

Grid Reliability in the Electric Era

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The United States has delegated the responsibility of keeping the lights on to a self-regulatory organization called the North American Electric Reliability Corporation (NERC). Although NERC is a crucial example of industry-led governance—and regulates in an area that is central to our economy and basic human survival—this unusual institution has received scant attention from policymakers and scholars. Such attention is overdue. To decarbonize its economy, the United States must enter a new “electric era,” transitioning many sectors to run on electricity while also transforming the electricity system itself to run largely on clean but intermittent renewable resources. These new resources demand new approaches to electric grid reliability—approaches that NERC is failing to adequately embrace.

This Article traces NERC’s history, situates NERC in ongoing debates about climate change and grid reliability, and assesses the viability of reliability self-regulation in the electric era. A self-regulatory model for maintaining U.S. electric-grid reliability sufficed in prior decades, when regulated monopolies managed nearly every segment of electricity production. But the criteria that NERC once used to justify self-regulation—electric utilities’ expertise, clear accountability metrics, and public-private alignment of interests—no longer hold. The climate crisis creates a need for expertise beyond NERC’s domain, while the introduction of competition in the electricity sector blurs lines of accountability for reliability failures. NERC’s structure also perpetuates an incumbency bias at odds with public goals for the energy transition.

These shifting conditions have caused to fail to keep pace with the reliability challenges of the electric era. Worse still, outdated NERC standards help entrench fossil-fuel interests by justifying electricity-market rules poorly suited to accommodate renewable resources. We therefore suggest a suite of reforms that would increase direct government oversight and accountability in electricity-reliability regulation.

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Introduction

Politicians and pundits rarely spoke of the North American Electric Reliability Corporation (NERC) until 2021, when Texas and other parts of the Midwestern and Southeastern United States experienced a deadly and wide-ranging grid blackout. Children and other vulnerable people perished from hypothermia, house fires caused by wood-burning stoves, and carbon-monoxide poisoning, and essential home medical equipment failed.¹ Politicians, meanwhile, lobbed accusations about who was responsible.² As the entity in charge of grid reliability in the United States and much of Canada and Mexico, NERC made a brief appearance in news accounts and policy discussions.³ But as memory of the blackout faded,⁴ so too did public scrutiny of this peculiar institution.⁵

NERC operates as a self-regulatory organization that, since 2006, has been statutorily charged to act as the nation’s “Electric Reliability Organization” (ERO) to ensure the reliability of the U.S. “bulk-power

1. *FERC-NERC-Regional Entity Staff Report: The February 2021 Cold Weather Outages in Texas and the South Central United States*, FERC, NERC & REG'L ENTITIES 9 (Nov. 2021), <https://ferc.gov/media/february-2021-cold-weather-outages-texas-and-south-central-united-states-ferc-nerc-and> [https://perma.cc/589D-H62X].

2. Cf. Letter from DeAnn T. Walker, Chairman, Pub. Util. Comm'n of Tex., to Governor Greg Abbott (Mar. 1, 2021), <https://www.powermag.com/wp-content/uploads/2021/03/496558704-chairman-walker-resignation-letter.pdf> [https://perma.cc/4H96-D5WS] (resigning and arguing for shared culpability among “[t]he gas companies, the Railroad Commission, the electric generators, the transmission and distribution utilities, the electric cooperatives, the municipally owned utilities, the Electric Reliability Council of Texas, and finally the Legislature”).

3. See, e.g., *U.S. Wants Natgas/Power Coordination to Prevent Another Feb Freeze*, REUTERS (Nov. 16, 2021) <https://www.reuters.com/business/energy/us-wants-natgaspower-coordination-prevent-another-feb-freeze-2021-11-16> [https://perma.cc/E2HD-NH4P] (noting the NERC-FERC report on the causes of the freeze); Jeremy Schwartz, Kiah Collier & Vianna Davila, *“Power Companies Get Exactly What They Want”: How Texas Repeatedly Failed to Protect Its Power Grid Against Extreme Weather*, TEX. TRIB. (Feb. 22, 2021), <https://www.texastribune.org/2021/02/22/texas-power-grid-extreme-weather> [https://perma.cc/V44H-DZZB] (noting that NERC had “methodically laid out how power-generating equipment failed” during a 2014 southern cold snap but how Texas grid operators had ignored NERC’s recommendations).

4. See Glenn Hegar, *Fiscal Notes: Winter Storm Uri 2021*, TEX. COMPTROLLER OF PUB. ACCTS. 3 (Oct. 2021), <https://comptroller.texas.gov/economy/fiscal-notes/2021/oct/docs/fn.pdf> [https://perma.cc/LPM8-H783] (estimating an economic toll of \$80 to \$130 billion from Winter Storm Uri and “at least 210 deaths”).

5. Scholars have also largely ignored NERC. The literature typically discusses NERC only in short snippets, exploring its public-private “hybridity” and potential nondelegation issues. See Emily Hammond, *Double Deference in Administrative Law*, 116 COLUM. L. REV. 1705, 1741-47 (2016) (describing NERC as an example of a self-regulatory organization to which the government has delegated regulatory authority); Hari M. Osofsky & Hannah J. Wiseman, *Hybrid Energy Governance*, 2014 U. ILL. L. REV. 1, 31-45 (exploring NERC’s role as an organization that integrates public and private actors and its innovation in some areas, such as cybersecurity). Some literature has begun to document NERC’s role in modern grid reliability, but no sources of which we are aware have fully described or analyzed NERC’s governance role. For more limited discussion of NERC’s regulation of grid reliability, see Alexandra Klass, Joshua Macey, Shelley Welton & Hannah Wiseman, *Grid Reliability Through Clean Energy*, 74 STAN. L. REV. 969, 1043-53 (2022), which explores NERC’s failure to recognize how renewable energy can contribute to grid reliability, not just imperil it; and Alexandra B. Klass, *Expanding the U.S. Electric Transmission and Distribution Grid to Meet Deep Decarbonization Goals*, 47 ENV'TL. REP. 10749, 10750 (2017), which briefly describes NERC’s role in maintaining a reliable grid.

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system.”⁶ But NERC’s existence dates back far longer, to 1968, when electric utilities voluntarily formed the corporation to jointly establish grid-reliability standards.⁷ For decades, NERC did an admirable job of helping to minimize grid disruptions that lead to major blackouts. Yet climate change has rendered the tasks of maintaining grid reliability (providing adequate power all of the time) and resilience (regaining power quickly after blackouts and maintaining some power during grid emergencies) more difficult, creating a pressing need to reexamine the theory and practice of reliability governance in the United States.⁸

Climate change complicates grid reliability in two ways. First, responding to the problem requires a transformation of the electricity grid to run on zero-carbon (“clean”) energy, even as the grid expands in order to allow the country to “electrify everything”—from vehicles to heating, cooking, and industrial processes—thereby launching a new “electric era” of energy.⁹ This transformation to a grid powered predominantly by renewable energy is well underway in the United States and will accelerate as a result of the Inflation Reduction Act of 2022.¹⁰ However, because of its intermittency, renewable energy requires new approaches to reliability, including nimble solutions such as battery storage, “flexible” power that can turn on quickly, and commitments from consumers to reduce

6. See Order No. 672, 114 FERC ¶ 61,104 (2006); 16 U.S.C. § 824o (2018). “Bulk-power system” is a technical term that essentially refers to electricity generation and transmission infrastructure. It explicitly excludes most small distribution lines that carry power to individual homes and businesses. For ease of readership, we often refer to the bulk-power system as the “grid,” recognizing that the grid as regulated by NERC does not include the distribution wires that lead to individual homes, industries, and businesses. See Joseph H. Eto, Kristina H. LaComare, Heidemarie C. Caswell & David Till, *Distribution System Versus Bulk Power System: Identifying the Source of Electric Service Interruptions in the U.S.*, 13 IET GENERATION TRANSMISSION & DISTRIB. 717, 718-19 (2019) (noting that FERC’s jurisdiction since 2010 extends mostly to lines operating at over 100 kilovolts).

7. David Nevius, *The History of the North American Electric Reliability Corporation*, NERC 3, <https://www.nerc.com/AboutNERC/Resource%20Documents/NERCHistoryBook.pdf> [<https://perma.cc/GFX8-7YSE>].

8. See *infra* notes 9-13 and accompanying text.

9. See, e.g., Florian Knobloch, Steef V. Hanssen, Aileen Lam, Hector Pollitt, Pablo Salas, Unnada Chewpreecha, Mark A. J. Huijbregts & Jean-Francois Mercure, *Net Emission Reductions from Electric Cars and Heat Pumps in 59 World Regions over Time*, 3 NATURE SUSTAINABILITY 437, 437 (2020) (“Policymakers widely consider electrification a key measure for decarbonizing road transport and household heating.”); Runsen Zhang & Shinichiro Fujimori, *The Role of Transport Electrification in Global Climate Change Mitigation Scenarios*, ENV’T RSCH. LETTERS, Mar. 2020, at 1, 9 (noting the necessary synergies between “transport electrification” and renewable energy).

10. Inflation Reduction Act of 2022, Pub. L. No. 117-169, 136 Stat. 1818; see Off. of Pol’y, *The Inflation Reduction Act Drives Significant Emissions Reductions and Positions America to Reach Our Climate Goals*, U.S. DEP’T OF ENERGY 1 (Aug. 2022), https://www.energy.gov/sites/default/files/2022-08/8.18%20InflationReductionAct_Factsheet_Final.pdf [<https://perma.cc/8HCL-JX35>] (stating that the Act “will help drive 2030 economy-wide greenhouse gas (GHG) emissions to 40% below 2005 levels”).

consumption.¹¹ As we explain, we believe NERC has been insufficiently proactive in responding to the shifting nature of modern grid reliability.¹²

The second reason NERC's job is becoming increasingly difficult stems from the *effects* of climate change on the U.S. grid. Climate change is worsening wildfires, exacerbating droughts that threaten the viability of hydroelectric dams as sources of electricity, and contributing to more erratic and frequent cold snaps and heat waves throughout the country—with significant attendant grid-management challenges.¹³ These reliability challenges are compounded by the aging nature of U.S. grid infrastructure and growing cyberthreats and other security risks.¹⁴ The United States experiences “more power outages than any other developed country” and has seen a ten-fold increase in major outages between the mid-1980s and 2012.¹⁵ Although most power outages occur on local distribution lines

11. See Nestor A. Sepulveda, Jesse D. Jenkins, Fernando J. de Sisternes & Richard K. Lester, *The Role of Firm Low-Carbon Electricity Resources in Deep Decarbonization of Power Generation*, 2 JOULE 2403, 2403-04 (2018); Amy L. Stein, *Distributed Reliability*, 87 U. COLO. L. REV. 887, 891-96 (2016) (exploring the growth of customer-owned (distributed) reliability resources and the complexities presented by the “growing separation between ownership and control of reliability resources within our grid,” including jurisdictional challenges); Amy L. Stein, *Regulating Reliability*, 54 HOUS. L. REV. 1191, 1194-95 (2017) (noting the growing importance of a range of “methods” and technologies to support reliability, such as “energy storage, electric vehicles, and demand response,” and incentives to support distributed solar energy).

12. NERC has instead focused on maintaining sufficient levels of “firm” capacity that are available to meet demand throughout the year and shoring up the strength of large-scale infrastructure, both physically and from a cybersecurity perspective. In urging a broader lens, we do not intend to minimize the importance of these concerns, which are important *components* of enhancing grid reliability. But NERC has given less attention than we believe is merited to reactive and flexible resources and practices, including localized microgrids powered by renewable energy and battery and greater interregional connection of the transmission grid. For NERC's and its regional entities' foci, see, for example, *2022 State of Reliability: An Assessment of 2021 Bulk Power System Performance*, NERC vi (July 2022), https://www.nerc.com/pa/RAPA/PA/Performance%20Analysis%20DL/NERC_SOR_2022.pdf [<https://perma.cc/8JYC-3ZYF>], which notes the adoption of three revised winter weatherization standards and fuel-assurance guidelines and observes that “nation-state adversaries and organized cyber criminals have demonstrated that they have the ability and willingness to disrupt critical infrastructure”; and *2021 State of Reliability: An Assessment of 2020 Bulk Power System Performance*, NERC x (Aug. 2021), https://www.nerc.com/pa/RAPA/PA/Performance%20Analysis%20DL/NERC_SOR_2021.pdf [<https://perma.cc/XM6N-YME3>], which notes modern needs—including “the need for flexibility as conventional generation retirements are considered” and the need for “unserved energy metrics” to be “used alongside traditional capacity planning approaches” in light of the “transformation” of the electricity generation mix—but does not indicate the adoption of standards to address these needs.

13. See *Public Safety Power Shutoff (PSPS) Program*, CAL. INDEP. SYS. OPERATOR (June 2020), <https://www.caiso.com/documents/PublicSafetyPowerShutoffProgram-FactSheet.pdf> [<https://perma.cc/7DBM-DKS5>]; *2022 Summer Reliability Assessment*, NERC 4 (May 2022), https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SRA_2022.pdf [<https://perma.cc/U72M-V773>]; Judah Cohen, Laurie Agel, Mathew Barlow, Chaim I. Garfinkel & Ian White, *Linking Arctic Variability and Change with Extreme Winter Weather in the United States*, SCIENCE, Sept. 3, 2021, at 1.

14. *2022 Summer Reliability Assessment*, *supra* note 13, at 5-6.

15. Ula Chrobak, *The US Has More Power Outages than Any Other Developed Country. Here's Why.*, POPULAR SCI. (Aug. 17, 2020), <https://www.popsci.com/story/environment/why-us-lose-power-storms> [<https://perma.cc/5AJX-L4KK>]; see Douglas MacMillan & Will Englund, *Longer, More Frequent Outages Afflict the U.S. Power Grid as States Fail to Prepare for Climate*

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(such as a tree limb downing a line in a single neighborhood), when the larger system fails, the results are catastrophic—as illustrated by the 2021 U.S. Southern blackout. NERC itself has described these risks as “unprecedented” and warned that “two-thirds of North America [was] at risk of energy shortfalls” for the following summer.¹⁶

Given these evolving challenges, it is time to fully theorize and scrutinize the decision to rely primarily on a privatized self-regulatory model to ensure grid reliability. Scholars of administration have coalesced around a set of criteria that allows self-regulation to function well, including technical expertise, incentives to self-police fairly, and alignment between the goals of industry and the goals of government regulators, among other criteria.¹⁷ We argue that these characteristics have broken down in grid-reliability regulation.

This breakdown began in the 1990s with the weakening of the public-utility model for generating electricity.¹⁸ For decades, there was regulatory consensus that baseload resources—electricity generation that runs constantly and has relatively low fuel costs—should provide a steady stream of power during ordinary conditions.¹⁹ There was also consensus that “peaker” plants, generators with higher operating costs but lower fixed costs, should be called online during periods of peak electricity demand.²⁰

NERC’s private governance structure could be justified, at least theoretically, in those circumstances. Under that public-utility model, market participants—all regulated utilities—had incentives to invest in reliability solutions because they could recover the costs of such investments from their ratepayers, plus a generous rate of return. At the same time, utilities had an incentive to monitor their interconnected neighbors since a neighboring utility’s reliability failures could create

Change, WASH. POST (Oct. 24, 2021), <https://www.washingtonpost.com/business/2021/10/24/climate-change-power-outages> [https://perma.cc/H8H7-6H8E].

16. *Announcement: Two-Thirds of North America Faces Reliability Challenges in the Event of Widespread Heatwaves*, NERC 1 (May 17, 2023), <https://www.nerc.com/news/Headlines%20DL/Summer%20Reliability%20Assessment%20Announcement%20May%202023.pdf> [https://perma.cc/7V5W-UXPF]; Robert Walton, *North American Electric Grid Faces “Unprecedented” Widespread Risk This Winter*: NERC, UTIL. DIVE (Nov. 18, 2022), <https://www.utilitydive.com/news/north-american-electric-grid-unprecedented-widespread-risk-winter-nerc-assessment/636926> [https://perma.cc/77KJ-G53U].

17. See *infra* Section I.B.

18. David B. Spence, *Can Law Manage Competitive Energy Markets*, 93 CORNELL L. REV. 765, 772-75 (2008).

19. See generally Will McNamara, *Issue Brief: Energy Storage to Replace Peaker Plants*, SANDIA NAT’L LAB’YS (2020), <https://www.sandia.gov/app/uploads/sites/163/2022/04/Issue-Brief-2020-11-Peaker-Plants.pdf> [https://perma.cc/CY88-F68T] (describing the changing circumstances of a system that previously relied primarily on baseload and peaker plants); Ed Smeleff, *The End of the Era of Baseload Power Plants*, GREENTECH MEDIA (June 29, 2016), <https://www.greentechmedia.com/articles/read/the-end-of-the-era-of-baseload-power-plants> [https://perma.cc/GN88-KBEZ] (noting the history of baseload plants and the breakdown of their predominance).

20. See generally McNamara, *supra* note 19.

cascading blackouts and damage equipment throughout an entire region.²¹ And regulators knew whom to blame when things went wrong: the utilities charged with providing power to their service territories and NERC, the industry-led entity charged with developing reliability standards. There were thus clear lines of accountability that led directly to utilities and to NERC's governing body.

Even if those clear lines of accountability were never so neatly defined, that is the story market participants told when they lobbied for a private ERO governance model and resisted enhanced federal oversight over grid reliability.²² These theoretical arguments are, however, eroding in the face of changing industry players and climate change.

Industry expertise and asymmetric access to information, the first widely recognized criterion for self-regulation, remains the strongest justification in NERC's favor.²³ But although NERC's leaders and members continue to have considerable expertise in *traditional* reliability solutions—shoring up baseload and peaker power plants—this knowledge does not as readily extend to the innovations necessary to address the reliability concerns raised by a shifting resource mix.²⁴ In addition, because much of NERC's expertise comes from regulated utilities—NERC outsources most data collection and modeling to market participants—expertise is being provided by firms that own and operate traditional reliability solutions.

Incentives to self-police have also eroded. Industry changes in the 1990s moved the United States largely to a model of competition within electricity generation, weakening the unity of interests among industry players and introducing new market structures and market participants.²⁵ In more recent years, the rapid ascendance of new competitors that are critical in a lower-carbon electrified era—including renewable energy, energy storage, and demand management companies—has only compounded this challenge. Utilities—still a dominant voice within NERC²⁶—often view these entrants as threats. For these reasons, rather than rewriting NERC standards to accommodate these new entrants into the grid, NERC's membership has a financial incentive to decline to pursue useful reforms and, instead, to enact reliability standards that actively impede technical changes needed to accommodate high levels of

21. See *infra* Section II.B (discussing regulatory reactions to blackouts during the utility era).

22. See *infra* Section I.B (discussing NERC's arguments for self-regulatory authority).

23. See *infra* Section I.A.

24. See *infra* Section IV.A.

25. Today, independently owned generators that invest in reliability cause their own costs to increase, which, for reasons explained below, causes them to be dispatched less frequently. See *infra* Part I; see also *Industry Data*, EDISON ELEC. INST., <https://www.eei.org/en/resources-and-media/industry-data> [https://perma.cc/4X4R-XLW2] (showing that independent power producers accounted for 46.9 percent of electricity generation in 2022).

26. See *infra* Section II.B.

renewables.²⁷ And when reliability disasters do occur, industry members (and sometimes government agencies) can engage in intra-industry finger pointing, rather than accept failures as a matter of collective responsibility.²⁸ Moreover, the enlarged array of players involved in ensuring grid reliability obscures the fact that a small number of energy-market participants have outsized control within several of the core institutions governing electricity. Most notably, major utilities play dominant roles within NERC, grid-system operators, and the Regional Entities that implement many NERC standards. These unusual arrangements—a kind of nested and interwoven self-governance—allow large, entrenched actors to implement their agendas across institutions in opaque and unaccountable ways.²⁹

The final factor that typically counsels in favor of self-regulation—alignment of interests between industry and regulators—is also crumbling in the reliability context. As we enter the electric era, operational flexibility and resiliency, rather than consistent output and peak availability, are paramount. But as we show, NERC has inadequately focused on these modern solutions, instead doubling down on traditional reliability standards that focus on factors such as firm generation capacity. This myopia cascades throughout the system, as other grid actors use outdated NERC standards to justify interventions that favor incumbent fossil-fuel interests and impede decarbonization efforts.³⁰

This all creates a misalignment between the ERO model and publicly established goals for the electricity sector—most notably, the rapid decarbonization promoted for several decades now by dozens of states and, increasingly, by the federal government.³¹ Although the Federal Energy Regulatory Commission (FERC) oversees NERC, it is limited by an unusually stringent deference regime that requires the agency to defer to NERC and other regional reliability entities.³² FERC has taken steps recently to force NERC to adopt standards to better integrate renewable energy reliably and prepare for climate extremes,³³ but improvements

27. See, e.g., *infra* notes 371-375 and accompanying text.

28. For example, in the wake of the Southern blackout, gas companies, electric generators, transmission and distribution utilities, government agencies, and the Texas legislature engaged in an extensive and frequently inaccurate blame game targeting renewables. See Letter from Walker, *supra* note 2; Klass, Macey, Welton & Wiseman, *supra* note 5, at 975 (describing inaccurate finger pointing toward wind farms being a primary culprit in the 2021 blackout).

29. See *infra* Section III.D.

30. See *infra* Section III.D.

31. See Off. of Pol'y, *supra* note 10, at 1 (showing anticipated federal progress on greenhouse-gas-emission reductions as a result of investments under the Inflation Reduction Act). See generally Kirsten Engel & David Adelman, *Reorienting State Climate Change Policies to Induce Technological Change*, 50 ARIZ. L. REV. 835 (2008) (documenting state climate efforts).

32. See Hammond, *supra* note 5, at 1744; John S. Moot, *When Should the FERC Defer to the NERC?*, 31 ENERGY L.J. 317, 317-19 (considering the puzzling features of FERC's standard of review for NERC's proposed reliability standards).

33. See *infra* Section III.E.

remain slow, piecemeal, and inadequate. To be sure, NERC is far from alone in shouldering blame for these inadequacies. Although NERC is, by name, *the* electric reliability organization, the title is, in some ways, a misnomer. In today's complex system, the reliability challenge has spilled over the banks of what NERC can realistically and legally accomplish via its self-regulatory, standard-setting model.³⁴ This dispersed responsibility reinforces the need for substantial revision of the current self-regulatory model for grid reliability.

To address these challenges, this Article advocates for a more public and comprehensive approach to grid-reliability governance. Although we see a critical ongoing place for NERC,³⁵ we argue that the organization should play a more cabined and embedded technical and expertise-based role within a largely public regime. Without fundamental changes to grid governance, the United States risks more frequent and severe grid-reliability crises in the coming years. We propose a range of potential internal and external reforms, including a restructured NERC board and voting body, a reworked legal deference regime, and a FERC with more comprehensive jurisdiction over the many facets of grid reliability.³⁶

The analysis necessary to build to these solutions is, at times, technical and dense, mirroring reliability regulation itself. Before diving in, we want to re-emphasize the stakes of plumbing NERC theory and practice at this moment. Journalist David Wallace-Wells has traced how the primary strategy for slowing progress on climate change has shifted in recent years from denial to delay, as climate impacts become impossible to ignore.³⁷ This dilatory rhetoric emphasizes the threats that a rapid clean-energy transition poses to grid reliability.³⁸ NERC itself sometimes engages in this rhetoric: in 2023, NERC's President and CEO, James B. Robb, testified that the current pace of the energy transition (toward more renewable energy) was not being managed "in an orderly way" and framed the problem as one of eroding baseload resources, warning that "[c]onventional generation is retiring at an unprecedented rate."³⁹

34. See *infra* notes 162-168 and accompanying text.

35. See *infra* note 381 for a discussion of the difficulties that FERC faces in attempting to hire engineers.

36. See *infra* Part IV.

37. David Wallace Wells, Opinion, *What's Worse: Climate Denial or Climate Hypocrisy?*, N.Y. TIMES (June 22, 2022), <https://www.nytimes.com/2022/06/22/opinion/environment/climate-hypocrisy-larry-fink.html> [https://perma.cc/J36H-QZJP].

38. See Klass, Macey, Welton & Wiseman, *supra* note 5, at 974; Erin Douglas & Ross Ramsey, *No, Frozen Wind Turbines Aren't the Main Culprit for Texas' Power Outages*, TEX. TRIB. (Feb. 16, 2021), <https://www.texastribune.org/2021/02/16/texas-wind-turbines-frozen> [https://perma.cc/P3YT-ZG9U] (quoting the Texas Agriculture Commissioner's Facebook statement amid the Southern blackout: "We should never build another wind turbine in Texas.").

39. *Hearing to Examine the Reliability and Resiliency of Electric Services in the U.S. in Light of Recent Reliability Assessments and Alerts: Hearing Before the S. Comm. on Energy & Nat. Res.*, 117th Cong. 1 (2023) (statement of James B. Robb, President and CEO, NERC), <https://www.energy.senate.gov/services/files/D47C2B83-A0A7-4E0B-ABF2-9574D9990C11> [https://perma.cc/YL39-DVSD] [hereinafter Robb Testimony].

Similarly, after insisting that NERC supports the clean-energy transition, John Moura, director of reliability assessment and performance analysis at NERC, was quoted in May 2022 as explaining that “[t]he pace of our grid transformation is a little out of sync” with the system’s technical requirements.⁴⁰ In our view, it is precisely the other way around: our institution for developing and implementing technical grid requirements for reliability is out of sync with the necessary pace of system transformation.

This Article proceeds in four Parts. Part I introduces the theory of self-regulation and explores how NERC historically fashioned itself in this model. Part II analyzes NERC as a self-regulatory organization, exploring the largely private regime through which NERC and its subsidiaries govern grid reliability in the United States. Part III then critiques this model’s ability to address modern grid-reliability challenges. Part IV relates these failures to the theory of self-regulation, arguing that NERC no longer meets most of the theoretical conditions that support robust self-regulation and building the case for a more public governance regime in the context of grid reliability.

I. Self-Regulation in Theory and Practice

The fact that a private organization is primarily responsible for the reliability of the sprawling U.S. grid—a key backbone of the economy and a critical facet of human well-being—is likely surprising to those unfamiliar with grid governance. To understand how it came to be this way, this Part synthesizes the theoretical conditions that justify self-governance and explores the history of NERC’s attempts to regulate in this model.

A. The Theory of Self-Regulation

There is a sizeable academic literature on “self-regulation,” including considerable typologizing of what is meant by the term.⁴¹ Broadly speaking, legal scholars define self-regulation as “any system of regulation in which the regulatory target—either at the individual-firm level or sometimes through an industry association that represents targets—imposes commands and consequences upon itself.”⁴² Of course, self-

40. Peter Behr & Jason Plautz, *Grid Monitor Warns of U.S. Blackouts in “Sobering Report,”* ENERGY WIRE (May 19, 2022), <https://www.eenews.net/articles/grid-monitor-warns-of-u-s-blackouts-in-sobering-report> [https://perma.cc/2ZUZ-B5YD].

41. See, e.g., Cary Coglianese & Evan Mendelson, *Meta-Regulation and Self-Regulation, in THE OXFORD HANDBOOK OF REGULATION* 146, 147-48 (Robert Baldwin, Martin Cave & Martin Lodge eds., 2010); Saule T. Omarova, *Rethinking the Future of Self-Regulation in the Financial Industry*, 35 BROOK. J. INT’L L. 665, 671 (2010) (“[T]he meaning of the term ‘self-regulation’ defies simple definitions.”); Anthony Ogas, *Rethinking Self-Regulation, in REGULATION, ECONOMICS AND THE LAW* 345, 347 (Anthony I. Ogas ed., 2001).

42. Coglianese & Mendelson, *supra* note 41, at 150.

regulation exists along a continuum. At one end, there is complete self-regulation at the firm level, which essentially converges with firm decision-making under political and legal constraints.⁴³ In the middle exist standard-setting or self-regulatory organizations (SROs), where an industry group might promulgate standards or rules, enforce them, and serve a broader convening function within its industry.⁴⁴ On the other end, there is what scholars term “meta-regulation,” a nested arrangement in which the state or another entity at a higher level than the regulated firm has some legal oversight authority over self-regulatory arrangements.⁴⁵ There are a variety of forms of meta-regulation, such as “enforced self-regulation,” in which a government actor enforces “privately made rules” in addition to its own rules; “mandated self-regulation,” in which the government requires industry to self-regulate; and “co-regulation,” in which “public agencies and private market actors cooperate in the creation, implementation, and enforcement of rules.”⁴⁶

By many accounts, U.S. grid-reliability governance led by NERC involves meta-regulation, with NERC potentially rising to the level of a “quasi-governmental organization” in light of its coordination with and oversight by FERC.⁴⁷ But as we explore in this Article, FERC—NERC’s government overseer—is required to give substantial deference to NERC, and NERC’s multiple layers of private governance, through Regional Entities and smaller sub-regional organizations, seem to dwarf FERC’s public involvement. We therefore refer to NERC as an SRO despite possible definitional quibbles. The obvious question then becomes, when is such a public-private arrangement desirable? And, more granularly, how can policymakers know where on the continuum of self-regulation an industry should fall?⁴⁸

We focus on three core features that scholars widely identify as making self-regulation workable in a particular industry or setting. The first feature is **specialized industry expertise** and related asymmetrical access to information. Self-regulation is particularly important when an

43. See William A. Birdthistle & M. Todd Henderson, *Becoming a Fifth Branch*, 99 CORNELL L. REV. 1, 7 (2013) (“If ‘law’ is simply the set of rules that regulate the actions of a community, then law is made by families, by firms, by universities, by private clubs, and by countless other nongovernmental authorities.”).

44. ROBERT BALDWIN, MARTIN CAVE & MARTIN LODGE, *UNDERSTANDING REGULATION: THEORY, STRATEGY, AND PRACTICE* 138 (2d ed. 2012).

45. See Coglianese & Mendelson, *supra* note 41, at 147-48.

46. Omarova, *supra* note 41, at 675-77; see Coglianese & Mendelson, *supra* note 41, at 147-48; see also BALDWIN, CAVE & LODGE, *supra* note 44, at 146 (describing co-regulation).

47. William A. Birdthistle & M. Todd Henderson explore how quasi-governmental organizations are SROs that essentially become “public bodies” and how scholars debate whether financial SROs have become quasi-governmental. See Birdthistle & Henderson, *supra* note 43, at 13.

48. The first question posed above is much better theorized than the second. See Coglianese & Mendelson, *supra* note 41, at 162 (noting that “[m]uch more research is needed” to understand “the circumstances under which meta-regulation can successfully deliver public value”).

industry is complex, dynamic, and “not well understood by outside regulators.”⁴⁹ In this circumstance, regulators may lack the knowledge, information, or bandwidth to craft effective rules and standards, making industry participation a prerequisite for sound results.⁵⁰ Industry expertise may also help make rules more cost effective and achievable, creating a greater likelihood that those in the industry will actually follow them.⁵¹ And finally, harnessing industry expertise can allow for speedier adoption of rules and faster adaptation to changing circumstances.⁵² Financial markets are sometimes described as a quintessential example of an industry that embodies the industry-expertise criterion, with the convoluted and ever-changing nature of securities trading often used as a strong justification for self-regulation.⁵³ The internet—another technically complex and dynamic beast—is also a common example.⁵⁴

For self-regulation to work, industry members must also have **incentives to fairly self-police**—that is, industry members must believe they get something worthwhile out of a system of self-regulation.⁵⁵ This criterion tends to be met when an industry is “small, relatively homogeneous, and interconnected.”⁵⁶ These types of industries sometimes possess an “industry commons” problem, in which the public’s or regulators’ perceptions of a risk posed by the industry affect all actors

49. *Id.* at 153; see BALDWIN, CAVE & LODGE, *supra* note 44, at 139; Benjamin P. Edwards, *The Dark Side of Self-Regulation*, 85 U. CIN. L. REV. 573, 601 (2017); Hammond, *supra* note 5, at 1718; Birdthistle & Henderson, *supra* note 43, at 55.

50. See Omarova, *supra* note 41, at 670 (arguing for a continued role for self-regulation in the financial industry, despite challenges, because of “the industry’s superior ability to access and assess, in a timely and efficient manner, the relevant market information”).

51. See Coglianese & Mendelson, *supra* note 41, at 152; BALDWIN, CAVE, & LODGE, *supra* note 44, at 139; Omarova, *supra* note , at 674; Ogas, *supra* note 41, at 346; Peter Grajzl & Peter Murrell, *Allocating Lawmaking Powers: Self-Regulation vs Government Regulation*, 35 J. COMPAR. ECON. 520, 521 (2007).

52. See BALDWIN, CAVE & LODGE, *supra* note 44, at 140; Coglianese & Mendelson, *supra* note 41, at 153; Hammond, *supra* note 5, at 1718 (“[T]oday’s major oversight agencies could not themselves assume the responsibilities of their SROs without extraordinary increases in their staffing and budgets.”). *But see* Sidney A. Shapiro, *Outsourcing Government Regulation*, 53 DUKE L.J. 389, 391 (2003) (“[U]sing government employees will often be the least costly option because relying on private parties commonly involves incomplete contracts, opportunistic behavior, and hold-up problems, which significantly increase the government’s transaction costs.”).

53. See Edwards, *supra* note 49, at 601; Omarova, *supra* note 41, at 669-70.

54. See, e.g., Llewellyn Joseph Gibbons, *No Regulation, Government Regulation, or Self-Regulation: Social Enforcement or Social Contracting for Governance in Cyberspace*, 6 CORNELL J.L. & PUB. POL’Y 475, 509-10 (1997); Philip J. Weiser, *Internet Governance, Standard Setting, and Self-Regulation*, 28 N. KY. L. REV. 822, 825-26 (2001).

55. Birdthistle & Henderson, *supra* note 43, at 8-10; Hammond, *supra* note 5, at 1718.

56. Coglianese & Mendelson, *supra* note 41, at 154; see Ogas, *supra* note 41, at 348 (explaining that self-regulation works best “where the affected group is relatively homogeneous and externalities are largely absent”); *cf.* Andrew A. King & Michael J. Lenox, *Industry Self-Regulation Without Sanctions: The Chemical Industry’s Responsible Care Program*, 43 ACAD. MGMT. J. 698, 702 (2000) (discussing Mancur Olson’s theory that firms will cooperate in organizations such as SROs—overcoming collective action challenges—when there is a small group of firms, since a collective good or harm will fall quite heavily on any one firm in the group).

within that industry—even those that pose a lower risk.⁵⁷ For example, nuclear power is often held up as an industry in which all members have an interest in ensuring that the others act responsibly and avoid severe accidents, so as to stave off more intrusive federal regulation and ensure the industry's continued viability.⁵⁸ Each one of these close-knit industry actors is, in essence, “a hostage of every other,” because “a single catastrophic accident (think of Chernobyl) . . . would have ruinous consequences for the entire industry.”⁵⁹ The securities industry also has this hostage-like element, because “good” securities brokers fear the taint of “bad” brokers and thus have internal motivations to police abusive practices.⁶⁰ In contrast, as Cary Coglianese and Evan Mendelson observe, “[f]irms in a large, heterogeneous industry can probably defect more easily on any self-regulatory collective action.”⁶¹ Moreover, if firms differ too much in size, strength, and interests within an industry, then “[p]articular groups within self-regulatory organizations may also use their regulatory power in anticompetitive ways by crafting regulations that disproportionately burden their competitors.”⁶²

Third, from a public-interest perspective, self-regulation is advisable only where there exists either **alignment between the goals of regulators**

57. Andrew King & Michael W. Toffel, *Self-Regulatory Institutions for Solving Environmental Problems: Perspectives and Contributions from the Management Literature*, in GOVERNANCE FOR THE ENVIRONMENT: NEW PERSPECTIVES 98, 102-03 (Magali A. Delmas & Oran R. Young eds., 2009).

58. See JOSEPH V. REES, HOSTAGES OF EACH OTHER: THE TRANSFORMATION OF NUCLEAR SAFETY SINCE THREE MILE ISLAND 2 (1994); see also Coglianese & Mendelson, *supra* note 41, at 160-61; Michael J. Lenox & Jennifer Nash, *Industry Self-Regulation and Adverse Selection: A Comparison Across Four Trade Association Programs*, 12 BUS. STRATEGY & ENVT 343, 343 (2003) (“Fatal accidents, damaging spills and the emission of toxic pollutants have consequences not only for the offending firms but all firms within an industry.”).

59. REES, *supra* note 58, at 2. In addition to the shared threat of public outcry and greater regulation of a relatively homogenous industry, the physical interconnectedness of an industry, either through reliance on a shared resource (such as fish) or interconnected infrastructure, such as shared transmission lines, can also produce effective self-regulation. See King & Lenox, *supra* note 56, at 713 (noting that the “nature of the common good, or commons, being protected” by self-regulation influences its effectiveness).

60. Birdthistle & Henderson, *supra* note 43, at 8-9 (observing that in the financial industry, “[i]ndustry professionals have strong incentives to police their own, since many of the costs of misbehavior are born by all members of the profession while the benefits inure only to the misbehaving few.”).

61. Coglianese & Mendelson, *supra* note 41, at 161; see also BALDWIN, CAVE & LODGE, *supra* note 44, at 154 (discussing the challenges of deliberation in self-regulation among groups that have “divergent interests”). More heterogeneous groups are also less likely to be able to effectively police their members to ensure that they are complying with industry standards and not simply free-riding on the public benefits of perceived beneficial outcomes of self-regulation, such as safety. See Lenox & Nash, *supra* note 58, at 347 (noting the importance of close monitoring of member behavior and other internal compliance mechanisms for self-regulation to be effective).

62. Edwards, *supra* note 49, at 605; see also Birdthistle & Henderson, *supra* note 43, at 26 (explaining that self-regulation works better when potential victims are not easily identified *ex ante* and are “central actors within the industry being regulated”); REES, *supra* note 58, at 49 (attributing nuclear self-regulation’s success to its ability to create “close integration between regulator and regulated” and foster a “communitarian” spirit).

and the goals of industry, or accountability mechanisms to bring them into alignment.⁶³ For example, scholars have argued that both nuclear regulators *and* the nuclear industry have a baseline goal of avoiding nuclear meltdowns, because a meltdown at a single reactor can dramatically change the regulatory environment for the entire industry.⁶⁴ But in some contexts, creating this alignment is a challenge. As Robert Baldwin, Martin Cave, and Martin Lodge recount, numerous studies have observed “the tendency of self-regulatory bodies to act anti-competitively on access requirements and prices, so that members’ interests rather than those of the public are served.”⁶⁵ Note, too, that alignment can be affected by governance constructs *within* an SRO: who initiates and participates in drafting rules and standards, who must approve them, how transparently, and under what parameters.⁶⁶

When interests do not naturally align, **robust accountability mechanisms** are necessary to avoid cartelization and the lethargy that can arise from a self-regulatory organization’s potential incentive to “fail[] to address known problems.”⁶⁷ In these situations, meta-regulation gains importance and appeal.⁶⁸ Embedding self-regulation within regulatory oversight can help pull the outcomes of self-regulation “closer to the overall public interest.”⁶⁹ At times, industry itself may even lead the push

63. See BALDWIN, CAVE & LODGE, *supra* note , at 141-43; see also Ctr. for Fin. Mkt. Integrity, *Self-Regulation in Today’s Securities Markets: Outdated System or Work in Progress?*, CFA INST. 1 (2007), <https://www.cfainstitute.org/-/media/documents/article/position-paper/self-regulation-in-todays-securities-markets-outdated-system-or-work-in-progress.ashx> [https://perma.cc/UZ3B-JFL2] (“[T]he overarching purpose of any self-regulatory group is to keep industry interests aligned with the public interest so as to avoid government intervention and the possibility of more-restrictive regulation.”); Shapiro, *supra* note 52, at 405 (noting the necessity of either natural alignment or the ability of the oversight agency to “create incentives to align its interests and the interests of the private actor”).

64. See REES, *supra* note , at 72-73 (describing the “industrial morality” cultivated via nuclear self-regulation); see also Shapiro, *supra* note 52, at 429 (noting alignment of interests in the stock markets “[b]ecause consumer participation in stock markets is influenced by consumer confidence in the integrity of market operations”). To be sure, analysis of the nuclear and securities industries suggests that they, too, often fail in practice to live up to the ideals of self-regulation. Our analysis does not turn upon these industries being demonstrably *good* candidates for self-regulation—we merely offer them as frequently used examples.

65. BALDWIN, CAVE & LODGE, *supra* note , at 142; see also Edwards, *supra* note 49, at 605 (“One of self-regulation’s major dangers is that it may give industry members ‘the ability to reduce competition and to raise their own profits.’”).

66. See Hammond, *supra* note 5, at 1716; see, e.g., The Governance of Self-Regulatory Organizations, 69 Fed. Reg. 32326, 32328 (June 9, 2004) (requesting public comment on a governance structure for SROs in the securities industry, including questions of how much power the SRO should have over regulatory and compliance actions, who should be on the SRO board, and how the board should be nominated and elected).

67. Edwards, *supra* note 49, at 608; see also Birdthistle & Henderson, *supra* note 43, at 12 (describing the main debate in self-regulation as turning on the tension between “the efficiency of self-regulation versus the risk of cartelization”).

68. See Coglianese & Mendelson, *supra* note 41, at 161 (“Meta-regulation seeks to address some of the drawbacks of a purely self-regulatory approach.”). But see Birdthistle & Henderson, *supra* note 43, at 5, 12 (decrying the “governmentalization” of self-regulatory organizations in the financial space).

69. Coglianese & Mendelson, *supra* note 41, at 163.

for meta-regulation—perhaps after an accident that brings public scrutiny and the threat of losing industry control of regulation, or when an industry finds itself no longer able to fully control its members.⁷⁰

Meta-regulation's effectiveness in closing gaps in accountability between SROs and the public interest depends both on the nature of the industry and the oversight regime.⁷¹ In particular, Baldwin, Cave, and Lodge note that this oversight becomes more difficult “[w]hen an activity is regulated by a network or assemblage of regulators” and when activities cross international borders.⁷² Similarly, Emily Hammond highlights the importance of focusing on how statutes construct deference within a self-regulatory regime, since these legal frameworks control the extent to which an agency can exercise meta-regulatory authority effectively.⁷³ And as particularly relevant to this Article, F.C. Simon observes that when the regulated industry implicates strong and sometimes conflicting public interests—as is the case with electricity, which involves powerful environmental values, social objectives such as affordability, and economic ideals such as competition—the effectiveness of meta-regulation must be closely scrutinized.⁷⁴

There are other features of governed activities that can justify SROs in some contexts. These include activities that cross or have externalities that cross geopolitical lines, areas in which innovation is or should be occurring,⁷⁵ and situations that require relatively rapid adaptation to changing conditions.⁷⁶ SROs are potentially beneficial in all of these

70. *See id.* at 163-64 (describing the chemical industry's and nuclear industry's self-regulatory efforts); BALDWIN, CAVE & LODGE, *supra* note 44, at 141 (“[W]here [incentives] are not fully effective, it is common for organizations to seek explicit recognition from the state and controls to make membership compulsory.”).

71. Coglianese & Mendelson, *supra* note 41, at 162 (noting that meta-regulation might work best when gains for the regulator—that is, publicly oriented changes at the firm—also align with private benefits to the firm); BALDWIN, CAVE & LODGE, *supra* note 44, at 154 (describing the difficulty of developing meta-regulation “in a manner that produces coherence and harmony between corporate and social ends, rather than confusion and conflict”).

72. BALDWIN, CAVE & LODGE, *supra* note 44, at 159-60; *see also* Omarova, *supra* note 41, at 670 (treating as an advantage SROs’ “ability to monitor and regulate their own business operations on a truly global basis, without regard to national borders and jurisdictional limitations”); Ctr. for Fin. Mkt. Integrity, *supra* note 63, at iv (noting challenges created by “dual or wasteful regulatory oversight conducted by multiple regulatory offices”).

73. *See* Hammond, *supra* note 5, at 1709.

74. F.C. SIMON, META-REGULATION IN PRACTICE: BEYOND NORMATIVE VIEWS OF MORALITY AND RATIONALITY 4-7 (2017).

75. Christodoulos Stefanidis, *Self-Regulation, Innovation, and the Financial Industry*, 23 J. REGUL. ECON. 5, 5 (2003).

76. *See, e.g.*, Ruthanne Huisng & Susan S. Silbey, *Accountability Infrastructures: Pragmatic Compliance Inside Organizations*, 15 REGUL. & GOVERNANCE S40, S42 (2021); Llewellyn Joseph Gibbons, *No Regulation, Government Regulation, or Self-Regulation: Social Enforcement or Social Contracting for Governance in Cyberspace*, 6 CORNELL J.L. & PUB. POL’Y 475, 509 (1997) (emphasizing how private standards support flexibility in rulemaking as an industry develops). *See generally* CRISTIE FORD, INNOVATION AND THE STATE: FINANCE, REGULATION, AND JUSTICE (2017) (describing “flexible” regulatory approaches, including self-regulation).

scenarios. In the context of the internet, for example, many accounts point to the critical nature of industry standards in the early phases of internet development, as technologies and practices were rapidly changing and adapting, innovation was paramount, and both the internet and its externalities defied political boundaries.⁷⁷ As we explore here, however, these features—in addition to the three features (discussed above) that we view as most widely cited in the literature—no longer justify the extent of NERC self-regulation that is present today.

B. Self-Regulation of Grid Reliability: NERC and SRO Principles

The baseline conditions that support self-regulation provide a useful lens through which to evaluate the wisdom of NERC as the central actor in grid reliability.⁷⁸ Over the past fifty years, NERC has purposefully and explicitly used the classic SRO criteria to justify itself. For example, former NERC president Rick Sergel has reflected:

When trying to explain who NERC is and what we do, I am often asked: “How can an industry regulate itself? Isn’t there a conflict of interest?” I answer them by explaining that the electric industry is different than others in that we are critically interconnected: the [bulk-power system] is only as strong as its weakest link. Every asset owner has an interest in ensuring its neighbors keep reliability a priority—what happens on one system affects the next, and so on. In short, we are in a unique position to make the self-regulatory model work. The incentives are in the right place, the experts are engaged. Mutual interest exceeds personal gain.⁷⁹

This Section probes this logic, exploring the historical conditions that led to an SRO model for grid reliability. To do so, it reconstructs the story of how grid-reliability regulation in the United States morphed from a matter of loose intra-industry collaboration into today’s more legally formalized regime. It also sketches many of the important changes in the electricity industry that are foundational to assessing the viability of the SRO model in the electric era.

1. The Early Shape of Grid-Reliability Regulation and the Breakdown of Industry Uniformity

The U.S. grid consists of all entities that build, own, operate, or use electricity generation (power plants); transmission lines that transport electricity, typically over long distances; distribution lines that deliver electricity to households, businesses, and industry; and all of the equipment in between, such as transformers that increase or decrease (step up or step

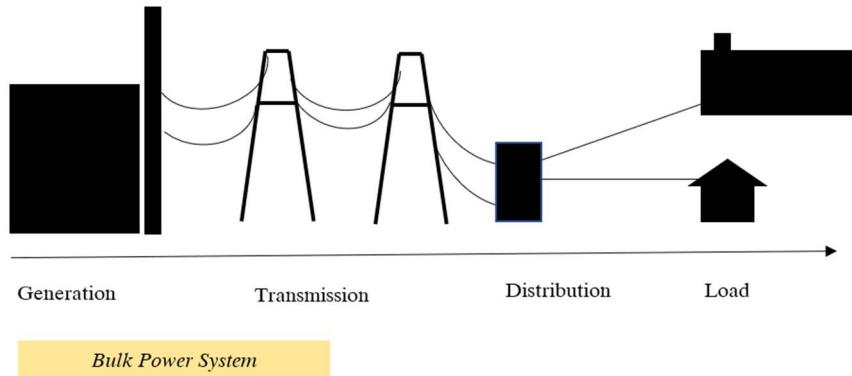
77. Joel R. Reidenberg, *Governing Networks and Rule-Making in Cyberspace*, 45 EMORY L.J. 911, 914 (1996).

78. Cf. BALDWIN, CAVE & LODGE, *supra* note 44, at 164 (noting the need to assess the appropriateness of self-regulation in context).

79. NEVIUS, *supra* note 7, at 91-92.

down) the voltage of electricity when it is being transferred between power plants, transmission lines, and distribution lines (see Figure 1). The generation and transmission components of this system comprise the “bulk-power system” that NERC evolved to regulate.

Figure 1. Key Elements of U.S. Grid



Historically, electric utilities operated as “vertically integrated” regulated monopolies, charged with supplying necessary generation, transmission, and distribution infrastructure within their territories.⁸⁰ But even in electricity’s early days, regulators and utilities understood that sharing power across utilities could enhance the ability of each system to respond to plant outages, downed lines, or other emergencies. As early as 1892, electric generating units began to interconnect to provide backup power to each other.⁸¹ As utilities grew throughout the early part of the twentieth century, they increasingly began to share power among themselves when necessary to balance the system and prevent blackouts.⁸² The Pennsylvania-New Jersey Interconnection became the first official “power pool”—where regional utilities formalized a generation-sharing arrangement—in 1927.⁸³

Numerous additional pools, interconnections, and ties formed and expanded in the following decades among U.S. utilities and some Canadian counterparts.⁸⁴ Alongside these changes came expanded federal regulation of the electricity system. After the Supreme Court in *Public Utilities Commission of Rhode Island v. Attleboro Steam & Electric Co.* exposed

80. Spence, *supra* note 18, at 769.

81. NEVIUS, *supra* note 7, at 147 (describing “the first recorded implementation of economic dispatch”).

82. *Id.*; see also Fed. Power Comm’n v. Fla. Power & Light Co., 404 U.S. 453, 457 (1972) (describing the “pool” of “national interlocking . . . utilities that automatically provides power in case of emergencies”).

83. NEVIUS, *supra* note 7, at 148.

84. *Id.* at 148-50.

Grid Reliability in the Electric Era

the unconstitutionality of intrastate control of interstate transactions and the lack of interstate electricity regulation,⁸⁵ Congress in 1935 passed the Federal Power Act (FPA). The Act maintained state jurisdiction over the distribution system and electricity generation but gave the Federal Power Commission (FPC, now FERC) authority over interstate “wholesale” sales of electricity and interstate transmission.⁸⁶

Despite these jurisdictional shifts, ad hoc industry self-management of electric-grid reliability remained the norm for several decades.⁸⁷ There is a reasonable argument that such self-management was justified under prevailing conditions. Individual utilities had a monopoly over their service territories.⁸⁸ When people lost power, they knew exactly who had caused that loss—as did the regulators who oversaw utilities’ rates and practices. Utilities also had financial incentives to invest in infrastructure needed to support grid reliability, because they earned a profit off such capital expenditures.⁸⁹

A major blackout in 1965, however, exposed the weaknesses of this arrangement. The 1965 Northeast Blackout lasted approximately thirteen hours and “was the most significant disruption in the supply of electricity at that point in the history of the electric industry.”⁹⁰ Following this blackout, President Johnson and Congress began to consider whether there was a need for greater federal oversight of electric reliability. The proposed Electric Power Reliability Act of 1967 would have expanded the FPC’s authority and jurisdiction over interconnection and reliability and mandated communication standards between utilities.⁹¹ However, utilities opposed the bill, arguing that “the diversity of the industry . . . could provide more informed expertise, more informed opinions, and an

85. Pub. Utils. Comm’n of R.I. v. Attleboro Steam & Elec. Co., 273 U.S. 83, 84 (1927).

86. See 16 U.S.C. § 824 (2018); Matthew R. Christiansen & Joshua C. Macey, *Long Live the Federal Power Act’s Bright Line*, 134 HARV. L. REV. 1360, 1372 (2021).

87. Some early formalization came with the creation of the North American Power System Interconnection Committee (NAPSIC) in April 1962, which “promulgat[e]d ‘operating guidelines’ for the reliable operation of interconnected systems” across the United States and Canada. NEVIUS, *supra* note 7, at viii.

88. *Transforming the Nation’s Electricity System: The Second Installment of the Quadrennial Energy Review*, DEPT OF ENERGY A-11 (Jan. 2017), <https://www.energy.gov/sites/prod/files/2017/02/f34/Appendix-Electricity%20System%20Overview.pdf> [https://perma.cc/UQ8Z-HWPQ].

89. Utility regulators review capital expenses and authorize cost recovery and an administratively determined rate of return. Utilities have an incentive to make reliability-enhancing investments since they earn a return on those investments. See Paul L. Joskow & Richard Schmalensee, *Incentive Regulation for Electric Utilities*, 4 YALE J. ON REGUL. 1, 4-6 (1986) (describing a cost-of-service ratemaking process that still applies in states that have not restructured their retail electricity structures).

90. NEVIUS, *supra* note 7, at 3.

91. The Federal Power Commission (FPC) is the predecessor organization to FERC. For a discussion of the proposed Electric Power Reliability Act of 1967, see 113 CONG. REC. 15323 (1967) (statement of Sen. Magnuson).

environment in which electric utilities could be their own critics than could be provided by the proposed Act.”⁹²

Based on this logic—and to forestall federal regulation—the electricity industry instead proposed its own reliability council. Following negotiations, the FPC ultimately agreed, and in June 1968, twelve regional and area utility organizations signed an agreement creating NERC.⁹³ NERC’s early mission included encouraging interregional collaboration on reliability, facilitating information exchange, reviewing regional and interregional reliability activities, and providing information to the FPC.⁹⁴ NERC also created a “Technical Advisory Committee” to develop voluntary reliability criteria for the industry.⁹⁵

Over the next decade, NERC conducted numerous reviews and reports on various pressing matters of reliability. Its board chairs appeared periodically before Congress.⁹⁶ Things hummed along at this pace until the late 1970s, when Congress passed the Public Utility Regulatory Policies Act (PURPA).⁹⁷ Among other things, PURPA sought to inject more competition into the industry by requiring utilities to purchase the output of certain small renewable or efficient energy generators.⁹⁸

NERC then undertook a study scrutinizing its own role and functions in light of the changing system, but ultimately recommended no structural changes.⁹⁹ Nevertheless, the shifts “revealed tension between reliability and the introduction of new players and new uses of the [bulk-power system],” with utilities worrying that “new non-utility players would not play by the reliability rules.”¹⁰⁰ To translate this into SRO theory-speak, the industry worried that its internal alignment and incentives to self-police might be weakening. Alternatively or additionally, this demonstrated the same (self-preserving) worry currently being expressed by a NERC dominated by large utility interests: that the addition of new, competitive market entrants represented a threat to reliability as defined by NERC—and therefore should be slowed down, not encouraged.¹⁰¹

These tensions came to a head in the 1990s. It is impossible to understand the drama that roiled NERC and electric reliability after this

92. Michael R. Gent, *You Only Miss It When It’s Not There*, 8 IEEE POWER ENG’G REV. 22, 22 (1988).

93. NEVIUS, *supra* note 7, at 5-6.

94. *Id.* at 9.

95. *Id.* at 10-11.

96. *Id.* at 11-18.

97. Public Utilities Regulatory Policies Act of 1978, Pub. L. No. 95-617, § 210, 92 Stat. 3117, 3144 (codified at 16 U.S.C. § 824a-3 (2018)).

98. *Id.*

99. NEVIUS, *supra* note 7, at 21-22 (noting the board’s conclusion that “NERC should remain voluntary without power to enact sanctions against a member”).

100. *Id.* at 24.

101. See *supra* text accompanying notes 39-40 (showing NERC’s current concerns about renewable-energy market entrants).

time without a grasp of the broader changes taking place in the industry. In the early 1990s—following on the heels of deregulation in several other industries—Congress and FERC became interested in facilitating more competition in electricity. Through the Energy Policy Act of 1992 and several subsequent orders at FERC, they required utilities to offer “open access” to their transmission lines to all comers at fair rates.¹⁰² This change allowed independent power producers—generators not owned by regulated utilities—to sell into the system. By the end of the 1990s, FERC moved to open the system even further, encouraging utilities to join “Regional Transmission Organizations” (RTOs) to jointly manage transmission lines at a regional level and to administer markets for electricity.¹⁰³ Ultimately, utilities in two-thirds of the United States (as measured by population) joined an RTO.¹⁰⁴

While many celebrated these shifts for their potential to improve competition and efficiency, the moves to open access and more competitive electricity generation posed new risks for grid reliability. Whereas monopoly utilities tended to operate their systems within their own silos, with controlled exchanges of electricity among themselves, the new system was much more dynamic.¹⁰⁵ A federal task force convened in 1997 to examine these issues concluded that the new, unbundled system meant that “the old institutions for reliability are no longer sufficient.”¹⁰⁶ As it noted, NERC’s traditional “peer-reviewed standards coupled with voluntary cooperation” worked well when “costs associated with maintaining reliability could be recovered through rates.”¹⁰⁷ However, restructuring removed the possibility of rate recovery for reliability-related expenses in some parts of the country, rendering the voluntary system “clearly unsustainable.”¹⁰⁸ The increasing interconnectedness of the grid also meant that “isolated, local [disturbances] . . . [could] almost instantaneously propagate through the system as a whole,” creating greater

102. Energy Policy Act of 1992, Pub. L. No. 102-486, §§ 721-726, 106 Stat. 2776, 2915-21 (allowing FERC to order utility-owned and -operated transmission to “wheel” (transport) competitors’ electricity); FERC Order No. 888 (1996) (requiring all transmission lines over which FERC had jurisdiction to be open access); FERC Order No. 890 (2007) (strengthening the open access of Order No. 888 and prohibiting price and service discrimination on transmission lines).

103. FERC Order No. 2000 (1999).

104. *Electric Power Markets*, FERC (May 16, 2023), <https://www.ferc.gov/electric-power-markets> [<https://perma.cc/NA4J-7A6H>]; *ISO/RTO Council*, ISO/RTO COUNCIL, <https://isorto.org> [<https://perma.cc/7HSR-2R7C>] (“Nine ISOs/RTOs serve two-thirds of electricity consumers in the United States and more than 50 percent of Canada’s population.”).

105. SEC’Y OF ENERGY ADVISORY BD., U.S. DEP’T OF ENERGY, MAINTAINING RELIABILITY IN A COMPETITIVE U.S. ELECTRICITY INDUSTRY: FINAL REPORT OF THE TASK FORCE ON ELECTRIC SYSTEM RELIABILITY ix, 19 (1998), https://certs.lbl.gov/sites/all/files/basic-page/maintaining-reliability-in-competitive-electricity-industry-1998_0.pdf [<https://perma.cc/MM5N-GX9R>] [hereinafter ADVISORY BOARD TASK FORCE].

106. *Id.* at vii.

107. *Id.* at xi.

108. *Id.* at xi, 1.

risks of system-wide outages.¹⁰⁹ A 1996 blackout across the Western system reinforced these risks, as a local transmission outage in Idaho ballooned into a power loss that affected two million people in fourteen states, as well as Canada and Mexico.¹¹⁰

This federal task force also voiced concerns about NERC's governance. In particular, it worried about the potential for intra-industry rent seeking via private reliability regulation, observing that pre-existing reliability arrangements might not manage reliability in the shifting industry "in a competitively neutral fashion, without favoring one or another set of market participants."¹¹¹ For these reasons, the task force indicated that it was "especially interested in seeing the reliability institutions becoming truly independent of commercial interests" to avoid any actual or apparent bias.¹¹² It thus recommended assigning primary reliability responsibility to FERC, which until this time had exercised no control over reliability.¹¹³ FERC was simultaneously exploring such changes, including through a 1998 inquiry and technical conference on reliability.¹¹⁴

This task-force analysis suggests that, even in the 1990s, the conditions justifying reliability self-regulation were disintegrating. NERC, however, wanted to preserve its authority and autonomy in this new system and therefore pushed back. As early as 1991, NERC's president wrote several letters to congressional representatives and staffers expressing concern about proposals to assign responsibility for reliability to FERC.¹¹⁵ Instead, NERC's president proposed a "NERC Amendment" that would keep reliability oversight with NERC and the NERC-recognized regional councils.¹¹⁶ This "NERC Amendment" was ultimately not included in the Energy Policy Act of 1992, leaving questions over reliability under competition unresolved. NERC persevered in its advocacy for self-regulation, forming its own task force to examine the "future of NERC."¹¹⁷

By the time the federal task force described above convened in 1997, NERC appeared to have largely cemented its future role in the system:

109. *Id.* at xiii.

110. *Reliability Primer: An Overview of the Federal Energy Regulatory Commission's Role in Overseeing the Reliable Operation of the Nation's Bulk Power System*, FERC 31, https://www.ferc.gov/sites/default/files/2020-04/reliability-primer_1.pdf [<https://perma.cc/MUL4-8A7X>] [hereinafter *FERC Primer*]; ADVISORY BOARD TASK FORCE, *supra* note 105, at 13; NEVIUS, *supra* note 7, at 35.

111. ADVISORY BOARD TASK FORCE, *supra* note 105, at x. The task force proceeded to detail a 1997 complaint filed by power marketers against NERC, which claimed that certain "tagging" requirements imposed by NERC allowed utilities to discriminate against competitive power. *Id.* at 26.

112. *Id.* at xv.

113. *Id.* at xv, 10.

114. *Id.* at 38.

115. NEVIUS, *supra* note 7, at 29.

116. *Id.* at 30.

117. *Id.* at 31.

although it voiced the concerns documented above, the task force ultimately recommended that FERC act as the oversight agent for a “self-regulating reliability organization . . . such as a reformed NERC.”¹¹⁸ It further noted that NERC needed enhanced enforcement authority to effectively take on this role.¹¹⁹ NERC shared this view, recognizing that it could no longer persist as a “confederation of reliability groups that worked toward common reliability goals in a collegial, mutual interest, self-help atmosphere”; what the shifting system demanded was “more detailed, uniform standards and more uniform compliance.”¹²⁰ Yet NERC was emphatic that an SRO remained superior to a government body in terms of flexibility, technical competence, and innovation.¹²¹

In 1999, NERC led a group of industry stakeholders that agreed on draft legislative language that would establish mandatory reliability standards and an officially designated ERO (that they presumed would, in due course, be NERC). At the same time, NERC independently undertook governance changes to transform its stakeholder board into an independent one, in anticipation of legislative changes.¹²² Thus, while concerns about the regulation of grid reliability initially reflected apprehension about the continued viability of a self-regulatory model, by the turn of the century, industry had successfully convinced important policymakers and stakeholders to entrench the self-regulatory model—advocating for increasing NERC’s enforcement power but largely preserving the privatized model of grid-reliability regulation. It remained only to codify this model into law, a move that would be aided by policymakers’ increased interest in grid reliability following the largest blackout in the history of the North American power grid.¹²³

2. The 2003 Blackout and the ‘Governmentalization’ of Reliability Regulation

Because of the complex interconnections of the electric grid, a single misstep on one small piece of equipment can cause cascading outages that flow for hundreds or even thousands of miles. The consequences of such a misstep were on dramatic display in August 2003, when cascading failures caused power outages for 52 million people in the U.S. Northeast and parts of Canada. Nearly 100 people died in New York City alone.¹²⁴ The causes of death were numerous and wide ranging, as they typically are in a major

118. ADVISORY BOARD TASK FORCE, *supra* note 105, at 25.

119. *Id.*; NEVIUS, *supra* note 7, at 34 (describing NERC’s position that “peer pressure” would no longer be sufficient).

120. NEVIUS, *supra* note 7, at 36 (quoting a speech by NERC Board vice chair Erle Nye).

121. *Id.* at 44 (describing the conclusions of a NERC Blue Ribbon Panel report).

122. *Id.* at 47.

123. FERC PRIMER, *supra* note 110, at 31-32.

124. G. Brooke Anderson & Michelle L. Bell, *Lights Out: Impact of the August 2003 Power Outage on Mortality in New York, NY*, 23 EPIDEMIOLOGY 189, 191 (2012).

blackout. People were trapped in subways and elevators; experienced heart failure as they walked up numerous flights of stairs; lacked access to safe drinking water and life-sustaining medicine as pharmacies and food stores closed; had difficulty reaching emergency services due to failed cellular service; suffered direct health impacts from the lack of air conditioning and heat-exacerbated air pollution; experienced loss of power to home medical equipment such as ventilators; and faced hospital power outages and overcrowding as many sought access to medical equipment.¹²⁵

The 2003 blackout also had extensive economic impacts. Numerous motor-vehicle manufacturing and assembly plants, steel mills, and chemical and food plants ground to a halt, which disrupted supply chains for critical goods, caused losses of worker income, and led to food spoilage and other losses of valuable products. Consulting groups and the Department of Energy estimated the impacts of the two-day blackout at \$4.5 billion to \$10 billion.¹²⁶

The events leading to this catastrophe started in two portions of the grid in Ohio that were at the time called “control areas,” whose operators were responsible for continuously managing the flow of power through the grid.¹²⁷ Operators of these adjacent control areas, FirstEnergy and American Electric Power (AEP), both exacerbated the problem. FirstEnergy failed to properly trim trees around their transmission lines, and both FirstEnergy and AEP failed to manage the flow of power through their transmission lines and properly balance generation and load.¹²⁸ After a tree—too close to a transmission line due to inadequate tree trimming—brushed against a wire, that wire “shut down,” forcing electricity to flow through other, overcrowded wires.¹²⁹ The effect of too much electricity flowing through a transmission line is similar to a traffic jam on a highway. Everything grinds to a halt. That wire, too, shuts down, causing even more

125. *Id.* at 191-92.

126. *The Economic Impacts of the August 2003 Blackout*, ELEC. CONSUMERS RES. COUNCIL 1-2 (Feb. 9, 2004), <https://elcon.org/wp-content/uploads/Economic20Impacts20of20August20200320Blackout1.pdf> [https://perma.cc/C7SX-X97Z].

127. U.S.-CANADA POWER SYSTEM OUTAGE TASK FORCE, FINAL REPORT ON THE AUGUST 14, 2003 BLACKOUT IN THE UNITED STATES AND CANADA: CAUSES AND RECOMMENDATIONS 11-12 (Apr. 2004), <https://www.energy.gov/sites/default/files/oeprod/DocumentsandMedia/BlackoutFinal-Web.pdf> [https://perma.cc/Z5AB-AMGN]. NERC has since abandoned the term “control area operators” and there are a variety of entities that now perform what was once the “control area operator” function of balancing power in real time, including utilities, independent system operators, and regional transmission organizations. *See* Functional Model Advisory Grp., *Reliability Functional Model: Function Definitions and Functional Entities Version 5.1*, NERC 5 (Aug. 2018), https://www.nerc.com/pa/Stand/Functional%20Model%20Advisory%20Group%20DL/Functional_Model_V5.1_clean_10082019.pdf [https://perma.cc/ZLB3-PPX4].

128. U.S.-CANADA POWER SYSTEM OUTAGE TASK FORCE, *supra* note 127, at 12, 17-21.

129. JR Minkel, *The 2003 Northeast Blackout—Five Years Later*, SCI. AM. (Aug. 13, 2008), <https://www.scientificamerican.com/article/2003-blackout-five-years-later> [https://perma.cc/S43G-WAAA].

electricity to flow through the wires that are still operational, also overtaxing those wires.¹³⁰

A variety of technologies and human interventions can prevent cascading outages. Better technologies can prevent cascading effects by, for example, sensing conditions that could lead to a fault, isolating faults, and preventing automatic “tripping” (disconnection) of generation during conditions that lead to faults.¹³¹ But in Ohio, a combination of faulty equipment (the failure of an alarm to sound), inadequate employee training in detecting and responding to transmission-line problems, and inadequate availability and management of “reactive power”—generators that can be quickly ramped up to maintain needed voltage in wires—in both FirstEnergy’s and AEP’s areas caused an initially small outage to cascade through the Northeast.¹³²

In addition to these technical problems, the 2003 blackout resulted from more fundamental challenges related to governing institutions and fractured decision-making processes that blurred lines of accountability. Government investigations faulted not just the operators of the control areas, but also NERC and its lack of federal oversight. Reviewers cited unclear NERC reliability standards, standards that failed to require adequate training of personnel who operate the grid, and the lack of a “well-defined” process for auditing control areas for their ability to supply reliable electricity.¹³³ The reviewers concluded, however, that many of the problems were not related to NERC’s substantive “rules” (standards) for reliability but rather its structure and status, highlighting that NERC at the time had “no structural independence from the industry it represent[ed]” and had “no authority to develop strong reliability standards and to enforce compliance with those standards.”¹³⁴ Collectively, these findings pointed to a need to rethink the tools and systems in place for managing reliability.¹³⁵

The 2003 blackout reveals how the original justification for self-regulation was already breaking down in the early 2000s. As the Final Report on the 2003 blackout observed, the grid had become a single, integrated system in which a variety of actors played a crucial role in maintaining the reliability of the bulk-power system.¹³⁶ Responsible parties included RTOs that operate transmission lines, vertically integrated utilities that own (but do not operate) transmission lines and own some

130. U.S.-CANADA POWER SYSTEM OUTAGE TASK FORCE, *supra* note 127, at 7-8.

131. See COMMITTEE ON ENHANCING THE RESILIENCE OF THE NATION’S ELECTRIC POWER TRANSMISSION AND DISTRIBUTION SYSTEM, ENHANCING THE RESILIENCE OF THE NATION’S ELECTRICITY SYSTEM: A CONSENSUS STUDY REPORT OF THE NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE 26, 74, 77 (2017).

132. U.S.-CANADA POWER SYSTEM OUTAGE TASK FORCE, *supra* note 127, at 17-23.

133. *Id.* at 19-21.

134. *Id.* at 21.

135. FERC *Primer*, *supra* note 110, at 31-32.

136. U.S.-CANADA POWER SYSTEM OUTAGE TASK FORCE, *supra* note 127, at 11.

generation assets, independent power producers that sell energy in competitive markets, and a variety of other reliability regulators, including NERC and Regional Entities, that all have some role in regulating grid reliability.¹³⁷

The task force that investigated the causes of the 2003 blackout found that this diffusion of responsibility contributed to its scale and magnitude. Notable violations included utilities' failure to "notify other reliability coordinators of potential system problems," RTOs' failure to develop "procedures or guidelines between their respective organizations regarding the coordination of actions to address an operating security limit violation observed by one of them in the other's area due to a contingency near their common boundary," and utilities' inability to "adequately communicate [their] emergency operating conditions to neighboring systems."¹³⁸ All of these conclusions highlight the extent to which one principle of effective self-regulation—a relatively homogenous industry with incentives to fairly police—had eroded in reliability regulation by this time.

The 2003 blackout provided an opening for major reliability reform, and this post-mortem might have counseled in favor of more public, comprehensive governance. But NERC savvily argued instead for enhanced meta-regulation,¹³⁹ pushing to become embedded within FERC and to be given enforcement authority. The organization evidently had sway with relevant policymakers: the task force on the 2003 blackout ultimately recommended that Congress establish a legislatively recognized ERO to develop and enforce mandatory reliability standards.¹⁴⁰ Although the task-force report did not entirely presuppose that this ERO would be NERC, it noted that "[i]f the proposed U.S. reliability legislation passes, the North American Electric Reliability Council (NERC) may undertake various organizational changes and seek recognition as the electric reliability organization (ERO)"—and then proceeded to reference NERC as the ERO for the remainder of its report.¹⁴¹

Congress obliged, adopting these changes in the Energy Policy Act of 2005 (EPAct 2005).¹⁴² The Act added Section 215 to the FPA, giving FERC authority to certify an entity to act as an ERO to develop and enforce mandatory reliability standards for the bulk-power system, subject to FERC oversight.¹⁴³ EPAct 2005 further specified certain characteristics for this ERO, including an independent governing board, fair stakeholder

137. *Id.*

138. *Id.* at 20-21.

139. NEVIUS, *supra* note 7, at 72.

140. U.S.-CANADA POWER SYSTEM OUTAGE TASK FORCE, *supra* note 127, at 140.

141. *Id.* at 142.

142. Energy Policy Act of 2005, Pub. L. No. 109-58, 119 Stat 594 (2005).

143. *FERC Primer*, *supra* note 110, at 37; Federal Power Act § 215, 16 U.S.C. § 824o (2018).

representation, and public participation in its governance.¹⁴⁴ FERC implemented these requirements in two orders focused on the rules for ERO certification and reliability standards.¹⁴⁵

There was never really any doubt that NERC would become the nation's designated ERO. Although a few parties raised concerns about whether the "kind, gentle, and voluntary consensus-building" NERC of the twentieth century could "transform itself into a steel-fisted czar that would enforce mandatory standards," NERC's president and CEO retorted, "If you want us to be a dictator, we can be a dictator."¹⁴⁶

The path to a NERC 'dictatorship' was short. After revising its bylaws to accord with EPAct's ERO requirements, NERC filed its application with FERC to be named the ERO in April 2006.¹⁴⁷ Just a few months later, in July 2006, FERC certified NERC as the nation's ERO.¹⁴⁸ It also approved most of NERC's previously voluntary reliability standards as mandatory and enforceable reliability standards under the new statutory framework.¹⁴⁹ With these changes, NERC moved along the self-regulatory spectrum toward greater meta-regulation but retained its centrality in establishing the rules of grid reliability.

II. NERC's Modern Position, Structure, and Functions

With NERC's entrenchment and evolution as a self-regulatory organization established, this Part turns to exploring the modern landscape of grid-reliability governance and NERC's central role within it. This sets the stage for our argument in Parts III and IV that grid-reliability governance no longer suits the criteria for industry self-regulation. Section A maps the complex ways in which NERC carries out its responsibilities alongside, under, and above other grid-reliability actors. Section B turns inward, considering how NERC conducts its internal governance.

A. Situating NERC: The Legal Tapestry of Grid Reliability

At a basic level, grid reliability depends upon having the available necessary physical infrastructure to match electricity supply (generation

144. 16 U.S.C. § 824o(c) (2018).

145. Order No. 672, 114 FERC ¶ 61,104 (2006); Order No. 672-A, 114 FERC ¶ 61,328 (2006).

146. Richard Stavros, *NERC Knows Best?*, PUB. UTILS. FORT., Jan. 2006, at 4 [<https://perma.cc/BR7Y-K5E4>] (quoting Richard P. Sergel, then-president and CEO of NERC).

147. NEVIUS, *supra* note 7, at 88.

148. *Id.*; Order Certifying North American Electric Reliability Corporation as the Electric Reliability Organization and Ordering Compliance Filing, 116 FERC ¶ 61,062 (2006).

149. Order Certifying North American Electric Reliability Corporation as the Electric Reliability Organization and Ordering Compliance Filing, 116 FERC ¶ 61,062 (2006).

resources) with electricity use (load) at all times, under all conditions.¹⁵⁰ The practice of instantaneous matching of supply and demand is often referred to as “load-resource balancing” and is a central focus of NERC. Successful balancing of an industry as complex and capital-intensive as electricity, however, also requires systematic longer-term planning and sustained oversight to ensure that the infrastructure necessary for a reliable grid—including generation, transmission, and distribution—is constructed and maintained over time.¹⁵¹

A variety of private and public actors at different levels of government are responsible for these various elements of grid reliability. Under the legal framework of Section 215 of the FPA, NERC has regulatory authority to “enforc[e] compliance with mandatory Reliability Standards”¹⁵² for “all owners, users and operators who have a material impact” on “the bulk power system.”¹⁵³ NERC also views itself as a “catalyst for positive change—including shedding light on system weaknesses, helping industry participants operate, and plan to the highest possible level, and communicating lessons learned throughout the industry.”¹⁵⁴ Thus, the modern NERC is, on the one hand, a traditional regulatory entity (albeit a private one that operates under federal-government oversight) and, on the other hand, a self-regulatory entity that tries to keep its members in line through softer governance.

NERC delegates many of its grid-reliability governance functions to regional institutions called “regional entities.” These entities, like NERC, are private corporations, and they, in turn, delegate their duties to sub-regional institutions, individual electric utilities, and groups of utilities.¹⁵⁵

Other regulatory actors also have significant roles in grid reliability. FERC is at least nominally given ultimate authority, as Section 215 of the

150. See P. Denholm & J. Cochran, *Balancing Area Coordination: Effectively Integrating Renewable Energy into the Grid*, NAT'L RENEWABLE ENERGY LAB'Y 1 (2015), <https://www.nrel.gov/docs/fy15osti/63037.pdf> [https://perma.cc/2TY9-2GKT].

151. See *FERC Primer*, *supra* note 110, at 22-29 (describing physical infrastructure, short- and long-term planning, grid operation, and other factors as central to grid reliability).

152. *Frequently Asked Questions*, NERC 2 (Mar. 2023), <https://www.nerc.com/news/Documents/March%202023%20NERC%20Frequently%20Asked%20Questions%20FAQ.pdf> [https://perma.cc/4Y27-8745].

153. *Statement of Compliance Registry Criteria: Revision 5.2*, NERC 1 (Oct. 15, 2015), https://www.nerc.com/pa/Stand/Resources/Documents/Appendix_5b_of_the_Rules_of_Procedure_Statement_of_Compliance_Registry_Criteria.pdf [https://perma.cc/W4SJ-9D7K]. FERC regulations require that “all users, owners and operators of the Bulk-Power System . . . shall be subject to the jurisdiction” of FERC and must comply with any “applicable Reliability Standards” and “Regional Entity Rules.” 18 C.F.R. § 39.2 (2022).

154. *Frequently Asked Questions*, *supra* note 152, at 2.

155. See 16 U.S.C. § 824o(e)(4) (2018); NERC, STANDARD IRO-001-4, RELIABILITY COORDINATION – RESPONSIBILITIES, in NERC, RELIABILITY STANDARDS FOR THE BULK ELECTRIC SYSTEMS OF NORTH AMERICA 811 (Aug. 10, 2023), <https://www.nerc.com/pa/Stand/Reliability%20Standards%20Complete%20Set/RSCompleteSet.pdf> [https://perma.cc/VJ7C-YAVC] [hereinafter NERC RELIABILITY STANDARDS] (describing Reliability Coordinators, which perform work for regional entities, and Reliability Coordinators’ delegation of responsibilities to others).

FPA provides: “The Commission shall have jurisdiction, within the United States, over the ERO certified by the Commission . . . , any regional entities, and all users, owners and operators of the bulk-power system . . . for purposes of approving reliability standards established under this section and enforcing compliance with this section.”¹⁵⁶

Section 215 goes on to instruct FERC to approve NERC-proposed reliability standards as “just, reasonable, not unduly discriminatory or preferential, and in the public interest” before they can take effect.¹⁵⁷ Note, however, the complex deference regime that the FPA establishes between FERC and NERC, as the certified ERO: when evaluating proposed standards for approval, FERC is instructed to “give due weight to the technical expertise” of NERC.¹⁵⁸ NERC, in turn, is instructed to “rebuttably presume” that standards proposed by regional entities under its supervision are “just” and “reasonable.”¹⁵⁹ And courts, when evaluating all these decisions, also defer to FERC.¹⁶⁰ Legally, this creates a type of *triple* deference regime, the effects of which we explore later.¹⁶¹

The picture gets more complicated from here. NERC supervision is far from FERC’s only role in grid reliability. FERC also oversees transmission-system planning and the design and operation of regional electricity markets.¹⁶² But FERC’s ability to fully control the system is legally limited, again by the contours of the FPA. The Act assigns *states* central control “over facilities used for the generation of electric energy or over facilities used in local distribution.”¹⁶³ Thus, as Amy Stein notes, “federal reliability standards have traditionally ended at the edge of the bulk energy grid, leaving states to regulate reliability as they see fit within their exclusive distribution sphere.”¹⁶⁴ States also maintain control over siting—though not planning or distributing the costs of—new transmission infrastructure.¹⁶⁵ That means that very little physical grid infrastructure can be constructed without state approval.¹⁶⁶ States also regulate the natural-gas wells that provide the fuel for the bulk of U.S. power plants.¹⁶⁷ And finally, RTOs control the flow of electricity through the portions of the

156. 16 U.S.C. § 824o(b)(1) (2018).

157. *Id.* § 824o(d)(2).

158. *Id.*

159. *Id.* § 824o(d)(3).

160. See Hammond, *supra* note 5, at 1710-11.

161. See *infra* Section IV.B.2.a.

162. See 16 U.S.C. § 824(a) (2018).

163. *Id.* § 824(b).

164. Stein, *Regulating Reliability*, *supra* note 11, at 1193-94.

165. See Alexandra B. Klass & Elizabeth J. Wilson, *Interstate Transmission Challenges for Renewable Energy: A Federalism Mismatch*, 65 VAND. L. REV. 1801, 1813-14 (2012).

166. Federal power-marketing administrations may site transmission lines, and FERC may do so in corridors designated as critical by the Department of Energy. See Klass, Macey, Welton & Wiseman, *supra* note 5, at 1040-42.

167. See generally Michael Burger, Response, *Fracking and Federalism Choice*, 161 U. PA. L. REV. ONLINE 150 (2013) (describing state dominance of oil and gas production regulation).

North American grid that serve two-thirds of U.S. customers.¹⁶⁸ This operational control of the system makes RTOs central actors in ensuring real-time reliability and making key decisions about how to keep the system online under emergency conditions.

Because of this split in jurisdiction, NERC's work as a standard-setter for the industry has radiating effects. Today, NERC reliability standards affect load (demand) and resource (generation) balancing and the three stages of grid infrastructure essential to reliability: planning, development, and operation, irrespective of who is responsible for carrying out a particular stage. Below we explore how NERC standards interrelate with other grid actors' responsibilities to affect grid infrastructure development and operation across the United States.

1. The Core Reliability Function: Balancing Electricity Supplied with Electricity Used

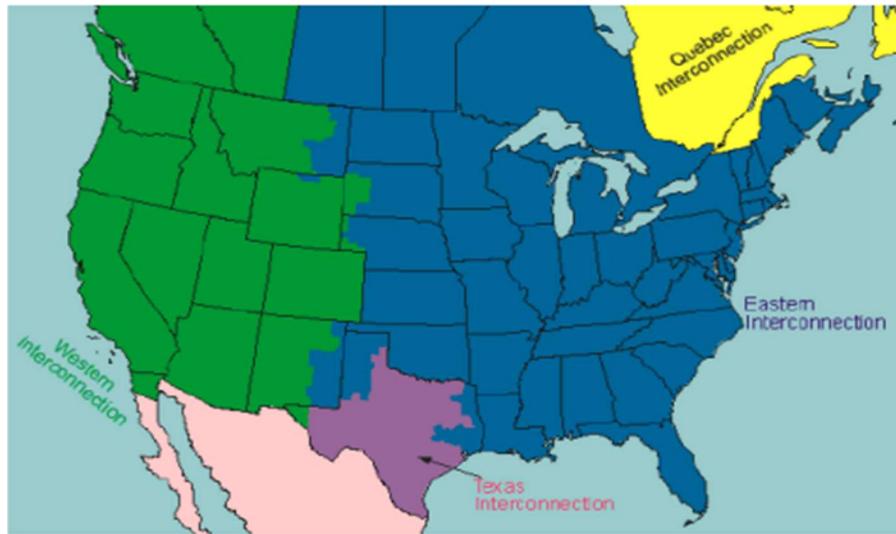
The most important function of grid reliability—and one that requires extensive planning—is “load-resource” balance. This involves exactly matching the demand for and use of electricity (“load”), with the amount of electricity “injected” into the grid, or dispatched, from generators (“resources”).¹⁶⁹ This matching must occur within a specific geographic area of the grid. “Interconnections” are the geographic portions of the North American grid that contain large numbers of connected wires. There are also limited “ties” (wires) that connect neighboring interconnections (see Figure 2).

168. See *infra* text accompanying notes 173-176 (discussing RTOs' role in balancing supply and demand).

169. Denholm & Cochran, *supra* note 150, at 1.

Grid Reliability in the Electric Era

Figure 2. The Four North American Grid Interconnections¹⁷⁰



The entity responsible for balancing generation and load within a given portion of each interconnection is called a “Balancing Authority.” As NERC explains, “Every generator, transmission facility and end-use customer is in a Balancing Authority Area.”¹⁷¹ Instantaneously and constantly matching generation with load is necessary to maintain a specific “frequency” within the wires controlled by the Balancing Authority, measured in cycles per second or hertz (Hz). If the frequency deviates too far from the target value of 60 Hz, grid stability is thrown into jeopardy.¹⁷²

In most parts of the country, RTOs or “independent system operators” (ISOs) fill the roles of Balancing Authorities.¹⁷³ Like NERC, they are nonprofit 501(c)(6) organizations, run by boards of directors, that control the operation of a web of connected transmission lines and determine when and how much electricity may flow through these lines. Interestingly, this structure makes RTOs themselves a species of self-

170. *Balancing and Frequency Control: A Technical Document Prepared by the NERC Resources Committee*, NERC 5 (Jan. 26, 2011), https://www.nerc.com/comm/OC/BAL0031_Supporting_Documents_2017_DL/NERC%20Balancing%20and%20Frequency%20Control%20040520111.pdf [https://perma.cc/8SKP-TKJ5].

171. *NERC [Function] Certification Review Summary Report*, NERC 8 [https://perma.cc/HB3Q-BNZA].

172. *Id.*

173. We call these RTOs, as they are essentially identical types of organizations. In the Southeast and West, no RTO/ISO exists; utilities or other entities fill these roles. Cf. Denholm & Cochran, *supra* note 150, at 3 (noting bilateral exchanges used as an alternative to energy-imbalance markets that balance load and resources); Sara Hoff, *U.S. Electric System is Made Up of Interconnections and Balancing Authorities*, U.S. ENERGY INFO. ADMIN. (July 20, 2016), <https://www.eia.gov/todayinenergy/detail.php?id=27152> [https://perma.cc/2Y74-AJH4].

regulatory organization, wherein electricity-industry members (many of whom *also* make up the membership of NERC) establish rules and protocols for transmission and market operations under FERC oversight.¹⁷⁴ Utilities that own transmission lines voluntarily choose—or are sometimes required by state electricity regulators—to transfer control over the operation of their lines to an RTO or ISO.¹⁷⁵ Entities called “Interchange Coordinator Authorities” control the flow of electricity between Balancing Authorities.¹⁷⁶

Overseeing this balancing is a larger authority—the Reliability Coordinator. The Reliability Coordinator is the “highest operating authority” of the grid and is responsible for ensuring the balancing of electricity over a broad area.¹⁷⁷

Numerous NERC standards undergird this constant balancing of generation and load. For example, NERC enforces a reliability standard that measures the difference between Balancing Authorities’ scheduled interchanges of electricity and the interchanges that actually occur (Actual Net Interchange).¹⁷⁸ The difference between what the Balancing Authority expected to happen and what actually happened represents an error, since deviations from the schedule mean a slight imbalance in the grid.¹⁷⁹

2. Planning, Developing, and Operating a Reliable Grid

Beyond centrally regulating the effective balancing of the actual electricity flowing through the grid, NERC standards also influence—but do not fully dictate—grid planning, development, and operations. On the **planning** front, NERC standards influence how various grid actors plan for: 1) adequate “reserve” generation capacity to supply load during periods of peak demand or unexpected unavailability of some generation, and 2) adequate transmission lines to carry electricity from power plants to load centers. For example, NERC reliability standards for “Modeling, Data,

174. See Federal Power Act §§ 205-206, 16 U.S.C. §§ 824d-824e (2018); Shelley Welton, *Rethinking Grid Governance for the Climate Change Era*, 109 CALIF. L. REV. 209, 221-22 (2021); Joshua C. Macey, *Outsourcing Energy Market Design*, 91 U. CHI. L. REV. (forthcoming 2024) (manuscript at 43-52) (on file with authors). Utilities themselves have unusual governance incentives. See Aneil Kovvali and Joshua C. Macey, *The Corporate Governance of Public Utilities*, 40 YALE J. ON REGUL. 569, 573-74 (2023).

175. Joel B. Eisen, *Regulatory Linearity, Commerce Brinksmanship, and Retrenchment in Electric Utility Deregulation*, 40 WAKE FOREST L. REV. 545, 552-53 (2005); see, e.g., VA. CODE ANN. §§ 56-577, -579 (2023) (requiring some utilities to join an RTO).

176. Functional Model Advisory Grp., *supra* note 127, at 42.

177. *Id.* at 30.

178. NERC, STANDARD BAL-001-02, REAL POWER BALANCING CONTROL PERFORMANCE, in NERC RELIABILITY STANDARDS, *supra* note 155, at 2; see *Calculating and Using Reporting ACE in a Tie Line Bias Control Program*, NERC, https://www.nerc.com/pa/Stand/Project%2020101421%20Phase%202%20DL/White_Paper_on_the_Calculation_of_Reportin ACE-D3-20150518.pdf [https://perma.cc/CSS2-XY88].

179. *Calculating and Using Reporting ACE in a Tie Line Bias Control Program*, *supra* note 178.

and Analysis” require grid operators to calculate and report information such as available transmission-system capability and transmission-reliability margins, which relate to the ability of transmission lines to accommodate unusual flows of electrons through the wires, variations in generation dispatch, and uncertain customer loads.¹⁸⁰ FERC, in turn, requires all transmission operators to plan for new transmission lines that connect more generation within a region (such as a Balancing Authority region) and make interregional connections to enhance reliability and address state policy requirements such as increased renewable-energy generation.¹⁸¹ And many states require their utilities to engage in “integrated resource planning” that looks ahead to projected future demand and evaluates options to meet it cost-effectively and reliably.¹⁸²

But planning alone does not guarantee the construction of generation capacity, reserves, or transmission lines. NERC’s influence on resource **development** occurs behind the scenes, as states and RTOs (guided by FERC) have most of the control. States determine whether and where power plants and transmission and distribution lines may be built,¹⁸³ even in the case of interstate transmission lines.¹⁸⁴ NERC and FERC explicitly lack authority to force states to build anything against their will.¹⁸⁵

Yet NERC standards still wield quiet force within decision-making around “resource adequacy,” the state- and RTO-driven process of ensuring that planned additions of generating capacity match future demand needs.¹⁸⁶ NERC standards dictate calculation and reporting methods that directly influence states’ and RTOs’ numerical floors for generation capacity.¹⁸⁷ For example, a primary input into RTOs’

180. NERC, STANDARD MOD-008-1, TRM CALCULATION METHODOLOGY, in NERC RELIABILITY STANDARDS, *supra* note 155, at 939. TRM stands for Transmission Reliability Margin.

181. Order No. 1000, 136 FERC ¶ 61,051 (2011).

182. See, e.g., *Integrated Resources Planning*, CONN. DEP’T OF ENERGY & ENV’T PROT. (Oct. 2021), <https://portal.ct.gov/DEEP/Energy/Integrated-Resource-Planning/Integrated-Resource-Planning> [<https://perma.cc/7M8J-U3F7>] (describing the process of developing an integrated resource plan (IRP)); Alan Cooke, *Integrated Resource Planning in the U.S. Overview*, PAC. NW. NAT’L LAB’Y 6 (Mar. 1, 2021), https://eta-publications.lbl.gov/sites/default/files/sc_commission_day_1_irps_in_us_review_of_requirements_final.pdf [<https://perma.cc/JU8X-XYQC>] (noting that more than thirty-five states require IRPs or equivalents).

183. The exception is nuclear energy, over which the Nuclear Regulatory Commission wields licensing and siting authority. States may still reject nuclear-plant construction on economic grounds, however. See Entergy Nuclear Vt. Yankee, LLC v. Shumlin, 737 F.3d 228, 235 (2d. Cir. 2013).

184. Klass & Wilson, *supra* note 165, at 1815.

185. See 16 U.S.C. § 824o(i)(2) (2018) (“This section does not authorize the ERO or the Commission to order the construction of additional generation or transmission capacity or to set and enforce compliance with standards for adequacy or safety of electric facilities or services.”).

186. See Andrew Reimers, Wesley Cole & Bethany Frew, *The Impact of Planning Reserve Margins in Long-Term Planning Models of the Electricity Sector*, 125 ENERGY POL’Y 1, 1 (2019).

187. See *id.* (noting that “historical reserve margins have often exceeded the NERC-recommended levels”).

determination of how much capacity utilities must purchase in an RTO-designed and FERC-approved capacity market is a measurement of which generating units experienced forced outages—and how often.¹⁸⁸ NERC sets the calculation procedures for identifying these forced outages and runs the database—relied upon by RTOs—that tracks forced outages.¹⁸⁹ RTOs also obtain data on load (demand) that must be met through generation from NERC's regional entities.¹⁹⁰ At the state level, utilities often cite NERC reliability standards in asking states to approve the construction of new fossil-fuel-fired power plants.¹⁹¹ As these examples illustrate, NERC-established standards have cascading effects beyond NERC's substantive jurisdictional boundaries. We explore the implications of this influence further in Part III.

Finally, once grid infrastructure is built, it must be **operated** properly to protect grid reliability. Power-plant, transmission-line, and distribution-line operators must use quality software that is not vulnerable to cyberattacks, train their personnel to communicate with various grid actors before shutting down equipment for repair, weatherize power plants to withstand growing weather extremes, trim vegetation around transmission and distribution lines, and monitor and respond to rapid changes in generation and load.¹⁹² NERC administers numerous reliability standards that address the safe operation of the grid.¹⁹³ NERC is not alone in this task, however: states, too, centrally influence grid operations because they

188. See Capacity Mkt. & Demand Response Operations, *PJM Manual 18: PJM Capacity Market*, PJM 58 (July 26, 2023), <https://www.pjm.com/-/media/documents/manuals/m18.ashx> [<https://perma.cc/HVU7-2VBW>].

189. NERC maintains the Generating Availability Data System (GADS), which is used in Equivalent Demand Forced Outage Rate (EFOR) calculations and reporting. *Generating Availability Data System (GADS)*, NERC, [https://www.nerc.com/pa/RAPA/gads/Pages/GeneratingAvailabilityDataSystem-\(GADS\).aspx](https://www.nerc.com/pa/RAPA/gads/Pages/GeneratingAvailabilityDataSystem-(GADS).aspx) [<https://perma.cc/7AVZ-LFEF>]; see *Generating Availability Data System: Data Reporting Instructions*, NERC F-6 (Jan. 1, 2023), https://www.nerc.com/pa/RAPA/gads/DataReportingInstructions/GADS_DRI_2023.pdf [<https://perma.cc/Q4MH-WPK5>] (showing calculation requirements).

190. Res. Adequacy Plan., *PJM Manual 20: PJM Resource Adequacy Analysis*, PJM 20 (July 26, 2023), <https://pjm.com/-/media/documents/manuals/m20.ashx> [<https://perma.cc/TM2H-5FBL>].

191. See, e.g., Petition of Southern Indiana Gas and Electric Company d/b/a/ Centerpoint Energy Indiana South (“CEI South”), No. 45564, 2022 WL 2400650, at *11 (Ind. U.R.C. June 28, 2022) (showing a utility representative arguing before a state commission that NERC's Long-term Reliability Assessment “supports CEI South's request to install fast-starting, quick-ramping generation via the [natural-gas combustion turbines] in order to support the growing portfolio of renewable resources and maintain reliable service”).

192. See, e.g., NERC, STANDARD CIP-003-8, SECURITY MANAGEMENT CONTROLS, in NERC RELIABILITY STANDARDS, *supra* note 155, at 167, 190 (showing requirements to protect against cyberattacks, such as antivirus software); NERC, STANDARD COM-002-4, OPERATING PERSONNEL COMMUNICATIONS PROTOCOLS, in NERC RELIABILITY STANDARDS, *supra* note 155, at 607 (requiring standard communication procedures and training in communication for all operating personnel associated with the bulk-power system); NERC, STANDARD FAC-003-4, TRANSMISSION VEGETATION MANAGEMENT, in NERC RELIABILITY STANDARDS, *supra* note 155, at 717.

193. See, e.g., *supra* note 192.

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regulate *distribution* reliability and electric utilities' expenditures.¹⁹⁴ FERC also has a role in transmission-line operation through its regulation of the rates that line operators may charge for the use of the lines, including coverage of expenditures for reliability.¹⁹⁵

Another important facet of grid operation is ensuring fuel supply to power plants that run on fuel, such as natural-gas-fired and hydroelectric power plants. Here again, states and federal entities beyond NERC play a central role, although NERC often highlights risks associated with fuel supply, sometimes in hopes of spurring action beyond its jurisdictional sphere.¹⁹⁶ States, federal-regional commissions, or federal agencies such as the Bureau of Reclamation regulate in-stream flow and water use that affects the availability of hydropower.¹⁹⁷ States regulate natural-gas wells and determine whether these wells must be winterized to withstand extreme cold.¹⁹⁸ The Federal Pipeline and Hazardous Materials Safety Administration (PHMSA) and states regulate the safety and operations of gas pipelines.

Areas such as hydroelectricity and many aspects of gas pipelines and wells are thus beyond the authority of FERC, NERC, and Regional Entities, who have all pressured national private standards-setting organizations to update private standards to ensure the continued operation of natural-gas wells and pipelines even during extreme weather

194. See, e.g., *SB 978: Actively Adapting to the Changing Electricity Sector*, OR. PUB. UTIL. COMM'N 5 (Sept. 2018), <https://www.oregon.gov/puc/utilities/Documents/SB978LegislativeReport-2018.pdf> [<https://perma.cc/3HK7-BGMY>] (describing how utility rates approved by the state, in a state such as Oregon that regulates retail rates, include coverage of a utility's operating costs).

195. For example, in 2019, Duke Energy received approval from FERC to implement the cybersecurity standards of the National Institute of Standards and Technology (NIST), another private standards-setting organization. Duke Energy indicated that these standards were more stringent than NERC's and would better ensure reliability. *See Order Granting Accounting Request*, 169 FERC ¶ 61,232 (2019).

196. See, e.g., *FERC-NERC-Regional Entity Staff Report*, *supra* note 1, at 222-23 (recommending the implementation of advanced monitoring and control technologies at natural-gas wells and recommending state, federal, and local arrangements for coordinating information about gas and electricity).

197. See, e.g., *Hydrology/Flow Management*, DEL. RIVER BASIN COMM'N (July 18, 2023), <https://www.state.nj.us/drbc/programs/flow> [<https://perma.cc/9EHU-YPAY>] (noting that while there are no dams on the Delaware River, the Delaware River Basin Commission controls flow to reservoirs used for drinking water and other purposes); *Regulations*, SUSQUEHANNA RIVER BASIN COMM'N (Apr. 1, 2022), <https://www.srbc.net/regulatory/regulations> [<https://perma.cc/AKB5-6HTY>] ("Water withdrawals of 100,000 gallons per day (gpd) or more over a 30-day average from any source or combination of sources within the Basin are regulated."); *Overview of Lake Mead*, NAT'L PARK SERV. (Dec. 13, 2022), <https://www.nps.gov/lake/learn/nature/overview-of-lake-mead.htm> [<https://perma.cc/3RDV-9ZE2>] ("The U.S. Bureau of Reclamation manages water and power deliveries, which includes control of lake discharge, operation, and maintenance of Hoover Dam and power plant.").

198. See, e.g., Press Release, R.R. Comm'n of Texas, RRC's Commissioners Approve Final Rule to Weatherize Natural Gas Supply for Emergencies (Aug. 30, 2022), <https://www.rrc.texas.gov/news/083022-rrc-weatherization-standards> [<https://perma.cc/LMB4-53J7>] (showing the new Texas natural-gas weatherization requirements).

events.¹⁹⁹ FERC also has some direct authority in this area, regulating siting, construction, rates, and operations of interstate gas pipelines—sometimes expressly for reliability.²⁰⁰ And here, NERC again has leverage. For example, when FERC attempted in 2022 to update its interstate natural-gas pipeline certification and siting standards to address environmental justice and climate issues, FERC Commissioner Danly stated in a dissent to the updated policy statement:

The North American Electric Reliability Corporation (NERC) recently highlighted just how important natural gas is to our electric system when it explained in its most recent Long Term Reliability Assessment that “[n]atural gas is the reliability ‘fuel that keeps the lights on,’ and *natural gas policy must reflect this reality.*” Today’s issuance is unlikely to allay NERC’s reliability concerns.²⁰¹

Industry vociferously and successfully pushed back against the formalization of the updated certification standards; they are now merely advisory.²⁰²

In sum, this Section has situated NERC within the broader landscape of grid reliability—highlighting NERC’s core areas of oversight and influence, but also the ways in which its ability to fully ensure grid reliability is complicated and limited by the diverse array of actors and institutions involved in modern grid governance. As should be apparent from this brief but complex overview, electric reliability governance today bears little resemblance to the idealized SRO described in Part I or NERC’s early justifications as to why the grid fits this ideal. This is a point that we will return to in Part IV, where we consider whether the theory elucidated there still makes sense in this evolving regulatory landscape.

B. Exploring NERC: Governance and Reliability-Standards Development

Whereas Section A explored NERC’s external landscape, this Section explores NERC’s internal structure and workings. When Congress

199. See, e.g., Press Release, FERC, FERC, NERC Encourage NAESB to Convene Gas-Electric Forum to Address Reliability Challenges (July 29, 2022), <https://www.ferc.gov/news-events/news/ferc-nerc-encourage-naesb-convene-gas-electric-forum-address-reliability> [<https://perma.cc/JR7U-2ZWL>].

200. For example, when gas markets and electricity markets operated on different timelines each day, this threatened electric-grid reliability because power-plant operators sometimes had trouble verifying how much gas would be available on a given day. During some parts of the day, electricity markets were open, but gas markets were closed due to conflicting hours of operation. A FERC order required the harmonization of the markets to enhance reliability. *See Order No. 809, 151 FERC ¶ 61,049 (2015).* In crafting this order, FERC again relied on NERC, inferring power-plant-outage rates caused by inadequate fuel from NERC’s coding and tracking of data because RTOs do not collect this information. *See id.* ¶ 65.

201. Certification of New Interstate Natural Gas Facilities, 87 Fed. Reg. 11548, 11570 (Mar. 1, 2022).

202. Miranda Wilson, *FERC Retreats on Gas Policies as Chair Pursues Clarity*, E&E NEWS (Mar. 25, 2022), <https://www.eenews.net/articles/ferc-retreats-on-gas-policies-as-chair-pursues-clarity> [<https://perma.cc/R2DT-DNHB>].

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developed the ERO scheme in 2005,²⁰³ it also authorized the continuation of NERC's pre-existing private federalist scheme. Under this scheme, NERC delegates much of the work of writing reliability standards to Regional Entities, which propose reliability standards to NERC and help to enforce approved standards.²⁰⁴ Congress gave these regional entities relatively strong authority, requiring the ERO and FERC to "rebuttably presume" that reliability standards proposed by Regional Entities, or modifications to these standards, are "just, reasonable . . . and in the public interest."²⁰⁵ NERC Regional Entities cover all portions of the continental United States and Canada (see Figure 3).

Figure 3. Regional Entities²⁰⁶



NERC and Regional Entities have the same primary job: to write and enforce reliability standards. NERC and Regional Entities (sometimes working with FERC) also write regular reports assessing reliability risks and lessons learned from grid interruptions. NERC must also fulfill a variety of other duties prescribed by FERC, such as auditing its Regional

203. See *supra* text accompanying notes 139-148.

204. See 16 U.S.C. § 824o(e)(4) (2018) (authorizing this delegation).

205. *Id.* § 824o(d)(3).

206. *ERO Enterprise Regional Entities*, NERC, <https://www.nerc.com/AboutNERC/keyplayers/Pages/default.aspx> [https://perma.cc/2X85-NJPJ].

Entities.²⁰⁷ NERC additionally plays these roles for the Canadian provinces and portions of Mexico (and in the future, potentially all of Mexico) under terms negotiated with respective regulatory counterparts in those countries.²⁰⁸

NERC and its Regional Entities are 501(c)(6) not-for-profit corporations.²⁰⁹ NERC is governed by a twelve-member Board of Trustees,²¹⁰ which includes former engineers and CEOs of electric and water utilities, a former executive vice president of the Federal Tennessee Valley Authority, former consultants from firms such as Deloitte and Irving, Inc., and a former president of one of NERC's Regional Entities.²¹¹ NERC's Member Representatives Committee—comprised of two representatives from ten designated industry sectors—elects the trustees.²¹²

Proposed reliability standards originate from NERC's Standards Committee, which includes a cross-section of elected industry representatives.²¹³ Most of the current Standards Committee members

207. See *Compliance & Enforcement*, NERC, <https://www.nerc.com/pa/comp/Pages/default.aspx> [https://perma.cc/5DDU-VMTC]; *Regional Audit Reports of Registered Entities*, NERC, <https://www.nerc.com/pa/comp/Pages/NERC%20Regional%20Audit%20Reports.aspx> [https://perma.cc/D3TF-RE6Z].

208. When the United States was in the process of designating NERC as its ERO, a bilateral working group comprised of agency representatives from Canada and the United States prepared principles for an internationally functioning ERO, including, for example, board membership from both countries, fair allocation of ERO costs, and consultation between the ERO and authorities in each country during reliability-standards development. Between 2006 and 2018, NERC and the relevant Regional Entities that extend into Canada signed memoranda of understanding with all Canadian provincial utility regulators. Mexico's energy regulator also incorporated NERC's reliability standards into its "Grid Code," and NERC's western Regional Entity has some standards that apply to Mexico's government-owned utility in Baja California Norte. See *Principles for an Electric Reliability Organization That Can Function on an International Basis*, BILATERAL ELEC. RELIABILITY OVERSIGHT GRP. (Aug. 3, 2005), <https://www.nerc.com/FilingsOrders/ca/Canadian%20mous%20DL/BEROG%20Principles%20f%20ERO%2008032005.pdf> [https://perma.cc/6ZNR-X9X4]; *MOUs*, NERC, [https://www.nerc.com/FilingsOrders/ca/Canadian%20mous%20DL/Canada%20MOUs%20\(2020\).pdf](https://www.nerc.com/FilingsOrders/ca/Canadian%20mous%20DL/Canada%20MOUs%20(2020).pdf) [https://perma.cc/2EVN-3WWN]; *North America*, NERC, <https://www.nerc.com/AboutNERC/keyplayers/Pages/Canada.aspx> [https://perma.cc/JG5Y-8YMP]. NERC's bylaws demonstrate that NERC intends to extend its standards throughout Mexico. See *Amended and Restated Bylaws*, NERC, art. III, § 2 (Apr. 5, 2021), <https://www.nerc.com/gov/Annual%20Reports/Amended%20and%20Restated%20Bylaws%204-5-21.pdf> [https://perma.cc/2M4F-GRL6] (providing for a change in the number of NERC trustees "[w]hen the Corporation receives recognition by appropriate regulatory authorities in Mexico as its Electric Reliability Organization").

209. *Business Leagues*, IRS, <https://www.irs.gov/charities-non-profits/other-non-profits/business-leagues> [https://perma.cc/3EQW-YKJX] (explaining that § 501(c)(6) exempts, *inter alia*, business leagues and boards of trade); see I.R.C. § 501(c)(6) (2018).

210. *Board of Trustees*, NERC, <https://www.nerc.com/gov/bot/Pages/default.aspx> [https://perma.cc/36K9-NGGN].

211. See *id.*

212. *Member Representatives Committee*, NERC, <https://www.nerc.com/gov/bot/MRC/Pages/default.aspx> [https://perma.cc/Y5C8-R2Y6]; see *Amended and Restated Bylaws*, *supra* note 208, art. II, § 4; *id.* art. VIII.

213. More specifically, this committee is comprised of two representatives elected by members from each of the ten segments of NERC's Registered Ballot Body. See *infra* notes 219-

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represent large utilities; others represent state utility regulatory commissions, RTOs, and Regional Entities.²¹⁴ Any member of NERC, including a Regional Entity member, may request the development, modification, or withdrawal of a reliability standard.²¹⁵ NERC's Standards Committee is responsible for drafting reliability standards if it deems a request for a new standard to be worthwhile or if it self-initiates a drafting process.²¹⁶ The committee's meetings must be open "to all interested parties" but may include "preregistration . . . requirements," and notice of the meetings need only be provided to committee members in writing.²¹⁷ Committee actions for approving standards are taken by majority vote of the members present at the committee meeting.²¹⁸

After the Standards Committee develops a proposed standard, NERC's Registered Ballot Body votes and comments on it. The ballot body consists of over 400 registered voters broken into segments, including 125 transmission owners; 117 electric generators; 105 load-serving entities (utilities); 66 electricity brokers, aggregators, and marketers; 34 transmission-dependent utilities that solely distribute electricity to end users; 8 RTOs; 7 regional reliability organizations and Regional Entities; 5 large electricity end users; 3 small electricity end users; and 3 federal, state, provincial or other government entities (see Figure 4).²¹⁹ NERC uses a formula that allocates each industry segment equal weight in voting on proposed standards (except those segments with fewer than 10 voters), with approval requiring a two-thirds majority of the weighted segment votes.²²⁰

220 and accompanying text; *see also Procedure for Election of Members of the Standards Committee*, NERC 1 (Aug. 25, 2022), <https://www.nerc.com/AboutNERC/RulesOfProcedure/ROP%20App%203B%20eff%2020220825%20clean.pdf> [https://perma.cc/VU23-ZW4F]; *Appendix 3D: Registered Ballot Body Criteria*, NERC 2-3 (Mar. 9, 2018), https://www.nerc.com/FilingsOrders/us/RuleOfProcedureDL/Appendix_3D_BallotBodyCriteria_20180309.pdf [https://perma.cc/7CNE-EUW7].

214. *Standards Committee 2023 Segment Representatives*, NERC 1-2 (2023), <https://www.nerc.com/comm/SC/Documents/2023%20SC%20Roster.pdf> [https://perma.cc/RH2V-WUBH].

215. *Reliability Standards Development Procedure Version 7*, NERC 12, https://www.nerc.com/pa/Stand/Standard%20Process%20Manual%20DL/RSDP-V7_Clean_2009June9.pdf [https://perma.cc/N4W3-AQDS].

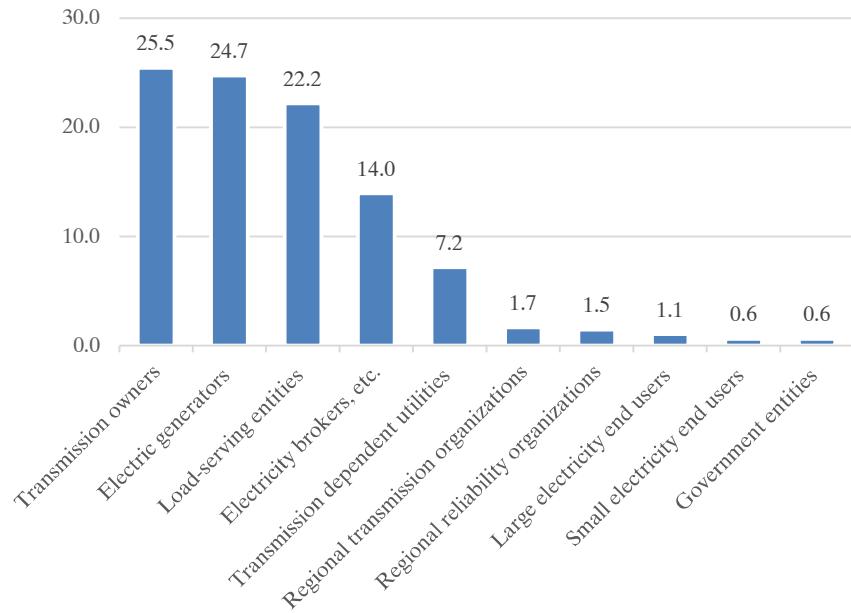
216. *Standards Committee Charter*, NERC (Dec. 2021), https://www.nerc.com/comm/SC/Documents/SC_Charter.pdf [https://perma.cc/7GDD-3LDV].

217. *Id.* at 11.

218. *Id.* That is, a majority of those present and voting. For a quorum, two-thirds of voting members must be present. *Id.*

219. *NERC Balloting Tool: Registered Ballot Body*, NERC (2023), <https://sbs.nerc.net/Users/VotersBallotBody> [https://perma.cc/A5C9-KX45].

220. *Standard Processes Manual Version 4*, NERC 19 (Mar. 1, 2019), https://www.nerc.com/comm/SC/Documents/Appendix_3A_StandardsProcessesManual.pdf [https://perma.cc/9TU3-DGC6]. If a segment has fewer than ten voters, its weight is adjusted downward. *Id.*

Figure 4. Registered Ballot Voters in NERC: Percentage Votes

Given the composition of NERC's Registered Ballot Body, weighted voting by segment creates the potential for a subset of industry—incumbent rate-regulated utilities—to wield outsized influence in NERC. New entrants, such as renewable-energy producers, typically fall into a single segment—most often the largest segment, generation. Vertically integrated utilities also have a vote in this segment because they own generating units. But because entities are allowed to have representatives within every sector for which they qualify, vertically integrated utilities have additional votes as transmission owners and load-serving entities. Skewing the ballot body yet further, RTOs and Regional Entities are *themselves* membership groups in which these same utilities frequently hold outsized sway.²²¹ Added all up, the major utilities have voting power in as many as five of the ten NERC segments—making their voices critical to any potential reforms and giving them functional veto power. Because these same segments also determine the composition of the Standards Committee, the entire standard-development process is weighted toward those with the greatest voice and representation within and across sectors.

221. See *infra* notes 359-361 and accompanying text (discussing how Southeast utilities govern the Regional Entity and NERC); see also Welton, *supra* note 174, at 214.

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If a standard makes it through the ballot-body gauntlet, it goes on to the NERC Board of Trustees.²²² NERC's Member Representatives Committee advises the Board of Trustees on whether the standard should be adopted, and the Board of Trustees, if it chooses to adopt the standard, forwards it to FERC for approval under the deference standards described in Part I.²²³ FERC can also approve region-specific reliability standards proposed by Regional Entities so long as they are "more stringent" than continent-wide standards and address either a regional difference not addressed by continent-wide standards or a "physical difference in the bulk power system."²²⁴

To further complicate this picture, there are additional private standard-setting organizations that operate alongside NERC and establish criteria related to grid reliability. For example, many entities subject to NERC compliance also voluntarily comply with North American Energy Standards Board (NAESB) standards. NAESB develops private standards for the operation of wholesale and retail power and natural gas, and it sometimes collaborates with NERC to develop standards.²²⁵ NERC itself also subscribes to another meta-SRO, the American National Standards Institute (ANSI), which "provides a framework for fair standards development."²²⁶ ANSI standards focus on achieving consensus and a balance of interest representation in the setting of private standards, thus creating a private version of due process.²²⁷ These rules—in addition to FERC requirements—drive the composition and rules governing NERC standard-setting and board elections.²²⁸

222. *Reliability Standards Development Procedure Version 7*, *supra* note 215, at 12.

223. *Id.* On deference, see *supra* note 158 and accompanying text. The Board can approve or reject but not modify proposed standards. *Standard Processes Manual Version 4*, *supra* note 220, at 21.

224. *Regional Standards Development*, NERC, <https://www.nerc.com/pa/Stand/Pages/RegionalStandardsDevelopment.aspx> [<https://perma.cc/XSS3-RLN3>]. Regional Entities' processes for adopting these standards generally mirror the process for continent-wide reliability standards. *Id.*

225. *NAESB 101 Webinar*, N. AM. ENERGY STANDARDS BD. 1 (Nov. 3, 2021), https://www.naesb.org/pdf4/course_flier_110321.pdf [<https://perma.cc/94P3-YYV5>]; *NERC NAESB Template: Procedure for Joint Standards Development and Coordination*, N. AM. ENERGY STANDARDS BD. 1, https://www.nerc.com/pa/Stand/Resources/Documents/NAESB_Procedure_for_Joint_Standards_Development_and_Coordination.pdf [<https://perma.cc/5L6P-US6R>].

226. *About ANSI*, AM. NAT'L STANDARDS INST., <https://www.ansi.org/about/introduction> [<https://perma.cc/E9BY-V2XW>].

227. *ANSI Essential Requirements: Due Process Requirements for American National Standards*, AM. NAT'L STANDARDS INST. 4 (Mar. 2, 2022), https://share.ansi.org/Shared%20Documents/About%20ANSI/Current_Versions_Proc_Docs_for_Website/ER_Pro_Current.pdf [<https://perma.cc/H6VF-D3A2>].

228. *See, e.g.*, Letter from Jim Thompson, Dir., Standards Dev. & ISO/TAG Accreditation Programs, Am. Nat'l Standards Inst., to Mark G. Lauby, Vice President & Dir. of Standards, NERC (May 17, 2013), <https://www.nerc.com/pa/Stand/ANSI%20Home%20Page%20Comm/Notice%20of%20NERC%20Reaccreditation%20from%20ANSI%20May%202017,%202013.pdf> [<https://perma.cc/PSJ6-PC3S>] (reaccrediting NERC on the basis of its compliance with ANSI procedures).

These details of NERC's internal design can feel tedious. Yet, as we have endeavored to show, they *matter* when it comes to the kinds of reforms proposed, discussed, voted on, and adopted or rejected by the organization. We now attempt to tie these institutionalist points to substantive outcomes, concluding that, together, they portend trouble for the world of reliability self-governance.

III. NERC's Performance as the Nation's Electric Reliability Organization

The previous Parts have focused on historicizing, situating, and unpacking NERC and its central role within reliability governance. This Part turns to assess NERC's performance as the nation's ERO. In many respects, NERC has been reasonably successful in maintaining grid reliability, both historically and under modern conditions. Although the United States experiences more power failures than other developed countries, some research suggests that reliability is on par with or stronger than the amount of reliability that consumers are willing to pay for. With several major exceptions, such as the deaths and economic losses caused by the major 2003 and 2021 blackouts, the recent history of the U.S. grid is not one of repeated disasters, despite the growing challenges posed by intermittent generation, extreme weather, and cyber threats. Yet this surface-level assessment masks a darker pattern occurring in the technical standard-setting weeds: many of NERC's standards are perpetuating—even if inadvertently—a regime that will worsen climate change and thus increase the climate impacts that now pose major threats to the grid.

This Part collates and analyzes evidence of NERC's outdated response to grid reliability, arguing that NERC has been adept at some aspects of reliability regulation but quite deficient in others. A recurring theme in this Part is that NERC has been able to identify new challenges to reliability through reports and statements by its leaders, but has sometimes failed to act—or act quickly enough—on the challenges that it has explicitly identified, even emphasized. A second theme is NERC's myopic focus on technical standards, which do not adequately address the sea change that is needed to electrify an entire electric grid, power it through zero-carbon intermittent resources, protect it from increasingly extreme weather and cyberthreats, and maintain the reliability of the system. This problem is not new. As the report addressing the causes of the 2003 blackout presciently observed, “NERC standards are frequently administrative and technical rather than results-oriented.”²²⁹

229. U.S.-CANADA POWER SYSTEM OUTAGE TASK FORCE, *supra* note 127, at 21.

A. NERC's Early Days as the ERO, 2005-2014: Growing Pains

As explored in Part I, the 2003 blackout and other reliability failures that preceded it ultimately spurred Congress to add a meta-regulator (FERC) to police the actions of the SRO (NERC), although this policing came with a heavy dose of deference to NERC. As FERC began its role of approving and making mandatory NERC's reliability standards and reviewing NERC's enforcement of these standards, some of the deficiencies of this reliability-governance model became clear. It was widely recognized—even in NERC's early days as the nation's ERO—that the complicated web of actors involved in reliability regulation made for an “unusual” relationship between FERC and NERC. Section 215's deference regime from FERC to NERC put FERC in an “awkward” position, “powerless to make things happen, yet still liable for failure, especially in the eyes of Congress.”²³⁰

Many early complaints about NERC focused on the slow speed of its standard setting. NERC's stakeholder-driven standard-setting process—its “great strength” in many eyes²³¹—proved sclerotic: as of 2010, it took an average of 21.7 months for a standard to work its way through NERC's process, creating a significant backlog of standards that FERC had identified as needing revision.²³²

Other early concerns centered on “confusion over the individual roles of FERC, NERC and regional entities in the process . . . as Section 215 of the Federal Power Act creates a fair amount of overlap.”²³³ These concerns mounted to outright tension in 2010. That year, in what was hyperbolically called the “March Massacre,” FERC issued several orders and notices in a single day that collectively evidenced sizeable disappointment in NERC's performance.²³⁴ Industry representatives were outraged at FERC's meddling and reacted particularly strongly to FERC's order on frequency response, which the American Public Power Association's head described as having “real unfortunate ready fire aim dynamics.”²³⁵

The frequency-response order was a direct reaction to perceived deficiencies in NERC's reliability governance in light of a grid that was changing to address the climate crisis. In the order, FERC instructed

230. Bruce W. Radford, *The Rush to Reliability*, PUB. UTILS. FORT., Feb. 2007, at 35, 36.

231. J.D. Schneider, *NERC on a Wire*, PUB. UTILS. FORT., Feb. 2013, at 32, 34.

232. Zhen Zhang & Matthew Stern, *NERC Today and Tomorrow*, PUB. UTILS. FORT., Mar. 2010, at 32, 33. There was also a backlog in enforcement cases: by 2010, 3,000 of a documented 5,500 possible NERC standards violations remained open and unprocessed. Bruce W. Radford, *Too Much Reliability*, PUB. UTILS. FORT., Jan. 2011, at 28, 28.

233. Zhang & Stern, *supra* note 232, at 35.

234. See 130 FERC ¶ 61,208 (2010) (transmission planning); 130 FERC ¶ 61,202 (2010) (contingency reserves); 130 FERC ¶ 61,218 (2010) (frequency response standards); 133 FERC ¶ 61,150 (2010) (bulk electric system definition); 130 FERC ¶ 61,203 (2010) (voting rules).

235. Allen Mosher, Senior Dir. of Pol'y Analysis & Reliability, Am. Pub. Power Ass'n, Remarks at FERC Reliability Standards Development Technical Conference [hereinafter Technical Conference] 179 (July 6, 2010) [<https://perma.cc/7RGL-77RY>].

NERC to submit within six months a new standard on how to manage swings in operating frequency on the grid—and did so in language that condemned NERC’s delay.²³⁶ The order reflected FERC commissioners’ concerns about whether NERC was adequately responding to the trend of rising intermittent (renewable) resources—a trend that Commissioner Philip D. Moeller had previously worried “can perhaps swamp us.”²³⁷ NERC itself was well aware of these changes, having convened a task force a year earlier that published a report on NERC’s role in “accommodating high levels” of renewable generation.²³⁸ But, FERC did not view NERC as moving fast enough to address these concerns through its standard-setting and guidelines authority. This problem, as we shall see, has reoccurred in recent years.

In the wake of FERC’s stronger assertion of NERC oversight in the “March Massacre,” NERC continued to insist that there remained strong justifications for self-regulation. NERC representatives emphasized that NERC—not FERC—remained the expert in how to assess and achieve reliability.²³⁹ Consequently—and in an assurance of unity of interests—NERC pleaded that “there should be never, ever any major surprises between NERC, FERC and the industry as occurred on March 18th We all want to improve reliability.”²⁴⁰ This assurance of mutual interest was echoed by many in the industry, one of whom suggested that a “CEO level discussion of what’s really important” would resolve “99 percent or better” of “harder issues.”²⁴¹ Only FERC Commissioner Spitzer seemed skeptical, asking whether there might not be a difference between “technical disputes or disagreements . . . over very arcane and complex matters” and “the stalemate . . . [that] comes from a policy dispute.”²⁴²

In the ensuing years, as renewable-energy penetration continued to grow and climate-change concerns continued to mount, new questions

236. Mandatory Reliability Standards for the Bulk Power System, 130 FERC ¶ 61,218, 61,991 (2010).

237. Philip D. Moeller, Comm’r, FERC, Remarks at Technical Conference, *supra* note 235, at 73. At this point in time, most thinking around intermittency, resource adequacy, and reliability was being done at the ISO/RTO and state level—with regions developing “their own methodology for incorporating these resources into their resource adequacy and reserve-margin calculations.” Lawrence Risman & Jane Ward, *Winds of Change Freshen Resource Adequacy*, PUB. UTILS. FORT., May 2007, at 14, 14.

238. NERC, SPECIAL REPORT: ACCOMMODATING HIGH LEVELS OF VARIABLE GENERATION (2009). The report generated several recommendations regarding potential standards to help integrate variable energy resources (renewables), including revisiting balancing area size and standardizing basic reliability requirements. *Id.* at 63-65.

239. See, e.g., John A. Anderson, President, Elec. Consumers Res. Council (ELCON), Remarks at Technical Conference, *supra* note 235, at 36 (“FERC will never be able to, nor should it try to[,] duplicate the depth of the industry’s expertise.”).

240. David Mohre, Executive Dir. for Energy Pol’y, Nat’l Rural Elec. Coop. Ass’n (NRECA), Remarks at Technical Conference, *supra* note 235, at 135.

241. Mosher, *supra* note 235, at 172.

242. Marc Spitzer, Comm’r, FERC, Remarks at Technical Conference, *supra* note 235, at 163.

emerged about NERC's role in the evolving grid. As one FERC commissioner pointedly asked in 2014, "Do we need a different set of standards . . . for a different kind of system?"²⁴³

This question was prompted by two observations. First, most severe bulk-power-system disruptions—at least eight of ten between 2009 and 2014—had been caused by “severe and unusual weather, including thunderstorms, tornadoes, and hurricanes—not by the sorts of systemic operational miscues that NERC’s reliability standards are designed to prevent.”²⁴⁴ That meant that perhaps NERC was missing key facets of the modern reliability challenge in its standard-setting process—a point already emphasized in the 2003 task-force report criticizing the focus on technical regulation rather than results.²⁴⁵ Second, it was increasingly clear that renewable energy was creating a need for new and different reliability-performance standards to ensure that intermittency did not threaten reliability. Industry, however, remained wary of adopting new standards based on these considerations.²⁴⁶

B. Modern Grid-Reliability Failures: Two Portraits of the Challenges

The tensions between NERC and its meta-regulator, and the deficiencies of NERC’s grid-reliability governance amid a climate crisis, have only become more apparent since the first decade of NERC’s role as a regulated SRO. This Section explores these rising concerns through in-depth looks at two windows into modern reliability crises: the 2021 Southern blackout and the 2022 California near miss.

2021 had the dubious distinction of witnessing a widespread electricity outage with some of the largest-ever damages. This blackout, affecting 10 million individuals in Texas and more people in neighboring states, unfolded when Winter Storm Uri blanketed the Southern United States with extremely cold weather.²⁴⁷ In Texas alone, at least 246 people died from the storm.²⁴⁸ Most of these deaths were attributable to loss of

243. Bruce W. Radford, *Reliability vs. Resiliency*, PUB. UTILS. FORT., July 2014, at 4, 6 (quoting FERC Acting Chairman Cheryl LaFleur).

244. *Id.*

245. *See supra* text accompanying note 223.

246. Radford, *supra* note 243, at 6.

247. Joshua W. Busby, Kyri Baker, Morgan D. Bazilian, Alex Q. Gilbert, Emily Grubert, Varun Rai, Joshua D. Rhodes, Sarang Shidore, Caitlin A. Smith & Michael E. Webber, *Cascading Risks: Understanding the 2021 Winter Blackout in Texas*, ENERGY RSCH. & SOC. SCI., July 2021, at 1.

248. *February 2021 Winter Storm-Related Deaths—Texas*, TEX. DEP’T OF STATE HEALTH SERVS. 2 (Dec. 31, 2021), https://www.dshs.texas.gov/sites/default/files/news/updates/SMOC_FebWinterStorm_MortalitySurvReport_12-30-21.pdf [https://perma.cc/VU6X-TZJ3]. See also Katie Hall, *In final tally, State Officials Say 246 Texans Died in February From Freeze and Power Loss*, AUSTIN AMERICAN-STATESMAN (9:00 AM CT Jan. 4, 2022) <https://www.statesman.com/story/news/2022/01/04/246-texans-died-february-freeze-and-power-loss-officials-say/9080688002> [https://perma.cc/J254-LP5W] (discussing the deaths resulting from the loss of power in Texas).

power.²⁴⁹ Causes included hypothermia and frostbite; exacerbation of pre-existing illnesses due to failed dialysis machines, oxygen treatments, and other medical equipment; and carbon-monoxide exposure and fires stemming from unsafe attempts to find alternative ways to heat homes.²⁵⁰ 49% of Texans lost water as pump stations lost power, with the average water outage lasting fifty-two hours.²⁵¹

The blackout also caused tremendous economic damage, including major supply-chain disruptions affecting everything from disinfectants to plastic bottles and fertilizers to packaging; a twenty-percent inflation-adjusted decline in Texas's chemical, plastic, and rubber exports; and damage to homes as water pipes froze and burst.²⁵² Total economic damages from the storm are estimated at \$80 billion to \$130 billion.²⁵³

The Southern blackout was almost much worse. Experts believe that if the entire grid had failed—which would have required a weeks-long “blackstart” of all power plants to get them running and reconnected to the grid—Texas would have been economically and socially devastated.²⁵⁴ Managers at the Electric Reliability Council of Texas (ERCOT), the operator that controls the Texas grid and follows NERC regulations, avoided this catastrophe only by creating controlled blackouts, thus balancing the small amount of electricity generation that was still operating with the “load” (demand). The ERCOT CEO reported that at its worst point, the grid was only minutes away from a high risk of complete failure.²⁵⁵

The primary cause of the outage was the direct, cold-induced failure of equipment at power plants—most importantly, natural gas plants. The cold weather accounted for fifty-three percent of plant outages or reduced generation.²⁵⁶ Water lines carrying water for steam or cooling to power plants froze, and ice accumulated on wind turbines.²⁵⁷ Additional factors included a reduction in fuel supply to natural-gas power plants—the

249. *Id.* at 2, 7.

250. *Id.* at 2-3, 7.

251. Hegar, *supra* note 4, at 4.

252. *Id.* at 4-5.

253. *Id.* at 2.

254. See *id.* at 4-5; Catherine Morehouse, *ERCOT Narrowly Avoided ‘Much More Devastating’ Impacts as Nearly Half of Generation Went Offline: CEO, UTIL. DIVE* (Feb. 25, 2021), <https://www.utilitydive.com/news/ercot-narrowly-avoided-much-more-devastating-impacts-as-nearly-half-of-ge/595701> [https://perma.cc/6BDC-DL7C].

255. Morehouse, *supra* note 254; Bill Magness, *Review of February 2021 Extreme Cold Weather Event—ERCOT Presentation*, ERCOT 12 (Feb. 25, 2021), https://www.ercot.com/files/docs/2021/03/03/Texas_Legislature_Hearings_2-25-2021.pdf [https://perma.cc/GF9E-GPBA] (showing that, for over four minutes, the frequency of the Texas grid was below 59.4 hertz—the level at which complete grid failure would occur after nine minutes).

256. *Update to April 6, 2021 Preliminary Report on Causes of Generator Outages and Derates During the February 2021 Extreme Cold Weather Event*, ERCOT 8-9 (Apr. 27, 2021), https://www.ercot.com/files/docs/2021/04/28/ERCOT_Winter_Storm_Generator_Outages_By_Cause_Updated_Report_4.27.21.pdf [https://perma.cc/DC3S-NJH3].

257. *Id.* at 9.

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leading source of power in Texas²⁵⁸—as natural-gas wells and pipelines stopped operating.²⁵⁹ Well and pipeline operations were disrupted when electricity stopped flowing to the equipment that powered them. Scheduled outages—power-plant downtime that had been scheduled prior to the emergency, such as regular shutoffs (mothballing) of plants during certain seasons and temporary shutoffs for maintenance—contributed to approximately fifteen percent of outages, and other equipment issues not directly related to cold played a similarly-sized role.²⁶⁰ Texas’s longstanding decision not to interconnect its grid with neighboring states (so as to avoid FERC jurisdiction) also contributed: regional grid operators in neighboring states that had more transmission interconnections with other, non-weather-impacted areas experienced fewer outages compared to Texas.²⁶¹

Over a year later, California narrowly missed a similarly devastating outage. In summer 2022, as wildfires raged at both ends of California, a heatwave descended upon the state. Temperatures and energy-usage statistics shattered records, putting significant strain on California’s rapidly transforming grid.²⁶² These record-high temperatures caused particular grid stress as the sun set, when demand remained high due to air-conditioning usage, but solar output declined.²⁶³ California’s grid operator was only able to avoid blackouts through the successful issuance of “Flex Alerts” to customers via Twitter and text message, begging them to conserve power during these periods by reducing nonessential uses.²⁶⁴ A grid-operator report on the incident from November 2022 found that consumers conserved up to 1,500 megawatts on these Flex Alert days,

258. See *Texas State Profile and Energy Estimates*, U.S. ENERGY INFO. ADMIN. (2021), <https://www.eia.gov/state/?sid=TX> [<https://perma.cc/KG47-EK92>].

259. *Update to April 6, 2021 Preliminary Report on Causes of Generator Outages and Derates During the February 2021 Extreme Cold Weather Event*, *supra* note 256, at 8-9.

260. *Id.* at 8, 10.

261. See FERC, NERC & Reg’l Entity Joint Staff, *February 2021 Cold Weather Grid Operations: Preliminary Findings and Recommendations*, FERC, NERC & REG’L ENTITIES 10 (Sept. 23, 2021) <https://www.ferc.gov/media/february-2021-cold-weather-grid-operations-preliminary-findings-and-recommendations-full> [<https://perma.cc/ZSK5-EBTP>]; see generally 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 (2022) (discussing how Texas’s market design contributed to the 2021 blackout).

262. Shawn Hubler, Kellen Browning, Ivan Penn & Jill Cowan, *California Narrowly Averts an Electricity Crisis Amid Scorching Heat*, N.Y. TIMES (Sept. 6, 2022), <https://www.nytimes.com/2022/09/06/us/california-heat-wave-energy-crisis.html> [<https://perma.cc/B5KU-D2SW>].

263. *Summer Market Performance Report*, CAL. ISO 12-13 (Nov. 2, 2022), <https://www.caiso.com/Documents/SummerMarketPerformanceReportforSeptember2022.pdf> [<https://perma.cc/T7MP-PHCY>].

264. A “flex alert” is “a call for voluntary electricity conservation.” See *California ISO extends Flex Alert to today from 3-10 p.m.*, CALIFORNIA ISO (Sept. 8, 2022) <https://www.flexalert.org/news#:~:text=The%20Flex%20Alert%20is%20scheduled%20between%203%20p.m.%20and%2010,an%20turning%20off%20unnecessary%20lights> [<https://perma.cc/Q7YQ-BEK8>].

significantly contributing to system stability.²⁶⁵ In many ways, this story is a heartening one of collective sacrifice and action. That said, appealing to consumers' better angels is far from a sustainable, surefire strategy for avoiding catastrophic outages under ever-more-frequent extreme weather conditions.

The Texas crisis and California near miss highlight the dual challenges that climate change poses to the grid today. The climate crisis is no longer distant or theoretical: it is wreaking direct, measurable havoc on grid infrastructure across the country. NERC's response, however, has not kept pace with these emerging challenges.

C. NERC Understands the Challenges

On paper, NERC recognizes the reliability challenges that this Article explores.²⁶⁶ Over and over again, in summer and winter reliability assessments, in annual employee retreats, in official reports following major blackouts or near misses, and in congressional testimony from its president and CEO, NERC has highlighted the opportunities and challenges posed by renewable energy and the climate crisis that renewable energy addresses.²⁶⁷

Take, for example, the 2022 Summer Reliability Assessment, in which NERC identified numerous climate-related trends that threaten the grid, including continuing "widespread" drought and "below-normal snowpack" conditions that limit hydropower and the water needed for thermal-power plants.²⁶⁸ The agency also warned of continued drought in the West, with "above-normal wildfire risk," which can negatively impact transmission lines and generate extensive smoke that can "diminish[] output from solar [photovoltaic] resources."²⁶⁹ NERC further acknowledged the challenges and opportunities associated with increased renewable generation, identifying "widespread solar [photovoltaic] loss events" in Texas as photovoltaic panels tripped and went offline during grid disturbances, impacting many parts of the system—even localized (distributed) energy resources.²⁷⁰ Further, NERC noted that Texas's extreme heat increases demand and threatens the supply of generation—a gap largely filled by additions of solar energy and some wind in recent

265. *Id.* at 42-43.

266. See, e.g., *Essential Reliability Services Task Force Measures Framework Report*, NERC iv-vii (2015), <https://www.nerc.com/comm/Other/essntlrlbltysrvctskfrDL/ERSTF%20Framework%20Report%20-%20Final.pdf> [<https://perma.cc/6FXH-FYCB>]; Press Release, NERC, Industry Experts Author Paper on Climate Change Impacts to the Grid (Apr. 8, 2022), <https://www.nerc.com/news/Headlines%20DL/IEEE%20Report%20Announcement%20Final.pdf> [<https://perma.cc/24UJ-JHCG>].

267. See Robb Testimony, *supra* note 39, at 3-4.

268. 2022 Summer Reliability Assessment, *supra* note 13, at 4.

269. *Id.* at 6, 8.

270. *Id.* at 5.

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years.²⁷¹ Similarly, in brainstorming sessions, NERC staff has emphasized the importance of “dynamic resource adequacy,” batteries, better data awareness to understand daily and seasonal generation trends from renewables, “flexible grid operations,” and visualization of “long-term grid architecture,” among other needs.²⁷² In June 2023, NERC’s president and CEO testified to Congress that “we must identify new resources to replace the retiring generation that provides both sufficient energy *and* essential reliability services (such as flexibility, voltage support, frequency response, and dispatchability)” and that “we must shift focus from planning for solely ‘capacity on peak’ to ‘energy 24x7’ due to the changing fuel mix.”²⁷³

These assessments suggest that NERC is, on one level, wholly aware of the grid changes that must happen if renewable energy is to become a reliable, dominant energy source. Whereas traditional reliability has tended to focus on ensuring adequate generation reserves—backups or “spare tires” available during seasonal spikes in demand, for example²⁷⁴—the new approach to grid reliability requires more instantaneous flexibility and planning for times when generation will increase or decrease. A grid operator facing a shortage of solar electricity when clouds roll in needs to be able to draw from wind or solar in another location, rely on electricity users to quickly reduce their consumption or turn to their own storage, or draw upon resources that can quickly ramp up to address shortfalls, such as aggregated localized batteries or microgrids powered by hydrogen fuel cells. These tools form the core of the “dynamic resource adequacy” paradigm recognized by NERC staff as critical to reliability in the electric era yet not encompassed within NERC standards.²⁷⁵

Flexible grid resources are also increasingly important given climate extremes, from wildfires to storms. Fully “hardening” the grid against weather extremes is costly, although a great deal of hardening—such as weatherization of generation and the strengthening of transmission lines—is now deemed essential in light of extreme weather and other modern grid realities.²⁷⁶

271. *Id.* at 4.

272. *2021 ERO Reliability Risk Priorities Report*, NERC 14 (Aug. 12, 2021), https://www.nerc.com/comm/RISC/Documents/RISC%20ERO%20Priorities%20Report_Final_RISC_Approved_July_8_2021_Board_Submitted_Copy.pdf [https://perma.cc/XL5N-5Z8G] (representing the brainstorming sessions by NERC staff in a series of graphics).

273. Robb Testimony, *supra* note 39, at 1.

274. See *Reserves*, PJM, <https://learn.pjm.com/three-priorities/buying-and-selling-energy/ancillary-services-market/reserves> [https://perma.cc/HBL3-7L94].

275. *2021 ERO Reliability Risk Priorities Report*, *supra* note 272, at 14.

276. See, e.g., Ellen Meyers, *Fla. Investor-Owned Utilities Propose Investing \$19.4B in Grid Hardening*, S&P GLOB. (Apr. 16, 2020), <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/fla-investor-owned-utilities-propose-investing-19-4b-in-grid-hardening-58051086> [https://perma.cc/7SL9-3A9V]; Stephanie Eyocko, Opinion, *Utilities Need to Harden the Grid as They Green It. Consumers Aren’t Ready for the Cost*, UTIL. DIVE (Feb. 26, 2021), <https://www.utilitydive.com/news/utilities-need-to-harden-the-grid-as-they-green-it>.

Beyond the need for some critical hardening, there is growing recognition of the importance of *resilient* resources—those that can continue operating during storms and provide power when extreme weather or wildfires cause larger grid outages.²⁷⁷ More localized resources—such as microgrids powered by fuel cells, solar panels, or batteries—are critical to resilience. Microgrids are relatively small generation sources that power a small cluster of buildings, such as a hospital, university campus, or critical buildings within a neighborhood like gas stations, grocery stores, emergency shelters, and schools.²⁷⁸ These microgrids, which often use batteries as backup power storage, can generate power during normal grid conditions and even feed excess power back into the grid. During emergencies, they can also be “islanded” (disconnected) from the larger grid, meaning that they can continue producing power for the small cluster of buildings to which they are connected.²⁷⁹

NERC is actively considering the deployment of these resources—most notably, the localized or distributed energy resources (DER) discussed above. But while doing so, NERC has largely treated these as a reliability *risk*, not a potential boon—even as it has been slow to adopt standards that might help instill confidence in DER as a grid-reliability solution.²⁸⁰

consumers-arent-ready/595719 [https://perma.cc/R23H-2JF3]. There are ongoing debates over people’s willingness to pay for reliability. A 1975 study suggested that the one-day-in-ten-years outage standard is too stringent of a reliability standard, and that a five-day outage every ten years may be more reasonable from a cost-benefit perspective. See Michael L. Telson, *The Economics of Alternative Levels of Reliability for Electric Power Generation Systems*, 6 BELL J. ECON. 679, 681 (1975). For the costs of infrastructure hardening, see, for example, Peter H. Larsen, *A Method to Estimate the Costs and Benefits of Undergrounding Electricity Transmission and Distribution Lines*, ERNEST ORLANDO LAWRENCE BERKELEY NAT’L LAB’Y 6-7 (Oct. 2016), https://etapublications.lbl.gov/sites/default/files/lbnl-1006394_pre-publication.pdf [https://perma.cc/5HHH-49QH].

277. See, e.g., Adam Hirsch, Yael Parag & Joseph Guerrero, *Microgrids: A Review of Technologies, Key Drivers, and Outstanding Issues*, 90 RENEWABLE & SUSTAINABLE ENERGY REV. 402, 402 (2018).

278. *Distributed Generation (DG) for Resilience Planning Guide: Microgrids 101*, U.S. DEP’T OF ENERGY & OAK RIDGE NAT’L LAB’Y, <https://dg.resilienceguide.ornl.gov/microgrids> [https://perma.cc/TU3C-GVPG]; see, e.g., Lili Francklyn, *Community Energized: Hartford, Connecticut, Powers Up Fuel Cell Microgrid* (Apr. 25, 2017), HOMER MICROGRID NEWS, <https://microgridnews.com/connecticut-powers-up-hartford-fuel-cell-microgrid> [https://perma.cc/LP88-WTYN].

279. Fed. Emergency Mgmt. Prog., *Islanding a Microgrid*, U.S. DEP’T OF ENERGY (Oct. 15, 2021), <https://www.energy.gov/eere/femp/articles/islanding-microgrid> [https://perma.cc/W9MD-CDW6].

280. *Distributed Energy Resources: Connection Modeling and Reliability Considerations*, NERC (Feb. 2017), https://www.nerc.com/comm/Other/essntrllblysvrcstskfrcDL/Distributed_Energy_Resources_Report.pdf [https://perma.cc/8925-ZVT7]. This task-force report recommended the publication of a set of guidelines to help bulk-power-system owners and operators “account for the impact of DER” in their modeling; further evaluation of the requirements for sharing information about DER at the transmission-distribution interface, and other improvements to modeling. *Id.* at 6, 26.

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NERC has also taken on an additional, proactive role in addressing grid-reliability threats, particularly cybersecurity. It has secured more coordination and communication between NERC standards personnel and a system that collects and records real-time information on bulk-power-system security incidents (both physical and cyberthreats).²⁸¹ NERC wants those who draft reliability standards to better understand these physical threats and cyberincidents and to conduct a “reliability gap analysis” to identify standards that need fixing.²⁸² Furthermore, NERC’s Electricity Information Sharing and Analysis Center periodically organizes, with U.S. government agencies and its Registered Entities, a simulation in which the U.S. electric grid experiences a simultaneous cyber and physical attack²⁸³; all Registered Entities participating in the exercise must respond in real time and analyze the effectiveness and gaps in the response.²⁸⁴

Despite some meaningful progress, NERC’s forward-looking reports and assessments do not consistently translate to modern standards or recommendations. NERC has a two-faced approach to modern grid reliability: talking a good talk about the changing grid, but failing to do much about it. This inadequate response is not benign. On the contrary, as the next Section shows, it has reverberating consequences that not only weaken grid reliability but impede the clean-energy transition.

D. NERC’s Performance Under Pressure: Entrenchment, Not Innovation

Recall that NERC is a central player in a wider web of reliability governance. The standards it sets—for load-resource balance and grid planning, development, and operations—filter into decisions made by FERC, RTOs, states, balancing authorities, Regional Entities, utilities, and beyond.²⁸⁵ This Section explores how NERC’s standards and reports—developed by private actors and used by these same private actors in other reliability settings—perpetuate extensive, centralized, fossil-fuel-fired generation. These actions, which impede decarbonization efforts and thus contribute to greater climate impacts that threaten grid infrastructure, also appear to cause underinvestment in modern reliability needs, such as reactive and flexible power. These biases manifest in four patterns: (1) NERC’s preference for baseload resources; (2) anti-renewables reliability standards; (3) NERC’s influence over resource adequacy interventions; and (4) self-serving reliability reports, many of which are drafted by Regional Entities and not by NERC itself.

281. Order on Compliance Filings ¶ 27, 174 FERC ¶ 61,030 (2021).

282. *Id.*

283. *North America’s Largest Grid Security Exercise*, E-ISAC, <https://www.eisac.com/s/gridex> [<https://perma.cc/EM88-WHC2>] (last visited Dec. 27, 2023).

284. *Electricity and Information Sharing and Analysis Center*, NERC, <https://www.nerc.com/pa/CI/ESISAC/Pages/default.aspx> [<https://perma.cc/E865-X7UG>] (last visited Jan. 9, 2024).

285. *See supra* Part II.

1. NERC's Preference for Baseload Resources

In numerous reports, NERC has expressed concern about the reliability challenges arising from the retirement of baseload generators that can provide electricity when called on.²⁸⁶ Baseload generators run nearly all of the time to cover the typical base level of electricity demand. According to NERC, additional reliability challenges exist in regions that do not have large numbers of resources capable of storing fuel (gas or coal) onsite.²⁸⁷ When severe weather disrupts pipeline service or creates supply shortfalls, generators that store fuel onsite can provide crucial reliability services,²⁸⁸ since they can draw on reserves when they are unable to purchase fuel in real-time markets. Similarly, power plants that enter into firm contracts for gas receive uninterrupted (guaranteed) service from gas pipelines; they are, therefore, more likely to receive fuel during emergency conditions. And dual-fuel resources—electricity-generating units that can switch from one fuel type (gas) to another (petroleum)—can support reliability because they can operate if their primary fuel type

286. See, e.g., *Generation Retirement Scenario: Special Reliability Assessment*, NERC v (Dec. 18, 2018), https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_Retirements_Report_2018_Final.pdf [<https://perma.cc/34JK-QSK2>] (“The key conclusion is that generator retirements are occurring, disproportionately affecting large baseload, solid-fuel generation (coal and nuclear). If these retirements happen faster than the system can respond with replacement generation, including any necessary transmission facilities or replacement fuel infrastructure, significant reliability problems could occur.”). We agree that the retirement of generation assets is creating reliability challenges, especially in New England, but disagree that the only solution to fuel security issues is to intervene to ensure that fossil resources continue to operate. See *Potential Reliability Impacts of EPA's Proposed Clean Power Plan: Initial Reliability Review*, NERC 1 (Nov. 2014), http://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/Potential_Reliability_Impacts_of_EPA_Proposed_CPP_Final.pdf [<https://perma.cc/QY4K-6FGQ>] (expressing concerns about coal-plant retirements under the EPA's proposal to regulate greenhouse-gas emissions from existing power plants); K.K. DuVivier, Nate Larsen, Nick Lawton, Sam Kalen, Stephen R. Miller, Melissa Powers, Tara Righetti, Troy A. Rule & Amelia Schlusser, *Transmission and Transport of Energy in the Western U.S. and Canada: A Law and Policy Road Map*, 52 IDAHO L. REV. 387, 422 (2016) (characterizing NERC's concerns as being “premised on the understanding that baseload resources inherently promote grid reliability and stability by providing stable energy output to satisfy consumer energy demand”).

287. See *Reliability Guideline: Fuel Assurance and Fuel-Related Reliability Risk Analysis for the Bulk Power System*, NERC 20 (Mar. 2020), https://www.nerc.com/comm/RSTC_Reliability_Guidelines/Fuel_Assurance_and_Fuel-Related_Reliability_Risk_Analysis_for_the_Bulk_Power_System.pdf [<https://perma.cc/B9Z8-CRRL>]; *Short-Term Special Assessment Operational Risk Assessment with High Penetration of Natural Gas-Fired Generation*, NERC vii, 2, 12 (May 2016), https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC%20Short-Term%20Special%20Assessment%20Gas%20Electric_Final.pdf [<https://perma.cc/DQ4H-ARVT>].

288. See *Winter Storm Elliott Frequently Asked Questions*, PJM 7 (Apr. 12, 2023), <https://www.pjm.com/-/media/markets-ops/winter-storm-elliott/faq-winter-storm-elliott.ashx> [<https://perma.cc/W3US-SSPE>] (“While many generators performed well, the overall outage rate was unacceptably high. PJM had as many as 46,000 MW of units on forced outages during the hours when they were most needed. While a cross section of generation was impacted by the cold weather, gas plants and dual-fuel gas plants made up the majority of outages.”).

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becomes unavailable.²⁸⁹ In recent years, these capabilities have provided crucial reliability services.²⁹⁰

Perhaps for these reasons, NERC has urged states, RTOs, and vertically integrated utilities to make sure that these resources continue to play a role in the future resource mix.²⁹¹ NERC has repeatedly observed that accelerated retirements of baseload resources, lack of firm fuel-service contracts, and insufficient levels of dual-fuel resources have left the grid vulnerable to severe blackouts. To address these issues, it has suggested “market (e.g., capacity market reforms) or out-of-market solutions . . . to maintain or enhance fuel delivery contracts.”²⁹² In so doing, NERC seems to embrace a dated view that baseload resources capable of storing fuel onsite are the primary solution needed to maintain reliability.²⁹³ These, of course, are the types of reliability interventions that have historically been used to meet the country’s energy needs. NERC’s proposals, therefore, follow this questionable logic: *“The reliability challenges caused by a changing generation portfolio exist because the portfolio is changing; the solution to this changing portfolio is to keep gas and coal plants online, and to make sure that they have sufficient supplies of gas and coal.”*

NERC’s responses to recent reliability crises perpetuate this logic. The joint FERC-NERC-Regional Entity report retroactively assessing the causes of the 2021 Southern blackout and recommending solutions (twenty-eight of them, to be exact) focuses almost entirely on shoring up traditional generation resources and fuel supplies rather than the transformative grid solutions that NERC has identified as essential for a decarbonized and climate-vulnerable grid.²⁹⁴ One might assume that because NERC has limited jurisdiction over many of the aspects of a modernized grid—the need for expanded transmission lines, increased reliance on distributed energy and storage, and greater demand response, for example—it has a reasonable excuse for such a traditional focus. But NERC routinely advises entities outside its jurisdiction about how to manage emerging threats to grid reliability.²⁹⁵

289. See *Natural Gas-Burning Power Plant Operations Vary During Periods of Cold Weather*, U.S. ENERGY INFO. ADMIN. (Jan. 14, 2019), <https://www.eia.gov/todayinenergy/detail.php?id=37992> [https://perma.cc/6UTY-7S3B] (observing the benefits of dual-fuel resources during cold snaps).

290. *Id.*

291. *Reliability Guideline: Fuel Assurance and Fuel-Reliability Risk Analysis for the Bulk Power System*, *supra* note 287, at 2.

292. *Id.*

293. But see Robb Testimony, *supra* note 39, at 4, 8-9 (noting the importance of flexible resources).

294. *FERC-NERC-Regional Entity Staff Report: The February 2021 Cold Weather Outages in Texas and the South Central United States*, *supra* note 1, at 18-20.

295. See, e.g., *id.* at 196 (recommending the formation of a natural-gas electricity-reliability forum); *Reliability Guideline: Natural Gas and Electrical Operational Coordination Considerations*, NERC 2 (Mar. 22, 2023), <https://www.nerc.com/comm/>

The report on the 2021 blackout expressly recommended a variety of specific steps to be taken by other actors. It proposed that states and RTOs modify markets and rates to ensure that generators can recover the costs of winterization, and that state oil and gas commissions require weatherization of wells.²⁹⁶ This report embodied NERC's continued view that natural gas is the essential "fuel that keeps that lights on" in the face of variable resources and growing weather extremes.²⁹⁷

In the short run, with an electric grid dominated by gas, maintaining a secure gas supply is indeed critical. But, there are two problems with NERC's preferred solutions. First, there is considerable evidence that alternative solutions may be more effective at supporting reliability in a grid based primarily on inverter-based resources (that is, renewables).²⁹⁸ Second, additional inverter-based resources create new reliability challenges that cannot be met by continuing to rely on the old paradigm of baseload and peaker generation.

As multiple studies have shown, a variety of resources and market interventions can support reliability. Tools that can improve the grid's performance include, for example, increased battery storage, non-carbon-intensive firm resources like hydro and geothermal power, real-time electricity pricing that incentivizes consumers to use less electricity during periods of high demand (load), and demand-response programs that pay consumers for these load reductions'.²⁹⁹ As traced above, NERC has acknowledged the need for more diverse reliability solutions, pointing out, for example, that additional electricity-transmission capacity would make the grid more reliable and more resilient, that storage can provide ramping services, and that emerging technologies have the potential to provide

RSTC_Reliability_Guidelines/Reliability%20Guideline%20-%20Gas%20and%20Electric%20Operational%20Coord%20Considerations.pdf [https://perma.cc/Q8RF-XK9P] (recommending "face-to-face" meetings between natural-gas operators—beyond NERC's jurisdiction—and power-plant operators).

296. *FERC-NERC-Regional Entity Staff Report: The February 2021 Cold Weather Outages in Texas and the South Central United States*, *supra* note 1, at 191-92.

297. NERC, Comment Letter on Supplemental Notice of Technical Conference Inviting Comments 12 (Apr. 15, 2021), https://www.nerc.com/FilingsOrders/us/NERC%20Filings%20to%20FERC%20DL/NERC_Comments_AD21-13%20Extreme%20Weather.pdf [https://perma.cc/BP2R-P3FT] [hereinafter NERC Comment Letter]. NERC insists that there is no way around this conclusion "unless or until very large-scale battery deployments are feasible or an alternative flexible fuel such as hydrogen can be developed." *Id.*

298. See NERC, AN INTRODUCTION TO INVERTER-BASED RESOURCES ON THE BULK POWER SYSTEM 2 (2023), https://www.nerc.com/pa/Documents/2023_NERC_Guide_Inverter-Based-Resources.pdf [https://perma.cc/YL6B-YAPX] ("Inverter-based resources include modern wind turbines . . . solar photovoltaic, and battery energy storage resources, as well as high voltage direct current circuits and flexible alternating current transmission system devices.")

299. See Stein, *Distributed Reliability*, *supra* note 11, at 889-90 (defining "distributed reliability" resources); Gavin Maguire, 'Dispatchable' Renewables in Spotlight after Upbeat IEA Report, REUTERS (Dec. 8, 2022), <https://www.reuters.com/business/energy/dispatchable-renewables-spotlight-after-upbeat-iea-report-maguire-2022-12-08> [https://perma.cc/W2Z4-5P3K?type=image] (describing renewables such as hydropower that can act as a backup for weather-dependent renewables).

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additional reliability benefits.³⁰⁰ Nevertheless, NERC's reports typically treat baseload, fuel-secure resources (i.e., generation resources capable of storing fuel on-site) as the preferred reliability solution and often directly advocate for market interventions that give special treatment to these resources.³⁰¹

Because of its expertise, meta-regulatory status, and critical role, NERC's interventions carry real weight. When the organization pushes recommendations that favor certain resources over others, the grid follows—even if these aims are contrary to decarbonization goals advanced by federal and state legislatures. When NERC pushes for reforms that require the use of energy produced from coal, gas, and nuclear, it gives a justification for rules that make it impossible for many key decarbonizing technologies, including wind and solar, to reach their full potential on the grid.

Moreover, NERC's support for baseload resources runs counter to the demands of the modern grid—demands that the organization has itself acknowledged. Emerging reliability challenges simply cannot be resolved by doubling down on baseload and fuel-secure resources. High levels of renewables change the characteristics of the grid. Renewables increase the need for flexibility, including for fast-ramping resources, demand flexibility, and resources that provide inertia support.³⁰² Baseload resources do not necessarily possess any of these characteristics, such that many of NERC's proposals do not appear to respond to the actual reliability challenges that renewables introduce. And in instances where NERC does recognize the need for flexibility, it defaults to natural gas as

300. See, e.g., *Energy Storage: Impacts of Electrochemical Utility-Scale Battery Energy Storage Systems on the Bulk Power System*, NERC (Feb. 2021), https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/Master_ESAT_Report.pdf [<https://perma.cc/N4F5-MJK6>]; Robb Testimony, *supra* note 39, at 8 (noting that “[e]lectric transmission investment must keep pace with the increase in utility scale wind and solar resources, which are generally located outside of major load centers,” and that transmission investment can improve grid resilience).

301. See, e.g., *2022 State of Reliability: An Assessment of 2021 Bulk Power System Performance*, *supra* note 12, at 26-27 (“Until storage technology is fully developed and deployed at scale, natural-gas-fired generation will remain a necessary balancing resource to provide increasing flexibility needs. . . . [Intermittent baseload resources and distributed energy resources] increase variability and uncertainty in demand, so they require careful attention in planning for resource adequacy . . . ”).

302. Inertia support refers to energy that continues being generated even after a plant temporarily halts, as with a spinning turbine in a generator, and that provides the few seconds needed for equipment at the plant to correct the failure and get the plant back online. See, e.g., Shakir D. Ahmed, Fahad S.M. Al-Ismail, MD Shafiullah, Fahad A. Al-Sulaima & Ibrahim M. El-Amin, *Grid Integration Challenges of Wind Energy: A Review*, 8 IEEE ACCESS 10857, 10861 (2020) (noting the importance of “load control” (demand reduction) and storage when large amounts of intermittent wind energy are interconnected with the grid); Hirsch, Parag & Guerrero, *supra* note 277, at 403 (noting that microgrids maximize “reliability and resilience in the face of natural disasters, physical and cyber attacks, and cascading power failures”); ASHLEY J. LAWSON, CONG. RSCH. SERV., R45764, *MAINTAINING ELECTRIC RELIABILITY WITH WIND AND SOLAR SOURCES: BACKGROUND AND ISSUES FOR CONGRESS* 10-11 (2022) (listing key factors for reliability with higher penetration of renewables).

the obvious answer—despite evidence that natural gas itself may lack the flexibility NERC reflexively imbues it with (a point we take up further below).³⁰³

2. Reliability Standards Created for Baseload Resources

NERC's apparent preference for traditional fossil generators extends to specific reliability standards that (a) do not address today's reliability challenges and (b) ensure that fossil resources will continue to address reliability needs even when alternatives are available.

Some NERC standards directly favor traditional baseload resources. For example, NERC assigns reserve margins that establish a target amount of unused capacity that should be available in an electric power system.³⁰⁴ Typically, NERC sets a goal of fifteen-percent reserve margins.³⁰⁵ NERC thus targets fifteen-percent excess capacity that is available but not producing energy. The concept of a reserve margin was designed for markets that rely primarily on baseload and peaker power plants.³⁰⁶ When demand increases or certain suppliers are unavailable, the excess capacity procured to comply with NERC's target reserve margins could be counted on to provide energy.³⁰⁷

The reserve-margin approach to resource adequacy no longer makes sense. Recent blackouts have revealed that the risks associated with

303. For example, far from keeping the lights on during Winter Storm Uri, over-reliance on (unweatherized) natural-gas infrastructure was a key cause of Texas's 2021 blackout. *See supra* notes 256-258 and accompanying text. Sometimes NERC itself recognizes these risks, even as it continues to push gas as a solution. *See, e.g.*, NERC Comment Letter, *supra* note 297, at 5 (“High reliance on natural gas-fired generation and limited natural gas infrastructure elevates reliability risk in some . . . areas.”).

304. *M-1 Reserve Margin*, NERC, <https://www.nerc.com/pa/RAPA/ri/Pages/PlanningReserveMargin.aspx> [<https://perma.cc/Q2HN-SH8C>].

305. *See 2022 Summer Reliability Assessment*, *supra* note 13, at 36 (“If a Reference Margin Level is not provided by an assessment area, NERC applies 15% for predominately thermal systems and 10% for predominately hydro systems.”). We should note, however, that while NERC sets a target reserve margin, frequently the “Reference Margin Level is established by a state, provincial authority, ISO/RTO, or other regulatory body.” *Id.* NERC outsources the work of evaluating the risk associated with a region's reserve margin to assessment areas. NERC emphasizes that “[m]ethods and assumptions differ by assessment area and may not be comparable.” *Id.*

306. *See supra* notes 19-20 and accompanying text (introducing the concepts of baseload and peaker plants).

307. Recent blackouts have suggested those resources are not as reliable as regulators once thought, however, as exemplified by the failure of more than half of all generation capacity in Texas during the winter freeze of 2021—a failure that could not have been fixed by a reasonable capacity reserve margin. *See The Timeline and Events of the February 2021 Texas Electric Grid Blackouts*, UNIV. OF TEX. AT AUSTIN ENERGY INST. 9, <https://energy.utexas.edu/sites/default/files/UTAustin%20%282021%29%20EventsFebruary2021TexasBlackout%2020210714.pdf> [<https://perma.cc/29RC-NC4N>]. For an analysis of why capacity markets are not meeting reliability needs, see generally Jacob Mays & Joshua C. Macey, Accreditation, Performance, and Credit Risk in Electricity Capacity Markets (Sept. 21, 2023) (unpublished manuscript), https://epic.uchicago.edu/wp-content/uploads/2023/09/Credit-Risk-and-Capacity-Markets_Sept-2023.pdf [<https://perma.cc/MX5M-GFF9>].

extreme events are correlated. It is unlikely that only a few gas pipelines and generators freeze during periods of extreme cold. Instead, if gas prices go up or extreme cold causes some gas lines to go down, it is likely that many of them will be unavailable simultaneously.³⁰⁸ Similarly, when weather events adversely affect a region and reduce output from some solar arrays or wind turbines, they cause all such resources to reduce output in that region.

The prospect of correlated generator failures makes the reserve margin a relatively blunt instrument for ensuring that a region's capacity can support its reliability needs. For that reason, academics and some policymakers have consistently pushed for a more systems-based approach in which regulators consider how the various parts of the energy system work in tandem to support reliability.³⁰⁹ If all the resources that meet NERC's reserve margins face correlated risks, then even regions with excess reserve margins will struggle to maintain reliable power during extreme weather events.

The challenge of a reserve-margin-based approach to reliability became apparent during blackout events in the past few years, where a significant percentage of regional reserves were unavailable. While a comprehensive analysis of resource-adequacy markets is beyond the scope of this Article, recent scholarship has shown that the concept of capacity is poorly defined, fails to consider correlated outages, and imprecisely measures resource' availability during scarcity hours.³¹⁰ It is, therefore, necessary to diversify the resource mix and stress test the grid to make sure it can withstand the actual reliability issues it will face. Certain types of capacity may be much more valuable than others under the stresses of climate change. For example, increased transmission capacity can reduce the extent to which risks are correlated because it allows regions to import power from non-supply-constrained regions. If one part of the country faces a cold snap that prevents gas-fired generators from operating, reserves that come from other regions that are not supply constrained will be better able to support reliability.

At the same time, reserve margins have essentially no bearing on the flexibility of a region's grid. If a region struggles—as California does—with

308. Cf. *Update to April 6, 2021 Preliminary Report on Causes of Generator Outages and Derates During the February 2021 Extreme Cold Weather Event*, *supra* note 256, at 8-9 (showing that twelve percent of all generation outages in the ERCOT (Texas) region in 2021 were caused by fuel limitations and that fifty-three percent were caused by the direct impacts of cold on power plants, such as frozen valves or water lines).

309. See, e.g., Stein, *Regulating Reliability*, *supra* note 11, at 1197; Klass, Macey, Welton & Wiseman, *supra* note 5, at 978-80.

310. For scholarship on the problems with capacity markets, see generally Jacob Mays, David P. Morton & Richard P. O'Neill, *Decarbonizing Electricity Requires Re-Evaluating Capacity Mechanisms*, 4 NATURE ENERGY 912 (2019); Jacob Mays, David P. Morton & Richard P. O'Neill, *Asymmetric Risk and Fuel Neutrality in Electricity Capacity Markets*, 4 NATURE ENERGY 948 (2019); Mays & Macey, *supra* note 307; and Joshua C. Macey & Jackson Salovaara, *Rate Regulation Redux*, 168 U. PA. L. REV. 1181, 1221, 1236-51 (2020).

managing significant *ramps* of energy, rather than with managing total peak energy demand, then a reserve-margin measurement of reliability has little to offer.³¹¹

When regions implement rules based on NERC's target reserve margins, they ensure the continued operation of resources that do not meet today's changing reliability needs. Out-of-market payments to baseload and peaker power plants keep those units online, often for years. Those interventions are justified on the grounds that those resources will help meet the region's reliability needs. But if those resources are being paid to provide reliability services, they do not, in fact, provide, or if it was possible for renewables or less-carbon-intensive resources to meet those reliability needs, then resource-adequacy interventions based on NERC reserve margins provide a windfall for fossil generators.

3. NERC's Influence Over Resource-Adequacy Interventions

The recommendations contained in NERC reliability reports have a robust afterlife. Often, NERC's findings support market interventions by other actors that ensure that carbon-intensive resources will continue to be part of the U.S. energy mix. For example, in 2017, the Trump-era Department of Energy (DOE) was concerned about the retirement of baseload generation. The DOE proposed that FERC adopt a rule to remove baseload resources such as coal and nuclear from energy markets and guarantee them rate recovery. In support of this intervention, the DOE mentioned NERC documents *161 times*—observing again and again that “NERC is concerned with the trend of [baseload] retirements as it relates to reliability and resilience.”³¹² In particular, the DOE cited NERC documents that discussed gas deliverability challenges,³¹³ emphasized the need for baseload generators,³¹⁴ and expressed concern about the “impact of premature retirements” of conventional units such as coal plants [that] provide frequency response services.”³¹⁵

The DOE's proposed fuel-security rule was a striking, politically motivated attempt to support coal, which had experienced poor financial performance for years. And while FERC declined to implement DOE's proposal, in other cases, NERC's defense of traditional baseload generation has been used to justify market interventions that favor those

311. See Nat'l Renewable Energy Lab'y, *The Importance of Flexible Electricity Supply*, DEPT' OF ENERGY 1 (May 2011), <https://www1.eere.energy.gov/solar/pdfs/50060.pdf> [<https://perma.cc/6NYR-LOPX>] (describing ramp rates and explaining technologies suitable to managing flexibility).

312. *Staff Report to the Secretary on Electricity Markets and Reliability*, U.S. DEP'T OF ENERGY 8 (Aug. 2017), https://www.energy.gov/sites/default/files/2017/08/f36/Staff%20Report%20on%20Electricity%20Markets%20and%20Reliability_0.pdf [<https://perma.cc/6BUL-96Z3>].

313. *Id.* at 12.

314. *Id.* at 14.

315. *Id.* at 64.

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types of resources. For example, when regions face reliability challenges, they often cite NERC reports to support market interventions that ensure the exemption of gas-fired resources from many of the competitive pressures other resources face.³¹⁶

Utilities also use NERC standards to justify out-of-market payments to fossil resources. An important example of this is the use of reliability-must-run agreements that guarantee certain generators cost recovery. Grid operators use reliability-must-run agreements to provide cost recovery to resources that provide essential reliability services to prevent them from otherwise retiring due to noncompetitiveness.³¹⁷ It is common for units to receive cost recovery through reliability-must-run agreements when their retirement would cause the region to fall out of compliance with a NERC reliability standard. For example, the potential retirement of the Mystic Exelon Power Station, a six-unit, 1,413-megawatt gas-fired generation facility in Everett, Massachusetts, prompted ISO-NE to guarantee the power plant \$400 million in revenue over a two-year period.³¹⁸ The decision to grant cost recovery was justified in large part because the plant's retirement would cause reliability issues.

Other reliability-must-run agreements further highlight the extent to which sophisticated players can take advantage of seemingly neutral NERC standards to benefit their own financial interests. One of NERC's responsibilities is to certify Balancing Authorities, which are the entities that make sure that supply and demand are perfectly matched in real time. To certify a Balancing Authority, NERC performs technical assessments

316. See Constellation Mystic Power, LLC, 165 FERC ¶ 61,267 (2018).

317. See *Improvements to the Attachment Y Retirement Process PAC-2022-1, MISO Plant Retirements*, MISO, <https://www.misoenergy.org/engage/MISO-Dashboard/improvements-to-the-attachment-y-retirement-process> [https://perma.cc/4YYG-7NKF] (first file under Documents/Whitepapers tab) (detailing criteria for system support resources, including the “presence of unresolved reliability violations”); *Clarifications to the Reliability Must Run Designation Process*, CAL. IND. SYS. OP. 1 (Sept. 22, 2021), <http://www.caiso.com/InitiativeDocuments/StrawProposal-ClarificationstoReliabilityMustRunDesignationProcess.pdf> [https://perma.cc/4QX2-LY8S] (describing region’s Reliability Must Run contracts designed to “maintain reliability compliance . . . with all NERC, WECC, and ISO reliability standards”); *Study Estimate Design Guide*, SW. POWER POOL, INC. 15 (July 22, 2011), <https://www.spp.org/documents/17128/spp%20study%20estimate%20design%20guide%20dbppctf%20final%2020110722.pdf> [https://perma.cc/Q7XJ-MWKM] (“Criteria for employing protection and control principles in the design and construction of new substations must adhere to NERC Reliability Standards and SPP Criteria, as well as individual TO standards.”); *Reliability-Must-Run Procedures*, ERCOT 1 (May 2016), https://www.ercot.com/files/docs/2016/06/03/OnePager_RMR_May2016_FINAL.pdf [https://perma.cc/V395-MWRC] (describing Texas’s reliability-must-run agreements, based on “reliability criteria set forth by the North American Electric Reliability Corporation (NERC) and relevant guidelines in ERCOT’s protocols and operating guides”).

318. *Mystic Generating Station*, CONSTELLATION ENERGY, <https://www.constellationenergy.com/our-company/locations/location-sites/mystic-generating-station.html> [https://perma.cc/9UEA-2S4Z] (last visited Oct. 31, 2023); Josh Resnek, *Exelon Battling Environmental Realities to Keep Mystic Generating Station Open*, EVERETT LEADER HERALD (June 17, 2020), <https://everettleader.com/2020/06/17/exelon-battling-environmental-realities-to-keep-mystic-generating-station-open/> [https://perma.cc/8QTL-FNY8].

designed to ensure that the Balancing Authority is able to match physical power flows to system needs.³¹⁹ NERC does not consider whether utilities are creating the Balancing Authority as a mode of anticompetitive behavior. FERC and state PUCs have jurisdiction over market power issues.

In 2014, NERC certified a Balancing Authority for Michigan's Upper Peninsula.³²⁰ It did so in response to two petitions from Wisconsin Electric to split the Wisconsin Electric Balancing Authority into two separate balancing authorities—one for Wisconsin and the other for the Upper Peninsula.³²¹ When NERC reviewed Wisconsin Electric's petition, it sought to evaluate whether the new Balancing Authority had “the necessary processes, procedures, tools, training, facilities, and personnel to perform the function as a NERC-certified [Balancing Authority].”³²² After finding that it did, NERC certified the new Balancing Authority.³²³

Wisconsin Electric's petition may have been motivated by its desire to pass costs onto other utilities, as the change allowed the company to recover the costs of a coal unit it owned from utilities that served the Upper Peninsula.³²⁴ It turned out that, once NERC certified the new Balancing Authority, the retirement of one of Wisconsin Electric's coal-fired power plants would have caused the newly certified Upper Michigan Balancing Authority to fall out of compliance with NERC frequency standards. As a result, under NERC rules, two of Wisconsin Electric's coal-fired power plants were automatically entitled to system-wide cost recovery as system support resources (MISO's term for reliability-must-run agreements). We do not think that this episode suggests any deliberate attempt by NERC to favor coal over other resources, but it does suggest that market participants can use neutral NERC standards to favor their own interests.

319. *NERC Certification Review Summary Report*, NERC 3 (2023) (explaining Balancing Authority responsibilities and relevant NERC requirements).

320. *NERC Balancing Authority Certification Final Report Michigan Upper Peninsula (MIUP)*, NERC 1 (Aug. 28, 2014), [https://www.nerc.com/pa/comp/Organization%20Certification%20DL/BA%20Certification%20of%20Michigan%20Upper%20Peninsula%20\(MIUP\).pdf](https://www.nerc.com/pa/comp/Organization%20Certification%20DL/BA%20Certification%20of%20Michigan%20Upper%20Peninsula%20(MIUP).pdf) [https://perma.cc/GHQ5-7BSZ].

321. *Tilden Mining Company L.C. Empire Iron Mining Partnership v. Midcontinent Independent System Operator, Inc. Wisconsin Electric Power Company*, Docket No. EL14-103-000, at *2 (150 FERC ¶ 61,105 Feb. 19, 2015); *Michigan Public Service Commission v. North American Electric Reliability Corporation Wisconsin Electric Power Company*, Docket No. EL14-104-000, at *2 (150 FERC ¶ 61,105 Feb. 19, 2015).

322. *NERC Balancing Authority Certification Final Report Michigan Upper Peninsula (MIUP)*, *supra* note 320, at 4.

323. *See id.*

324. Neighboring utilities directly alleged as much. *See Tilden Mining Company L.C. Empire Iron Mining Partnership v. Midcontinent Independent System Operator, Inc. Wisconsin Electric Power Company*, Docket No. EL14-103-000, at *13 (150 FERC ¶ 61,105 Feb. 19, 2015) (Utilities objected that Wisconsin Electric used the NERC process for designating balancing authorities “to gerrymander its LBA for the sole purpose of significantly shifting costs” to utilities that operated on the Upper Peninsula of Michigan.).

But perhaps the most significant example of how incumbent utilities use seemingly neutral NERC reliability standards to favor their own interests is in the transmission system. To decarbonize quickly and cost effectively, the United States must invest in a significant amount of transmission capacity.³²⁵ Doing so allows renewables to provide power to areas that use large amounts of electric energy. It also increases the reliability of the bulk power system, since large transmission lines allow areas experiencing scarcity conditions to import power from areas with surplus capacity.³²⁶ In addition, because the U.S. plan to decarbonize involves electrifying carbon-intensive industries that are currently connected to the bulk electric system, it is necessary to increase transmission capacity in order to accommodate the additional demand that will be created by electrifying everything.

Building new transmission capacity in the United States requires developers to navigate a complex regulatory system. A full analysis of the regulatory process for planning, siting, and allocating the costs of new transmission is beyond the scope of this Article.³²⁷ A core problem today is that, although investor-owned utilities spend tens of billions of dollars a year building transmission lines,³²⁸ most of this investment goes toward small local lines that do not support deep decarbonization.³²⁹ By building small lines, transmission operators reduce the need to build regional lines that would more cost effectively meet their transmission needs and better support the United States's decarbonization goals. In addition, transmission operators that own generating units may prefer to build local lines because doing so protects their generators' market power, reduces competition from neighboring regions, and creates a need for investment

325. Gregory Brinkman, Joshua Novacheck, Aaron Bloom & James McCalley, *Interconnections Seam Study*, NAT'L RENEWABLE ENERGY LAB'Y 33 (2020) <https://www.nrel.gov/docs/fy21osti/78161.pdf> [<https://perma.cc/U4B5-UA5A>].

326. Ill. Com. Comm'n v. FERC, 721 F.3d 764, 774 (7th Cir. 2013) (explaining that additional transmission allows regions to lower reserve margins).

327. See Alexandra B. Klass & Jim Rossi, *Reconstituting the Federalism Battle in Energy Transportation*, 41 HARV. ENV'T L. REV. 423, 428 (2017) (arguing for more federal involvement in siting transmission lines); Felix Mormann, *Clean Energy Federalism*, 67 FLA. L. REV. 1621, 1628 (2015) (proposing a model for integrating feed-in tariffs and renewable portfolio standards to fill a gap in energy policy); Aneil Kovvali & Joshua C. Macey, *Hidden Value Transfers in Public Utilities*, 173 U. PA. L. REV. (forthcoming 2023); Ari Peskoe, *Is the Utility Transmission Syndicate Forever?*, 42 ENERGY L.J. 1, 58 (2021) (arguing that FERC should discipline IOU local transmission spending).

328. See *Industry Data*, EDISON ELEC. INST. (2022) <https://www.eei.org/resources-and-media/industry-data> [<https://perma.cc/KW4K-S42C>] (explaining that, in 2021, "investor-owned electric companies spent \$25.0 billion on transmission investment "and "\$40.3 billion on distribution investment").

329. See *Building for the Future Through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection*, 179 FERC ¶ 61,028, at 35-36 (Apr. 21, 2022) ("The vast majority of investment in transmission facilities since the issuance of Order No. 1000 has been in local transmission facilities. For example, transmission investment to resolve local needs accounted for almost 80% of total transmission investment in MISO from 2018 to 2020. Similarly, in PJM, about two-thirds of the total transmission investment in the region went to resolving local needs.").

in new generating units that would not exist if additional transmission capacity allowed the region to import more power from neighboring regions.³³⁰

Yet despite the fact that investing in local lines increases costs, reduces reliability, and makes it difficult for renewables to interconnect to the bulk power system, transmission operators have a strong incentive to build local lines. Most states do not review permits for local lines. At the federal level, RTO review of these lines is often limited to requesting an explanation of why the local line is needed.³³¹ Thus, utilities experience much less regulatory scrutiny when they invest in local lines instead of regional ones. In addition, because utilities do not need to compete with merchant developers when constructing local lines—FERC requires that regional lines undergo competitive solicitations but has exempted local lines from this requirement³³²—utilities have a financial incentive to build local lines in order to avoid the risk that a competitor will win the contract to build the line. Thus, taken as a whole, the current framework for building transmission lines creates strong financial incentives for utilities to invest in precisely the wrong types of lines. Given this regulatory system, it is little surprise that the majority of transmission investment today is spent on local lines.

NERC reliability standards also play an important role in allowing transmission operators to build small, local lines. Utilities are able to build local lines more easily than regional ones because, if a line is needed to remain in compliance with NERC standards, the utility does not need to go through the regional planning process.³³³ In PJM, the mid-Atlantic RTO, for example, transmission operators can construct new lines outside of the regional planning process if the lines are needed to meet NERC reliability standards.³³⁴ Transmission operators are also allowed to submit their own local planning criteria, which are again often influenced by NERC standards.³³⁵

PJM does not meaningfully review these projects. Instead, it conducts a “do-no-harm analysis to ensure such projects do not negatively affect the reliability of the system.”³³⁶ PJM “does not share the results of [its]

330. See Kovvali & Macey, *supra* note 327, at 33.

331. See Joshua C. Macey, *Outsourcing Energy Market Design*, 91 U. CHI. L. REV. (forthcoming 2024).

332. See Order No. 1000, 136 FERC ¶ 61,051 (Jul. 21, 2011).

333. *Business Practice Manual for Transmission Planning Process (Version 21.0)* CAISO 46-47 (June 30, 2020).

334. See *Attachment M-3: Additional Procedures for Planning Supplemental Projects and Asset Management Projects*, PJM 4781 (Sept. 17, 2010) <https://pjm.com/directory/merged-tariffs/oatt.pdf> [pdf on file with journal].

335. See *id.*

336. PJM, *PJM, Members Review Planning Under M-3 Process*, PJM INSIDE LINES (Oct. 22, 2019) <https://insidelines.pjm.com/pjm-members-review-planning-under-m-3-process> [https://perma.cc/S54Q-6NGN].

analysis.”³³⁷ It merely states that “PJM cannot examine systems not under [its] planning purview,” but that it does ensure that projects “meet the definition of supplemental projects in the [region’s operating tariff]” prior to being allowed to proceed.³³⁸ According to PJM, this is because it “does not have the authority or expertise to determine when a facility is at the end of its useful life or otherwise needs to be replaced.”³³⁹ Utilities in other RTOs also are exempted from regional planning when a project is needed to comply with NERC standards.³⁴⁰

Of course, we cannot prove that utilities manipulate their own transmission planning criteria to reduce the need for regional lines, or that any particular local line does not meet a pressing reliability need. Yet the turn away from regional planning clearly serves incumbent utilities’ financial interests. There is at least strong circumstantial evidence that utilities are building local lines to avoid competition and limit regulatory oversight, and NERC standards play an important role in allowing them to continue the parochial approach to planning new lines. Again, NERC standards that appear to be facially neutral—for example, standards that require frequency regulation or the designation of a Balancing Authority—empower other market actors to make investment decisions that protect their own resources.

4. Drafting Reliability Reports

Our final example of NERC’s shortsighted approach to reliability regulation in the electric era stems from its interrelationship with its sub-entities. Although NERC is nominally the nation’s primary reliability regulator, in reality, NERC delegates many of its substantive responsibilities to regional entities. These entities often draft reports and perform research about their own regions’ vulnerability to extreme weather events and other reliability challenges.³⁴¹ This arrangement

337. Aaron Berner, *M-3 Process Lessons Learned*, PJM 5 (Oct. 11, 2019). [pdf on file with journal].

338. *Id.*

339. Dean Oskvig, *October 4, 2019 Letter to PJM Members Committee*, PJM 1 (Oct. 4, 2019) <https://pjm.com/-/media/about-pjm/who-we-are/public-disclosures/20191004-pjm-board-reliability-committee-chair-dean-oskvig-regarding-supplemental-projects.ashx> [https://perma.cc/N5WJ-KNKK].

340. *Transmission Planning Manual*, MISO 25-26 (May 1, 2023).

341. See, e.g., *2021 SPP Loss of Load Expectation Study Report* SPP 5 (June 29, 2023), <https://www.spp.org/documents/67465/2021%20spp%20lole%20study%20report.pdf> [https://perma.cc/QE6W-4VF5] (reporting results of required biannual study on whether region had adequate reserves to meet its “one [electricity outage] day in ten years” standards); *MISO’s Response to the Reliability Imperative*, MISO 2 (2023) <https://cdn.misoenergy.org/MISO%20Response%20to%20the%20Reliability%20Imperative504018.pdf> [https://perma.cc/AYV7-PL3X] (highlighting reliability challenges of renewables, including that “[w]ind and solar resources are not always available to provide energy during times of need,” “renewables must sometimes be curtailed due to transmission constraints,” and “[t]he region’s penetration of

creates confusing and misleading lines of accountability that allow utilities to proffer self-serving assessments of regional reliability under the guise of NERC's expertise. It also likely explains seeming inconsistencies within NERC reports, since different sections are based on data and models submitted by different Regional Entities, which are themselves controlled by different utilities, RTOs, and reliability entities.

The result is that the actual data collection and drafting of reliability reports is outsourced to entities that are governed largely, if not entirely, by the incumbent utilities that have to comply with reliability standards. NERC itself stresses that its seasonal reliability reports are "independent assessment[s] by NERC and the ERO Enterprise."³⁴² In the same sentence, however, NERC acknowledges that the "reliability assessment process is a coordinated reliability evaluation between the NERC Reliability Assessment Subcommittee, the Regional Entities, and NERC staff with demand and resource projections obtained from the assessment areas."³⁴³

The actual report authorship follows a bewildering process, which NERC describes in its Reliability Assessment Guidebook.³⁴⁴ Regional entities collect data and submit it to NERC for reports. They develop modeling techniques that NERC uses to assess reliability, and regions routinely use different modeling techniques. Often, the Regional Entity that manages a particular region drafts the sections for that region.

As a result, when NERC says that SERC, the Regional Entity for the Southeast, is "projected to maintain sufficient capacity to meet the reliability PRM during the assessment time frame,"³⁴⁵ it is actually drawing from SERC's own assessment. SERC consists entirely of large utilities in the Southeast. Thus, when NERC reports that the Southeast has sufficient capacity, what is really happening is that the regulated monopolists that serve the Southeast are claiming that they have sufficient capacity. Yet

distribution-level and behind-the-meter resources is increasing, yet MISO does not have functional control or visibility into how these resources may affect the larger grid system"). Some Regional Entity reports provide valuable assessments of underexplored impacts of distributed renewable resources, such as displacement of large-scale solar and wind. *See, e.g., Impact of High Distributed Energy Resources*, WECC (2022) <https://www.wecc.org/Administrative/Executive%20Summary%20-%20Impact%20of%20High%20Distributed%20Energy%20Resources%20Study%20Assessment.pdf> [https://perma.cc/NY3L-9Z9T] (noting the reliability challenges posed by DERs and the fact that they caused curtailment of solar and wind). Other Regional Entity reports on reliability may create a false sense of adequate standards when in fact there is a need for updating. *See infra* note 376 and accompanying text (regarding weatherization standards).

342. 2023 Summer Reliability Assessment, NERC 4 (May 2023), https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SRA_2023.pdf [https://perma.cc/PS6Q-9YRB].

343. *Id.*

344. *ERO Reliability Assessment Process Document*, NERC 7 (Apr. 2018), <https://www.nerc.com/comm/PC/Reliability%20Assessment%20Subcommittee%20RAS%202013/ERO%20Reliability%20Assessment%20Process%20Document.pdf> [https://perma.cc/4862-LF52].

345. 2021 Long-Term Reliability Assessment, NERC 99 (Dec. 2021), https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_LTRA_2021.pdf [https://perma.cc/TT62-UEWC].

because the statement is published under NERC’s name, the conclusion has an imprimatur of independence.

In fact, *all* the underlying data in NERC reports come from regional entities.³⁴⁶ The Regional Entities provide actual and forecasted demand, the number and type of generating units, capacity and capacity transfers, planned transmission projects, and so on. Some of this information, such as forecasted demand, involves discretionary decisions that can further utilities’ financial interests. However, because NERC does not explain how Regional Entities are supposed to forecast demand or anticipate outages, it falls to the Regional Entity itself to develop the model that makes these forecasts. In this sense, the document only “promote[s] consistency for high-level data,” rather than actually requiring consistency.³⁴⁷

That said, NERC does not simply accept data as it is provided. Rather, there is a “peer review process that leverages industry subject matter expertise from various sectors of the industry [meant] to ensure the validity of the data and information provided by the Regional Entities.”³⁴⁸ Two peer members are assigned to review each assessment area’s data. Reviewer comments are discussed with the Regional Entity’s representative, and refinements and enhancements are made as needed. The finalized product is then subject to additional review by the entire Reliability Assessment Subcommittee (RAS).

This arrangement is codified in NERC’s Rules of Procedure, which emphasize that “the major sources of data and information for this program are the Regional Entities.”³⁴⁹ That does not mean NERC plays no role in reviewing reliability assessments. A team of reliability and technical experts develops and formulates independent conclusions about the near-term and long-term reliability of the Bulk Power Systems.³⁵⁰ Still, despite the fact that NERC reviews data submission, Regional Entities are responsible for providing most essential information through self-assessments, including demand and resource adequacy projections, transmission constraints, and any other reliability issues.³⁵¹

346. The data form is extensive. See *2023 Long-Term Reliability Assessment Data Form Instructions*, NERC, https://www.nerc.com/comm/RSTC/RAS/2023_LTRA_Data_Form_Instructions.pdf [<https://perma.cc/5JAY-DQMF>].

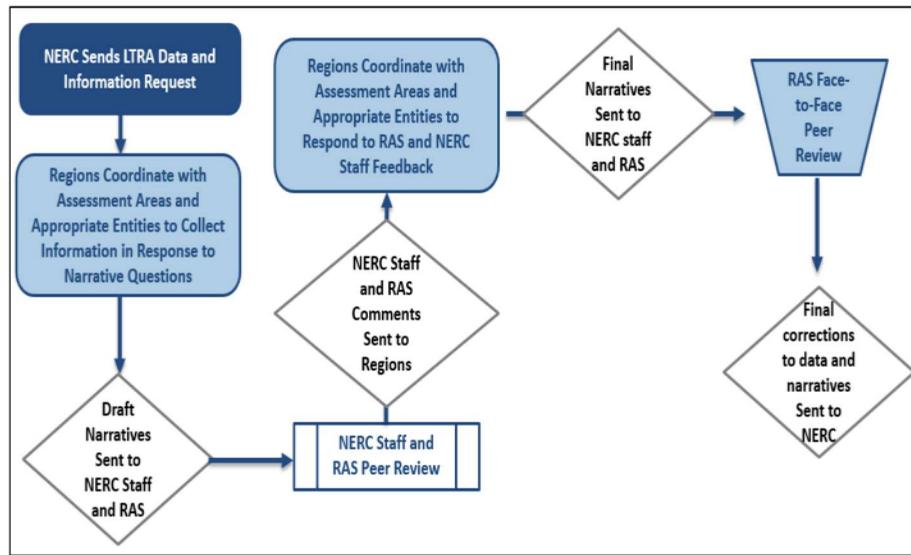
347. *Id.* at 1.

348. *ERO Reliability Assessment Process Document*, *supra* note 344, at 7.

349. NERC, *Rules of Procedure* § 804 (Aug. 25, 2022), https://www.nerc.com/AboutNERC/RulesOfProcedure/NERC%20ROP%20effective%2020220825_no%20appendicies.pdf [<https://perma.cc/4SX4-63UU>].

350. *Id.*

351. *Id.*

Figure 5. LTRA Development Process

Note: diamonds indicate when information, data, or documents are submitted.

In addition to the information provided to NERC, Regional Entities also submit supporting narratives that feed directly into NERC's reliability assessments.³⁵² NERC even admits that risk analysis is performed by the assessment areas themselves, and that “[m]ethods and assumptions differ by assessment area and may not be comparable.”³⁵³ Interestingly, the 2023 Summer Reliability Assessment summarizes the types of assessments each region performs. It seems that regions have developed distinct approaches to assessing reliability. For example, NERC performs seasonal reliability assessments in which it “reports on areas of concern regarding the reliability of the North American [bulk power system].”³⁵⁴ These reports often follow the pattern described above, where NERC emphasizes the need for baseload resources and resources that can store fuel onsite.³⁵⁵

352. *Id.*

353. 2022–2023 Winter Reliability Assessment, NERC 33 (Nov. 2022), https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_WRA_2022.pdf [<https://perma.cc/MBB7-WZGW>].

354. *Id.* at 3.

355. *Id.* at 4 (emphasizing consequences of nuclear and coal-fired generation retirements on declining reserves); *id.* (“Reliable operation of the thermal generating fleet is critical to winter reliability, and assured fuel supplies is an ongoing winter reliability concern. . . . Low fuel-storage levels coupled with a range of potential fuel-resupply challenges are creating additional risks for winter regional [bulk-power system] reliability.”).

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These reliability assessments, which are provided by local entities, often provide the strongest statements about reliability issues in the region.³⁵⁶

Occasionally, NERC statements expressing concern regarding renewables also appear to be taken verbatim from regional entities. For example, NERC reports that “ERCOT is also experiencing large increases in renewable production curtailments due to transmission constraints, and these curtailments are increasingly occurring at solar [photovoltaic] sites,” something that ERCOT itself reported.³⁵⁷ This is perhaps not surprising, given that one of the documents in which ERCOT reported the issue was a study “conducted for the North American Electric Reliability Corporation (NERC) as part of its 2022 Long Term Reliability Assessment.”³⁵⁸

Yet NERC never cites where its conclusions come from. There are *no explicit citations* in the entire NERC Summer Reliability Report. The closest NERC comes to attributing authorship to other entities is sentences such as “Based on a WECC Probabilistic Assessment, the WECC-SW assessment area had negligible LOLH” or “SPP projects a low likelihood of any emerging reliability issues.”³⁵⁹ There are no links to where the RTOs performed their calculations or independent NERC assessments of their conclusions.

Reliance on these regional reports is particularly problematic given regional governance constructs. In brief, incumbent utilities often fully control the regional planning entities or at least have substantial influence.³⁶⁰ NERC thus outsources reliability analyses to entities that stand to profit or lose from decisions made surrounding reliability in the region. This stands in tension with the requirement that NERC “assure its

356. See *id.* at 23 (“Entities in SERC-Central have not identified any potential reliability issues for the upcoming summer season.”); *id.* at 19 (“Based on [its] Probabilistic Assessment, NYISO may rely on limited use of its operating procedures that are designed to mitigate resource and energy shortages”); *id.* at 22 (“PJM expects no resource problems over the entire 2023 summer peak season”); *id.* at 24 (“[SERC-East] Entities have not identified any emerging reliability issues”).

357. *2023 Summer Reliability Assessment*, *supra* note 342, at 28; see also *Zonal Reliability Report*, ERCOT 22 (Jan. 9, 2023), https://www.ercot.com/files/docs/2023/01/10/ERCOT_Zonal_Reliability_Study_Report_1-9-2023.pdf [https://perma.cc/7WRB-88DY] (“[ERCOT] is curtailing large amounts of renewable capacity due to its export constraint limits.”); U.S. Energy Info. Admin., *A Case Study of Transmission Limits on Renewables Growth in Texas*, U.S. DEP’T OF ENERGY 23 (July 2023), https://www.eia.gov/electricity/markets/quarterly/archive/2023/transmission_limits_07_2023.pdf [https://perma.cc/3MU6-GGBR]; *Report on Existing and Potential Electric System Constraints and Needs*, ERCOT 13 (Dec. 2019), https://www.ercot.com/files/docs/2019/12/23/2019_Constraints_and_Needs.pdf [https://perma.cc/8U67-DLHS] (“[ERCOT’s] expansion analysis . . . identified a need for additional transmission paths . . . to deliver additional wind and solar generation.”).

358. *Zonal Reliability Report*, *supra* note 357, at 22.

359. See *2023 Summer Reliability Assessment*, *supra* note 342, at 27, 33.

360. For example, SERC, the Southeast Reliability Entity, is composed of nine large utilities that operate in the region. See *Reliability Plan for the Southeastern Subregion Reliability Coordinator*, SERC 2 (May 3, 2022), https://www.nerc.com/comm/RSTC/RTOS/Reliability%20Plan%20-%20SeRC%20Southeastern%20Subregion_5-5-2022.pdf [https://perma.cc/BL5N-MJUS].

independence of the users and owners and operators of the bulk-power system.”³⁶¹

Recall that an SRO is most effective when there are clear lines of accountability and when the SRO is independent. From an accountability standpoint, NERC’s reliability-assessment procedure is dubious. NERC appears at times to simply parrot regional conclusions that are themselves driven by utilities with financial stakes in the results reached. These utilities benefit from laundering their positions through a putatively neutral NERC assessment—but the process does not make for independent, accountable SRO governance.

E. FERC’s Role in Filling Modern Reliability Gaps

Thus far, we have built a case that NERC’s approach to the reliability challenges falls short of the electric era’s needs, and may retrench a cascading and perverse reliance on fossil fuels. But is the SRO really to blame, or should responsibility lie with FERC, NERC’s meta-regulator since 2005? In this final Section assessing NERC’s modern performance, we explain why—for legal and jurisdictional reasons—FERC has not been able to fully close the gaps created by NERC. This sets the stage for our discussion of solutions in Part IV, many of which would give a stronger role to FERC as a true “umbrella” organization for reliability.

In many respects, FERC has been more aggressive than NERC in identifying and attempting to address changing risks to grid reliability and reliability “gaps” (in FERC’s words).³⁶² Below, we explore several of FERC’s forward-looking actions that expressly addressed reliability challenges posed by the climate crisis and that aimed to force NERC to act. These positive examples reinforce our conclusion that FERC is capable of expertly assessing reliability and intervening to improve it. However, the SRO structure of reliability governance—particularly the deference that FERC must afford to NERC decisions, and FERC’s often risk-averse interpretation of its own jurisdictional limits—constrains the Agency’s effectiveness.

We begin with the positive view of FERC’s actions addressing reliability in the electric era. In 2021, FERC commenced a proceeding entitled “Climate Change and Extreme Weather,” designed to address the threats to grid reliability that extend far beyond the Southern cold snap of 2021.³⁶³ This proceeding aimed to require NERC to do more to address

361. See 16 U.S.C. § 824o(c)(2)(A).

362. See, e.g., *FERC Moves to Close Gap in Reliability Standards for Electric Grid Cyber Systems* FERC (Jan. 20, 2022), <https://www.ferc.gov/news-events/news/ferc-moves-close-gap-reliability-standards-electric-grid-cyber-systems> [https://perma.cc/ZB8J-PHUS].

363. *FERC Acts to Boost Grid Reliability Against Extreme Weather Conditions*, FERC (June 16, 2022), <https://cms.ferc.gov/news-events/news/ferc-acts-boost-grid-reliability-against-extreme-weather-conditions> [https://perma.cc/F54G-LYKA].

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grid risks posed by climate and extreme weather—the very risks that NERC had spoken about in reliability assessments but largely ignored in its standard-drafting process. FERC proposed requiring transmission providers to study extreme weather conditions and the generation resources available to them during such conditions, and to implement actual solutions in cases where the grid floundered during extreme events.³⁶⁴ These proposed rules starkly contrast with NERC’s current approaches, which do not mandate corrective actions—only general planning for weather extremes—and do not require planning for extreme weather than can “affect wide geographical areas simultaneously over several days.”³⁶⁵

FERC does other gap filling by writing its own rules when NERC rules lapse or expire. For example, when NERC’s guidance on calculating available space in transmission lines was set to retire, FERC proposed and finalized rules requiring transmission-line operators to accurately rate their lines for available space.³⁶⁶ These ratings are a key part of avoiding overcrowding (congestion) of the wires and thereby mitigating the risk of blackouts. They also help lower prices for consumers and inform decisions about the location of new generation.³⁶⁷ Indeed, FERC justified its jurisdiction in this area by noting that transmission-line congestion directly affects wholesale electricity rates.³⁶⁸

FERC also proactively requires access to some NERC information to determine whether new reliability standards are needed. For example, in 2016, FERC ordered NERC to grant FERC staff access to NERC databases that provide information on generation and transmission outages.³⁶⁹ These included, among others, the Generating Availability Data System, which RTOs and other entities rely upon in determining the amount of new generating capacity needed, as noted in Section II.A.2.³⁷⁰

Similarly, FERC has had to force NERC into an adequate response to the reliability issues posed by inverter-based resources (IBRs, which are mostly renewables).³⁷¹ As FERC noted in a series of November 2022 actions on these resources, NERC has taken numerous steps to identify the

364. One-Time Informational Reports on Extreme Weather Vulnerability Assessments; Climate Change, Extreme Weather, and Electric System Reliability, 87 Fed. Reg. 39414 (proposed July 1, 2022).

365. *Staff Presentation I NOPR on Transmission System Planning Performance Requirements for Extreme Weather*, FERC (June 16, 2022), <https://www.ferc.gov/news-events/news/staff-presentation-nopr-transmission-system-planning-performance-requirements> [https://perma.cc/J9BP-PJP9].

366. 18 C.F.R. § 35 (2019).

367. *Id.*

368. *FERC Issues Proposed Rulemaking on Transmission Line Ratings*, JDSUPRA (Dec. 11, 2020), <https://www.jdsupra.com/legalnews/ferc-issues-proposed-rulemaking-on-24323> [https://perma.cc/FM89-UTL9].

369. FERC Order No. 824, 155 FERC ¶ 61275 (2016).

370. *Id.* at *2 (2016 WL 3439798).

371. *See supra* note 298.

challenges related to inverter-based resources—including a task force, incident reports, technical reports, and a strategy document.³⁷² FERC found, however, that NERC’s “actions to date have not successfully addressed the most common reliability issues posed by IBRs.”³⁷³ Consequently, FERC ordered NERC to act—and to act expeditiously. In a Notice of Proposed Rulemaking, FERC required NERC to develop, within 90 days, a plan to develop reliability standards “addressing four reliability gaps pertaining to IBRs: (1) data sharing; (2) model validation; (3) planning and operational studies; and (4) performance requirements.”³⁷⁴

In forcing NERC to set necessary standards, FERC took note of the fact that NERC had already described the integration of IBRs as “the most significant driver of grid transformation.”³⁷⁵ Yet because of the SRO arrangement between FERC and NERC, FERC could not remedy this problem itself—instead, it had to take a circuitous path *through* NERC and hope that the organization develops high-quality standards.

The slow implementation of mandatory weatherization standards for generators offers another example of foot dragging. Following several cold snaps in the South, FERC repeatedly recommended mandatory weatherization standards. However, regional entities and NERC demurred.³⁷⁶ It was only after the 2021 reliability crisis in the South, coupled with pressure from FERC’s chairman, that NERC finally commenced a standard-review and standard-setting process for reliability during extreme cold-weather events and ultimately mandated that utilities prepare weatherization plans.³⁷⁷

372. Registration of Inverter-Based Resources, 181 FERC ¶ 61,124 at 28-29 (Nov. 17, 2022).

373. *Id.* at 29. NERC did itself propose one change to its reliability standards in response to its work studying IBRs, but this was a fairly minor definitional shift. *See Order Approving Reliability Standards FAC-001-4 and FAC-002-4*, 181 FERC ¶ 61,126 (Nov. 17, 2022).

374. *See Reliability Standards to Address Inverter-Based Resources*, 181 FERC ¶ 61,125 (proposed rule Nov. 17, 2022).

375. *Id.*

376. For Regional Entity reports recommending but not mandating winterization measures, see, for example, *ReliabilityFirst’s Review of Winter Preparedness Following the Polar Vortex*, RELIABILITYFIRST 7 (Nov. 13, 2015), <https://rfirst.org/about/publicreports/Public%20Reports/RF%20Review%20of%20Winter%20Preparedness%20Following%20the%20Polar%20Vortex.pdf> [<https://perma.cc/UV6V-3LDD>]. (providing that “entities *should* review their power plant weatherization programs” (emphasis added)); and Klass, Macey, Welton & Wiseman, *supra* note 5, at 1047-48 (describing NERC’s failure to mandate winterization measures for several years).

377. *Project 2021-07 Extreme Cold Weather*, NERC <https://www.nerc.com/pa/Stand/Pages/Project-2021-07-ExtremeColdWeather.aspx> [<https://perma.cc/M7MD-R3S3>]; Robert Walton, *FERC Chair Glick Wants Mandatory Winterization Standards for Power Plants Following Texas Grid Failure*, UTILITY DIVE (Sept. 24, 2021), <https://www.utilitydive.com/news/ferc-chair-glick-wants-mandatory-winterization-standards-for-power-plants/607111> [<https://perma.cc/A3TU-VYDX>]; *Order Approving Cold Weather Reliability Standards*, 176 FERC ¶ 61,119 (2021).

Despite important FERC efforts to update reliability standards for an electric era plagued by growing threats to the grid from climate change, FERC's ability to force NERC into action on these issues has proven slow and piecemeal under FERC's existing legal and policy tools. This inability is due in part to the limits that Congress places on FERC's jurisdiction and also, we argue, FERC's failure to fully exercise its existing jurisdictional authority. Under the present legal structure, FERC is allowed to (deferentially) approve or reject NERC standards—and to solicit NERC's development of new standards—but not to develop its own standards, modify proposed standards, manage NERC's messaging, or control how NERC standards infiltrate myriad areas of grid decision-making.³⁷⁸ FERC has also repeatedly been timid in flexing its existing jurisdictional powers to solve modern reliability issues that it could address through, for example, transmission siting and greater regional control over electricity flows and markets. This is in part due to political economy—the fear of recalcitrance by states that vehemently resist any efforts to require regional management of the grid or federal transmission line siting, for example.³⁷⁹ In its totality, the present FERC-NERC arrangement simply appears ill-suited for the dynamism and complexity of the modern grid.

IV. Assessing NERC's Structure in Light of the Evidence: Solutions for Grid Reliability in the Electric Era

As our analysis demonstrates, a sizeable gap has emerged between the nature of reliability challenges today and the strategies NERC is pursuing to address them. This gap, in turn, provokes the question of whether the institutional structure we have for managing grid reliability remains up to the task. In this Section, we return to self-regulatory theory to suggest several reasons that the answer is no. We then propose a range of structural and procedural changes that would move grid-reliability governance away from an SRO-dominant approach to better address the challenges explored in this Article.

378. See *infra* Section IV.B.2.i.

379. See, e.g., Klass, Macey, Welton & Wiseman, *supra* note 5, at 1040 (noting that after a federal court's rejection of a FERC attempt to use limited federal transmission-line siting authority, experts argued that FERC could have tried to use it again in light of the limited holding); Hannah J. Wiseman, *Regional Cooperative Federalism and the U.S. Electric Grid*, 90 GEO. WASH. L. REV. 147, 166 (2022) (describing the two orders in which FERC encouraged but did not mandate the formation of RTOs, which open up wholesale energy markets and allow more competitive generators, including renewable generators, to enter those markets); Iulia Gheorghiu, *Despite Authority to Require RTOs, Glick Says FERC Will Encourage Bottom-Up Approach to Creating Power Markets*, UTILITY DIVE (Dec. 3, 2021), <https://www.utilitydive.com/news/despite-authority-to-require-rtos-glick-says-ferc-will-encourage-bottom-up/610874> [https://perma.cc/P24W-RHJF]; Regional Transmission Organizations, 65 Fed. Reg. 810, 937 (Jan. 6, 2000) (codified at 18 C.F.R. pt. 35) (expressing concern about “usurp[ing] state authorities over siting, planning, and reliability of the transmission system.”).

A. The Gap Between SRO Theory and NERC Reality

In Section I.A., we presented three conditions that counsel in favor of industry self-regulation: expertise, incentives to self-police, and alignment of interests between the industry and its regulators. Throughout its existence, NERC has justified and defended its SRO status on precisely these grounds. But given the evidence amassed above and the many changes to the electricity sector in recent decades, does this logic still hold? This Section develops our contention that it does not, working factor by factor.

1. Expertise

The strongest factor still supporting SRO governance in the grid reliability context is NERC's technical expertise. Grid-reliability regulation is perhaps one of the most technically complex areas of the law, given the challenge of balancing massive quantities of generation and load in real time and maintaining a relatively constant and precise frequency within transmission lines. As we transition to more-intermittent renewable technologies that will require more storage and flexible response, we still need generation reserves (the traditional hallmark of reliability) that can be counted on to meet demand when needed.³⁸⁰ And until storage expands dramatically, grid operators will still have to manage the incredibly complex balancing of generation and load to maintain the sixty-hertz frequency in the wires.

NERC's expertise here is paramount. With members consisting of generators and transmission owners and operators, among others, NERC benefits from the on-the-ground knowledge of utility engineers.³⁸¹ In some evolving areas of grid reliability, however—such as distributed-energy resources like rooftop solar panels or small-battery storage—NERC has less experience. Although NERC members appear highly technically adept in managing a reliable power system based primarily on baseload resources, the organization has proven less competent at adapting to the reliability challenges posed by renewables. Some of its recent actions suggest that it lacks the expertise to respond to a fast-changing grid: for

380. See Sepulveda, Jenkins, de Sisternes & Lester, *supra* note 11, at 2404-06 (2018); Letter from Kenneth W. DeFontes, Jr., Chair, NERC Bd. of Trs., to Roy Jones, Chair, NERC Member Reps. Comm. (July 13, 2022), <https://www.nerc.com/gov/bot/Agenda%20highlights%20and%20Mintues%20202013/Policy-Input-Package-August-2022-PUBLIC-POSTING.pdf> [<https://perma.cc/5F2W-FGS9>].

381. It has proven difficult for FERC to pay engineers a competitive rate that lures them away from industry opportunities. See, e.g., Miranda Willson, *FERC Policy Chief Frets About Agency's Staff Openings*, E&E NEWS ENERGY WIRE (Sept. 30, 2022), <https://www.eenews.net/articles/ferc-policy-chief-frets-about-agencys-staff-openings> [<https://perma.cc/K9KD-UZVR>].

example, its frequency regulations simply failed to recognize the distinct technical challenges posed by inverters.³⁸²

Thus, industry expertise is no longer an absolute justification for industry self-regulation in the electric era. That said, in our proposed solutions, we recognize that enduring channels of critical knowledge counsel for preserving NERC in some form.³⁸³

2. Incentives to Self-Police

In the early years of NERC, when the industry was primarily comprised of a small group of vertically integrated public utilities, NERC could compellingly argue that there were strong incentives to self-police. A failure at one generating plant, transformer, transmission line, or distribution line can quickly cascade through an interconnected system, as shown by the Northeast blackout of 2003³⁸⁴—making electric utilities “hostages of each other.”³⁸⁵

However, the introduction of competition into the electric industry already began to erode this rationale for self-regulation. Recall that, in the 1990s, NERC *itself* begged Congress for legislation granting it official recognition and enforcement authority—largely because NERC worried that incentives to self-police were not present for independent generators entering the system.³⁸⁶

More recently, incentives to self-police have continued to diminish. The industry today is far more dynamic than it was even a decade ago. Renewable-energy installations have soared. There is growing use of distributed-energy resources like rooftop solar power, demand response (that is, the temporary reduction of energy use in lieu of generation), microgrids, and small batteries.

These changes break down industry unity in two ways. First, in modern energy markets, the existence of multiple actors makes it difficult to assign responsibility for discrete reliability issues. In the face of reliability crises, the industry splinters, devolving into a blame game rather than assuming that either NERC failed to properly write standards, or that utilities failed to properly follow them. This breakdown is not NERC’s fault. Perhaps more than anything, it is the doing of state and federal policies that have favored electricity restructuring and decarbonization. Nevertheless, the complex modern reliability landscape erodes a core justification for the ERO model. Today, our nation’s ERO is simply incapable of managing many of the most pressing challenges in the field.

382. *See supra* notes 314-316 and accompanying text.

383. *See infra* Section IV.B.

384. *See supra* notes 124-130 and accompanying text.

385. *See supra* note 59 and accompanying text.

386. *See supra* Section I.B.

Even so, one might imagine an idealized version of NERC actively voicing these challenges, pushing larger reforms, and empowering a fresh approach to reliability. But a second dynamic obstructs this vision: many of the entities charged with designing and implementing reliability standards—which are *all largely the same set of companies*, shuffled into different governance arrangements—have a financial interest in impeding decarbonization goals. Consequently, given these entities’ prominent role in NERC governance, we see NERC cling to outdated reliability paradigms, as traced in Section III.C, even as NERC staffers themselves often admirably identify and voice the need for change. And we see these market actors use NERC standards strategically to draft energy-market rules or make investment decisions that favor their own resources, as traced in Section III.D.

In sum, while the electric grid remains highly interconnected, the electricity industry has moved from relative unity into a rather pitched battle for market share and political power—eroding any self-policing tendencies that might have previously justified self-regulation.

3. Alignment of Interests/Accountability Mechanisms

Many of the same dynamics that erode electricity-industry incentives to self-police also erode any accountability regime that once existed between NERC, its members, and public regulators.

In brief, the key mistake here is one of pretending that FERC and NERC have a plausible handle on grid reliability under current jurisdictional and legal arrangements. As we have traced, the multifaceted nature and demands of grid reliability today mean that a complex array of actors contribute to the stability—or instability—of the grid.³⁸⁷ NERC’s traditional focus on reliability standards is necessary but woefully insufficient to guarantee the success of the grid in the electric era—even if it were focused on innovative solutions. NERC can set reliability-related standards for the bulk power system—but it cannot single-handedly guarantee that system’s success. In addition, RTOs must cooperate with FERC and utilities to plan a more robust transmission grid and fairly allocate its costs. RTOs’ electricity market design must adjust to the changing resource mix. States must agree to site new transmission lines, weighing such approvals against the possibility of building new generation—a decision that NERC standards can influence but not force. And states must decide what *type* of generation this should be: large or small, renewable or fossil, utility-owned or competitive.

We have presented evidence that despite NERC’s limited jurisdiction, it is not doing all it can to mandate, push, and cajole a more modern

^{387.} See Stein, *Regulating Reliability*, *supra* note 11, at 1194 (describing this array of actors and currently inadequate jurisdiction).

approach to reliability.³⁸⁸ Even as NERC remains slow to update standards, many of its older standards are used by other grid actors to justify interventions that slow the clean-energy transition and lock in outdated modes of ensuring reliability.³⁸⁹ This reality puts NERC out of alignment with the public interest, as expressed through amassing state and federal laws in favor of rapid decarbonization.

In response to our critiques, NERC might reasonably explain that it is simply not fair to expect it to fix the reliability challenges facing the grid today. It can only do so much through setting standards and issuing reports. We agree in principle with this point, but believe it cuts in favor of our argument. NERC's inability to manage grid reliability in the modern era is perhaps the most compelling reason to shift away from self-regulation, toward a more fulsome regulatory structure that can achieve a new reliability paradigm.

Other factors that sometimes call for SRO governance, such as innovation and the importance of flexibility, have also proven problematic in the grid reliability self-governance context. Self-regulation remains important with respect to jurisdiction: as we explore in our solutions, Canada and Mexico would have more difficulty incorporating U.S. governmental standards into their own laws, for example. But other features that might call for robust self-governance are lacking. With respect to the importance of innovation in grid reliability techniques as the climate-stressed grid rapidly evolves, as we have described, incumbent interests dominate the standard-writing process and tend to impede innovation and flexibility.³⁹⁰ Furthermore, NERC's governance has in some cases proven surprisingly inflexible and maladaptive, as in the context of the organization's failure to adopt updated inverter standards for solar generators, for example, and its foot dragging in other reliability areas.³⁹¹

We argue here for infusing more public authority within FERC, to varying degrees along a spectrum of meta-regulatory involvement. The public—whether FERC or direct representatives of, say, citizens' groups—will often not have the expertise needed to fully draft standards, thus suggesting a continued role for NERC. But greater public involvement will provide the *vision* and *impetus* for new, updated standards for the modern grid—a vision that NERC purports to have in its various reviews and reports but often fails to carry out in standard-setting processes. To translate this vision into action, the public will be a key entity to set clearer metrics and policy objectives for NERC, creating a sort of “embedded self-

388. *See supra* Part III.

389. *See supra* Section III.C.3.

390. *See supra* Section III.C.3.

391. *See supra* Section III.D.2.

regulation” that will steer reliability governance toward critical modern needs.³⁹²

B. Governance Solutions

For decades, NERC has done an admirable job of keeping the lights on most of the time, avoiding all but a few significant bulk power system failures. But as we have illustrated, the conditions that once justified self-regulation no longer exist. New and mounting pressures make NERC’s job not just more difficult but potentially untenable. The United States needs a more holistic, forward-looking reliability-governance model in order to embrace the potential of the electric era and address its challenges.

This Part offers a continuum of solutions that would improve U.S. reliability governance. These solutions range from smaller, internal procedural reforms within NERC to larger institutional changes in NERC’s and FERC’s roles in reliability governance. Below we sketch our broader theory and approach to improving NERC and reliability governance.

1. Internal Reforms

The first set of reforms that might improve reliability governance are internal to NERC. As our research highlights, NERC standard-setting often displays a proclivity for traditional reliability solutions, while failing to pursue reforms that might enhance the ability of newer resources to reliably serve the grid. Similarly, although NERC has repeatedly recognized the reliability threats posed by climate change, it has been slow to respond with new or updated standards, or to adequately penalize failures to comply. Further, NERC has failed to fully embrace the potential of low-carbon resources—particularly small-scale ones—to address climate-change mitigation and adaptation. These resources, such as renewable microgrids, reduce carbon emissions and can sometimes ride out weather extremes and other emergencies.

Several internal governance reforms might help align NERC’s agenda-setting and standard-setting with public priorities for the electric era. One possibility is board reform. NERC’s current board is elected by the industry and often comes from its ranks.³⁹³ Adding several more public representatives to the board—perhaps one-third of total membership—might help steer NERC’s priorities toward those of regulators. Ensuring

392. Omarova, *supra* note 41, at 703 (in the financial sector, arguing for a “strong and effective system of government regulation, which defines key policy objectives and monitors performance of self-regulatory institutions” and which involves self-regulation “firmly ‘embedded’ within the system of government regulation and oversight”).

393. See *Amended and Restated Bylaws*, NERC 6 (Apr. 5, 2021), <https://www.nerc.com/gov/Annual%20Reports/Amended%20and%20Restated%20Bylaws%204-5-21.pdf> [<https://perma.cc/H723-GM3D>].

that these representatives actually represent public interests will be a challenge, as shown by the financial sector, where the majority of the (private) Financial Industry Regulatory Authority's 'Board of Governors must be "public," but the board, some argue, is in fact dominated by those with strong "connections to the financial services industry."³⁹⁴ One solution is to require the public board members of NERC be publicly elected or appointed.³⁹⁵

Similarly, modifications to the composition of the standard-setting committee might help shift its incumbency bias by creating sectoral representation that better mirrors the state of the industry today.

Equally important are reforms to NERC's ballot body itself. As the composition of the electricity sector has dramatically shifted, voting rules have not kept pace. It should not be the case that utilities have at least three—and arguably five—times the voting power of independent generators or demand-side companies.³⁹⁶ Under FERC oversight, NERC should change its designations of industry segments and refine sectoral membership rules to better align with the modern industry and its shifting goals and paradigms.

We also believe that an independent committee, comprised of a mix of federal and state officials, should be constituted to review NERC's approach to reliability and its effectiveness in achieving publicly established reliability objectives. Independent review bodies bring a bird's-eye perspective and can push agencies in new directions.³⁹⁷ Such a committee could both evaluate NERC's progress and make suggestions for overcoming many of the jurisdictional gaps that plague reliability governance. Alternatively, the Government Accountability Office (GAO)—an existing agency already tasked with reviewing agency actions and making recommendations to agencies—could play this role.³⁹⁸

These suggestions for internal NERC reform are all relatively feasible. To force board and committee changes, FERC can use its certification authority over NERC, threatening to decertify it if it does not meet updated governance criteria that respond to changing grid

394. Edwards, *supra* note 49, at 575.

395. *Id.* at 614-15.

396. See *supra* note 221 and accompanying text.

397. For example, the National Transportation Safety Board—an independent federal agency—reviews the causes of transportation incidents, such as aviation or rail accidents, and recommends changes to agencies, such as the Federal Railroad Administration, to address these causes. *About Us*, NAT'L TRANSP. SAFETY BD., <https://www.ntsb.gov/Pages/home.aspx> [<https://perma.cc/HW2S-FRDQ>].

398. Indeed, the GAO has already stepped into an analogous role at times. In 2021, for example, it made recommendations to FERC for how to improve reliability coordination. U.S. GOV'T ACCOUNTABILITY OFF., GAO-21-346, ELECTRICITY GRID RESILIENCE: CLIMATE CHANGE IS EXPECTED TO HAVE FAR-REACHING EFFECTS AND DOE AND FERC SHOULD TAKE ACTIONS 44 (2008).

conditions.³⁹⁹ Similarly, either FERC or Congress could undertake the relatively noncontroversial step of constituting a new oversight committee.

These shifts might also facilitate real change within and beyond NERC. A more proactive standard-setting committee, coupled with a ballot body likely to approve of forward-looking changes, might significantly change both the content and pace of standard-setting around the clean-energy transition. A more publicly accountable NERC board could help advance such developments—and could shift NERC's rhetoric about the clean-energy transition from foot dragging to can-do spirit. At the same time, a move away from outdated standards would limit the ability of other grid actors to use NERC requirements as their own tactical delay tool.⁴⁰⁰

Despite these potential benefits, some might argue that adding independent oversight will, despite shifting reliability regulation toward an important modern focus, also increase bureaucratic red tape and further slow needed reliability reforms. This is a risk—but one we believe is justified by the need for transformative shifts in reliability governance to match public goals for the system.

Internal governance reforms cannot fully solve the challenges we have identified. As we have discussed, NERC also faces a legal and jurisdictional inability to respond to some of the most pressing reliability problems today. Accordingly, more robust reforms to reliability governance—external to NERC—are imperative.

2. External Reforms

To adequately drag grid reliability governance into the twenty-first century—toward a grid with numerous, diverse, flexible, and responsive resources and generation sources that can withstand or quickly bounce back from weather extremes—more extensive external reforms are likely necessary.⁴⁰¹ To be sure, such reforms will be difficult under current political-economic realities, given large utilities' outsized clout across multiple spheres of reliability governance (within NERC, regional entities, and RTOs, and at state public-utilities commissions). But more events like the Southern freeze of 2021, or worse, could galvanize public opinion, opening a window of opportunity for extensive governance changes.

Here we explore a range of such changes—some more fundamental than others—that should be considered if such a window materializes. Our proposals for external reform center on creating more public, comprehensive control over reliability governance. Today's highly

399. See 16 U.S.C. § 824o(c) (2018).

400. See *supra* Section III.D.

401. Scholars such as Amy Stein have also proposed comprehensive reliability reforms that accord with the ones presented here—though without a focus on NERC. See generally Stein, *Regulating Reliability*, *supra* note 11.

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networked grid needs a regulatory regime in which the federal agency notionally charged with ensuring grid reliability—FERC—can legally and practically accomplish the mission. To do so, FERC will need to assume a stronger role overseeing the numerous actors that currently possess separate and sometimes overlapping authority over reliability.

i. Modifying Deference and Restructuring FERC and NERC

The first larger institutional change that might improve reliability governance is a shift in the legal deference regime. As we explored in Part II, the current reliability process involves triple deference: As an expert agency, FERC receives deference from reviewing courts.⁴⁰² But FERC itself must give “due weight” to NERC’s technical expertise when reviewing NERC reliability, and NERC must presume that regional-entity reliability standards are “just and reasonable.”⁴⁰³ Although this triple deference standard allows FERC to reject NERC standards that are blatantly misguided,⁴⁰⁴ it does not give the agency much ability to *shape* NERC standards in its preferred directions. A deference regime that gave FERC the ability to employ its regulatory knowledge and priorities in reviewing proposed standards, and to request specific amendments in the public interest, could both speed up NERC standard-setting and help make it more responsive to administrative imperatives.⁴⁰⁵ This would, of course, require statutory reform, as the Energy Policy Act of 2005 mandates these deference standards. But again, with a galvanizing moment such as another nationally relevant reliability incident, Congress could be spurred to act.

A bolder set of reforms would more fundamentally change the structure of reliability governance—a move that we think may be necessary in light of the growing complexity of grid reliability in the electric era. As we have highlighted throughout this Article, reliability governance is multifaceted and extends well beyond reliability standards. Reliability now also hinges on proper linkages between the electric and gas systems, interconnection rules for renewables and microgrids, the shape and size of the interstate transmission network, and a well-planned balance among resources with different performance characteristics. Accordingly, the case

402. See Hammond, *supra* note 5, at 1710-11 (describing the pernicious impacts of embedded deference).

403. 16 U.S.C. § 824o (2018).

404. It is not uncommon for FERC to send NERC’s proposed reliability standards back for revision. In one of its early bulk orders on NERC’s proposed reliability standards, FERC designated twenty-four of eighty-three proposed mandatory and enforceable reliability standards as “pending,” citing concerns about preventing blackouts. See *Mandatory Reliability Standards for the Bulk-Power System*, 118 FERC ¶ 61,218 (2007).

405. Cf. U.S. GOV’T ACCOUNTABILITY OFF., *supra* note 398, at 44 (noting that FERC “could require NERC to update reliability standards to specifically address climate change”).

has strengthened for vesting more power in a public, centralized entity to oversee the multifaceted nature of reliability in the electric era.⁴⁰⁶

One approach would be for FERC's Office of Electric Reliability (OER), which currently serves an oversight and collaborative role with NERC and states,⁴⁰⁷ to have the primary authority to propose reliability standards to FERC. In this restructuring, NERC might become a nested entity within this office, free to suggest, support, or oppose standards but not to drive the standard-setting agenda. This traditional notice-and-comment approach to standard-setting would facilitate broader participation, in recognition of the broader expertise necessary to manage reliability in the electric era. And it would eliminate NERC members' ability to gatekeep the types of standards developed and proposed. At the same time, maintaining the structures and membership of NERC and regional entities and giving them prominent access to FERC officials would preserve their expertise regarding system-wide needs and characteristics, regional variations in climate impacts, and those impacts' relationship to reliability.

Of course, there are risks to this model as well: notice-and-comment rulemaking has spawned a huge range of related litigation that could entangle publicly set standards (especially in an era of decreasing agency deference),⁴⁰⁸ and NERC might be less willing to lend its expertise under this model as well. But ultimately, we think the benefits of consolidated and publicized processes outweigh hypothetical drawbacks, especially since standard-setting is too slow and already deeply proceduralized under the current model.

One other challenge of shifting standard-setting responsibility to FERC would be NERC's international nature. The Canadian provinces that have agreed to NERC jurisdiction explicitly avoid any U.S. *federal-government* authority over them. Revised memoranda of understanding between Canadian provincial governments and FERC could address this issue. Canadian provinces could indicate their intent merely to harmonize regulatory standard-setting but explicitly disclaim any accession to U.S. jurisdiction, as could Mexico if and when it fully embraces NERC standards.

ii. FERC as the “Reliability Fed”

It may be time to go bigger yet and vest FERC with the full authority it needs to properly manage reliability in the electric era—making it the

406. See Stein, *Regulating Reliability*, *supra* note 11, at 1238-61 (describing factors supporting FERC jurisdiction over “system-wide reliability”).

407. *Office of Electric Reliability*, FERC, <https://www.ferc.gov/office-electric-reliability-oer> [<https://perma.cc/4HS8-3ZZN>].

408. See, e.g., Nicholas Bagley, *The Procedure Fetish*, 118 MICH. L. REV. 345, 356-57 (2019).

“Fed” of electric-grid reliability. Under this model, Congress would assign FERC control over all critical functions of reliability governance, including, for example, reliability standard setting and enforcement, transmission planning and siting, regional resource adequacy, and integration of energy storage and other flexible resources.⁴⁰⁹ FERC would draft and finalize reliability standards in all of these areas—with the advice of NERC—allowing FERC far more comprehensive planning and control over the many facets of grid management that influence reliability.

FERC already takes action in several of these areas, including electricity-market oversight, interconnection policies, and mandates for regional and interregional transmission planning.⁴¹⁰ But in other areas, it lacks control—including the initial crafting of reliability standards (as we have documented), electricity market design and participation rules,⁴¹¹ transmission siting, and regional resource adequacy.⁴¹² Placing a comprehensive set of reliability functions firmly within FERC’s jurisdiction would help synthesize what is currently a highly scattered approach to reliability.

Just as the stability of the entire U.S. financial system is entrusted to the Federal Reserve, fully functional reliability governance requires a national, centralized, top-down entity with comprehensive responsibility for the reliability of the entire U.S. electric grid.⁴¹³ The Fed is unique in the breadth of its responsibilities: it steers national monetary policy by establishing interest rates and purchasing securities, among other measures.⁴¹⁴ It also ensures the health of individual financial institutions by regulating them and, through regional reserve banks, serving as a “bank for banks”—lending them money and processing transactions among banks.⁴¹⁵

FERC is the closest institution the United States has to the Fed in the energy context. But in contrast with the Fed, FERC faces key limitations on its authority, created through the FPA’s splintering of jurisdiction between the federal government and the states.⁴¹⁶ and the many varieties of self-regulation embedded within electricity law (including NERC,

409. Cf. LAWSON, *supra* note 302, at 16 (“Congress could assess whether the existing regulatory framework is sufficient to maintain reliability given the changing mix of energy sources used for electricity generation.”).

410. See Stein, *Regulating Reliability*, *supra* note 11, at 1236 (noting FERC’s efforts in some of these areas but arguing for broader FERC controls).

411. See Welton, *supra* note 174, at 218.

412. See Stein, *Regulating Reliability*, *supra* note 11, at 1195 (highlighting the importance of transmission planning to reliability).

413. *The Fed Explained: What the Central Bank Does*, FED. RSRV. SYS. 1 (2021) <https://www.federalreserve.gov/aboutthefed/files/the-fed-explained.pdf> [<https://perma.cc/SX7U-V6NZ>].

414. *Id.* at 24.

415. *Id.* at 11.

416. See *supra* note 86 and accompanying text.

RTOs, and regional entities). Bolstering FERC's authority would likely require reforms to both sets of limitations.

To address the federalism divide, Congress could extend FERC's reach over retail electricity specifically in the context of reliability. Such a move would allow FERC clear jurisdiction to mandate that retail utilities consider the use of microgrids, battery storage, or enhanced demand response in addition to traditional reliability measures such as the "hardening" of electric-distribution wires.⁴¹⁷ Alternatively, FERC might create a federal-regional-state authority in which RTO members, state public-utility commissioners, and the Commission had voting authority. This commission could jointly govern those aspects of reliability that inextricably spill across jurisdictional lines. There are examples of this approach in governing shared environmental resources such as rivers; educational policy; some shared physical infrastructure, such as bridges and airports; and financial risk—although none that has functioned without challenges.⁴¹⁸

Relegating NERC to the status of an advisory entity to FERC would raise a variety of objections, but most would be the same arguments that NERC has raised before when threatened with more public-reliability regulation.⁴¹⁹ These objections would include, for example, arguments that NERC is an effective SRO due to the interdependence of its actors, the risk of collective failure, and the tight-knit nature of its actors. But as we have documented, all of these conditions have substantially changed. And the most compelling reason for the continued reliance on an SRO for U.S. grid-reliability governance—industry expertise—would be preserved by maintaining NERC as an important advisory entity to FERC.

Another challenge of making FERC the "Reliability Fed" would be its limited resources. FERC is already tasked with a wide range of energy-related functions, such as oversight of interstate oil-pipeline tariffs, granting of certificates and eminent-domain authority for interstate

417. Stein provides other examples of areas ripe for more federal control over retail reliability, such as requirements to protect power substations on the distribution grid from attack. Stein, *Regulating Reliability*, *supra* note 11, at 1233-34.

418. See generally Dave Owen & Hannah J. Wiseman, *Coequal Federalism and Federal-State Agencies*, 55 GA. L. REV. 287 (2020) (describing this form of governance, assessing its benefits and drawbacks, and providing examples). The difficulty of bringing together parallel actors within one organization and achieving effective, coordinated action is highlighted by organizations such as the Federal Stability Oversight Council (FSOC) in the financial regulatory area. Congress created FSOC to achieve the same types of goals that we highlight in the electric reliability context: addressing "regulatory gaps" and facilitating "information sharing and coordination" of information about risks. See *Financial Stability Oversight Council*, U.S. DEP'T OF THE TREASURY, <https://home.treasury.gov/policy-issues/financial-markets-financial-institutions-and-fiscal-service/fsoc> [https://perma.cc/WH7B-RJWZ]; *About FSOC*, U.S. DEP'T OF THE TREASURY, <https://home.treasury.gov/policy-issues/financial-markets-financial-institutions-and-fiscal-service/fsoc/about-fsoc> [https://perma.cc/JLY9-5VGJ]. But there is so much disagreement among the members that FSOC has had trouble achieving its congressional mandates of identifying and addressing risks to financial stability.

419. See *supra* Section I.B.

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natural-gas pipelines, and a variety of functions relating to wholesale electricity and transmission rates. But FERC already has basic staffing to review NERC's actions and work with NERC to examine the causes of reliability incidents.⁴²⁰ These positions could be enhanced with budget modifications. Congress has recently demonstrated its willingness to pour billions of dollars into a modernized, reliable grid through the Infrastructure Investment and Jobs Act and the Inflation Reduction Act.⁴²¹ If this modern, “greener” grid is not reliable, federal efforts to transform the grid are likely to fall flat due to enhanced public opposition. Investment in a governance system that would better ensure reliability would thus likely have large returns.

We have barely scratched the surface of the interesting debates to be had about the merits of these major potential changes in federal-state jurisdictional lines in energy law. Our point here is to emphasize that shifting the degree of NERC self-regulation cannot itself solve many of the challenges plaguing grid reliability, because the legal challenges extend well beyond questions over self-regulation. A major overhaul of the system—should it become politically possible—must attend to all these dimensions of the modern reliability challenge.

iii. NERC as the Reliability Expert

Whither NERC in this new world of reliability regulation? We do not see NERC as unnecessary or impotent in these new regimes; rather, its technical expertise will remain crucial. At present, we worry that NERC's technical strengths often mask the need for revised and expanded reliability approaches, as other agencies tend to simply assume that complex, highly technical standards are adequate. But these technical

420. These staff appear to primarily work in the FERC Office of Electrical Reliability and Office of Enforcement. *See, e.g.*, Press Release, NERC, NERC and FERC Staff Recognized for Work on Joint Cold Weather Inquiry (Nov. 18, 2021), <https://www.nerc.com/news/Pages/NERC-and-FERC-Staff-Recognized-for-Work-on-Joint-Cold-Weather-Inquiry.aspx> [<https://perma.cc/WH2M-ZJXZ>]. There are approximately fifteen deputy directors and managers within FERC's Office of Electric Reliability. *OER Org Chart*, FERC (Dec. 1, 2021), <https://www.ferc.gov/media/oer-org-chart-0> [<https://perma.cc/X573-2MDT>].

421. Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, 135 Stat. 429 (2021); Inflation Reduction Act, Pub. L. No. 117-169, 136 Stat. 1818 (2022); *see* Adam Wilson, *As IRA Drives Renewables Investment, Attention Turns to Transmission Upgrades*, S&P GLOB. (Sept. 27, 2022), <https://www.spglobal.com/marketintelligence/en/news-insights/research/as-ira-drives-renewables-investment-attention-turns-to-transmission-upgrades> [<https://perma.cc/PVY8-REWR>] (noting that the Inflation Reduction Act “set aside \$5 billion for direct loans for the construction, modification or repowering of generation and transmission facilities,” and that the Department of Energy’s “Building a Better Grid Initiative” uses \$12.5 billion in Infrastructure Investment and Jobs Act funding for enhancing grid reliability); Grid Deployment Off., *Request for Information: Grants to Facilitate the Siting of Interstate Electricity Transmission Lines*, U.S. DEP’T OF ENERGY 2 (Jan. 13, 2023), <https://www.energy.gov/sites/default/files/2023-01/IRA%2050152%20Transmission%20Siting%20and%20Economic%20Development%20Grants%20RFI.pdf> [<https://perma.cc/JNH3-APS4>] (noting “\$2 billion in loan authority to support transmission facility financing . . . and \$760 million in grant authority to facilitate the siting and permitting of interstate electricity transmission lines” under the Inflation Reduction Act).

strengths are difficult to replace. FERC has difficulty hiring electrical engineers,⁴²² and NERC—comprised of industry members intimately familiar with the wires, substations, software, repair practices, and droves of other technical infrastructure and actions necessary to maintain reliability—has a long-curated trove of technical knowledge.

But as we have traced, reliability in the electric era requires far more than technical standards. It requires a reconfiguration of the entire electric system toward one that more substantially integrates and balances distributed resources, consumer-demand reductions, and far-flung utility-scale renewable generation plants. How precisely to harness NERC's expertise in a more centralized system—without having it unduly influence regulators—is a difficult question. We see a continuing role for the agency in identifying areas of grid weakness and vulnerability, preparing retroactive reviews of reliability incidents, gathering data on individual generation outages through the Generating Availability Data System, and implementing simulations to practice responses to reliability threats.

In short, we recommend that NERC continue carrying out most of its current responsibilities—but more in an advisory role than a formal governance role. This will force FERC to take more ownership of reliability standards and the many other facets of reliability governance that demand an accountable, comprehensive, integrated approach. NERC, in turn, will continue to provide the valuable information and technical support necessary for effective grid-reliability governance.

Conclusion

The United States has the least reliable electricity system of any developed country. Things do not look set to improve: wildfires, droughts, floods, and increasingly extreme storms exacerbated by climate change are pummeling regions throughout the country. We have traced several reasons to believe that NERC's self-regulatory model—heretofore a fairly trustworthy way of ensuring grid reliability—will falter under these conditions. Although NERC might once have effectively policed a tight-knit group of similar industry actors, the electric industry has changed dramatically over the years in ways that undermine self-regulation.

Drawing from both SRO and energy-law scholarship, we argue for a revitalized approach to U.S. grid reliability, moving along the continuum of self-regulation toward enhanced federal-government control. And we contend that at minimum, NERC's internal governance structures and the deference to utilities baked into reliability governance must change. More fundamentally, FERC needs broader jurisdiction within this space, as others have persuasively argued.⁴²³

422. See *supra* note 380.

423. See, e.g., Stein, *Regulating Reliability*, *supra* note 11, at 1262.

Grid Reliability in the Electric Era

Our goal has been to drag an understudied yet vastly important private governance organization into the limelight, highlighting NERC's central role in maintaining grid reliability. We hope our examination proves fruitful for SRO theory and energy law alike. NERC is an unusual and understudied example of SRO federalism, raising particularly challenging questions about the dynamics of private delegation under shifting public priorities and physical conditions.⁴²⁴ At the same time, as we have traced, NERC is but one piece of the larger, siloed, jurisdictionally complex tapestry of energy governance that may need reforming for the electric era.⁴²⁵ It is of paramount importance to develop a regulatory apparatus capable of managing reliability through this coming era. In the words of California Energy Commissioner Siva Gunda, "If we stumble on keeping the lights on, the whole climate agenda is at risk."⁴²⁶

424. Emily Hammond's work has sparked an important conversation in this area and provided an important framework for analysis of delegation to SROs. *See* Hammond, *supra* note 5, at 1741-47.

425. We focus directly on these silos in our previous article *Grid Reliability Through Clean Energy*. *See generally* Klass, Macey, Welton & Wiseman, *supra* note 5. Amy Stein has also done important work framing and analyzing these silos. *See* Stein, *Regulating Reliability*, *supra* note 11, at 1196.

426. Anne C. Mulkern, *California Faces Summer Blackouts from Climate Extremes*, SCI. AM. (May 23, 2022), <https://www.scientificamerican.com/article/california-faces-summer-blackouts-from-climate-extremes> [https://perma.cc/S7LJ-885A].