an RTO-governance model where incumbents hold outsized sway and, at times, have structural interests against the build-out **[*1063]** of clean energy. [414]Transmission companies resist having their customers pay for their fair share of transmission upgrades, instead pushing these costs onto renewable entrants and overbuilding local transmission lines to the detriment of regional and interregional development. Incumbent fossil fuel generators resist market reforms that increase the entry of new flexible resources into competitive energy markets, while pushing market reforms that are punitive to renewable energy.

There are, to be sure, counterexamples to the ones discussed above, where RTOs have pursued policies to support renewable energy integration. The most cited of these is the multi-value projects (MVP) planning initiative in MISO. MISO undertook the MVP initiative to help build the transmission necessary for states in the region to meet their renewable energy targets. [415]Through the MVP process, MISO identified projects that were regional in nature, provided economic value to the region, and allowed for compliance with state public policy requirements such as renewable energy mandates. The costs of these projects, which were effective in connecting new wind energy resources to the regional grid, were distributed across load on a regional rather than a local basis. [416]SPP has

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[411] *See, e.g.*, N. AM. ELEC. RELIABILITY CORP., 2020 STATE OF RELIABILITY: AN ASSESSMENT OF 2019 BULK POWER SYSTEM PERFORMANCE, at x, 49-51 (2020); Amory B. Lovins, *Reliably Integrating Variable Renewables: Moving Grid Flexibility Resources from Models to Results*, ELEC. J., Dec. 2017, at 58, 58 ("Careful analyses consistently find that largely or wholly renewable power supply can be delivered with little or no bulk storage and at reasonable cost by integrating at least seven kinds of 'grid flexibility resources.' "); 2020 LONG-TERM RELIABILITY ASSESSMENT, *supra* note 332, at 37; NAT'L RENEWABLE ENERGY LAB'Y, *supra* note 32, at 3 ("Electric sector modeling shows that a more flexible system is needed to accommodate increasing levels of renewable generation.").

[412] *See* ERIC GIMON, ENERGY INNOVATION, WHY THE CLEAN ENERGY INDUSTRY SHOULD BE INTERESTED IN RESOURCE ADEQUACY 1 (2020) (describing how incumbent generators, "having failed to make the argument that clean power is too expensive . . . are now falling back on resource adequacy as a last bastion to defend their market share and slow the power grid's decarbonization").

[413] *See* Welton, *supra* note 142, at 241-45; *see also* *FERC v. Elec. Power Supply Ass'n, 136 S. Ct. 760, 774 (2016)* (upholding a FERC order forcing RTOs to compensate demand response and generation equally).

[414] *See* AGGARWAL & O'BOYLE, *supra* note 410, at 20 ("RTO/ISO proposals [for market rules] tend to favor incumbents, stifle innovation, and lack upfront input from state, consumer, and environmental interests that have to then battle bad proposals in FERC-regulated dockets."); *see also* Ethan Howland, *SOO Green Transmission Project Faces PJM Obstacles: Are Grid Operators Hindering the Energy Transition?*, UTIL. DIVE (Jan. 13, 2022), *https://perma.cc/ST6M-YE4G* (discussing how outdated PJM rules that favor incumbent utilities are creating unnecessary roadblocks to innovative interregional HVDC transmission projects designed to bring wind energy from MISO to PJM).

[415] Wiseman, *supra* note 144, at 181-82.

[416] *See* Ill. Com. Comm'n v. FERC (*ICC II), 721 F.3d 764, 771-72 (7th Cir. 2013)* (describing the MISO MVP process); LIEBERMAN, *supra* note 265, at 14, 24. MISO has begun planning a second round of regional projects, but disagreements over regional cost sharing between the north and south subregions of MISO has slowed progress. *See, e.g.*, Jeffrey Tomich, *MISO Urges Splitting South, Midwest Grid for Transmission Build-Out*, POLITICO PRO: ENERGYWIRE (Oct. 15, 2021, 7:19 AM EDT), *https://perma.cc/Z4HQ-DBKY* (to locate, select "View the live page") (discussing success of MVP lines and MISO efforts to build

undertaken similar initiatives. [417]MISO and SPP have also proven proactive in integrating new wind resources into energy markets through improved forecasting and bid flexibility. [418]

[*1064] Notably, these proactive, pro-renewables stances have taken place in RTOs where (1) states retain substantial decisionmaking authority within RTO-governance structures; and (2) utilities remain vertically integrated, recovering their generation costs under cost-of-service ratemaking. [419]This first factor is important because it allows states in SPP and MISO to have more institutional power in advancing pro-renewables stances in both regions. [420]The second factor is important because it makes incumbent generators in a region less likely to object to renewable energy growth, as they are more likely to recover their sunk generation costs under state public-utility law. [421]

The two examples discussed above, both of RTOs stymieing new clean-energy technologies and at times accepting them, highlight the importance of governance structures to substantive outcomes. RTOs' mixed performance drives home the risks of public-private siloing, as well as the importance of public oversight in policing the potential skewed incentives of private providers of critical public services. These dynamics suggest that it may not be enough to *substantively* fix each discrete RTO rule or practice that discriminates against renewable energy and complementary reliability-enhancing resources. It might, instead, be wise to engage in more *structural* reforms that carve away at the ways in which RTO-governance models enable anti-renewable incumbent power. Subpart C below offers several suggestions for reforms in this regard, drawing on examples of RTO pro-renewables policies for inspiration. First, though, we turn to discuss governance challenges in those regions outside of RTOs and ISOs.

B. Non-organized Regions

RTO and ISO regions serve two-thirds of the nation's electricity load, which means that millions of Americans live in areas of the country without this regional-governance construct. These areas are underdiscussed in the academic and policy literature, likely because their diffuse governance **[*1065]** structures and regional specificity make them less easy to analyze as a bloc. [422]But although RTOs deserve critique, unorganized regions pose perhaps even greater institutional risks to the project of constructing a reliable, clean energy grid.

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on that success); Ballard, *supra* note 242 (discussing the opposition of Louisiana and utilities in the southern region of MISO to paying for Midwest transmission lines).

417 Wiseman, *supra* note 144, at 185; *Priority Projects*, SW. POWER POOL, *https://perma.cc/J5KX-VX47* (archived Apr. 9, 2022).

418 *See* Stafford & Wilson, *supra* note 402, at 225; SW. POWER POOL, 2016 WIND INTEGRATION STUDY 5 (2016), *https://perma.cc/CY7X-2PNV* (describing how the RTO proactively undertook a study "to identify challenges for integrating higher levels of wind penetration into the SPP transmission system").

419 In MISO, state regulatory authorities maintain 16% of the membership voting rights. MIDCONTINENT INDEP. SYS. OPERATOR, STAKEHOLDER GOVERNANCE GUIDE 9 (2021). In SPP, a regional state committee maintains oversight of transmission planning and pricing and resource adequacy. SW. POWER POOL, GOVERNING DOCUMENTS TARIFF: MEMBERSHIP AGREEMENT § 3.10 (2021); SW. POWER POOL, GOVERNING DOCUMENTS TARIFF: BYLAWS § 7.2 (2010); FISHER ET AL., *supra* note 192, at 8 ("[T]he majority of the generators in the market regions of [MISO] and [SPP] are owned by regulated utilities.").

420 *See* Stafford & Wilson, *supra* note 402, at 228 (describing state and wind industry pressure on MISO to "better integrate" renewable resources); GRAMLICH & CASPARY, *supra* note 222, at 79 ("State involvement was critical to the successful regional transmission plans that have occurred.").

421 These same dynamics, however, are involved in the self-scheduling challenges discussed in notes 192-94 and the accompanying text above.

422 *See* Harrison & Welton, *supra* note 24, at 2-3 & 2 n.1; Wiseman, *supra* note 144, at 159, 173-74.

Outside RTOs, reliability remains much more tightly managed by state public-utility-commission oversight of individual utilities. [423]Many of these commissions--especially in southern states--oversee politically powerful utilities that frequently dominate legislative and regulatory initiatives at the state level. [424]As highlighted by the recent debates in Texas, utilities often resist energy-system change at their commissions and statehouses, deploying reliability as an argument against clean-energy integration. [425]

In non-RTO regions, there is limited regional coordination of transmission planning or electricity dispatch, each of which hinders clean-energy integration. Although Order No. 1000 applies to these regions, [426]in practice utilities outside RTOs have resisted any dramatic transformations to their bottom-up transmission-planning processes and rarely cooperate as well as RTO regions. [427]When it comes to dispatch, most non-RTO utilities run their own systems that have only limited integration with neighboring utilities. [428]This siloed approach frequently causes these utilities to overbuild fossil fuel generation as a means of ensuring reliability--all while impeding competition from cost-effective renewable energy generators who have limited ability to interconnect into these systems.

Some states outside RTOs have, however, begun to reconsider this go-it-alone governance model for their utilities, particularly given the challenges presented by the clean-energy transition. In 2014, several non-RTO western **[*1066]** states collaborated with California to form a regional energy imbalance market (EIM). [429]The EIM operates as an extension of CAISO's preexisting EIM and allows utilities across the region to share energy resources more efficiently in real time. [430]A 2020 analysis suggests that the EIM has created $ 1.1 billion in total economic benefits in its first six years, through cost savings and better integration of renewable energy in the region. [431]Whether the EIM goes far enough is a continued point of debate: Many suggest that a full Western RTO would create even greater regional benefits--if participants were able to agree on a suitable governance model that would not threaten California's climate leadership. [432]

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[423] *See* LAWSON, *supra* note 397, at 4.

[424] *See* Harrison & Welton, *supra* note 24, at 8.

[425] *See supra* notes 11-14. For an example of this same phenomenon outside Texas, see RACHEL WILSON, NINA PELUSO & AVI ALLISON, NORTH CAROLINA'S CLEAN ENERGY FUTURE: AN ALTERNATIVE TO DUKE'S INTEGRATED RESOURCE PLAN 1 (2019) (highlighting the perversity of Duke's proposed strategy of adding 9,000 MW of new natural gas generation, given reliable and cost-comparable renewable energy options); and Travis Fain, *State Regulators: More Info Needed to Approve Duke Energy's Natural Gas, Other Construction Plans*, WRAL.COM (updated June 30, 2021, 11:42 AM EDT), *https://perma.cc/VG3C-UR5F* ("Duke has argued that it needs the reliability of natural gas in the near and medium term.").

[426] *See supra* Part IV.B.

[427] *See* Wiseman, *supra* note 144, at 173-74, 185.

[428] *See, e.g.*, SE. ENERGY MKT. SERVS., SOUTHEAST ENERGY EXCHANGE MARKET AGREEMENT 5-7 (2020), *https://perma.cc/Z2AV-JR54* (describing the traditional southeastern marketplace).

[429] *See* Lenhart et al., *supra* note 380, at 94-95, 103.

[430] *Id.* at 95.

[431] *See* MKT. ANALYSIS & FORECASTING, CAL. ISO, WESTERN EIM BENEFITS REPORT: THIRD QUARTER 2020 5, 17 (2020); SADIE COX & KAIFENG XU, NAT'L RENEWABLE ENERGY LAB'Y, INTEGRATION OF LARGE-SCALE RENEWABLE ENERGY IN THE BULK POWER SYSTEM: GOOD PRACTICES FROM INTERNATIONAL EXPERIENCES 7 (2020) ("A significant potential benefit of BA coordination and expansion is that it reduces renewable curtailment. By the end of 2018, the Western EIM market had avoided more than 700 cumulative gigawatt-hours of curtailments.").

[432] *See* BENTHAM PAULOS, PAULOSANALYSIS, A REGIONAL POWER MARKET FOR THE WEST: RISKS AND BENEFITS 5-7 (2018).

In light of the EIM's success, the long-market-resistant South is also beginning to explore the possibility of more regional cooperation. One 2020 analysis of the southeastern energy grid found that if the region were to form a competitive RTO, it could reap cost savings of $ 384 billion by 2040, while lowering retail costs by 23% and carbon emissions by 37% (relative to 2018 levels). [433]Utilities in the southeast have since cited this study in support of their petition to form what they call the Southeast Energy Exchange Market. This market--scheduled to go into operation as a result of FERC deadlock and currently facing litigation in the D.C. Circuit--will facilitate more bilateral sales among utilities in the region, but will *not* result in centrally dispatched electricity nor full market competition. [434]Many have expressed concerns that this multi-utility agreement or "RTO-lite" arrangement might be a poor model for facilitating a clean-energy transition in the Southeast. [435]Again, it appears that the devil is the details of these new regional-governance arrangements. **[*1067]** Regional collaborations can only counteract energy silos when their governance is calibrated to appropriately mediate public and private, and state and federal, objectives for energy policy.

C. Regional-Governance Reforms to Support Reliability Through Renewables

Regional-governance arrangements must shift if regions are to fulfill their potential as integrationists of clean and reliable energy, state and federal aims, and public and private entities. But reforming RTOs and non-RTO regional governance will be complex. One way to conceptualize potential approaches to creating more effective regional organizations is to identify them on a spectrum from minor, useful adjustments to transformative systemic overhaul.

We begin with more pragmatic adjustments, which would not require congressional action to implement. One of the central challenges with RTO governance outlined above is its overly privatized nature. States, new entrants, and organizations representing the public interest have little sway within current regional-governance constructs. There are several solutions internal to RTOs that might remediate this challenge. Perhaps the most basic would be to enhance the transparency of RTOs, which too often operate like secret cabals. For example, reformers in New England are pushing for their RTO's stakeholder processes to allow public representatives at its meetings, [436]while reformers in PJM have expressed outrage at the continued secretive nature of transmission-rate development. [437]

There is a relatively simple fix available for these transparency-related concerns: As suggested by several congressional representatives during a 2019 hearing, FERC could initiate a notice of inquiry into whether RTOs continue to meet required governance characteristics. [438]In 2007, in Order No. 719, FERC established governance objectives that regional entities had to achieve to maintain RTO status, emphasizing the need for RTO boards' "responsiveness," defined as their "willingness, as evidenced in its practices and procedures, to directly receive

[433] ERIC GIMON, MIKE O'BOYLE, TAYLOR MCNAIR, CHRISTOPHER T.M. CLACK, ADITYA CHOUKULKAR, BRIANNA COTE & SARAH MCKEE, SUMMARY REPORT: ECONOMIC AND CLEAN ENERGY BENEFITS OF ESTABLISHING A SOUTHEAST U.S. COMPETITIVE WHOLESALE ELECTRICITY MARKET 1-2 (2020).

[434] *See* SE. ENERGY MKT. SERVS., *supra* note 428, at 1; Ethan Howland, *Clean Energy, Environmental Groups Sue FERC Over Approval of Southeast Energy Market*, UTIL. DIVE (updated Feb. 9, 2022), https://perma.cc/H9K8-P94X.

[435] *See, e.g.*, Protest of Public Interest Organizations at 1, 9, Ala. Power Co., Docket Nos. ER-21-1111-0000 et al. (FERC June 28, 2021).

[436] FERC rejected a petition forcing such openness in 2019. *RTO Insider LLC, 167 FERC P 61,021, at 17-18 (Apr. 10, 2019)*. States, however, continue to pursue other avenues of reform. *See* Mark Pazniokas, *Governors Want Sunlight on the Secretive ISO New England*, CT MIRROR (Oct. 15, 2020), https://perma.cc/UJT9-PWLA; NEW ENG. STATES COMM. ON ELEC., NEW ENGLAND STATES' VISION FOR A CLEAN, AFFORDABLE, AND RELIABLE 21ST CENTURY REGIONAL ELECTRIC GRID 6-8 (2020), https://perma.cc/77FQ-J8SY.

[437] Peskoe, *supra* note 149, at 52-53 (describing PJM's "secretive" transmission-planning process and FERC's investigation into these practices).

[438] Paul Ciampoli, *Lawmakers Seek Details from FERC on RTO Governance*, AM. PUB. POWER ASS'N (June 19, 2019), https://perma.cc/MHL2-C4LA.

concerns and recommendations from customers and other stakeholders, and to fully consider and take actions in response to the issues **[*1068]** that are raised." [439] In light of mounting evidence of secrecy and skewed representation within RTOs, FERC can and should revisit whether or not RTOs are living up to these preexisting expectations perhaps through reopening Order No. 2000 or by requiring that RTOs have new characteristics or functions. Similarly, such a proceeding might provide a forum for considering whether RTOs' current membership rules, including sectoral designations and weighted voting procedures, prove adequately representative of all members in light of the shifting nature of energy generation.

These reforms to internal RTO-governance arrangements would be a useful first step, but they likely would not go far enough to create regional entities trusted by states and public actors. Instead, FERC may need to reconsider the role it has carved out for states within privatized regional processes. As states have argued, they are "not just stakeholders . . . . States are sovereign entities with their own laws that the regulators are tasked with implementing." [440] To date, FERC has allowed RTOs to differ on the extent to which states reserve authority over certain issues, including resource adequacy. [441] Going forward, FERC might consider rebalancing the nature of public, state-level input and control in RTOs. Fortunately, the agency has several tools at its disposal to do so. It might inquire as to whether RTO rules that do not accommodate state resource preferences are "just and reasonable," and thereby force accommodative changes to RTO governance. [442] Or, it might explore using its section 209 authority in more muscular ways. Section 209 allows FERC to delegate its full authority over particular matters to a committee of affected states. [443] More experimental use of this section 209 authority could prove important in addressing a range of roadblocks that exist at the clean energy-reliability nexus, including innovative approaches to regional resource adequacy and regional carbon pricing.

Finally, and particularly if FERC initiatives prove unsuccessful, Congress might consider more thorough set of reforms to RTO governance. A series of court decisions has bounded FERC's oversight of RTO-governance **[*1069]** arrangements and their outputs under its current FPA (Federal Power Act) authority. In particular, two D.C. Circuit cases have held that FERC cannot dictate RTO board composition or require RTOs to make amendments to their filings to gain FERC approval. [444] If Congress is concerned that such decisions cabin FERC too greatly, it could pass legislation overriding these precedents and thereby give FERC greater ability to dictate the shape of RTO-governance arrangements and their substantive outcomes. Or it could even go so far as to consider whether to restructure RTOs more thoroughly, making them publicly governed and accountable through more classic channels of administrative law. [445]

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[439] *See* Wholesale Competition in Regions with Organized Electricity Markets, *73 Fed. Reg. 64,100, 64,154* (Oct. 28, 2008) (codified at 18 C.F.R. pt. 35).

[440] Catherine Morehouse, *New England States Push for Governance Changes in ISO-NE, Ahead of Anticipated MOPR Reform*, UTIL. DIVE (June 7, 2021), *https://perma.cc/FG7A-7ZEM*.

[441] *See* CHEN & MURNAN, *supra* note 391, at 2.

[442] *See, e.g.*, TRAVIS KAVULLA, NRG ENERGY, MOVING FORWARD: APPROACHES FOR STATE-FEDERAL COOPERATION IN A DECARBONIZING ELECTRICITY SECTOR 12 (2021) (describing how such arrangements might be modeled off of SPP, where the "Regional State Committee" exercises the rights to "determine what the regional market will file as a tariff at FERC with respect to certain topics that traditionally implicate states' regulatory prerogatives").

[443] *16 U.S.C. § 824h(a)*-(b).

[444] See *Cal. Indep. Sys. Operator Corp. v. FERC, 372 F.3d 395, 396 (D.C. Cir. 2004)* (addressing FERC's authority over board composition); *NRG Power Mktg. v. FERC, 862 F.3d 108, 110 (D.C. Cir. 2017)* (addressing FERC's authority to require amendments to tariff filings).

[445] California's ISO is already structured in this public manner. *See* Welton, *supra* note 142, at 229-30.

Of course, there is a glaring challenge to tinkering too greatly with RTOs, either at FERC or through Congress: They remain voluntary membership organizations. If utilities do not like changes made in the degree of public oversight of RTOs, they retain the right to exit. Because of this exit threat, and because the regions not currently participating in RTOs are even worse than their organized counterparts, many respected voices within the energy policy community have begun to call for FERC to revisit the idea of making RTO membership mandatory. [446]

If FERC were to heed this call, it would be entering uncharted legal terrain. It has never been determined whether the agency has the legal authority to require RTO membership. [447]Given the increasing number of studies that show clear economic gains to RTO membership, [448]however, we believe FERC at least has a strong argument that mandating RTO participation is within its authority to ensure "just and reasonable" rates. The counterargument is that section 202(a) of the Federal Power Act specifically authorizes FERC to "promote and encourage" voluntary interconnection within regional districts--perhaps although not definitively foreclosing more muscular action on the part of the agency.

[*1070] Legal authority aside, there are careful political considerations that must enter any decision about whether FERC or Congress should mandate RTOs. As we have catalogued above, current RTOs are far from perfect. If not coupled with governance reforms, a requirement that all states join RTOs could end up setting some states back on their clean-energy goals, should their newly formed RTO prove resistant to integrating renewable energy thoroughly into its markets. Therefore, we think it imperative that FERC and Congress focus first on reforming existing RTOs to allow them to live up to their potential as mediators among the energy-governance silos. Only then should reformers consider whether mandatory membership would be an advisable or necessary accompanying shift.

Conclusion

Building a cleaner, more reliable grid is central to the fight against climate change. The grid cannot remain reliable under conditions of climate change without a commitment to decarbonization through clean energy. Thus, politicians' resort to the fear of blackouts as an objection to ambitious climate action is a dangerous stunt.

As this Article demonstrates, however, current institutional arrangements in U.S. energy law exacerbate this misperceived tension between clean energy and reliability by disaggregating responsibility across actors and scales. We have argued that policy and governance reforms are available to remediate these tensions without dramatically upending the central features of our disaggregated energy governance regime. These reforms should be priorities for those seeking to advance climate policy in the United States, given the central importance of the electricity grid to climate stabilization.

As we close, it is worth reemphasizing that a clean, reliable grid is crucial not only as a matter of sound economic policy and climate politics, but also from an equity perspective. The technical nature of conversations about grid reform often serves to obscure its social stakes. But make no mistake: The transition to a clean, reliable grid is fundamentally a matter of justice. The fossil fuel-based grid has too long disproportionately harmed low-income communities and communities of color. [449]Going forward, wealthy Americans might be able to insulate themselves from the risks of climate change and grid failure, but the vast majority of Americans will be rendered increasingly vulnerable to both challenges over time. Thus, although the clean-energy transition presents justice-related

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[446] *See* Letter from Former FERC Commissioners to Richard Glick, Chairman, FERC, et al. 1-2 (June 2, 2021), https://perma.cc/9DP2-9LU6. *But see* Jasmin Melvin, *Ex-state Utility Regulators Caution FERC Against Upending Voluntary RTO Regime*, S&P GLOB. (June 25, 2021, 3:25 PM UTC), https://perma.cc/P6TA-5DSN (reporting on a response letter urging FERC to do the opposite).

[447] FERC abandoned efforts in the early 2000s to mandate RTOs for political reasons as well as legal uncertainty. *See* Harrison & Welton, *supra* note 24, at 2.

[448] *See* GIMON ET AL., *supra* note 433, at 9.

[449] *See supra* notes 33-34 and accompanying text.

challenges of its own, [450]decarbonization--designed **[*1071]** and implemented in a matter that protects low-income ratepayers from major rate increases--remains a critical foundation of a more just future.

The reforms we have proposed to energy markets, energy governance, and transmission planning and siting will not remediate all of these inequities--but they are a vital step in the right direction. A *nationally* reliable, clean, interconnected grid would bring less expensive renewable energy to communities disproportionately facing energy poverty and the health impacts of fossil fuels. And a legal regime that appropriately values the contributions of clean energy to reliability will empower communities to pursue cleaner, more reliable energy sources, including microgrids, distributed energy resources, and energy storage. If our institutions can deliver it, such a grid will ultimately help ensure that all communities--not just privileged ones--maintain electricity services in the face of the weather extremes that climate change is already delivering to our doors.

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[450] Shelley Welton & Joel Eisen, *Clean Energy Justice: Charting an Emerging Agenda*, 43 HARV. ENV'T L. REV. 307, 310-11 (2019) (charting the justice challenges presented by the clean-energy transition).

1. *Deep Decarbonization of New Buildings, 48 ELR 10130*

Deep Decarbonization of New Buildings

February, 2018

Reporter
48 ELR 10130 *

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Text

[*10130] I. Introduction

New buildings present an especially important opportunity to advance energy efficiency and achieve decarbonization in the building sector, as compared with existing buildings, because of the ability to incorporate efficiency and decarbonization approaches directly into new building design. However, new buildings present a particular challenge to decarbonization. If energy-efficiency measures or electrification opportunities are not incorporated into the building design, it may be years before these measures are employed for the existing building. Further, carbon emissions from production of building materials become locked in. As a result, it is critical to focus now on new building design, construction, and operation to achieve decarbonization of new buildings.

This Article explores the rapidly changing landscape related to decarbonization of new buildings, and recommends ways to accelerate this effort. Part II addresses some of the current issues in building construction and design in terms of energy use and carbon intensity. Part III sets out the specific decarbonization goals for new buildings in the United States by 2050. Part IV defines and discusses zeroenergy buildings (ZEBs), as they represent an overarching concept that unites many of the steps that will need to be taken in new building design and construction to achieve decarbonization; Part V discusses passive buildings. Next, the Article considers action being taken in the United States (Part VI) and the European Union (EU) (Part VII) to facilitate new building energy performance. Part VIII discusses recommendations designed to meet the new building decarbonization goals, and Part IX concludes.

II. Background

Commercial and residential buildings in the United States consume a significant amount of energy, and new buildings raise important questions about energy use and efficiency over the course of their useful lives. This part will provide background information on U.S. building stocks, building life expectancy, energy usage in buildings, and energy-efficiency efforts in the building sector.

Based on 2013 census data, the median year that houses in the United States were built was 1976, and the largest percentage of residences is between 35 and 64 years old. [1] The life expectancy of commercial buildings ranges from just over 50 years for wood buildings to more than 87 years for concrete buildings. [2] These data indicate that

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[1] U.S. Census Bureau, 2013 Housing Profile: United States (2015) (AHS/13-1), *available at*http://www2.census.gov/programs-surveys/ahs/2013/factsheets/ahs13-1_UnitedStates.pdf.

today's **[*10131]** new residential and commercial buildings are likely to still be in use well beyond 2050. As a result, near-term action is required to prevent lock-in of building stock that produces significant carbon emissions.

Buildings are major sources of these emissions. In 2015, energy use by buildings made up 40% of all energy use in both the United States [3] and worldwide, [4] as well as 30% of all greenhouse gas (GHG) emissions, [5] with U.S. buildings responsible for 9% of the world's GHGs by themselves. [6] Natural gas is the source of one-half of the energy used for heating houses and heating water in houses. [7]

However, there is good news in the trends on energy use. For example, between 2003 and 2012, energy intensity for commercial buildings declined by 12% and energy intensity for government buildings declined by 23%. [8] Still, to achieve deep decarbonization goals, new buildings must be much more energy efficient, must increasingly utilize low-carbon sources of energy, especially for heating and hot water, and should acquire or generate zero-carbon energy to offset energy used in the buildings.

Among the factors that have led to energy-efficiency improvements, the commercial building market's uptake of Leadership in Energy and Environmental Design (LEED) and Energy Star(R) standards for new buildings has been notable. Both LEED and Energy Star for buildings are discussed later in this Article. However, the focus for achieving significant reductions in building energy use, particularly fossil fuel consumption, has increasingly been on the concept of ZEBs. [9]

Several strategies are emerging to drive increased decarbonization of new buildings. These strategies for the most part do not need to rely on new or untested technologies. Utilizing the best technology available today could lower energy demands by 61% for residential buildings and 78% for commercial buildings. [10] Important work has already

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[2] Jennifer O'Connor, Survey on Actual Service Lives for North American Buildings, Presentation at Woodframe Housing Durability and Disaster Issues Conference 1, 5 (Oct. 2004), http://cwc.ca/wp-content/uploads/2013/12/DurabilityService_Life_E.pdf.

[3] U.S. Energy Information Administration (EIA), *Frequently Asked Questions--How Much Energy Is Consumed in U.S. Residential and Commercial Buildings?*, http://www.eia.gov/tools/faqs/faq.cfm?id=86&t=1 (last updated May 10, 2017).

[4] UNITED NATIONS ENVIRONMENT PROGRAMME, BUILDINGS AND CLIMATE CHANGE: SUMMARY FOR DECISION-MAKERS 1, 3 (2009), *available at*https://europa.eu/capacity4dev/unep/document/buildings-and-climate-change-summary-decision-makers.

[5] *Id.*

[6] U.S. DEPARTMENT OF ENERGY, ENERGY EFFICIENCY TRENDS IN RESIDENTIAL AND COMMERCIAL BUILDINGS 11 (2008), *available at*http://apps1.eere.energy.gov/buildings/publications/pdfs/corporate/bt_stateindustry.pdf.

[7] *See* EIA, *Everywhere but Northeast, Fewer Homes Choose Natural Gas as Heating Fuel*, Today in Energy, Sept. 25, 2014, http://www.eia.gov/todayinenergy/detail.cfm?id=18131.

[8] *See* EIA, *Recent Energy Intensity Decline in Government Buildings Exceeds Commercial Sector Average*, Today in Energy, Sept. 16, 2016, http://www.eia.gov/todayinenergy/detail.cfm?id=27972.

[9] Also called a net zero-energy building or zero net-energy building. This Article will use the term "zero energy building" due to the U.S. Department of Energy's (DOE's) adoption of it after determining it concisely describes the concept and resonates with building owners "in striving for simplicity, consistency and to accentuate the core objective." *See* Roger Grant et al., National Institute of Building Sciences et al., A Common Definition for Zero Energy Buildings 2 (2015), *available at*https://energy.gov/sites/prod/files/2015/09/f26/bto_common_definition_zero_energy_buildings_093015.pdf.

[10] DOE, *Increasing Efficiency of Building Systems and Technologies September 2015, in* QUADRENNIAL TECHNOLOGY REVIEW: AN ASSESSMENT OF ENERGY TECHNOLOGIES AND RESEARCH OPPORTUNITIES 143, 155-56 (2015), *available at*http://energy.gov/sites/prod/files/2015/09/f26/QTR2015-05-Buildings.pdf.

occurred in conceptualizing a much lower carbon future for new buildings. For example, the American Institute of Architects' (AIA's) 2030 Challenge envisions all new buildings and major renovations resulting in carbon-neutral operation by 2030. [11]

In addition to operational energy use, new buildings raise one other important energy question--embodied energy--which is the energy contained in the materials used to construct new buildings. Embodied energy includes emissions from resource extraction, processing, material production, building construction, building deconstruction, and disposal, as well as transportation for those activities. [12] Of the total energy consumed in a building's life cycle, embodied energy accounts for 10%-38% of total energy use for conventional buildings and 9%-46% for more energy-efficient buildings. [13] Embodied energy is receiving more attention, and it is a complex issue that requires consideration of trade offs and diminishing returns. For example, at what point does the embodied energy in manufacturing, transporting, and installing large amounts of insulation materials exceed the energy savings achieved with the additional insulation?

III. Pathways to Deep Decarbonization in the United States

The Deep Decarbonization Pathways Project (DDPP) technical report established three primary goals that affect new buildings: (1) an 80% reduction in GHG emissions from 1990 levels; (2) 90% of final energy from decarbonized electricity in both (existing and new) residential and commercial buildings [14] ; and (3) highly efficient end use of **[*10132]** energy in buildings--all by 2050. [15] This part will discuss the specific actions described in the DDPP policy report as necessary to achieve DDPP's overall deep decarbonization target for 2050 for buildings: to maintain the same level of final energy use in commercial and residential buildings as a whole, despite a projected increase by 2050 of 40% in commercial floor space and 36% in population. [16]

The DDPP report suggests that policymakers need to make an early decision on the fate of using natural gas in buildings. [17] In order to meet decarbonization goals, natural gas use in buildings would have to be almost completely eliminated by 2050 and replaced by decarbonized pipeline gas or electricity. However, the natural gas phaseout is not a simple process. Natural gas is predominantly used in buildings for three purposes: space heating, water heating, and cooking.

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[11] Architecture 2030, *The 2030 Challenge: All New Buildings, Developments, and Major Renovations Shall Be Carbon-Neutral by 2030*, http://architecture-2030.org/2030_challenges/2030-challenge/ (last visited Nov. 1, 2017).

[12] SØREN E. LUTKEN & PER HARRY WRETLIND, UNEP DTU PARTNERSHIP, WORKING PAPER SERIES No. 13, CITY BASED CARBON BUDGETS FOR BUILDINGS 3 (2016), http://www.unepdtu.org/-/media/Sites/Uneprisoe/Working%20Papers/Working-Paper-13_LCD_final.ashx?la=da.

[13] Cassandra L. Thiel et al., *A Materials Life Cycle Assessment of a Net-Zero Energy Building*, 6 Energies 1125, 1127 (2013), *available at*http://www.mdpi.com/1996-1073/6/2/1125/htm.

[14] JAMES H. WILLIAMS ET AL., ENERGY AND ENVIRONMENTAL ECONOMICS, INC. ET AL., US 2050 REPORT, VOLUME 2: POLICY IMPLICATIONS OF DEEP DECARBONIZATION IN THE UNITED STATES 1, 22 (2015) [HEREINAFTER POLICY IMPLICATIONS OF DEEP DECARBONIZATION], *available at*http://deepdecar-bonization.org/wp-content/uploads/2015/11/US_Deep_Decarbonization_Policy_Report.pdf.

[15] JAMES H. WILLIAMS ET AL., ENERGY AND ENVIRONMENTAL ECONOMICS, INC. ET AL., PATHWAYS TO DEEP DECARBONIZATION IN THE UNITED STATES, US 2050 REPORT, VOLUME 1: TECHNICAL REPORT 1, 24 (2015) [hereinafter TECHNICAL REPORT], *available at*http://deepdecarbonization.org/wp-content/uploads/2015/11/US_Deep_Decarbonization_Technical_Report.pdf.

[16] *Id.* at 1, 25-26.

[17] POLICY IMPLICATIONS OF DEEP DECARBONIZATION, *supra* note 14, at 1, 91-92.

The most recent data for all building types and sizes across the United States showed that annual consumption of natural gas for space heating was 1,307 billion cubic feet (bcf). [18] Natural gas overshadows electricity as a primary space-heating energy source by 1,240 bcf to 51 bcf. [19] There are nearly 320,000 miles of interstate and intrastate gas transmission pipelines. [20] Natural gas-fired power generation increased 19% in 2015, and growth is expected to continue as 18.7 gigawatts of new capacity comes online between 2016 and 2018. [21] Additionally, in the short term, switching space heating, water heating, and cooking to electricity is likely to mean that the electricity is provided by a significant amount of coal- or gas-fired generation.

Thus, it is important for policymakers and builders to develop a strategy for simultaneously phasing out fossil fuel use in space heating, cooking, and water heating while phasing in electrification of these functions so that the transition progresses at the same time the grid is being decarbonized. This switch alone will create most of the 20% decrease in total building final energy use, reducing final energy use even as floor space increases. [22] Decarbonized electricity will then be poised to make up 90% of the final energy in buildings, up from 50% electricity and 50% natural gas today. [23] Fuel switching on the scale anticipated by the DDPP is a long-term project that will require a concerted effort to accomplish. [24]

In discussing policy approaches for new buildings, the DDPP report asserts that "from the deep decarbonization perspective, some of the fundamental paradigms that have made these [energy-efficiency] programs successful in the past will need to be reoriented going forward, requiring significant policy innovation in both state and federal codes and standards." [25] The DDPP report sets out five major ways that building energy policy should change, but the ideas center on the importance of fuel switching and increased electrification of buildings in tandem with decarbonization of electricity generation [26] to achieve final energy use of more than 90% decarbonized electricity in all buildings. [27]

For new buildings in particular, the DDPP's overall deep decarbonization target for 2050 is to maintain the same level of final energy use in commercial and residential buildings as a whole, despite a projected increase by 2050 of

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[18] *See* EIA, *Commercial Buildings Energy Consumption Survey (CBECS)--Table E8*(414 bcf for water heating, 384 bcf for cooking, and 89 bcf for other), *https://www.eia.gov/consumption/commercial/data/2012/c&e/cfm/e8.cfm* (last released May 2016).

[19] *Id.*

[20] *See* Pipeline 101, *Why Do We Need Pipelines?*, *http://www.pipeline101.com/why-do-we-need-pipelines* (last visited Nov. 1, 2017).*See also* EIA, *Estimated Natural Gas Pipeline Mileage in Lower 48 States, Close of 2008*(finding a total of 305,954 miles), *https://www.eia.gov/naturalgas/archive/analysis_publications/ngpipeline/mileage.html* (last visited Nov. 1, 2017).

[21] *See* EIA, *Many Natural Gas-Fired Power Plants Under Construction Are Near Major Shale Plays*, TODAY IN ENERGY, May 19, 2016, *http://www.eia.gov/todayinenergy/detail.cfm?id=26312*.

[22] POLICY IMPLICATIONS OF DEEP DECARBONIZATION, *supra* note 14, at 22.

[23] *Id.* at 22-23.

[24] Major infrastructure investments in natural gas transmission and distribution lines as well as natural-gas power generating facilities have lifespans of 40 or more years. Accordingly, the country needs to make decisions in the short term about current and future construction of natural gas facilities and infrastructure. The longer decisions are delayed about the fate of natural gas usage, the more infrastructure will be built and the concern about stranded assets becomes more significant.

[25] POLICY IMPLICATIONS OF DEEP DECARBONIZATION, *supra* note 14, at 1, 91.

[26] *Id.* at 92-93.

[27] *Id.* at 22.

40% in commercial floor space and 36% in population. [28] This target is proposed to be attained by achieving three goals:

. Maximize energy efficiency to highly efficient end use in new buildings by requiring:

. Improved building shells/envelopes.

. Highly efficient electric end-use equipment. [29]

. Widespread use of sensors and data analytics to regulate energy use, including increased installation and use of smart meters.

. Facilitate, encourage, and/or require the construction of ZEBs, which requires the following:

. Increase the decarbonized electrification of the building sector, including space and water heating. [30]

. Develop incentives for fuel switching to electricity and other low-carbon fuels, particularly for space and water heating from fuel oil and natural gas combustion to decarbonized electricity. [31]

[*10133] . Increase distributed generation of renewable energy on-site and encourage the purchase of offsite renewable energy or renewable energy credits.

. Consider embodied energy in new buildings and reduce the use of carbon-intensive products, like concrete, steel, and aluminum, by substituting innovative building materials made from recycled materials and wood. [32]

In the United States, individual states and local governments have authority over building construction standards, including energy-efficiency requirements, materials requirements, performance standards, and incentive programs for energy use. States also have most of the authority over infrastructure investment decisions that could facilitate fuel switching.

The federal government's authority over relevant areas includes: energy-efficiency standards for appliances, certain infrastructure projects including interstate natural gas pipelines and electric transmission lines, policies regarding federal buildings, and schemes that guide the allocation and spending of federal funds. This is not insignificant; the U.S. government owns or leases 273,000 buildings, totaling 2.8 billion square feet. [33] The federal government can also play a role in broader areas like tax policy, biofuel development, and regulation of electric and natural gas wholesale markets through the Federal Energy Regulatory Commission. The federal government can also demonstrate new, efficient construction methods in its new buildings.

In the parts that follow, each goal is discussed along with its associated legal issues, and co-benefits like cost savings, job creation, economic development, and reduced pollution. For each goal, there are examples of how federal action could be taken to advance it and how states and local governments, as well as the private sector, could make progress on achievement of the goal.

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[28] TECHNICAL REPORT, *supra* note 15, at 1, 25-26.

[29] DOE Office of Energy Efficiency and Renewable Energy, *Appliance and Equipment Standards Program*, *http://energy.gov/eere/buildings/appliance-and-equipment-standards-program* (last visited Nov. 1, 2017).

[30] These are the two primary residential energy end uses. *See* Technical Report, *supra* note 15, at 1, 25.

[31] Fuel switching of space and water heating from fuel oil and natural gas combustion to decarbonized electricity will be responsible for most of a projected 20% decrease in total building final energy use. *See id.* at 22.

[32] THE WHITE HOUSE, UNITED STATES MID-CENTURY STRATEGY FOR DEEP DECARBONIZATION (2016), *available at**https://unfccc.int/files/focus/longterm_strategies/application/pdf/mid_century_strategy_report-final_red.pdf*. *See also* ClimateTechWiki, *Carbon Sink and Low-Carbon Building Materials*, *http://www.climatetechwiki.org/technology/carbon-sink-and-low-carbon-building-materials* (last visited Nov. 1, 2017).

[33] Fiscal Year 2015 Federal Real Property Profile Tool Open Data Set, Table 5 FY 2012-FY 2015 U.S. and U.S. Territories--Office Square Footage Trend by Agency, *https://www.gsa.gov/cdnstatic/FY_2015_FRPP_Open_Data_Set_20160531.xlsx*.

IV. Green Building Approaches

A. LEED and Energy Star for Buildings

LEED and Energy Star for buildings are the two leading voluntary certification programs for buildings in the United States. This section will explain how these schemes encourage the adoption of energy-efficiency measures for commercial and institutional buildings as well as homes.

The U.S. Green Building Council, which manages the LEED program, describes LEED as providing "independent verification of a building or neighborhood's green features, allowing for the design, construction, operation and maintenance of resource-efficient, high-performing, healthy, cost-effective buildings." [34] Building owners can seek "certification" of their building as meeting a LEED standard (Certified, Gold, Silver, or Platinum, with Platinum being the highest standard), or specify in their construction contract that a new building be constructed in a manner that would achieve a particular LEED level but not require certification. Energy Star for buildings is a voluntary program run by the U.S. Environmental Protection Agency (EPA) that allows building owners to benchmark their buildings against standards for energy efficiency. If the building meets the standards, it can display an Energy Star logo. Energy Star for buildings benchmarking is incorporated into the factors for LEED certification. [35]

LEED and EPA's Energy Star for buildings certification programs have become the two leading voluntary standards for "green buildings," with LEED increasingly being adopted by cities as a mandatory requirement for new buildings. The prominence of the LEED system for certifying green buildings might lead to the conclusion that a LEED building will be highly energy efficient. The number of points achieved by the building's design and features allow it to be certified as attaining one of the LEED standards.

However, LEED certification points can be earned by adopting a wide range of practices, including recycled building materials, water-efficiency techniques, low-volatile organic compound paints, and many other attributes of a green building beyond energy efficiency and renewable energy. The LEED certification prioritizes and assigns the most points in the category Energy and Atmosphere, which encompasses energy efficiency, renewable generation on-site, green power, and carbon offset credit purchasing. [36] Pursuing points in this area is not mandatory, but ignoring it amounts to a penalty. Ignoring energy efficiency and renewable energy also would not make sense economically when seeking to achieve the higher levels of certification, particularly LEED Platinum. [37]

Although LEED is not a guarantee that a building will employ specific strategies to increase energy efficiency or minimize resource consumption, there are some new offerings in LEED's menu of features to earn credits that address energy efficiency. For example, credits are now available for demand-response sensitivity and an alternate compliance path of optimized accounting for energy use according to carbon rather than cost (which is the current standard for **[*10134]** that credit). LEED also cycles in pilot credits that allow testing of new ideas, like an upcoming emphasis on peak load factor to encourage building energy usage that does not coincide with peaks in

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[34] *See* U.S. Green Building Council, *This Is LEED*, *http://leed.usgbc.org/leed.html* (last visited Nov. 1, 2017).

[35] ENERGY STAR, *ENERGY STAR Certification for Your Building*, *https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification* (last visited Nov. 1, 2017).*See* ENERGY STAR, *Green Buildings and ENERGY STAR*, *https://www.energystar.gov/buildings/about-us/how-can-we-help-you/energy-staraction/green-buildings-and-energy-star* (last visited Nov. 1, 2017).

[36] Interview With Brendan Owens, LEED Fellow, Chief of Engineering, U.S. Green Building Council, in Washington, D.C. (Aug. 16, 2016).

[37] *Id.*

electricity demand. Additionally, LEED standards also address embodied carbon in new buildings through the Materials and Resources credit category in LEED Version 4. [38]

Both Energy Star and LEED have specialized programs for residential buildings, Energy Star-Certified Homes [39] and LEED for Homes, [40] which certify homes in the same way that the programs certify commercial buildings, but use criteria developed for single-family homes and multifamily buildings.

B. ZEBs

ZEBs provide an endpoint or ultimate goal toward which green building can and should be directed. The federal government has encouraged the construction of commercial ZEBs and provided a common definition for the ZEB. In the Energy Independence and Security Act (EISA) of 2007, [41] the U.S. Congress set a goal of zero net-energy use for all new commercial buildings by 2030 and for one-half of the existing commercial building stock by 2040, and established the Zero Net Energy Commercial Buildings Initiative to achieve those goals. [42] ZEBs rely on efficiency, fuel switching, and on-site renewable energy generation to operate buildings without fossil fuel energy resources.

ZEB definitions vary depending upon the organization involved and the different rules and accounting methodologies used, but all definitions agree on the ultimate goal of net-zero fossil-fuel energy consumption. [43] The U.S. Department of Energy (DOE) has produced a proposed common definition for a ZEB: "an energy-efficient building where, on a source energy basis, the actual annual delivered energy is less than or equal to the on-site renewable exported energy." [44] Energy-efficiency measures that reduce building energy use are a fundamental requirement for ZEBs. Connection to the electric grid (or other energy networks) is another crucial requirement in order to transfer surplus energy generated on-site to the grid. DOE states that any "delivered energy" used by the building, including "grid electricity, district heat and cooling, [and] renewable and non-renewable fuels," must be

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[38] U.S. Green Building Council, *LEED V4 Building Design + Construction Guide, MR Overview*("focuses on minimizing the embodied energy and other impacts associated with the extraction, processing, transport, maintenance, and disposal of building materials . . . [and is] designed to support a life-cycle approach that improves performance and promotes resource efficiency." For example, the "building life-cycle impact reduction" credit provides four options for compliance that generate anywhere from two to five points for the building and involve reuse of existing materials, preservation of existing buildings for incorporation into the new structure, and a whole-building life-cycle assessment.), http://www.usgbc.org/guide/bdc#mr_overview (last visited Nov. 1, 2017);*see also* U.S. Green Building Council, *Building Life-Cycle Impact Reduction*, http://www.usgbc.org/node/2614363?return=/credits/new-construction/v4/material-%26amp%3B-resources (last visited Nov. 1, 2017).

[39] *See*ENERGY STAR, Energy Efficient New Homes, https://www.energystar.gov/newhomes (last visited Nov. 1, 2017).

[40] U.S. Green Building Council, *Guide to Certification: Homes*, https://new.usgbc.org/cert-guide/homes (last visited Nov. 1, 2017).

[41] EISA, *42 U.S.C. § 17001.*

[42] *Id.* § 17082.

[43] Focusing solely on operational energy usage, there is a continuum that spans from the "on-site ZEB" generating "enough renewable energy onsite to equal or exceed its annual energy use," to the "off-site ZEB," which uses "renewable energy from sources outside the boundaries of the building site." PAUL TORCELLINI ET AL., NATIONAL RENEWABLE ENERGY LABORATORY, ZERO ENERGY BUILDINGS: A CRITICAL LOOK AT THE DEFINITION 2-3 (2006) (NREL/CP-550-39833).

[44] GRANT ET AL., *supra* note 9, at 1, 4.

offset by equal or greater "exported energy" generated from renewable sources onsite [45] and sent to the grid or other energy network. [46]

The most commonly referenced way to generate renewable energy to offset delivered energy is photovoltaic (PV) solar, generated with panels on the top or sides of the building. [47] DOE's ZEB definition allows combustion of fuels on-site, but requires that such fuel consumption be offset by excess renewable energy generation. DOE's ZEB definition maintains strict divisions between on-site renewable

> energy and delivered energy, stating: Renewable fuels delivered to the *site boundary* are not included in this term [on-site renewable energy], because they are treated as *delivered energy* to the *building*. . . . For example, wood chips or biofuel harvested on-site would be considered *on-site renewable energy*, while wood or biofuel/biomass delivered to the site would not be considered on-site renewable energy. [48]

Accordingly, the DOE ZEB definition would require on-site generation to offset even renewable fuels that were generated off-site but delivered to a building.

DOE's requirement of on-site generation may unnecessarily constrict the sources of renewable generation as the effort to move away from carbon-based fuel sources expands. On-site generation can suffer from problems of scale because of insufficient land or building space to accommodate some forms of renewable energy or generate sufficient energy. On-site generation can also suffer from problems of efficiency because urban density may limit sunlight and installation size, and because larger-scale renewable energy facilities may be more cost effective. [49]

DOE also defined specialized forms of ZEBs, [50] including the renewable energy certificate zero-energy building **[*10135]** (REC-ZEB). The premise is that "[m]ulti-story *buildings* that occupy entire lots located in dense urban areas, or *buildings*, such as hospitals with high process loads, may not be able to balance *annual delivered energy* with *on-site renewable energy* simply because the site is not large enough to accommodate all the *on-site renewable energy* required." [51] The REC-ZEB is defined as "[a]n energy-efficient building where, on a *source energy* basis, the actual *annual delivered energy* is less than or equal to the on-site renewable *exported energy* plus acquired *Renewable Energy Certificates* (RECs)."

An REC is "a market-based instrument that represents the property rights to the environmental, social and other non-power attributes of renewable electricity generation. RECs are issued when one megawatt hour of electricity is generated and delivered to the electricity grid from a renewable energy resource." [52] The REC-ZEB only allows use

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[45] Either generated within the building footprint or on the building site (on the property or contiguous to the property where the building is located) and connected to the building's energy distribution infrastructure. *Id.*

[46] The DOE definition takes a hard stance on the issue of on-site generation; whereas, previous definitions included off-site energy supply options, like use of renewable energy resources imported from off-site to the building to generate energy on-site, or purchase of renewable energy generated off-site, whether in the form of certified credits, or a power purchase agreement for a newly installed renewable system. *Id.*

[47] GRANT ET AL., *supra* note 9, at 5; SHANTI PLESS & PAUL TORCELLINI, NATIONAL RENEWABLE ENERGY LABORATORY, NET-ZERO ENERGY BUILDINGS: A CLASSIFICATION SYSTEM BASED ON RENEWABLE ENERGY SUPPLY OPTIONS 1, 6 (2010) (NREL/TP-550-44586), *available at*http://www.nrel.gov/docs/fy10osti/44586.pdf.

[48] GRANT ET AL., *supra* note 9, at 1, 7.

[49] *See, e.g.*, John Farrell, *Report: Is Bigger Best in Renewable Energy?*, Inst. for Loc. Self-Reliance, Sept. 30, 2016, https://ilsr.org/report-is-bigger-best/.

[50] Two others are the zero-energy campus and the zero-energy community, which are groupings of buildings where renewable energy resources are shared. Grant et al., *supra* note 9, at 1, 4, 7.

[51] *Id.* at 10.

of RECs as a supplement after on-site renewable energy sources have been employed. In addition, the building's owner must demonstrate through actual measurements that its delivered energy consumption is less than or equal to renewable energy generated on-site plus RECs. [53]

Beyond reductions in energy consumption from carbon-intensive sources, ZEBs could provide numerous benefits, including lower operating costs, better resiliency to power outages, improved energy security, reduced air pollution, new business opportunities, increased demand for renewable energy, and ancillary benefits for building users, like increased productivity [54] and improved health. [55] Yet ZEBs also raise issues that may affect their implementation as well as their incorporation into law, including varying and conflicting definitions, questions about the use of offsets to qualify in meeting the zero emissions standard, [56] the technology and systems required to operate ZEBs, [57] up-front costs, [58] problems that ZEBs may pose for the operation of the electric grid, [59] and lack of energy

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[52] U.S. EPA, *Green Power Partnership--Renewable Energy Certificates (RECs)*, *https://www.epa.gov/greenpower/renewable-energy-certificates-recs* (last updated Sept. 8, 2017).

[53] GRANT ET AL., *supra* note 9, at 1, 10; *see also* DRURY CRAWLEY ET AL., NATIONAL RENEWABLE ENERGY LABORATORY, GETTING TO NET ZERO 1, 4 (2009) (NREL/JA-550-46382) (describing ZEBs that employ off-site energy supply options and "[p]urchase recently added off-site [renewable energy] sources, as certified from Green-E (2009) or other equivalent REC programs [and] [c]ontinue to purchase the generation from this new resource to maintain [net-zero energy building] status"), *available athttps://www.nrel.gov/docs/fy09osti/46382.pdf*.

[54] Nationally, improvements to indoor environmental conditions are estimated to have generated $ 20 to $ 160 billion from workforce productivity gains. William J. Fisk, *Health and Productivity Gains From Better Indoor Environments and Their Relationship With Building Energy Efficiency*, 25 ANN. REV. ENERGY & ENV'T 537 (2002); *see also* Lawrence Berkeley National Lab, *Indoor Air Quality Scientific Findings Resource Bank: Human Performance*, *https://iaqscience.lbl.gov/performance-summary.7* (last visited Nov. 1, 2017).

[55] Poor indoor environmental quality resulting from insufficient air circulation, poor lighting, mold, temperature variances, carpeting and furniture materials, pesticides, toxic adhesives and paints, and high concentrations of pollutants contribute widely to respiratory problems and allergies. *See* U.S. EPA, *Introduction to Indoor Air Quality*, *https://www.epa.gov/indoor-airquality-iaq/introduction-indoor-air-quality* (last updated Jan. 26, 2017);*see also* Marco Ferreira & Manuela Almeida, *Benefits From Energy Related Building Renovation Beyond Costs, Energy, and Emissions*, 78 ENERGY PROCEDIA 2397-402 (2015), *available athttp://www.sciencedirect.com/science/article/pii/S1876610215019311#*.

[56] The REC-ZEB category recognizes the challenges of urban density and energy-intensive building uses for on-site generation and takes into account the potential for off-site generation in more optimum areas, which might reduce the cost and increase the attainability of ZEBs. However, DOE missed an opportunity to create a hierarchy of priorities between the purchase of RECs and a power purchase agreement (PPA) for renewable energy from a local utility or an arrangement where the building's owners finance or own generation equipment (e.g., solar PV panels, wind turbines) and pay a utility to operate and maintain them. Use of a PPA would provide direct investment into the utility to support the construction, maintenance, and operation of the means of producing renewable energy. Depending on what is preferable for the utility serving the building, a potential hierarchy would have a PPA or ownership of means of generation at the top, because it involves a contractual relationship (often long-term) that the utility can rely on. Next would be purchase of RECs, because it provides no direct investment and no guaranteed revenue stream for the utility.

[57] Experts have written extensively about the simulation models, sensors, actuators, and building optimization and control technologies needed for effective ZEB operation and have expressed concerns about the harmony required between these technologies and the building's users to achieve a ZEB. Complex systems, high-tech components, and diverse users must all work together in real time on a daily basis for a building to succeed as a ZEB. *See* Denia Kolokosta et al., *A Roadmap Towards Intelligent Net Zeroand Positive-Energy Buildings*, SOLAR ENERGY 3 (2010).

[58] Some studies indicate that a ZEB, whether residential or commercial, can be constructed for approximately 0%-10% more than the same type of traditional building. *See* NEW BUILDINGS INSTITUTE, GETTING TO ZERO 2012 STATUS UPDATE: A FIRST LOOK AT THE COSTS AND FEATURES OF ZERO ENERGY COMMERCIAL BUILDINGS (2012), *available athttp://newbuildings.org/sites/default/files/GettingtoZeroReport_0.pdf*. *See* Paul Torcellini et al., *A Pathway for Net-Zero Energy*

storage requirements. [60] The bottom line, though, is that ZEBs are playing and likely will play a growing role in decarbonization of new buildings.

V. Energy-Efficiency Technologies for Deep Decarbonization of New Buildings

A wide range of energy-efficiency technologies are available today that can be utilized in new building construction to satisfy the fundamental ZEB requirement of extraordinary energy efficiency, as well as to meet the DDPP goals. The following approaches and measures can be employed in residential, commercial, and industrial buildings. "Passive" building design represents the high end of the spectrum of **[*10136]** energy efficiency and includes features that can be included into less comprehensive but still quite efficient buildings.

Passive building is "both a set of design principles . . . and a quantifiable performance standard that can be implemented in all building types. . . ." [61] The major principles of passive building include superinsulation; airtightness; high-performance components such as windows; solar gain through building orientation, building floor plans that reduce the need for lights ("daylighting"), and heating/cooling with solar shading designed to reduce thermal loads and save energy; natural ventilation; and use of materials that absorb and store heat energy. [62] The use of passive technologies can play a key role in reducing energy demand and is a significant element in designs that help meet AIA's 2030 Challenge. [63]

For example, new residential buildings that adhere to standards for passive construction may not even need to use electricity or very efficient heating technologies, such as ground-source heat pumps, [64] because little additional heating may be required to maintain desired comfort levels. Instead, small electric heating appliances can be used to provide supplemental heating. This approach reduces electric demand and the associated carbon emissions from the portion of the grid that remains reliant on fossil fuels, as well as building costs that would typically be related to space heating.

Buildings: Creating a Case for Zero Cost Increase, 43 Building Res. & Info. 25-33 (2015) (demonstrating how an office building was constructed as a ZEB at no incremental cost increase over a traditional building of that size in that location).

[59] ZEB models assume that excess energy generated on-site can always be sent to the grid to be used; however, the grid may not always need this energy and on-site storage would be needed to maintain the building's ZEB status. PLESS & TORCELLINI, *supra* note 47, at 2. The electric grid (which is and may remain for some time heavily reliant on fossil fuels) needs to provide backup generation for the ZEB, even though the ZEB will not need energy from the grid on an annual net basis. *See* Mark MacCracken, *The Flaw of "Zero Energy Buildings" Without Energy Storage*, CLEAN TECHNICA, Mar. 16, 2016, http://cleantechnica.com/2016/03/16/the-flaw-of-zero-energy-buildings-without-energy-storage/.

[60] Most grid-connected ZEB models use the grid for storage and/or consider on-site electric vehicle charging to be energy storage. Mark MacCracken, *The Flaw of "Zero Energy Buildings" Without Energy Storage*, CleanTechnica, Mar. 16, 2016, http://cleantechnica.com/2016/03/16/the-flaw-of-zero-energy-buildings-without-energy-storage; *see also* Karsten Voss et al. *Nearly-Zero, Net Zero, and Plus Energy Buildings--How Definitions & Regulations Affect the Solutions*, REHVA J. 23 (2012). Then, as electric vehicles drive away from the building and use the energy stored in their batteries, the charging becomes a means of transmission for exporting that energy. GRANT ET AL., *supra* note 9, at 7.

[61] Katrin Klingenberg & Mike Knezovich, *An Introduction to Passive House Principles and Policy*, 26 Envtl. L. N.Y. 39 (2015), *available at*http://www.phius.org/Releases/Environmental-Law-In-NY-March-2015.pdf.

[62] Autodesk Sustainability Workshop, *Thermal Mass*, http://sustainability-workshop.autodesk.com/buildings/thermal-mass (last visited Nov. 1, 2017).

[63] Architecture 2030, *supra* note 11.

[64] Ground-source heat pumps, also called geothermal heat pumps, use the constant temperature of the earth, a few feet below the surface, as the exchange medium instead of the outside air temperature. "Like a cave, this ground temperature is warmer than the air above it during the winter and cooler than the air in the summer." By exchanging heat with the earth, a ground-source heat pump is able to heat, cool, and, if so equipped, supply the house with hot water. *See* DOE, *Geothermal Heat Pumps*, https://energy.gov/energysaver/geothermal-heat-pumps (last visited Nov. 1, 2017).

Additional energy-efficiency measures that are often implemented in construction of ZEBs include innovative heating, ventilating, and air conditioning (HVAC) strategies that decouple ventilation from space conditioning and reduce fan energy; energy-efficient appliances, electronics, and equipment; use of the most efficient lighting technology (light-emitting diodes (LEDs)); and intelligent building technologies that automatically adjust features to maintain a consistent temperature and minimize HVACrelated energy losses.

One question that highly engineered designs raise is the issue of embodied energy, particularly embodied carbon. If superinsulation of the building envelope and triple pane windows are used to increase energy efficiency, there should be some consideration of the balance between the emissions produced to create the extra insulation and glass and the building's reduced energy consumption over its life cycle. There are three main ways to minimize embodied energy in new buildings: (1) increase material efficiency (i.e., use less material by changing the design or increasing the strength of materials), (2) use the same materials with less embodied carbon (i.e., manufactured more efficiently or with low-carbon energy), [65] or (3) substitute materials. [66]

Incorporating into the design energy-efficiency strategies that have manageable up-front costs and positive lifecycle value is one way to move the building sector away from carbon-based fuel dependence and toward ZEBs.

VI. U.S. Approaches to Improve the Energy Performance of New Buildings

A. Federal Approaches to Improving Energy Performance in New Buildings

Over the past decade or so, the United States has taken a range of actions on a federal level that support decarbonization goals by improving energy efficiency and promoting increased use and generation of renewable energy. These actions have been taken in accordance with a variety of federal laws, standards, and mandates, including the Energy Policy Act of 2005 (EPAct 2005), EISA, General Services Administration (GSA) 2016 Facilities Standards, President Barack Obama's Executive Order No. 13693, and DOE's 2008 "Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings."

The EPAct 2005 provides several examples of the federal government's authority and willingness to take action on energy efficiency in new buildings. [67] The EPAct mandated that the Secretary of Energy "establish, by rule, revised Federal building energy efficiency performance standards. . . ." The Act requires that, "if life-cycle cost-effective for new Federal buildings," the buildings are to "be designed to achieve energy consumption levels that are at least 30 percent below the levels established in the version of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard or the International Energy Conservation Code, as appropriate." [68] The implementing regulations were adopted in December 2006. [69]

EISA took energy efficiency further. For new federal buildings and major renovations, the Act required that fossil fuel energy use, including natural gas--relative to the **[*10137]** 2003 level--be reduced 55% by 2010 and be

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[65] If fuel switching to renewable and low-carbon sources occurs, as laid out in the DDPP, then embodied carbon in building materials would also be reduced.

[66] An example of a substitute material is a new type of laminated wood, cross-laminated timber, being produced that is as strong and fire-resistant as steel and concrete. Trees also absorb carbon dioxide from the air as they grow, in sharp contrast with the carbon-intensive production of concrete and steel, making this new material very attractive from an embodied carbon perspective. *See* Nexus Media, *Wooden Skyscrapers--Coming to a City Near You*, Sci. Am., June 16, 2016, *http://www.scientificamerican.com/video/wooden-skyscrapers-coming-to-a-city-near-you*; *see also* LUTKEN & WRETLIND, *supra* note 12, at 8.

[67] EPAct 2005, H.R. 6, 109th Cong. § 109 (2005) (enacted), *https://www.gpo.gov/fdsys/pkg/BILLS-109hr6enr/pdf/BILLS-109hr6enr.pdf*.

[68] *Id.*

[69] Life-cycle costing, 10 C.F.R. § 433.8 (2006); Energy efficiency performance standard, 10 C.F.R. § 433.100 (2006).

eliminated (100% reduction) by 2030. [70] In order to continue these initiatives and others, EISA required GSA to establish the Office of Federal High-Performance Green Buildings to coordinate green building information and activities within GSA and with other federal agencies. [71] With regard to specific features in buildings, the Act directed GSA to review the current use of, and design a strategy for increased use of, cost-effective lighting, ground-source heat pumps, and other technologies in GSA facilities. [72]

The GSA 2016 Facilities Standards (P100) also contain energy-efficiency strategies and energy performance standards. [73] The GSA has addressed energy efficiency and sustainability by requiring LEED certification in its standards.

GSA's Facilities Standards for public buildings also require new buildings be designed to comply with the energy performance requirements of the EPAct 2005 (designed to be at least 30% more efficient than the design required by ASHRAE 90.1) and EISA (designed to reduce fossil fuel-generated energy use by 80% reduction in 2020, 90% in 2025, and 100% by 2030). [74] From concept design through each design phase, the project must demonstrate that it meets its energy targets by using energy modeling that includes the building enclosure systems in concert with mechanical systems and provides documentation showing that systems were chosen based on a life-cycle cost analysis. [75] All buildings must meet minimum levels of performance. Energy cost and its effect on life-cycle cost is an essential consideration in the design of GSA buildings. [76] The GSA requirement that new GSA buildings achieve the LEED Version 4 Gold standard encourages smart grid-connected demand response capability by providing points for that capability.

President Obama's Executive Order No. 13693, Planning for Federal Sustainability in the Next Decade, signed in 2015, established other energy-efficiency requirements for federal agencies. [77] The head of each federal agency is required to promote building energy conservation, efficiency, and management by submitting monthly performance data to EPA for certain buildings, installing and monitoring smart meters in all data centers by fiscal year 2018, and creating power usage effectiveness targets for new and existing data centers. The agency heads must also ensure

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[70] EISA, *42 U.S.C. § 433.* Unfortunately, regulations implementing this provision of EISA were never finalized. *See also* Fossil Fuel-Generated Energy Consumption Reduction for New Federal Buildings and Major Renovations of Federal Buildings, *75 Fed. Reg. 63404* (Oct. 15, 2010). The rule never advanced beyond the notice of proposed rulemaking. *See also* Energy Efficiency Standards for the Design and Construction of New Federal Commercial and Multi-Family High-Rise Residential Buildings, 10 C.F.R. pt. 433.

[71] EISA, *42 U.S.C. § 17092.*

[72] *Id.* § 17095.

[73] *See*GSA 2016 Facilities Standards (P100), ch. 1, §§ 1.7, 1.8, and 6.5.1.1, *https://www.gsa.gov/cdnstatic/P100_2016.pdf*.

[74] GSA, PBS-P100: FACILITIES STANDARDS FOR THE PUBLIC BUILDINGS SERVICE (2016), *https://www.gsa.gov/cdnstatic/P100_2016.pdf*.

[75] *Id.*

[76] *Id.*

[77] Exec. Order No. 13693, *80 Fed. Reg. 15871* (Mar. 19, 2015). President Donald Trump has not yet revoked Exec. Order No. 13693. If it is revoked in the future, agencies could withdraw their plans for energy efficiency and renewable energy, except for the U.S. Department of Defense (DOD) because its 25% renewables by 2025 target was codified in the National Defense Authorization Act of 2007. In July 2017, amendments to the National Defense Authorization Act that would have reversed climate change-related activities were all voted down by the U.S. House of Representatives, including an amendment that sought to bar the Pentagon from implementing relevant portions of Exec. Order No. 13693. Bonner R. Cohen, *House Rejects Amendments to Free Pentagon From Climate Change Policies*, HEARTLAND INST., Sept. 15, 2017, *https://www.heartland.org/news-opinion/news/house-rejects-amendments-to-free-pentagon-from-climate-change-policies*.

that minimum percentages of total building electric and thermal energy are generated from renewable and alternative sources, ranging from not less than 10% in 2016 and 2017, up to not less than 25% by 2025. There are similar targets for renewable energy consumed by agency buildings--not less than 30% of electric energy by 2025. [78]

For all new agency lease solicitations larger than 10,000 rentable square feet, the Executive Order requires that energy efficiency be considered either as a required performance specification or as a source selection evaluation factor in best-value trade off procurements. Beginning in 2016, there have also been requirements for lessor disclosure of carbon emissions or energy consumption data for that portion of the building occupied by the agency in order to facilitate reporting requirements. For new buildings and leases, agencies must also "optimize sustainable space usage and consideration of existing community transportation planning and infrastructure, including access to public transit." [79] Finally, all new construction and major renovations are required to incorporate "climate-resilient design and management elements," which are to be defined in new guiding principles for both new and existing federal buildings that also contemplate employee and visitor wellness. [80]

Federal agencies have shown strong results from their energy management over the years. From 1975 to 2015, the federal government has decreased the energy intensity of its buildings by more than 40%. Furthermore, in 2015, 8.7% of the federal government's electricity use came from renewable sources. [81]

Federal agencies are required by statute, Executive Order, and presidential memorandum to meter electricity, natural gas, and steam in federal buildings with advanced metering. Pursuant to § 103 of the EPAct 2005, federal agencies are required to meter electricity used in federal buildings for the purposes of efficient use of energy and reduction in the cost of electricity. [82]

DOE's 2008 "Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings" provided additional requirements for installation of building-level electricity, natural gas, and steam meters in new major **[*10138]** construction, renovation projects, and existing buildings. [83] DOE guidance, developed in accordance with a presidential memorandum, Federal Leadership on Energy Management, set a deadline of October 1, 2016, for such metering of natural gas and steam. [84] By the end of 2013, federal agencies collectively reported installing 96% of electricity, 96% of natural gas, and 69% of steam meters at buildings the agencies deemed appropriate. [85] The

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[78] *Id.*

[79] *Id.*

[80] Exec. Order No. 13693, *80 Fed. Reg. 15871* (Mar. 19, 2015).

[81] Fact Sheet, DOE Office of Energy Efficiency and Renewable Energy, Federal Energy Management Program, *https://energy.gov/sites/prod/files/2016/08/f33/femp_overview%281%29.pdf*.

[82] *As amended and codified* at *42 U.S.C. § 8253*(e), *https://www.gpo.gov/fdsys/pkg/USCODE-2008-title42/pdf/USCODE-2008-title42-chap91-subchapIII-partB-sec8253.pdf*.

[83] DOE, *Guiding Principles for Sustainable Federal Buildings*, *http://energy.gov/eere/femp/guiding-principles-sustainable-federal-buildings* (last visited Nov. 1, 2017).

[84] DOE, FEDERAL BUILDING METERING GUIDANCE (Nov. 2014 Update), *http://energy.gov/sites/prod/files/2014/11/f19/metering_guidance.pdf*; Presidential Memorandum on Federal Leadership on Energy Management, PUB. PAPERS 833 (Dec. 5, 2013), *https://www.fedcenter.gov/admin/itemattachment.cfm?attachmentid=779*.

[85] *Id.* (The following buildings are excluded from metering: building planned to be sold or razed within the next five years; building leased or owned, but the agency either does not pay the utility bill or does not pay the lessor for utilities based on actual consumption; building does not have an energy-consuming heating or cooling system or significant process loads; building

DOE guidance also provides that "[e]ach agency shall use, to the maximum extent practicable, advanced meters or advanced metering devices that provide data at least daily and that measure at least hourly consumption of electricity in the Federal buildings of the agency." [86] This data, particularly the data on natural gas, can be analyzed and used to support decisions on continued energy-efficiency measures and fuel switching from natural gas to electricity. Further, the fact that the data must be generated likely supports better planning for new buildings to minimize emissions.

EISA also established the Zero Net Energy Commercial Buildings Initiative, with a national goal to achieve zero net-energy use for new commercial buildings built after 2025. [87] The Act also created the Office of Commercial High-Performance Green Buildings at DOE and required that DOE establish a national clearinghouse for information and public outreach about high-performance green buildings. [88]

In 2008, the U.S. Department of Defense (DOD) and DOE began a joint initiative to address military energy use by identifying specific actions to reduce energy demand and increase use of renewable energy on DOD installations. Part of this initiative involved evaluating the potential for net zero-energy military installations. A broad definition used by DOE and DOD in this context included producing as much energy from renewable energy sources as is consumed; limiting the consumption of water to not deplete the local watershed; and reducing, reusing, and recovering waste streams to add zero waste to landfills. [89] Although little-to-no progress [90] has been made thus far, DOD has indicated that it will issue guidance soon on incorporating net zero into planning for new facilities larger than 5,000 gross square feet, among others, in compliance with Executive Order No. 13693. [91]

B. State and Local Approaches to Improving Energy Performance in New Buildings

The best way to implement energy-efficiency measures, like those mentioned above, at a state level is through amendments to state building codes. This section will cover how states and cities have developed building and energy codes to encourage energy efficiency, comply with federal mandates, and/or chart their own courses into requiring increased efficiency through the incorporation of LEED compliance into their standards or the creation of their own original codes.

There are two general approaches to building codes among U.S. states. First, state building codes may be adopted and applied statewide. Second, a state-level building code may be adopted to set minimums and guide counties and municipalities in adopting building codes. This second approach may allow local codes at the county and municipal level to be stricter than the state code. A state's code may consist of multiple building codes, including international model codes that may be amended to suit the state's needs. [92]

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generates electricity that is sold commercially to other parties in the course of regular business, where installing meters would require an impractical shutdown of service.).

[86] DOE, *supra* note 84.

[87] EISA, *42 U.S.C. § 422.*

[88] *Id.* §§ 421 and 423.

[89] U.S. GOVERNMENT ACCOUNTABILITY OFFICE, REPORT ON DEFENSE INFRASTRUCTURE: DOD EFFORTS REGARDING NET ZERO GOALS (2016) (GAO-16-153R), *http://www.gao.gov/assets/680/674599.pdf*.

[90] *Id.* at 1.

[91] *Id.* at 2.

[92] This is a great resource that lists whether a state has a statewide code or a combination of state and municipal building codes. U.S. DEPARTMENT OF ENERGY, STATUS OF STATE ENERGY CODE ADOPTION (Dec 15, 2017), *https://www.energycodes.gov/status-state-energy-code-adoption* (last visited Dec. 20, 2017).

The state may also have an energy code that interfaces with its building codes. The energy code may be written by and for that state specifically, but there also are model energy codes states can adopt in full and/or tailor to their needs. Two model codes are most commonly used by states and the federal government for energy efficiency in buildings: the International Energy Conservation Code (IECC) and ANSI/ASHRAE/IES Standard 90.1. [93] These two codes address efficiency and energy use comparison. Despite some technical differences in what they allow for various building types over all climatic zones, they are "within 1% for both energy use and energy costs" on a national average basis. [94]

States and cities are also increasingly looking to the LEED certification system for ways to improve energy efficiency and lower the environmental impact of buildings, often by incorporating compliance with LEED into their **[*10139]** building standards. [95] Sixteen states require new buildings to meet or exceed LEED Silver certification; some of those states require the same for renovated buildings and allow compliance through a somewhat equivalent standard, the Green Globe system. [96] Thirty-two cities require some form of LEED certification for new and/or renovated buildings; some apply this requirement exclusively to municipal buildings and some apply it to all new construction above a specific square footage. [97]

The Energy Policy Act of 1992 required each state to review the energy-efficiency provisions of its residential building codes and to determine within two years whether it should adopt the 1992 Model Energy Code published by the Council of American Building Officials. [98] For commercial building codes, the Act requires states to adopt the current ASHRAE code. [99] Both of these codes are revised periodically. Whenever either code is revised, the Act requires states to consider or adopt updated provisions that DOE determines "would improve energy efficiency" in residential or commercial buildings. [100] To bolster state performance, the EPAct 2005 authorizes DOE to provide $ 25 million annually to states to improve existing energy-efficiency codes and to improve compliance with such codes. [101]

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[93] There is also a long list of model codes, to name a few: the International Building Code, International Residential Code, International Mechanical Code, International Plumbing Code, International Fuel Gas Code, International Green Construction Code, and International Property Maintenance Code.

[94] For an in-depth comparison of the two standards, see JIAN ZHANG ET AL., PACIFIC NORTHWEST NATIONAL LABORATORY, ENERGY AND ENERGY COST SAVINGS ANALYSIS OF THE 2015 IECC FOR COMMERCIAL BUILDINGS app. B (2015) (PNNL-24269 Rev. 1), *available at*https://www.energycodes.gov/sites/default/files/documents/2015_IECC_Commercial_Analysis.pdf.

[95] *See* Jocelyn Durkay, *Energy Efficiency Requirements for Public Buildings*, NAT'L CONF. ST. LEGISLATURES, Nov. 20, 2013 (listing state energy-efficiency requirements that involve LEED certification), http://www.ncsl.org/research/energy/energy-efficiency-requirements-for-public-buildings.aspx; *see also* Everblue Training Institute, *Cities Requiring or Supporting LEED*(listing city ordinances and requirements that involve LEED certification), http://www.everbluetraining.com/blog/cities-requiring-or-supporting-leed-2015-edition (last updated Sept. 21, 2017).

[96] *See* Durkay, *supra* note 95; *see also* Green Globes, *About Green Globes*, https://www.greenglobes.com/about.asp (last visited Nov. 1, 2017).

[97] *See* Everblue Training Institute, *supra* note 95 (listing city ordinances and requirements that involve LEED certification).

[98] 42 U.S.C. §§ 6832(15), 6833(a).

[99] *Id.* §§ 6832(16), 6833(b).

[100] *Id.* § 6833(a)(5), (b)(2).

[101] *Id.* § 6833(e).

Three states have adopted energy codes that are more energy efficient than the 2012 or 2015 IECC [102] for their residential building energy codes, eight states and the District of Columbia have adopted the 2012 or 2012 IECC or equivalent, and 28 states have adopted the 2009 IECC or a code between the 2009 and 2012 or 2015 IECC. [103] For commercial building energy codes, seven states have adopted ASHRAE 90.1 (2013) or more efficient codes, and seven states and the District of Columbia have adopted ASHRAE 90.1 (2010) or a code between the 2010 and 2013 versions. Twenty-three states have commercial building codes between 90.1 (2007) and 90.1(2010). [104]

California's 2016 Building Energy Efficiency Standards [105] (effective January 2017) apply to new residential and nonresidential buildings and provide mandatory, prescriptive, and performance standards for building envelopes for buildings with and without air-conditioned environments. [106] The California Energy Commission has estimated that the implementation of the 2016 Building Energy Efficiency Standards will reduce statewide annual electricity consumption by about 281 gigawatt hours per year, natural gas consumption by 16 million therms per year, and GHG emissions by an amount equivalent to 160,000 metric tons of carbon dioxide annually. [107]

The 2016 Building Energy Efficiency Standards will not achieve zero net-energy use, but they will push residential building standards closer to ZEBs. The 2019 standards, effective in January 2020, will take the final step to achieve zero net energy for newly constructed residential buildings, meaning the buildings must use a combination of improved efficiency and distributed renewable energy generation on-site to meet 100% of their annual energy needs. According to the California Public Utilities Commission (PUC), "[t]ypically the Standards' stringency increases at the rate of 12-15% in each cycle. . . ." [108] Areas to be covered in the 2016 and 2019 standards related

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[102] The most recent version of IECC is 2015 IECC, which can provide a 15% increase in energy savings compared to the 2009 IECC. *See* Ryan Meres, *2015 IECC: What You Need to Know*, BUILDER, Nov. 18, 2014, *http://www.builderonline.com/building/code/2015-iecc-what-you-need-to-know_o*.

[103] DOE, STATUS OF STATE ENERGY CODE ADOPTION (Dec 15, 2017), *https://www.energycodes.gov/status-state-energy-code-adoption* (last visited Dec. 20, 2017). For a discussion of the difference between the 2009 IECC and the 2012 IECC, see TERRY S. MAPES & DAVID R. CONOVER, PACIFIC NORTHWEST NATIONAL LABORATORY, GUIDE TO THE CHANGES BETWEEN THE 2009 AND 2012 INTERNATIONAL ENERGY CONSERVATION CODE (2012) (PNNL-21435), *available athttps://www.energycodes.gov/sites/default/files/documents/Comparison_2009to2012_IECC.pdf*.

[104] DOE, *supra* note 103.

[105] n105 The abstract to the standards states:

> Public Resources Code Sections 25402 subdivisions (a)-(b) and 25402.1 emphasize the importance of building design and construction flexibility by requiring the Energy Commission to establish performance standards, in the form of an **"energy budget" in terms of the energy consumption per square foot of floor space**. For this reason, the Standards include both a **prescriptive option**, allowing builders to comply by using methods known to be efficient, and a **performance option**, allowing builders complete freedom in their designs provided the building achieves the same overall efficiency as an equivalent building using the prescriptive option.

CALIFORNIA ENERGY COMMISSION, 2016 BUILDING ENERGY EFFICIENCY STANDARDS FOR RESIDENTIAL AND NONRESIDENTIAL BUILDINGS (2015) (CEC-400-2015-037-CMF) (emphasis added), *available athttp://www.energy.ca.gov/2015publications/CEC-400-2015-037/CEC-400-2015-037-CMF.pdf*.

[106] *Id.* at 48, § 100.0.

[107] Additionally, there will be a net reduction in nitrous oxide emissions by about 508 tons per year, sulfur oxides by 13 tons per year, carbon monoxide by 41 tons per year, and particulate matter (PM2.5) by 13.75 tons per year. *See*CALIFORNIA ENERGY COMMISSION, STAFF REPORT: INITIAL STUDY/PROPOSED NEGATIVE DECLARATION FOR THE 2016 BUILDING ENERGY EFFICIENCY STANDARDS FOR RESIDENTIAL AND NONRESIDENTIAL BUILDINGS (2015) (CEC-400-2015-012), *http://www.energy.ca.gov/2015publications/CEC-400-2015-012/CEC-400-2015-012.pdf*.

to zero-energy policy goals for 2020 include "high performance walls and attics with increased continuous insulation; high efficacy lighting; energy-efficient water heating system requirements; conditions under which solar can be offered as a compliance credit; and defining a [Zero Net Energy] ZNE **[*10140]** tier for CALGreen, which implements California's green building standard." [109]

Several zero-energy communities in California have been built over the past few years or are planned for the near future to begin piloting designs and technologies that will soon be required for new single-family homes as well as new multifamily residential buildings. [110] As of early 2016, California already had 1,538 net-zero buildings, more than any other state. [111]

California takes its building standards further in "CALGreen," the California Green Building Standards Code. [112] CALGreen goes beyond the state's Building Energy Efficiency Standards to account for other environmental factors and impacts in new building construction. The first version was created in 2010, the second in 2013, and the newest version in 2016 (effective January 2017). The purpose of this code is "to improve public health, safety and general welfare through enhanced design and construction of buildings using concepts that reduce negative impacts and promote those principles that have a positive environmental impact and encourage sustainable construction practices." [113] The code focuses on five areas: planning and design; energy efficiency; water efficiency and conservation; material conservation and resource efficiency; and environmental quality. [114]

The CALGreen code provides mandatory and voluntary requirements for new residential and nonresidential buildings (including buildings for retail, office, public schools,, and hospitals) throughout California. The code applies broadly to "every newly constructed building or structure on a statewide basis unless otherwise indicated." [115] Both sets of mandatory standards--for residential and nonresidential buildings--have requirements for electric vehicle charging, which promotes increased electrification, provides for energy storage/export if the building is a ZEB, and facilitates fuel switching in the transportation sector by making it more convenient to charge electric vehicles. [116]

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[108] CALIFORNIA ENERGY COMMISSION & CALIFORNIA PUC, CA ENERGY EFFICIENCY STRATEGIC PLAN: NEW RESIDENTIAL ZERO NET ENERGY ACTION PLAN 2015-2020, at 20 (2015), *available at*http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/Demand_Side_Management/EE_and_Energy_Savings_Assist/ZNERESACTIONPLAN_FINAL_060815.pdf.

[109] *Id.* (noting that "Codes and Standards are the most important push mechanism available for implementing policy goals"). *See also*CALIFORNIA ENERGY COMMISSION, 2016 BUILDING ENERGY EFFICIENCY STANDARDS FREQUENTLY ASKED QUESTIONS (2017), http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/2016_Building_Energy_Efficiency_Standards_FAQ.pdf.

[110] *See* Jake Richardson, *First Zero Net Energy Community in California Announced*, CLEAN TECHNICA, Apr. 28, 2015, https://cleantechnica.com/2015/04/28/first-zero-net-energy-community-california-announced/; *see also* Kerry A. Dolan, *Largest U.S. "Zero Net Energy" Community Opens in California at UC Davis*, FORBES, Oct. 14, 2011, http://www.forbes.com/sites/kerryadolan/2011/10/14/largest-u-s-zero-net-energy-community-opens-in-california-at-uc-davis/ # f522d136ad94.

[111] Andrew Meyer, *California's SGIP Is Bringing Net-Zero Homes Into the Mainstream*, Swell, Feb. 16, 2016, https://www.swellenergy.com/blog/2016/02/16/california-s-sgip-is-bringing-net-zero-homes-into-the-mainstream.

[112] International Code Council, *California*, https://codes.iccsafe.org/public/collections/CA (last visited Nov. 1, 2017).

[113] INTERNATIONAL CODE COUNCIL & DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT, GUIDE TO THE 2016 CALIFORNIA GREEN BUILDING STANDARDS CODE: RESIDENTIAL 1 (2016), *available at*https://cdn-codes-pdf.iccsafe.org/uploads/bookpdfs/Guide%20to%202016%20Cal-Green%20Residential.pdf#viewer.action=download.

[114] *Id.* at 2.

[115] *Id.*

The CALGreen standards miss an opportunity to require highly efficient, electric end-use equipment in the mandatory standards for residential and nonresidential buildings, which would promote increased electrification of new buildings. [117]

In the wake of Hawaii's 2015 law setting a 100% renewable energy goal by 2045, [118] the state has focused on lowering energy consumption as part of the strategy to achieve its goal. [119] Because "[h]omes and buildings account for most of Hawaii's electrical use[,]" [120] the state decided to strengthen its building energy codes and the State Building Code Council unanimously adopted the 2015 IECC with amendments to address the state's specific needs. [121] Once all of the county councils adopt the 2015 IECC, "[h]omes and buildings built to the 2015 IECC [will] use about 30% less energy than those built to the 2006 IECC--Hawaii's prior code . . . [and] Hawaii's amendments reduce energy use by up to another 3%." [122] Some of the specific highlights of Hawaii's new code are that a building's envelope must meet standards tailored to Hawaii's tropical climate and comply with testing requirements. [123] Hawaii requires that HVAC systems meet performance standards laid out in the code. [124] Also, lighting systems in buildings must operate with occupant sensors and time-sensitive controls; these systems must also be tested for functionality. [125]

The 2015 Washington State Energy Code mandates continuous improvement to energy efficiency in buildings, working toward the goal of 70% net annual reduction in energy consumption in newly constructed residential and nonresidential buildings by 2031. [126] However, the code also states that the State Building Code Council may defer adoption of energy-efficiency measures if "economic, technological, or process factors would significantly impede **[*10141]** adoption or compliance. . . ." [127] The city of Seattle's Energy Code goes beyond some of the mandates

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[116] *Id.* ch. 4.

[117] *Id.* Additionally, there are no enhanced standards for building envelopes beyond the Building Energy Efficiency Standards, the only equipment standard is an ENERGY STAR requirement for bathroom exhaust fans, there are no requirements around sensors, and HVAC design standards are set according to the American National Standards Institute (ANSI) and ASHRAE.

[118] Press Release, Governor David Ige, Governor Ige Signs Bill Setting 100 Percent Renewable Energy Goal in Power Sector (June 8, 2015), *http://governor.hawaii.gov/newsroom/press-release-governor-ige-signs-bill-setting-100-percent-renewable-energy-goal-in-power-sector/*.

[119] CADMUS GROUP, INC., ANALYSES AND PROPOSAL OF HAWAII AMENDMENTS TO THE 2015 INTERNATIONAL ENERGY CONSERVATION CODE 3 (2016), *available at* *https://energy.hawaii.gov/wp-content/uploads/2016/07/Analyses-and-Proposal-of-Amendments.pdf*.

[120] *Id.*

[121] Hawaii State Energy Office, *2015 IECC Update*, *http://energy.hawaii.gov/hawaii-energy-building-code/2015-iecc-update* (last visited Nov. 1, 2017).

[122] Cadmus Group, Inc., *supra* note 119.

[123] HAW. STAT. CODE § C402.5; HOWARD WIGG & ERIC MAKELA, 2015 IECC WITH HAWAII AMENDMENTS (2016), *https://energy.hawaii.gov/wp-content/uploads/2016/07/2015-IECC-with-Hawaii-Amendments.pdf*.

[124] HAW. STAT. CODE §§ C403.2.2 and C403.2.3.

[125] *Id.* §§ C405.2.1, C405.2.2, C405.2.3.

[126] The 70% net annual reduction is as compared to the 2006 Washington State Energy Code. This goal replaced one set in 2010 of "building zero fossilfuel greenhouse gas emission homes and buildings by the year 2031." *See* Washington State Building Code Council, 2015 WASHINGTON STATE ENERGY CODE: PROGRESS TOWARD 2030 (2015), *https://fortress.wa.gov/ga/apps/SBCC/File.ashx?cid=6095*.

in the statewide code. For example, solar readiness--the ability to accommodate the installation of a solar PV system and/or a solar hot water system--is mandatory rather than voluntary for new buildings. In addition, the city's building envelope requirement for commercial buildings (effective 2017) is more stringent than the Washington State code. [128] The Seattle Energy Code also has its own standards for HVAC, water heating, lighting, metering, plug load controls, transformers, motors, and renewable energy. [129]

Other cities have taken action on energy efficiency through energy use disclosure laws, often referred to as "benchmarking" laws. Thirty-five jurisdictions in the United States, including 13 states, have laws or executive actions requiring energy use disclosure that vary according to whether they cover commercial, multifamily, public, and/or single-family buildings. [130] New York City's benchmarking law, Local Law 84, requires owners of large buildings to annually measure their energy and water consumption and submit the data to the city using EPA's Energy Star tool. New York City then provides building owners with comparative information on consumption in similar buildings and tracks each building's progress over the years for energy-efficiency planning purposes. [131]

States have also played an important role in decarbonization by authorizing or requiring smart metering technology that allows building owners and operators to closely monitor and adjust energy use. As this Article went to press, 47 states and the District of Columbia had general smart metering legislation or policies. [132] As of 2016, about 70.8 million smart meters were installed, and about 88% were residential customer installations. [133] Data from smart meters can facilitate achievement of DDPP goals by encouraging customers to better monitor energy use, reduce energy use, move energy use to off-peak times, support on-site generation, and monitor the effectiveness of efficiency measures. [134]

There are three main barriers to widespread installation of smart meters across the country: privacy concerns, concerns about inaccuracy, and investment costs. Since smart meters report how much water, gas, and electricity is used by the building or household, as well as when it is used, there are concerns that this data will be sold, used for monitoring, intercepted through hacking, or turned over to law enforcement authorities. [135] Many of the privacy

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[127] WASH. REV. CODE § 19.27A.170 (2009), *http://app.leg.wa.gov/RCW/default.aspx?cite=19.27A.160*.

[128] The city of Seattle requires a tightness of 0.3 cubic feet per minute (cfm) per square foot rather than 0.4 cfm in the state code. *See*Fact Sheet, Northwest Energy Efficiency Council, Air Barrier Management (July 2011), *http://neec.net/sites/default/files/neec_codes_training/NREC-Air-Barrier-07-2011.pdf*.

[129] Seattle Department of Construction and Inspections, *Energy Code*, *http://www.seattle.gov/DPD/codesrules/codes/energy/overview/* (last visited Nov. 1, 2017).*See also*SEATTLE, WASH., ENERGY CODE, COMMERCIAL PROVISIONS (2016), http://www.seattle.gov/dpd/cs/groups/pan/@pan/documents/web_informational/p2395485.pdf.

[130] *See* Dave Eisenberg, *$ 2.6 Billion: Potential 2025 Global Revenue From Virtual Reality Use in the Housing Industry*, URB. LAND INST., Nov. 7, 2016, *https://americas.uli.org/research/centers-initiatives/center-for-capital-markets/number-of-the-week-4/*.

[131] NEW YORK, N.Y., LOCAL LAW NO. 84 (2009), *http://www.nyc.gov/html/planyc2030/downloads/pdf/ll84of2009_benchmarking.pdf*.

[132] Except New Jersey, New Mexico, and New York. State Policy Opportunity Tracker (SPOT) for Clean Energy, Policy Profile: Smart Meter Deployment, *https://spotforcleanenergy.org/policy/smart-meter-deployment/* (last visited Dec. 21, 2017). Note that this analysis looked for a statewide policy that is supportive of smart meters generally, not just for or by certain utilities only.

[133] EIA, *Frequently Asked Questions--How Many Smart Meters Are Installed in the United States, and Who Has Them?*, *http://www.eia.gov/tools/faqs/faq.cfm?id=108&t=3* (last visited Nov. 1, 2017).

[134] POLICY IMPLICATIONS OF DEEP DECARBONIZATION, *supra* note 14, at 1, 15.

concerns can be eased with the understanding that misuse of the data is likely prohibited under several federal statutes [136] and could also be addressed with state legislation that dictates limits on the use and storage of smart meter data. [137]

Early in California's adoption of smart meters, there were issues with inaccurate, higher bills [138] and, more recently, with underreported usage leading to inaccurate, lower bills. [139] Overall, the number of customers affected by these issues has been low compared to the number of smart meters installed today. Nonetheless, concerns around recording inaccuracies remain a rallying point for opponents of the technology.

Smart meters are a substantial investment. But there are significant savings for utilities and advantages for customers with smart meters in their service areas. These include reducing the need to dispatch personnel out on as many calls and decreasing the length of outages by pinpointing affected customers and problems. Federal stimulus money under the 2009 American Recovery and Reinvestment Act's Smart Grid Investment Grant awards and matching industry funds to private companies, utilities, manufacturers, cities, and other partners resulted in a total investment **[*10142]** of more than $ 8 billion for smart grid and smart meter technologies. [140]

VII. EU Approaches to Improve the Energy Performance of Buildings

The EU has long focused on reducing energy demand from new buildings, culminating in efforts around the Energy Performance of Buildings Directive (EPBD) in 2002 and its recast (or revision) in 2010. In coordination with the EPBD, both the Netherlands and Sweden have adopted ambitious energy-efficiency goals, material standards, and energy use disclosure requirements along with complementary regulatory regimes to implement these standards. The United States can learn from the initiatives that are the focus of this part.

The European Parliament and Council of the EU first adopted the EPBD in 2002. The directive established standards for buildings that all EU countries were required to incorporate into their national building regulations and

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[135] *SEE* BRANDON J. MURRILL ET AL., CONGRESSIONAL RESEARCH SERVICE, SMART METER DATA: PRIVACY AND CYBERSECURITY 3-7 (2012), *available at*https://fas.org/sgp/crs/misc/R42338.pdf.

[136] *Id.* (discussing the potential for application of the Electronic Communications Privacy Act, the Stored Communications Act, the Computer Fraud and Abuse Act, and the Federal Trade Commission Act to smart meter data collection, management, and use).

[137] n137 *See* Cassarah Brown, *States Get Smart: Regulating and Encouraging Smart Grid Technologies*, Nat'l Conf. St. Legislatures, July 2013:

> Several states are actively working to address and regulate the use of personal energy data provided by smart meters. Both Michigan and Vermont have pending bills (H.B 4728 and H.B 402, respectively) to require utilities to treat customer data confidentially to prevent unintended disclosure of personal information. Texas House Bill 1600 and Kansas House Bill 2128, both enacted, prohibit utilities from sharing or disclosing information collected from a smart metering system. California and Pennsylvania currently have similar bills pending and require customer consent before third party data disclosure.

Seehttp://www.ncsl.org/research/energy/regulating-and-encouraging-smart-grid-technologies.aspx.

[138] William Pentland, *Not-So-Smart Meters Overbilling Californians*, FORBES, May 3, 2011, http://www.forbes.com/sites/williampentland/2011/05/03/not-so-smart-meters-overbilling-californians/#7cae347669e8.

[139] Alice Walton, *Faulty Readings May Have Led to Incorrect Bills, Says Southern California Gas Co.*, L.A. TIMES, Aug. 9, 2016, http://www.latimes.com/local/lanow/la-me-ln-gas-company-meter-problems-20160809-snap-story.html.

[140] Press Release, The White House, President Obama Announces $ 3.4 Billion Investment to Spur Transition to Smart Energy Grid (Oct. 27, 2009), https://obamawhitehouse.archives.gov/the-press-office/president-obama-announces-34-billion-investment-spur-transition-smart-energy-grid.

introduced energy certification schemes for buildings. [141] The EU Commission launched the Concerted Action EPBD [142] in 2005 to promote dialogue on implementation of the EPBD, which led to 29 countries exchanging experiences and best practices.

In 2010, a revised version of the EPBD (EPBD recast) [143] was adopted by the European Parliament and Council of the EU. In it, the EU created an intermediate step between a traditional building and a ZEB, called a nearly zero-energy building, or NZEB. This is defined as "a building that has a very high energy performance. . . . The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby. . . ." [144] The EU directive provides factors for Member States to consider in defining what an NZEB is for each category of buildings, but does not specifically define what constitutes nearly zero. [145] The EPBD recast requires that "(a) **by 31 December 2020, all buildings** are nearly zero-energy buildings; and (b) after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings." [146] The directive instructs Member States to "draw up national plans for increasing the number of nearly zero-energy buildings . . . [that] may include targets differentiated according to the category of building." [147] Member States are also required to set minimum requirements for both the building envelope and technical systems according to a cost-optimal methodology.

Both the original 2002 EPBD and the 2010 EPBD recast established energy performance certificates (EPCs) as instruments to enhance energy performance in buildings by providing information to building owners, occupiers, and the real estate market to drive market demand for energy efficiency in buildings. The requirements for EPCs, certification, and registration vary by country in accordance with the baselines set in the EPBD and the EPBD recast. [148] EPCs can also be used to determine the impact of building and energy policies, and to document the energy performance of the building stock in a country and the entire EU. [149] The EPBD accounts for the cost of additional materials and technologies needed for NZEBs by suggesting cost-benefit analysis in terms of the economic life cycle [150] of a building to arrive at a cost-optimal level for a building.

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[141] Council Directive 2002/91/EC.

[142] The Concerted Action EPBD is a joint initiative between the EU Member States and the European Commission. It involves representatives of national ministries or their affiliated institutions who are in charge of preparing the technical, legal, and administrative framework for the EPBD (2002/91/EC) and the recast (2010/31/EC) in each EU Member State, plus Norway. The objective is to enhance the sharing of information and experiences from national adoption and implementation of this important European legislation. *See* Concerted Action EPBD, *Home Page*, *http://www.epbd-ca.eu/(last* visited Nov. 1, 2017).

[143] Council Directive 2010/31/EU.

[144] *Id.* art. 2.

[145] *Id.*

[146] *Id.* art. 9. This includes all residential, commercial, and industrial privately owned buildings.

[147] *Id.*

[148] Buildings Performance Institute Europe, *Energy Performance Certificates Across the EU: Mapping of National Approaches*, *http://bpie.eu/publication/energy-performance-certificates-across-the-eu/* (last visited Nov. 1, 2017).

[149] ALEKSANDRA ARCIPOWSKA ET AL., BUILDINGS PERFORMANCE INSTITUTE EUROPE, ENERGY PERFORMANCE CERTIFICATES ACROSS THE EU: A MAPPING OF NATIONAL APPROACHES (2014), *available athttp://bpie.eu/uploads/lib/document/attachment/81/BPIE_Energy_Performance_Certificates_EU_mapping_2014.pdf*.

[150] To be "determined by each Member State. It refers to the remaining estimated economic lifecycle of a building where energy performance requirements are set for the building as a whole, or to the estimated economic lifecycle of a building element where energy performance requirements are set for building elements." This definition is important because it affects what is "cost-

A 2016 report tracking the EPBD's implementation progress concluded that "NZEB continues to be a major challenge and it is yet unclear how much progress will be reached by 2020. . . ." [151] There have been some successes as Member States have improved minimum energy-efficiency requirements for buildings, taking into account cost optimality for a long (30-year) life-cycle approach. There have also been some shortcomings, like the lack of demanding NZEB standards. About 40% of the Member States do not yet have a detailed NZEB definition in place. About 60% of the Member States have established detailed NZEB definitions in a legal document, [152] but a few of them state that the definition is a draft or that it might be updated later. [153] Countries have differed on how to set requirements for renewable energy supply for new buildings. Some countries **[*10143]** have required that a percentage of primary energy use be from renewable sources (up to 50%), and others have set specific minimum renewable energy contributions in kilowatt hours per square meter per year (kWh/m<2>/y). [154]

There is a notable, complementary initiative aimed at improving resource efficiency in the building sector in the EU. That initiative is part of the European Commission's Roadmap to a Resource Efficient Europe. [155] It sets out structural and technological changes needed to ensure the European economy is on a path of sustainable growth by 2050, with milestones to be reached by 2020 as it interfaces with the Europe 2020 strategy. [156] One component of the Roadmap focuses on "a decisive move towards a low carbon economy." [157] Under that Roadmap, the EU will use a life-cycle assessment approach to go beyond energy efficiency and primary energy consumption to track the environmental impact of preconstruction materials production and post-demolition disposal in accordance with circular economy objectives focused on resource efficiency, recycling, and waste management. [158] This initiative demonstrates one approach to addressing embodied energy.

A. Implementation of the EPBD and Building Policies in the Netherlands

The Netherlands has made significant progress in implementing both the original 2002 EPBD and the recast 2010 EPBD by integrating the policies and goals advanced in the directives with its existing programs. [159] The Netherlands Enterprise Agency (RVO) implements the national EPBD legislation, manages the certification schemes, administers training, accredits experts, performs compliance checks, and serves as a central register for all certificates. [160]

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optimal" under the directive because "[t]he cost-optimal level shall lie within the range of performance levels where the cost benefit analysis calculated over the estimated economic lifecycle is positive." *See* Council Directive 2010/31/EU, art. 3, § 14(b).

[151] THE CONCERTED ACTION EPBD, 2016 IMPLEMENTING THE ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE 1, 7-8 (2015), *available at*http://www.epbd-ca.eu/outcomes/2011-2015/CA3-BOOK-2016-A-web.pdf.

[152] The relevant legal documents are found in building regulations, energy decrees and official guidelines, or the national NZEB plans. *Id.* at 1, 59.

[153] *Id.*

[154] *Id.*

[155] European Commission, *Environment--The Roadmap to a Resource Efficient Europe*, http://ec.europa.eu/environment/resource_efficiency/about/roadmap/index_en.htm (last updated June 8, 2016).

[156] European Commission, *Europe 2020 in a Nutshell*, ec.europa.eu/eurostat/web/europe-2020-indicators (last visited Dec. 20, 2017).

[157] European Commission, *supra* note 156.

[158] *Id.*

[159] HANS VAN ECK, IMPLEMENTATION OF THE EPBD IN THE NETHERLANDS: STATUS IN NOVEMBER 2015, at 1, 2 (2015), *available at*http://www.epbdca.eu/outcomes/2011-2015/CA3-2016-National-NETHERLANDS-web.pdf.

[160] *Id.* at 1.

The Netherlands regulates the energy performance of new buildings, both residential and commercial, through its Energy Performance Coefficient program that predates and also complies with the EPBD's EPC. The Netherlands' energy performance coefficient reflects "the estimated total primary energy consumption of a building based on a series of indicators, e.g., heating, ventilation and lighting, adjusted to the useful floor area and the renewable energy produced by the building." [161] To calculate the energy performance coefficient, the building's allowed primary energy performance is divided by its calculated annual primary energy needs.

The calculation of the energy performance coefficient is mandatory for all new buildings and is performed by a certified professional. New buildings also have to meet minimum requirements for building components (insulation value (R-value) of walls, roof, and floor; and insulation value (U-value) of windows and doors). [162] Beyond those minimum requirements, no specific energy-efficiency measures must be installed.

The Netherlands defines an NZEB as meeting an energy performance coefficient of zero, meaning that the building's allowed primary energy performance and annual primary energy needs are both zero. [163] The Netherlands follows a flexible approach; builders and developers have the freedom to choose the most cost-efficient solutions as long as the building reaches the required level of efficiency. The hope is that this freedom will stimulate technical innovation in building design and combinations of technology. [164]

Before construction may begin, a builder must receive a building permit from the local municipality. As part of the application process for this permit, a project developer must demonstrate compliance with the energy performance requirements. Dutch regional environmental services perform monitoring and enforcement. However, local municipalities are responsible for compliance checks during construction. In case of noncompliance, they issue a "cease-work" order that halts construction until applicable requirements are met, but there are no separate financial penalties. The RVO annually audits a pool of permits to ensure they are in compliance with requirements, and reports cases of noncompliance to the local municipality for legal action. [165]

The Netherlands has adopted a law to address the problem of the split incentive, where energy-efficiency improvements are not made because the costs of installing energy-efficiency measures fall on the building's owner while the tenants experience the benefit of lower energy bills. This law ("Energieprestatievergoeding") allows an owner to collect an energy performance fee from tenants to recoup investment costs that lead to a reduced energy bill or, in the case of a ZEB, the lack of an energy bill. [166]

With regard to national goals for NZEBs, the Netherlands currently plans to make all new public buildings NZEBs after 2019 and all nonpublic buildings NZEBs **[*10144]** after 2021. [167] The Netherlands' National Plan Toward Nearly Zero-Energy Buildings involves a wide range of national programs and activities on energy efficiency,

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[161] *Id.* at 1, 2-3 (the minimum energy performance coefficient is set according to the Energy Performance Standard that sets energy-efficiency requirements for new buildings).

[162] R-value measures resistance to heat transfer, and U-value measures the rate of heat transfer. The lower its U-value, the better the product's ability to resist heat conduction. *See* VAN ECK, *supra* note 159, at 1, 3.

[163] Factsheet, Buildings Performance Institute Europe, Nearly Zero-Energy Building Definitions Across Europe (Apr. 2015), *http://bpie.eu/uploads/lib/document/attachment/128/BPIE_factsheet_nZEB_definitions_across_* Europe.pdf.

[164] VAN ECK, *supra* note 159, at 6.

[165] *Id.* at 2.

[166] VAN ECK, *supra* note 159, at 1, 5; *see also* SBRCURnet, *Energiesprong 02: Wetgeving Energieprestatievergoeding [Energy Leap 02: Energy Performance Fee Legislation]*(providing the circumstances under which such a fee can be collected, the standards for relevant calculations, and limits to the fee), *http://www.sbrcurnet.nl/producten/infobladen/wetgeving-energieprestatievergoeding* (last visited Nov. 1, 2017).

[167] VAN ECK, *supra* note 159, at 1, 5. *See also* Buildings Performance Institute Europe, *supra* note 163.

renewable energy, innovation, information-sharing, smart metering, and smart grids. [168] A range of financial support and incentive mechanisms are in place for achievement of the plan, including incentives for sustainable energy production, better lending terms for loans to be spent on energy-saving measures, and subsidies for sustainable heating and energy performance. [169] The Netherlands has also adopted a plan to introduce smart meters to all homes and small businesses by 2020 in order to encourage customers to use energy as efficiently as possible and contribute to a future smart grid system. [170]

B. Implementation of the EPBD and Building Policies in Sweden

Sweden has also made remarkable progress incorporating the requirements of the EPBD into its national energy code. Sweden's energy performance regulations are based on "measured delivered energy, including energy performance requirements for heating, cooling, hot water and other general uses of the building . . . divided by the area intended to be heated to more than 10°C [50°F]." [171]

In 2009, Sweden set the goal of increasing energy efficiency in new and existing buildings undergoing renovation by 20% in 2020 and 50% in 2050 as part of its Integrated Climate and Energy Policy. [172] Measures addressing new building energy performance include the planning and building codes, [173] energy taxes, education programs, training courses, and mandatory and voluntary labeling schemes. [174] Sweden passed new climate legislation in June 2017 (effective January 2018) that drastically increases Sweden's emissions reduction goals. [175] Sweden's proposed goal for 2019 is for all public buildings (new and existing) to be zero-energy, and for 2021, all buildings are to be zero-energy. [176]

New buildings in Sweden must be designed to limit energy use through low heat losses, low cooling demands, efficient use of heating and cooling, and efficient use of electricity. Swedish regulations require that a building's primary energy use be in accordance with residential and nonresidential limits established per the climatic zone where it is located. [177] A building's energy performance is expressed using an indicator of primary energy in

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[168] *See*Hans van Eck, National Plan Towards Nearly Zero-Energy Buildings in the Netherlands, Webinar (Nov. 13, 2013), *https://cleanenergysolutions.org/sites/default/files/documents/Presentatie-Webinar-14-November_Hans-Van-Eck.pdf*.

[169] *Id.*

[170] VAN ECK, *supra* note 159, at 1, 6.

[171] HANS-OLOF KARLSSON HJORTH ET AL., IMPLEMENTATION OF THE EPBD IN SWEDEN: STATUS IN DECEMBER 2014, at 1 (2014), *http://www.epbd-ca.eu/outcomes/2011-2015/CA3-2016-National-SWEDEN-web.pdf*.

[172] Government Offices of Sweden, *An Integrated Climate and Energy Policy*, *http://www.government.se/information-material/2009/03/an-integrated-climate-and-energy-policy/* (last updated May 17, 2015);*see also* Global Buildings Performance Network, *Sweden*, *http://www.gbpn.org/databases-tools/rp-detail-pages/sweden* (last visited Nov. 1, 2017).

[173] Swedish Code of Statutes, *Plan-och Byggförordning (2011:338) [Planning and Building Regulation (2011: 338)]*, *http://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/plan--och-byggforordning-2011338_sfs-2011-338* (last visited Nov. 1, 2017).

[174] Global Buildings Performance Network, *supra* note 172.

[175] Government Offices of Sweden, *The Climate Policy Framework*, http://www. government.se/articles/2017/06/the-climate-policy-framework/ (last updated June 15, 2017);*see also* ÅSA **ROMSON, REPORT TO CENTRE INTERNATIONAL**DE DROIT COMPARÉ DE L'ENVIRONNEMENT, SWEDEN'S NEW CLIMATE POLICY FRAMEWORK: SETS THE WORLD'S MOST AMBITIOUS CLIMATE GOALS AND PUTS CLIMATE POLICIES IN NATIONAL LAW (2017), *https://cidce.org/wp-content/uploads/2017/01/report-CIDCE-climate-policy-framwork-1.pdf*.

[176] Global Buildings Performance Network, *supra* note 172.

kWh/m<2>/y. The limit ranges for NZEBs are 30-75 kWh/m<2>/y for new residential buildings and 30-105 kWh/m<2>/y for new nonresidential buildings, depending on the climate. [178] Buildings must also comply with a maximum electric power rating for heating and an average thermal transmission level for the building envelope. [179]

A compliance check occurs during the second year of the building's operation. Similar to the Netherlands, Sweden is focused on ensuring that the building's energy performance meets the limits set out in the building code. Sweden does not require individual parameters to be measured for their contribution to the building's energy usage; the building is only evaluated as a whole. Thus, the building's developer and/or owner is responsible for compliance with the standards, which are supervised by the municipality building board. [180]

In compliance with the EU EPBD, Sweden requires production of an EPC whenever a building is built, sold, or rented. [181] An EPC provides, at a minimum, the energy performance of a building and may include the percentage of energy consumed from renewable sources. [182] In addition, there are several voluntary labeling schemes on top of the EPC that involve established standards for three categories of houses in Sweden: NZEB, "Passivhaus" (passive house), and "Minienergihus" (low-energy house) for heating depending on the climatic zone where the house is located.

VIII. Recommendations

To achieve the DDPP goals to maximize energy efficiency to create highly efficient new buildings, to facilitate the construction of ZEBs or NZEBs that rely heavily on carbon-free electricity, and to take into account embodied energy in the new building construction process, several **[*10145]** steps should be taken by the federal, state, and local governments, and by the private sector.

A. Federal Government

One of the most effective ways to drive decarbonization of new building would be to place a national price on carbon that applies to both building energy use and embodied carbon in building materials. Such a pricing mechanism could significantly accelerate the adoption of low- and zero-carbon energy sources, thus allowing further electrification of new buildings for heating, cooking, and water heating. It should also encourage designers, architects, builders, building managers, and building owners to find innovative ways to reduce carbon. The prospects of federal legislation that would price carbon, however, are not good as this Article goes to press, given the current makeup of Congress and the views of the president. Still, the idea of pricing carbon should remain on the table, awaiting a sympathetic environment in Congress and the executive branch.

Current laws, Executive Orders, and initiatives by federal agencies have made significant progress in reducing the carbon impact of new buildings. Preserving these laws, orders, and initiatives is critical for a variety of reasons beyond carbon reduction, including national security, cost and resource efficiency, productivity, and worker health. Specifically:

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[177] HJORTH ET AL., *supra* note 171, at 1.

[178] DELIA D'AGOSTINO ET AL., EUROPEAN COMMISSION, SYNTHESIS REPORT ON THE NATIONAL PLANS FOR NEARLY ZERO ENERGY BUILDINGS (NZEBS): PROGRESS OF MEMBER STATES TOWARDS NZEBs (2016) (EUR 27804 EN), *available at*http://publications.jrc.ec.europa.eu/repository/bitstream/JRC97408/reqno_jrc97408_online%20nzeb%20report%281%29.pdf.

[179] HJORTH ET AL., *supra* note 171, at 1.

[180] *Id.* at 1, 3.

[181] An EPC is also required for large buildings occupied by public authorities or institutions that supply public services.

[182] Council Directive 2010/31/EU, arts. 11-18, http://eur-lex.europa.eu/Lex-UriServ/LexUriServ.do?uri=OJ:L:2010:153:0013:0035:EN:PDF.

1. Congress should preserve the tax incentives for investing in renewable energy sources to maintain progress toward decarbonization of the grid, thereby allowing progress in electrification of new buildings.

2. GSA and federal agencies should fully implement the requirement in EISA that federal buildings reduce fossil fuel use measured against a 2003 benchmark by 100% by 2030, and meet the goal that all new commercial buildings achieve zero net energy by 2030. These are ambitious goals that support the new building decarbonization effort.

3. The president should retain within the GSA the Office of Federal High-Performance Green Buildings that was mandated by EISA and that is the focal point for federal building energy-efficiency efforts through such mechanisms as the Sustainable Facilities Tool. [183]

4. The president should preserve the energy-efficiency and renewable energy requirements of Executive Order No. 13693.

5. GSA should retain its 2016 Facilities Standards that require all new federal buildings to attain LEED Gold (Version 4) certification, as a minimum.

6. Federal agencies should continue implementing the "Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings" adopted pursuant to Executive Order No. 13423, which requires advanced energy monitoring that provides at least daily data on energy use.

7. DOD should complete the guidance document called for under Executive Order No. 13693 that requires it to incorporate net zero into planning for new facilities larger than 5,000 square feet.

8. DOE should continue setting leading-edge energy-efficiency standards for heating, cooling, lighting, and other energy-consuming equipment used in new buildings.

9. EPA and DOE should continue providing guidance to consumers by maintaining updated versions of programs such as Energy Star for appliances and electrical equipment, and Energy Star for buildings.

10. Based on the authority provided to DOE under EISA and DOE's previous work on ZEBs, the agency should encourage the use of the most efficient sources and location of renewable energy rather than emphasizing only on-site generation.

11. DOE should fund research of innovative ways for buildings to capture as much wind and sunlight as possible within the confines of urban environments to generate decarbonized electricity. [184]

12. DOE should encourage through its work on ZEBs direct investment in the means of production of renewables or power purchase agreements as preferable to purchase of RECs. [185]

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[183] *See* Sustainable Facilities Tool, *Home Page*, https://sftool.gov (last visited Nov. 1, 2017) (The Sustainable Facilities Tool "is an interactive online resource created by the Office of Federal High-Performance Green Buildings that shows users how to build, buy and operate green. SFTool assists project managers, procurement professionals, facility managers and others to identify, understand and integrate sustainable strategies into their projects.").

[184] n184 A similar hierarchy was created by the National Renewable Energy Laboratory--the "NZEB RE Supply Option Hierarchy"--and for off-site supply options, they prioritized using renewable energy resources off-site to generate energy on-site above buying generation from off-site renewable energy sources. The system requires all off-site purchases to be certified, and suggested:

> A building could also negotiate with its power provider to install dedicated wind turbines or PV panels at a site with good solar or wind resource off site. In this approach, the building might own the hardware and receive credits for the power. The power company or a contractor would maintain the hardware.

See PLESS & TORCELLINI, *supra* note 47, at 4.

[185] By encouraging building operators to make a capital investment in the means of renewable energy generation, this takes the burden off the power provider to bear those up-front capital costs. PPAs also provide some certainty for power providers as they invest in renewable means of generation; they know they have a customer who will purchase, and perhaps pay a premium for, the power they will generate over the term of the agreement.

The previous set of recommendations addresses implementation of existing law and policy. However, the federal government should take additional steps beyond existing law and policy to help achieve DDPP goals:

[*10146] 1. In the absence of a national energy code [186] that would result in the construction of ZEBs or NZEBs, Congress should establish a national ZEBs or NZEBs goal for a specific date such as 2030, much as the EU, the Netherlands, and Sweden have done. Such a national goal would help focus on the need to address carbon emissions from new buildings. It could also stimulate state and local regulatory efforts and lend support to voluntary programs such as the AIA 2030 Challenge and newer versions of LEED.

2. Congress should provide tax incentives to encourage wider adoption of zero-emissions energy and passive buildings.

3. Congress should provide grants to community colleges and other organizations for training of building professionals to facilitate the design, construction, and management of high-efficiency, ZEB, LEED, and passive buildings.

4. Congress should, as the EU has done for buildings in Europe, require federal agencies to use a life-cycle assessment to track the environmental carbon impact of construction materials in accordance with circular economy objectives focused on resource efficiency, recycling, and waste management. [187]

5. DOE should produce a model ZEB-focused energy code. Such a model code could also address issues related to embodied energy. Additionally, a model code could deal with large-scale fuel switching by addressing issues such as the use of heat pumps and solar water heating. Such a model code could provide support for a national ZEBs goal discussed in the previous recommendation.

B. State Governments

States can have a significant impact on reaching the DDPP goals in several ways, including updating their building codes, providing incentives for energy-efficient buildings, and providing policy support for the installation of renewable energy facilities for new buildings.

1. State legislatures should adopt a price for carbon either through a carbon tax or through cap-and-trade systems that include new buildings. This step would encourage developers of new buildings to minimize carbon emissions to avoid the costs associated with buying allowances or paying the tax. For example, Tokyo's cap-and-trade system applies to1,300 commercial and industrial facilities with the goal of reducing carbon dioxide emissions by 25% by 2020 from a 2005 baseline. [188]

2. State legislatures should follow the lead of states like California, Hawaii, and Washington in developing advanced building and energy codes that significantly reduce the energy used by new buildings.

3. State legislatures should adopt building or electrical code standards that support the use of on-site energy storage to allow more-efficient usage of renewable energy generated on-site at new buildings.

4. If a state's utility regulation does not allow power purchase agreements for supplying new buildings with renewable energy, state legislatures should amend the utility regulation to authorize such purchases to

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[186] States have historically resisted a national building or energy code. Section 324 of the American Clean Energy and Security Act of 2009, H.R. 2454, would have established a National Energy Efficiency Building Code. Although the legislation passed the House, it never proceeded further.

[187] European Commission, *supra* note 155. The approach that GSA currently uses to comply with EPAct 2005 requires a life-cycle cost analysis that could be expanded into a life-cycle impact analysis that goes beyond cost alone to consider embodied carbon. Federal legislation would be necessary to direct GSA to broaden its analysis and include embodied energy, but this would be a crucial step in raising awareness and lowering levels of embodied carbon in new federal buildings. *See* GSA, *supra* note 73.

[188] *See* Yuko Nishida et al., *Alternative Building Emission-Reduction Measure: Outcomes From the Tokyo Cap-and-Trade Program*, 44 BUILDING RES. & INFO. J 5-6 (2016), *available at*http://www.tandfonline.com/doi/abs/10.1080/09613218.2016.1169475?journalCode=rbri20.

facilitate movement to low-carbon electrification for heating and hot water as part of the net-zero building process.

5. State legislatures should require that a minimum percentage of energy for large new buildings be derived from renewable energy, either generated on-site, obtained through a power purchase agreement, or evidenced by certified RECs, unless the building meets stringent low-energy usage criteria such as that for certified passive buildings. [189]

6. State legislatures should require new buildings to obtain a construction permit or obtain a certificate of occupancy before construction can begin, and, as a condition of obtaining the permit or certificate, require them to meet an "energy-efficiency coefficient," as mandated in the Netherlands.

7. State legislatures should allow owners of net-zero buildings to charge an energy-efficiency fee that reflects the prorated additional building cost of achieving net-zero status for the building, similar to the Dutch Energieprestatievergoeding system. [190]

8. State legislatures should maintain or adopt laws such as renewable portfolio standards, net metering, cost of solar tariffs, and renewable energy tax credits that encourage more rapid integration of renewable energy into the grid, thereby facilitating the goal of low-carbon electrification of new buildings.

[*10147] 9. States should revise building and energy codes to provide developers of a new building with a significant head start on LEED certification by specifying energy performance requirements that will lead to LEED points.

10. State legislatures or governors should establish state ZEB goals, such as California's goals under the California Building Standards Code that all new residential buildings be zero-energy by 2020 and all new commercial buildings be zero-energy by 2030. [191]

11. State education agencies should provide training opportunities to builders, architects, developers, and others through community colleges, universities, vocational technical schools, and other educational institutions on high-efficiency and ZEB construction practices, as well as passive solar techniques, to significantly expand the capacity of the building industry to design and build low-energy demand buildings, as has been done in Sweden.

12. State PUCs should authorize utilities to install smart meters. Data from smart meters can play a number of roles in meeting the DDPP goals, including stimulating customers to better monitor and reduce use of energy, allowing energy use to be moved to off-peak times, facilitating on-site generation, and monitoring the effectiveness of efficiency measures.

13. State energy, commerce, or other appropriate agencies should provide information on methods of minimizing the cost of ZEBs, as has been recommended by the National Renewable Energy Laboratory to help stimulate the market for ZEBs. [192]

14. State energy, commerce, or other appropriate agencies should promote voluntary programs, such as LEED for Homes and Energy Star for homes, [193] that recognize buildings for meeting energy-efficiency goals.

C. Local Governments

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[189] The Passive House Institute has a passive house certification program. *See* Passive House Institute, *Accredited Building Certifiers*, *http://www.passiv.de/en/03_certification/02_certification_buildings/03_certifiers/01_accredited/01_accredited.php?sort=organsiation* (last visited Nov. 1, 2017).

[190] SBRCURnet, *supra* note 166.

[191] California PUC, *Energy Efficiency Strategic Plan*, *http://www.cpuc.ca.gov/General.aspx?id=4125* (last visited Nov. 1, 2017).

[192] *See* Torcellini et al., *supra* note 58, at 32.

[193] *See* ENERGY STAR, *supra* note 39.

Local governments typically have substantial authority in dealing with buildings within their boundaries through building codes and energy use disclosure requirements.

1. Within the authority granted to them under state law and state building code requirements, local legislative bodies should adopt advanced building and energy codes that drive down carbon use in buildings, such as Seattle's Energy Code. [194]

2. Local legislative bodies should require energy use disclosures for larger commercial buildings (e.g., buildings larger than 50,000 square feet and multifamily buildings). They should require benchmarking information to be made publicly available in a format that is easy to understand so that it can be readily used in rental and purchase decisions. [195] Benchmarking requirements would encourage developers of new buildings to more carefully consider energy usage in the design process in order for their buildings to stand out in the benchmarking reports.

3. Local legislative bodies should mandate that new commercial buildings over a specified size achieve the equivalent of at least the latest version of LEED Gold certification. [196] Cities such as Portland under its Green Building Policy, [197] New York pursuant to Local Law 86 (which applies to new buildings that have city financial support), [198] and Washington, D.C., under its Green Buildings Act (which applies to city-owned, -funded, or -financed buildings) [199] require LEED Gold certification as a minimum.

4. Local legislative bodies should switch when feasible to district heating and cooling.

5. Local legislative bodies should decarbonize their own utility systems, where they own or operate such systems. Palo Alto's gas and electric utilities have been 100% carbon-neutral for electricity since 2013 through the use of renewables and offsets, and carbon-neutral for natural gas since July 2017 through the use of efficiency measures, offsets, and encouragement of switching to electric appliances. [200]

6. Local legislative bodies should adopt a citywide carbon budget that includes the carbon impact for new buildings. The carbon budget adopted by the city of **[*10148]** Oslo, Norway, aims for a carbon emissions reduction of 50% by 2020 and carbon neutrality by 2030. Such a budget may require new buildings to acquire offsets so as to not exceed the carbon budget ceiling. The Oslo carbon budget anticipates phasing out the use

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[194] WASH. REV. CODE § 19.27A.020, *http://app.leg.wa.gov/rcw/default.aspx?cite=19.27A.020*. In Washington, except for requiring new buildings to meet a certain level of energy efficiency, "the Washington state energy code for residential structures shall preempt the residential energy code of each city, town, and county in the state of Washington."

[195] New York City makes the information about water and energy usage gathered under Local Law 84 available online, but the energy information is presented as a score of Weather Normalized Source Energy Use Intensity (kilo-British thermal unit/square feet (kBTU/ft<2>)), which is not straightforward for a layperson to understand. NYC Energy and Water Benchmarking, *New York City Energy & Water Performance Map*, *https://serv.cusp.nyu.edu/projects/evt/* (last visited Nov. 1, 2017).

[196] Acknowledging that it could be considered an impermissible delegation of government power to incorporate LEED standards by reference into a local ordinance or regulation and, thus, provide that the LEED system become law, local governments should still rely on LEED certification to set standards for new buildings. In order to avoid the issue of improper delegation of setting building standards, local governments should undertake regular review of changes to the LEED certification system and adopt revisions on a case-by-case basis rather than providing that the most current version of LEED should be used at all times, even as it changes.

[197] *See* DOE, *City of Portland--Green Building Policy and LEED Certification*, *https://energy.gov/savings/city-portland-green-building-policy-and-leed-certification* (last visited Nov. 1, 2017).

[198] *Id.*

[199] *Id.*

[200] *See* City of Palo Alto, *Home Page*, *http://www.cityofpaloalto.org/gov/depts/utl/default.asp* (last visited Nov. 1, 2017).

of fossil fuel for home heating. [201] City carbon budgets could also take into account embodied energy to encourage materials substitution in circumstances where substitution is appropriate.

7. Finally, local legislative bodies should consider or expand the use of district heating systems. These systems can play an important role in reducing carbon emissions. Connecting new buildings to district heating systems can significantly reduce energy demand from new buildings compared to scattered site heating systems that typically have relied upon fossil fuel for heating and single building cooling systems. District energy heating and cooling is a long-standing strategy for energy efficiency in some cities like St. Paul, Minnesota, and is a growing strategy for other cities in reducing carbon emissions. The city of Vancouver, British Columbia, is employing district energy as a key strategy for reducing carbon emissions by 33% by 2020 from a 2007 baseline. [202] Paris is converting its existing district energy system and expanding the system to achieve both heating and cooling energy efficiencies by utilizing 60% renewable or recovered energy sources for 2020. [203] District cooling in Paris results in one-half of the carbon dioxide emissions that would occur with traditional cooling. [204]

D. Private Initiatives

The private sector has increasingly assumed a more active role in pursuing environmental goals that are not required by law--an approach that has been referred to as "private environmental governance." Companies are pursuing environmental goals for a wide range of reasons, including building and protecting their reputation, saving money, responding to individual customer demands and to business customers who have initiated green supply chain programs, taking advantage of government green procurement requirements, and mitigating liability.

The commercial buildings market provides a good example of this situation. Green buildings, including LEED properties, represented around 33% of all commercial and institutional construction in America in 2015 and are expected to make up 60% of new construction in 2018. [205] A more limited 2017 study focusing only on 30 markets within the United States found that 38% of commercial office space has been certified by LEED or Energy Star. [206] Much of this demand for green buildings is coming from customer desires and better building performance rather than from government mandates.

1. Consistent with the AIA's 2030 Challenge, building developers and purchasers should commit to building only ZEBs by no later than 2030. [207]

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[201] *See* Oslo, Norway, *Climate Budget*, https://www.oslo.kommune.no/getfile.php/13166287/Content/English/Politics%20and%20administration/Green%20Oslo/Best%20practices/Climate%20Budget/climate%20budget.jpg (last visited Nov. 1, 2017). The Oslo carbon budget also anticipates raising tolls, reducing parking availability, increasing bicycling, and utilizing carbon capture and storage for the city's waste incinerators, among other measures to reduce carbon emissions.

[202] *See Case Study: Reducing Carbon Emissions Through District Energy*, C40 CITIES, Dec. 11, 2013, http://www.c40.org/case_studies/reducing-carbon-emissions-through-district-energy.

[203] *See*GLOBAL ALLIANCE FOR BUILDINGS AND CONSTRUCTION, PUTTING THE BUILDINGS AND CONSTRUCTION SECTOR ON A BELOW 2°C Path, http://newsroom.unfccc.int/media/544101/building-alliance-common-statement.pdf.

[204] *Id.* at 9.

[205] DODGE DATA & ANALYTICS, SMARTMARKET REPORT--WORLD GREEN BUILDING TRENDS 2016: DEVELOPING MARKETS ACCELERATE GLOBAL GREEN GROWTH 35 (2016), http://fidic.org/sites/default/files/World%20Green%20Building%20Trends%202016%20SmartMarket%20Report%20FINAL.pdf.

[206] Jennifer Gunby, *2017 National Green Building Adoption Index Releases Data on Growth*, U.S. GREEN BUILDING COUNCIL, July 20, 2017 (This statistic does not include homes or government and institutional buildings, so the overall number is higher.), https://www.usgbc.org/articles/2017-national-green-building-adoption-index-releases-data-growth.

[207] Specifically, new buildings should be fully electric and use only renewable energy, whether generated on-site or off-site.

2. Building developers and owners should construct new buildings that meet the Silver, Gold, and Platinum levels of LEED certification and that focus on earning many of the LEED points through energy strategies.

3. Building owners should take full life-cycle costs and the carbon impacts of materials into account when deciding on the energy-efficiency measures for new buildings, with the aim of reducing embodied carbon and overall environmental impacts.

4. Building owners should specify that energy for large new buildings must be derived from renewable energy sources through on-site generation, the use of power purchase agreements for off-site renewable energy, or the purchase of certified RECs.

5. Trade associations and other organizations involved in training building professionals should increase training opportunities for architects, developers, and builders on passive buildings and ZEBs.

6. In its next update, the U.S. Green Building Council could revise the LEED certification system to better align with deep decarbonization goals. For example, the next version could more heavily prioritize and weight energy-related credits so that LEED buildings more uniformly increase electrification, reduce reliance on natural gas, become extremely energy efficient, purchase renewable energy or renewable energy credits, and install generating capacity on-site.

[*10149] IX. Conclusion

Although some of the recommendations proposed here may seem complex and politically challenging to implement, the bottom line is that the overall goal for new buildings--maintaining the same level of final energy use in commercial and residential buildings, despite a projected increase by 2050 of 40% in commercial floor space and 36% in population--is attainable. [208] Decarbonization in the new building sector will demand high levels of cooperation among federal, state, and local authorities, as well as architects and the construction industry. Consumer demand in the form of decisions by individuals, companies, and developers will be a driving force in this sector, as it has been in other areas that have progressively become "greener" and more mindful of sustainability. Despite some of the difficulties ahead, there is good reason for optimism as new buildings incorporate cost-effective energy performance measures, moving our building stock toward a zeroenergy and decarbonized future.

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[208] TECHNICAL REPORT, *supra* note 15, at 1, 25-26.