NOTES

WATT ABOUT IT: CLIMATE RESILIENCE IN THE ELECTRIC UTILITY SECTOR—HOW STATE REGULATORS CAN APPLY TORT'S FORESEEABILITY PRINCIPLE TO COMPEL CLIMATE RESILIENCE

*Liam Fine**

The electric grid is the bedrock of modern society, but recent climate events have highlighted that it may be vulnerable to extreme weather. One possible explanation for the grid's climate sensitivity is that its vast, interconnected hardware is exposed to the elements and has been built to withstand historical environmental conditions. Due to climate change, however, historical data regarding temperature, precipitation, and extreme weather is no longer reliably predictive of future conditions. As a result, there exists a significant and growing divergence between the level of protection afforded to existing grid infrastructure and the degree of protection needed to withstand climate change. Despite an urgent need to proactively adapt the grid to withstand future conditions, utilities and their supervising regulatory bodies have largely failed to engage in meaningful, forward-looking climate resilience.

To combat this problem, this Note offers an original proposal that seeks to introduce a forward-looking mechanism—arising out of tort law's foreseeability principle—into the utility regulatory regime to catalyze climate resilience in the sector. The foreseeability principle will effectively layer a prospective valence over the ratemaking process, thereby forcing regulators and utilities alike to confront climate change's anticipated grid impacts. Under this revamped regulatory structure, utilities that continue to rely on historic climate data will be subject to regulatory holdups during the ratemaking process and may even face legal liability; this Note hypothesizes that the very threat of such setbacks is likely to induce utilities to retire legacy practices and instead embrace forward-looking climate projections as a means of informing proactive resilience measures capable of protecting the grid in the face of climate change.

INTRODUCTION 2243
I. BACKGROUND: CLIMATE CHANGE, RESILIENCE, AND UTILITY REGULATION 2247

* J.D. Candidate 2023, Columbia Law School.

A. The Current State of the Climate Crisis and Its Impact on the Utility Sector 2247
1. The Latest Climate Trends....................2247
2. The Energy Sector Is Particularly Vulnerable to Climate Change 2247
3. Climate Modeling: Modern Techniques Can Reliably Predict Many Climate Impacts 2249
B. Combatting Climate Change in the Electric Utility Sector—Mitigation vs. Adaptation Strategies....................2250
C. How Are Electric Utilities Regulated in the United States?....................2251
1. Meeting the Key Players: Utilities, Customers, and Regulatory Bodies....................2251
2. Understanding the Ratemaking Process 2252
3. Understanding the Ratemaking Principles 2254
II. THE PROBLEM: CLIMATE RESILIENCE IS A NECESSARY ENDEAVOR FOR ELECTRIC UTILITIES, BUT ONE THE SECTOR HAS LARGELY FAILED TO PRIORITIZE....................2256
A. The Utility Sector Has Largely Failed to Combat Future Climate Risk via Adaptation....................2256
B. A Few Reasons Why Utilities Have Largely Neglected Climate Resilience....................2259
1. Federal and State Legislative Initiatives Have Failed to Encourage Climate Planning 2259
2. State Regulators Have Failed to Broaden Ratemaking Principles to Compel Resilience 2261
C. The Current Scholarship in This Area Fails to Solve the Problem 2263
III. THE SOLUTION—INJECTING TORT'S FORESEEABILITY PRINCIPLE INTO RATEMAKING....................2266
A. Pursuing Resilience via State Utility Regulation Rather Than Legislation 2266
B. Breaking the Barrier: Modifying the Ratemaking Regime to Accommodate Tort Law 2268
C. Modifying the Existing Regulatory Regime—Legal Mechanics and Anticipated Benefits....................2269
1. Understanding the Fundamental Elements of Tort Law....................2269
2. Injecting Tort's Foreseeability Into the Regulatory Regime....................2270
3. An Illustrative Example of the Ratemaking Process With an Explicit Foreseeability Component 2272

4. The Theory in Practice: A Case Study on Consolidated Edison and the NYPSC 2275
5. Anticipated Counterarguments and Rebuttals 2278
CONCLUSION 2283

INTRODUCTION

For most Texans, Valentine's Day in 2021 was far from a romantic ideal. Winter Storm Uri pummeled the state with record-setting ice and snowfall, which triggered cascading failures for the state's insufficiently weatherized electric grid.[1] Roughly 70% of Texans were without power for an average of forty-two hours.[2] Winter Storm Uri is believed to be responsible for 246 deaths[3] and $130 billion in economic loss.[4] While Texas has experienced at least three other severe freezes in the last thirty years, Winter Storm Uri's devastation was unparalleled,[5] and many attribute the storm's impact to a confluence of magnified climate risk and inadequate grid adaptation.[6]

A similar tale looms over Puerto Rico and its experience with Hurricane Maria in 2017. The Category 4 storm[7] was responsible for an

1. Kara Norton, Why Texas Was Not Prepared for Winter Storm Uri, PBS (Mar. 25, 2021), https://www.pbs.org/wgbh/nova/article/texas-winter-storm-uri/ [https://perma.cc/L25G-QCKA].

2. Neelam Bohra, Almost 70% of ERCOT Customers Lost Power During Winter Storm, Study Finds, Tex. Trib. (Mar. 29, 2021), https://www.texastribune.org/2021/03/29/texas-power-outage-ERCOT/ [https://perma.cc/L4UH-C8QY].

3. Tex. Dep't of State Health Servs., February 2021 Winter Storm-Related Deaths—Texas 2 (2021), https://www.dshs.texas.gov/news/updates/SMOC_FebWinterStorm_MortalitySurvReport_12-30-21.pdf [https://perma.cc/KPZ7-VQFT]; Patrick Svitek, Texas Puts Final Estimate of Winter Storm Death Toll at 246, Tex. Trib. (Jan. 3, 2021), https://www.texastribune.org/2022/01/02/texas-winter-storm-final-death-toll-246/ [https://perma.cc/XHL8-ZJYG].

4. 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, 1 ("Economic losses from lost output and damage [from the freeze] are estimated to be $130 billion in Texas alone.").

5. Id.

6. See, e.g., id. at 2, 8 (describing Texas's failure to sufficiently weatherize its electricity and gas systems, as well as the additional strain brought on by climate-change induced extreme weather events).

7. Michon Scott, Hurricane Maria's Devastation of Puerto Rico, Nat'l Oceanic & Atmospheric Admin. (Oct. 19, 2021), https://www.climate.gov/news-features/understanding-climate/hurricane-marias-devastation-puerto-rico [https://perma.cc/5F3A-PYKR] (highlighting that while Hurricane Maria "alternated between Category 4 and 5 as it approached Puerto Rico," the storm made landfall as a "Category 4 storm, although meteorologists have no land-based records of Maria's maximum winds because the storm damaged most of Puerto Rico's wind sensors").

estimated 4,645 deaths[8] and the longest blackout in U.S. history.[9] It took eleven months and $3.2 billion for the island's only electric utility—bankrupted as a result of the storm—to restore power.[10] Puerto Rico is no stranger to hurricanes, but many climatologists hypothesize that climate change likely enhanced Hurricane Maria's ferocity and also has the potential to make similar storms about ten times more likely to occur in the future.[11]

Winter Storm Uri and Hurricane Maria are only two of several recent examples where climate change has exposed just how vulnerable the electric grid is to extreme weather. Since many climate experts anticipate that these types of weather events will occur with increased regularity and intensity going forward, it is imperative that utilities identify why the grid is particularly susceptible to climate impacts.[12] The most likely answer lies in the fact that the grid—which consists of exposed hardware across large swaths of territory—has been built to withstand *historical* climate conditions, which, because of climate change, no longer track current or projected future conditions.[13] Accordingly, if the grid is to withstand the

---

8. Nishant Kishore, Domingo Marqués, Ayesha Mahmud, Mathew V. Kiang, Irmary Rodriguez, Arlan Fuller, Peggy Ebner, Cecilia Sorensen, Fabio Racy, Jay Lemery, Leslie Maas, Jennifer Leaning, Rafael A. Irizarry, Satchit Balsari & Caroline O. Buckee, Mortality in Puerto Rico After Hurricane Maria, 379 New Eng. J. Med. 162, 162, 166 (2018) (estimating a mortality rate of 14.3 deaths per 1,000 persons at a 95% confidence interval, which implies a total death count for the storm of 4,645).

9. This record-breaking blackout was also the second-largest in world history. Over 3.4 billion hours of electric service were lost, and the average household was without power for eighty-four days. Doug Criss, Puerto Rico's Power Outage Is Now the Second-Largest Blackout on Record, CNN (Apr. 16, 2018), https://www.cnn.com/2018/04/16/us/puerto-rico-blackout-second-largest-globally-trnd/index.html [https://perma.cc/S3WQ-PVCF].

10. Frances Robles, Puerto Rico Spent 11 Months Turning the Power Back On. They Finally Got to Her., N.Y. Times (Aug. 14, 2018), https://www.nytimes.com/2018/08/14/us/puerto-rico-electricity-power.html (on file with the *Columbia Law Review*).

11. Jeff Goodell, The Perfect Storm: How Climate Change and Wall Street Almost Killed Puerto Rico, Rolling Stone (Sept. 12, 2018), https://www.rollingstone.com/politics/politics-features/puerto-rico-hurricane-maria-damage-722570/ [https://perma.cc/24RM-JMBT] (quoting Professor Kerry Emanuel from MIT who emphasized that "Category 5 storms like Maria will go from a one-in-800-years event to a one-in-80-years event" by 2100).

12. See U.S. Glob. Change Rsch. Program, Fourth Nat'l Climate Assessment, Impacts, Risks, and Adaptation in the United States: Report-in-Brief 12 (D.R. Reidmiller, C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock & B.C. Stewart eds., 2018), https://nca2018.globalchange.gov/downloads/NCA4_Report-in-Brief.pdf [https://perma.cc/CD9W-L3R6] ("More frequent and intense extreme weather and climate-related events, as well as changes in average climate conditions, are expected to continue to damage . . . [already] aging and deteriorating infrastructure.").

13. See id. at 38 ("Current infrastructure is typically designed for historical climate conditions and development patterns . . . resulting in increasing vulnerability to future risks from weather extremes and climate change. Infrastructure age and deterioration make failure or interrupted service from extreme weather even more likely." (citations omitted)).

climate crisis, then utilities "must fundamentally rethink their approach."[14]

Despite the urgent need to act, however, utilities have largely failed to proactively engage in serious climate adaptation.[15] The industry is plagued by a "climate resilience gap," whereby a significant and growing divergence exists between the current level of protection afforded to critical grid infrastructure and the degree of protection needed to withstand the climate crisis.[16]

Utilities, however, are not solely to blame: Their supervising regulatory bodies have also largely failed to prioritize resilience.[17] In the United States, utilities are regulated by federal, state, and local entities, with state Public Service Commissions (PSCs)[18] typically exerting the closest degree of oversight.[19] These state commissions review and must ultimately approve some of the critical elements of a utility's business, ranging from rates and service terms, to capital projects and resource strategies.[20] When conducting these duties, a PSC typically considers whether a utility's business plan complies with principles of (1) prudence, (2) least-cost, and (3) used and useful.[21] Together, these three ratemaking components require the utility to make *reasonable efforts* to meet energy

14. Romany M. Webb, Michael Panfil & Sarah Ladin, Climate Risk in the Electricity Sector: Legal Obligations to Advance Climate Resilience Planning by Electric Utilities, 51 Env't L. 577, 579 (2021).

15. Craig D. Zamuda, Thomas Wall, Leah Guzowski, Joshua Bergerson, Janet Ford, Lawrence Paul Lewis, Robert Jeffers & Sean DeRosa, Resilience Management Practices for Electric Utilities and Extreme Weather, Elec. J., Nov. 2019, at 1, 1 ("[T]he practice of planning for and implementing resilience strategies is not yet universal among the Nation's utilities. In many cases, utilities are just beginning to consider or project how changes in extreme weather and climate will affect their operations, infrastructure, and business future.").

16. Sophie Marjanac & Lindene Patton, Extreme Weather Event Attribution Science and Climate Change Litigation: An Essential Step in the Causal Chain?, 36 J. Energy & Nat. Res. L. 265, 276 (2018).

17. Robert Walton, Are Utilities Legally Required to Plan for Climate Change? 'The Devil Is in the Details.', Util. Dive (Dec. 8, 2020), https://www.utilitydive.com/news/are-utilities-legally-required-to-plan-for-climate-change-the-devil-is-in/591744/ [https://perma.cc/S4C9-GS7V] (emphasizing that commissioners "still have not yet confronted [resilience] on a state-by-state regulatory basis").

18. "PSC" is a general term used to refer to the respective utility regulatory commission in a given jurisdiction.

19. Jim Lazar, Regul. Assistance Project, Electricity Regulation in the US: A Guide 3 (2d ed. 2016), http://www.raponline.org/wp-content/uploads/2016/07/rap-lazar-electricity-regulation-US-june-2016.pdf [https://perma.cc/UHE9-GRY4].

20. Id.

21. Id.; see also Webb et al., supra note 14, at 610–20 (identifying that the three key ratemaking components are "the prudence standard," "the least cost principle," and "the used and useful test").

demand by providing *reliable service* to customers at the *lowest possible cost.*[22]

A critical failure, however, stems from the fact that PSCs, despite their influence over utility behavior, have not updated the ratemaking principles to reflect the new climate reality. As a result, PSCs have continued to validate utilities' use of historic climate data in the infrastructure design process, even though such data is an increasingly unreliable predictor of future weather patterns.[23] Thus, by applying prudence, least-cost, and used and useful in a manner that does not incorporate observable shifts in baseline weather patterns, PSCs have largely failed to introduce climate resilience into the ratemaking process.[24]

To combat this problem and compel climate resilience, this Note offers an original proposal advocating for the injection of an explicit, forward-looking mechanism into the utility regulatory regime. To provide this prospective focus, this Note looks to other areas of the law before ultimately pinpointing tort's foreseeability principle. In tort law, foreseeability is the standard by which liability attaches to a defendant: An actor, owing a duty of care to another, is negligent if he knew or should have known of certain foreseeable risks but nonetheless fails to take reasonable precautions.[25] Mapping this construct onto utility ratemaking, foreseeability will apply a prospective valence over prudence, least-cost, and used and useful to require utilities to study future climate risks and take necessary precautions ex ante to avoid environmental harms ex post. Thus, relative to the existing scholarship in this area which tends to treat regulatory and tort law as separate, siloed legal channels, this Note instead emphasizes that the two disciplines should commingle in order to catalyze forward-looking resilience planning across the utility sector.

This Note proceeds in three parts. Part I contextualizes the climate crisis as it relates to electric utilities and provides an overview of resilience and utility regulation. Part II unpacks the core problem this Note seeks to address, namely, that utility and regulatory inaction has generated a resilience gap that exposes the electric grid to foreseeable climate risks. Part III offers a solution, suggesting that tort's foreseeability princi-

22. Lazar, supra note 19, at 174 (highlighting that utilities are required to ensure "reliable service at [a] reasonable cost while [also] meeting societal goals," a process that "involves balancing the interests of utility investors, energy consumers, and the entire economy").

23. U.S. Glob. Change Rsch. Program, supra note 12, at 30–38.

24. Webb et al., supra note 14, at 610–24.

25. Restatement (Third) of Torts: Liab. for Physical & Emotional Harm §§ 3–7, 29 (Am. L. Inst. 2010); see also Fowler V. Harper, Foreseeability Factor in the Law of Torts, 7 Notre Dame L. Rev. 468, 469 (1932) ("[T]he foreseeability factor is essential to liability . . . . [W]hile one may not be held legally responsible merely because the harm caused was to be anticipated, he is never held liable unless it was, in some sense, foreseeable.").

ple can be woven into utility ratemaking as a legal mechanism capable of compelling forward-looking climate planning.

I. BACKGROUND: CLIMATE CHANGE, RESILIENCE, AND UTILITY REGULATION

A. *The Current State of the Climate Crisis and Its Impact on the Utility Sector*

1. *The Latest Climate Trends.* — Allison Crimmins, Director of the National Climate Assessment (NCA), recently stated: "Climate change isn't something that's happening far away to someone else in some far-off future time. It's really happening here and now . . . ."[26] The NCA is an official climate report authorized by Congress under the Global Change Research Act.[27] Published every four years, the report analyzes the latest climate data, studies the interplay between climate change and society, and forecasts climate outcomes along a range of scenarios.[28] The latest Assessment, NCA4, was published in 2018 and offers a few significant conclusions.[29] First, the report suggests that global average temperatures are much higher and rising more rapidly than ever before.[30] Thus, it can no longer be assumed that future weather conditions will track past patterns, which renders historic data only nominally useful in terms of projecting future climate conditions.[31] Second, the NCA4 concludes that changes in average climate conditions, as well as more frequent and intense extreme weather, will likely damage infrastructure, ecosystems, and social systems to a degree beyond that which is currently observed.[32] Third, the report suggests that while climate change is irreversible, it is not necessarily too late to pursue mitigation measures or adapt critical infrastructure to decrease the magnitude of future climate impacts.[33] Overall, the NCA4 paints a fairly grim picture for the future, concluding that society is threatened by foreseeable, cross-cutting climate risks.

2. *The Energy Sector Is Particularly Vulnerable to Climate Change.* — Another key takeaway from the NCA4 is that climate threats are nonuniform, as some industries are more susceptible than others to environmental harms. This is especially true of the electric sector: "Climate change and extreme weather events are expected to increasingly disrupt our Nation's energy . . . systems, threatening more frequent

---

26. Rachel Treisman, What the U.S. Can Do About the Dire Climate Change Report, NPR (Aug. 9, 2021), https://www.npr.org/2021/08/09/1026131599/climate-change-report-takeaways-biden-administration [https://perma.cc/XJ5R-4ZBY].

27. U.S. Glob. Change Rsch. Program, supra note 12, at 1.

28. The NCA4 models various warming scenarios, but its conclusions are primarily informed by the "RCP8.5" and "RCP4.5" scenarios, which represent "higher" and "medium" levels of warming, respectively. Id. at 6.

29. Id.

30. Id. at 26.

31. Id. at 27–49.

32. Id. at 38.

33. Id. at 49–55, 168–70.

and longer-lasting power outages, fuel shortages, and service disruptions, with cascading impacts on other critical sectors."[34] Reinforcing the NCA4's conclusion is a recent, cross-industry study by Trucost, which suggests that utilities "face the highest combined physical risk from climate hazards."[35]

Two compounding reasons help explain why electric infrastructure is especially sensitive to climate risk. First, the grid has largely been designed based upon historical climate data, which, as the NCA4 concludes, can no longer reliably predict future environmental risk.[36] While other infrastructure has similarly relied upon historical data, the grid—as an interconnected web of exposed physical parts across large swaths of territory—is uniquely vulnerable because a failure at one chokepoint can send reverberations throughout the entire network.[37] Second, because electricity serves an "enabling function" for economic activity, minor grid interruptions can have trickle-down effects on markets, supply chains, and businesses.[38] Thus, the grid, as the very foundation of modern society, is threatened by future climate conditions that it was not built to withstand.[39]

---

34. Id. at 17.

35. Trucost's analysis ranked threats to the physical operations of 15,000 public companies and generated a composite sensitivity-adjusted risk score under the NCA4's moderate warming scenario. Yannic Rack, Utilities Face Greatest Threat as Climate Risks Intensify, S&P Glob. (Sept. 20, 2021), https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/utilities-face-greatest-threat-as-climate-risks-intensify-66613890 [https://perma.cc/S6Q9-KVR4].

36. Webb et al., supra note 14, at 586 ("[U]tilities should consider the full range of climate impacts expected to occur within their respective service territories during the planning period. This necessarily requires the use of forward-looking projections because, in the age of climate change, historic data is no longer a good predictor of future conditions."); see also Ula Chrobak, We Can No Longer Rely on Historical Data to Predict Extreme Weather, Popular Sci. (Mar. 19, 2020), https://www.popsci.com/story/environment/underestimating-extreme-weather-climate-change/ [https://perma.cc/MTB4-FZVA].

37. See Benjamin Schäfer, Dirk Witthaut, Marc Timme & Vito Latora, Dynamically Induced Cascading Failures in Power Grids, 9 Nature Commc'n 1, 2 (2018); About the U.S. Electricity System and Its Impact on the Environment, EPA, https://www.epa.gov/energy/about-us-electricity-system-and-its-impact-environment [https://perma.cc/5WPW-8G2G] (last updated July 11, 2022).

38. Press Release, Off. of the Press Sec'y, The White House, Presidential Policy Directive—Critical Infrastructure Security and Resilience (Feb. 12, 2013), https://obamawhitehouse.archives.gov/the-press-office/2013/02/12/presidential-policy-directive-critical-infrastructure-security-and-resil [https://perma.cc/2MDW-PUWG].

39. Melissa R. Allen-Dumas, Binita KC & Colin I. Cunliff, U.S. Dep't of Energy, Extreme Weather and Climate Vulnerabilities of the Electric Grid: A Summary of Environmental Sensitivity Quantification Methods 5 (2019), https://www.energy.gov/sites/prod/files/2019/09/f67/Oak%20Ridge%20National%20Laboratory%20EIS%20Response.pdf [https://perma.cc/JBQ2-LKWW]; see also Brad Plumer, A Glimpse of America's Future: Climate Change Means Trouble for Power Grids, N.Y. Times (Feb. 16, 2021), https://www.nytimes.com/2021/02/16/climate/texas-power-grid-failures.html (on file with the *Columbia Law Review*) (last updated June 15, 2021) ("[A]s Texas shows, blackouts

Fortunately, as the section below identifies, modern scientific and statistical tools can provide visibility into future threats that can inform tailored grid-protection strategies.

3. *Climate Modeling: Modern Techniques Can Reliably Predict Many Climate Impacts.* — Predictive climate reports like the NCA4 can be powerful tools for local decisionmakers, especially when combined with other techniques like statistical downscaling and probabilistic modeling. Downscaling bridges "the gap between global and local effects by layering local-level data over larger-scale climate models."[40] This strategy can yield results for geographic areas as precise as 3.5 square miles.[41] Probabilistic modeling is another tool that attempts to attach a statistical confidence to certain future climate conditions based upon (1) the probability of a climate event occurring and (2) its anticipated magnitude of impact.[42] Together, these techniques can generate a hierarchical, probability-weighted list of geographically specific future weather events from which decisionmakers can extrapolate policy responses.[43] For a utility, these modeling tools can expose certain climate risks in a service territory, which the utility can then use to identify grid vulnerabilities and tailor corresponding adaptation plans to avert catastrophic loss.[44]

---

can be extremely costly, too. And, experts said, unless grid planners start planning for increasingly wild and unpredictable climate conditions, grid failures will happen again and again.").

40. Catherine M. Cooney, Downscaling Climate Models: Sharpening the Focus on Local-Level Changes, 119 Env't Health Persps. A23, A24 (2012); see also Climate Model Downscaling, Nat'l Oceanic & Atmospheric Admin., https://www.gfdl.noaa.gov/climate-model-downscaling/ [https://perma.cc/2ERW-6XAA] (last visited Nov. 15, 2021) ("Dynamical downscaling refers to the use of high-resolution regional simulations to dynamically extrapolate the effects of large-scale climate processes to regional or local scales of interest.").

41. See Climate Tools, Cal-Adapt, https://cal-adapt.org/tools/ [https://perma.cc/7YYP-GRK4] (last visited Sept. 22, 2022); Climate Adaptation Sci. Ctrs., Data Spotlight: Downscaled Climate Projections to Inform Climate Research in the South-Central U.S. Region, U.S. Geographical Surv. (Mar. 24, 2021), https://www.usgs.gov/news/data-spotlight-downscaled-climate-projections-inform-climate-research-south-central-us-region [https://perma.cc/637E-F8KJ] (emphasizing that statistical downscaling is a common and powerful technique that can "translate large-scale [global climate models] into smaller spatial scales (such as a single watershed) which can be better utilized by regional and local stakeholders to address their specific needs").

42. There are several different methodologies for conducting probabilistic modeling, but the goal of each is to assign a probability of occurrence and magnitude of harm to certain incidents. Marjanac & Patton, supra note 16, at 282–83; see also Scott Steinschneider, Rachel McCrary, Linda O. Mearns & Casey Brown, The Effects of Climate Model Similarity on Probabilistic Climate Projections and the Implications for Local, Risk-Based Adaptation Planning, 42 Geophysical Rsch. Letters 5014, 5014 (2015).

43. See Bryan Walsh, Why Your Brain Can't Process Climate Change, TIME (Aug. 14, 2019), https://time.com/5651393/why-your-brain-cant-process-climate-change/ [https://perma.cc/3E4L-MAYL].

44. Lindene Patton & Felicia H. Barnes, Science and the Law: How Will Developments in Attribution Science Affect How the Law Addresses Compensation for

B. *Combatting Climate Change in the Electric Utility Sector—Mitigation vs. Adaptation Strategies*

In general, two complementary strategies can be deployed against climate change: mitigation and adaptation.[45] Mitigation attempts to slow the pace of climate change by advocating for carbon-reducing strategies.[46] One shortcoming with mitigation, however, is that warming is already "in the pipeline," so even if humans fully commit to reducing emissions, mitigation will be unable to completely reverse climate change.[47]

Thus, if society is to avoid the most severe climate consequences, "substantial and sustained . . . regional adaptation" must be prioritized alongside mitigation.[48] Adaptation, or climate resilience, is a strategy that employs "[f]orward-looking infrastructure design, planning, and operational . . . standards" to fortify new and existing infrastructure to withstand enhanced weather events like droughts and floods.[49] As the previous section highlighted, climate models and statistical tools can supply the forward-looking feature with which one can plan for and adapt to projected climate conditions.[50] In the utility sector, climate resilience frequently involves grid hardening, which may include elevating critical electrical equipment in areas vulnerable to flooding or ensuring that such equipment can function if subjected to extreme heat.[51]

Utilities do not, however, pursue climate resilience in a vacuum: Such efforts involve other stakeholders, namely industry regulators, who are responsible for reviewing and approving utilities' adaptation plans.[52] The section below endeavors to unpack the dynamic between utilities

---

Climate Change Effects?, *in* Risk, Resilience, Inequality and Environmental Law 147, 157–58 (Bridget M. Hutter ed., 2017).

45. Responding to Climate Change, NASA, https://climate.nasa.gov/solutions/adaptation-mitigation/ [https://perma.cc/CTT6-4KEL] (last visited Aug. 26, 2022).

46. Id.

47. James E. Parker-Flynn, The Intersection of Mitigation and Adaptation in Climate Law and Policy, 38 Environs 1, 3 (2014).

48. U.S. Glob. Change Rsch. Program, supra note 12, at 12.

49. Id. at 17; see also Adam Behsudi, What Is Mitigation vs. Adaptation, IMF (Sept. 2021), https://www.imf.org/external/pubs/ft/fandd/2021/09/climate-change-what-is-mitigation-and-adaptation-behsudi-basics.htm [https://perma.cc/9H7P-ATQ7] ("Adapting to climate change with more resilient infrastructure . . . and other measures can pay a triple dividend. Countries will suffer less . . . enjoy greater productivity . . . and reap social and environmental benefits."); The White House, Critical Infrastructure, supra note 38 (identifying that strengthening critical infrastructure is a national priority and an essential way to withstand and recover from climate harms).

50. See supra section I.A.3.

51. Sarah Brody, Matt Rogers & Giulia Siccardo, Why, and How, Utilities Should Start to Manage Climate-Change Risk, McKinsey & Co. (Apr. 24, 2019), https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/why-and-how-utilities-should-start-to-manage-climate-change-risk [https://perma.cc/M52K-2GFH].

52. See infra section I.C.1.

and regulators to better understand the process by which utilities are subject to oversight.

C. *How Are Electric Utilities Regulated in the United States?*

1. *Meeting the Key Players: Utilities, Customers, and Regulatory Bodies.* — Electric utilities in the United States take multiple forms. The most common ownership structure is the investor-owned utility (IOU), a private company financed with shareholder equity and bondholder debt.[53] IOUs serve about 75% of the U.S. population and are regulated by PSCs.[54] It is often the case that a single, vertically integrated utility owns and controls each step along the supply chain from electricity generation to transmission to end-use distribution.[55]

Downstream users of electric service include a utility's residential, commercial, and industrial customers. Traditionally, a utility maintains a duty to serve all customers within its service territory.[56] This duty emanates from common law and customarily obliges a utility to deliver to customers "safe, continuous, comfortable, and efficient service."[57]

Supervising the utility–customer dynamic is a "complex web" of federal, state, and local regulators that monitor a utility's legal, economic, technical, and environmental activities.[58] In general, interstate electric

---

53. Lazar, supra note 19, at 11–12.

54. Id. In contrast to the IOU model is the city-owned or municipal-utility model. Id. at 12. These municipal entities provide electric service to about 25% of the U.S. population and are typically governed by city councils or private nonprofit cooperatives. Id.

55. An alternative to the vertically integrated model is the "restructured" or "deregulated" system, where different companies along the supply chain provide generation, transmission, and distribution services. See Tony Clark, Ray Gifford & Matt Larson, Wilkinson Barker Knauer, LLP, The Vertically Integrated Utility 2 (2020), https://www.wbklaw.com/wp-content/uploads/2020/10/Vertically-Integrated-Utility-White-Paper-10.26.20.pdf [https://perma.cc/7SX4-VV7M]. Under this framework, energy generators—known as Independent Power Producers (IPPs)—are subject to a unique regulatory construct. Id. For example, IPPs are not regulated directly. Id. Instead, IPPs sell power to regulated distribution utilities whose rates are set by a PSC. Id. at 3. Additionally, while IPPs themselves may not owe a duty to serve customers directly, the in-state PSC indirectly imposes such a duty upon IPPs via the regulated distribution utilities to which IPPs sell output. Id. Ultimately, since this Note relies upon the traditional regulatory framework applied to vertically integrated utilities, the restructured model is not addressed in further detail. For a basic overview of deregulated markets, see Kathryne Cleary & Karen Palmer, US Electricity Markets 101, Res. for the Future (Mar. 3, 2020), https://www.rff.org/publications/explainers/us-electricity-markets-101/ [https://perma.cc/ECZ6-CJ5Y] (last updated Mar. 17, 2022).

56. There are infrequent circumstances in which a utility may be excused from extending service to certain customers, especially if doing so poses economic or technical challenges. This Note assumes, however, that a utility's duty extends to all customers. See Note, The Duty of a Public Utility to Render Adequate Service: Its Scope and Enforcement, 62 Colum. L. Rev. 312, 313–14 (1962).

57. Id.; see also N.J. Admin. Code § 14:3-3.7 (West 2008).

58. Mark F. Sundback, Bill Rappolt & Andrew P. Mina, Sheppard Mullin LLP, Electricity Regulation in the United States: Overview, Thomson Reuters Practical Law,

activity is regulated by the Federal Energy Regulatory Commission (FERC) and other federal agencies,[59] while intrastate operations are overseen by PSCs.[60] Since most electric activity occurs intrastate, PSCs are usually the closest to the utility and serve as the primary overseeing body.[61] As a result, PSCs are the principal focus herein.

In general, most PSCs consist of three-to-seven appointed or elected commissioners supported by a staff that provides legal and technical assistance.[62] A PSC's legal mandate, which usually emanates from the state constitution or a statute, often authorizes a mix of legislative-style rulemaking and quasi-judicial hearings.[63] This allows the PSC to carry out its oversight responsibilities and ensure that utilities provide safe, reliable service at a fair rate.[64] To do so, PSCs allocate costs among customer classes, set service quality standards, and approve utilities' capital investments and resource plans.[65]

2. *Understanding the Ratemaking Process.* — The basis of the regulatory construct stems from the fact that utilities are natural monopolies whose services affect the public interest.[66] Government regulation is therefore needed "to achieve public benefits that the market fails to achieve on its own."[67] The basic structure of the regulatory compact is set out in the landmark *Munn* case: To constrain utilities' monopolistic power, regulators offer utilities exclusive rights to sell electricity in designated service

---

Practical Law Country Q&A 8-525-5799 (2020) (on file with the *Columbia Law Review*) (last updated July 1, 2020); see also Lazar, supra note 19, at 3.

59. FERC is an independent agency under the Department of Energy (DOE) and is charged with regulating rates, terms, and conditions of interstate electricity sales and transmission. See Sundback et al., supra note 58. FERC also reviews certain corporate transactions, enforces reliability standards, and monitors electricity markets. Id. The following federal agencies are also involved in regulating interstate electric activity: Nuclear Regulatory Commission (NRC), which has jurisdiction over nuclear facilities; North American Electric Reliability Corporation (NERC), which is overseen by FERC and is chiefly responsible for monitoring grid reliability and security; Environmental Protection Agency (EPA), which regulates power plant emissions; and Department of Energy (DOE), which implements policies regarding nuclear power, fossil fuels, and alternative energy resources. Id.

60. Id.

61. Lazar, supra note 19, at 29 (noting that "[d]ifferent regulators control different parts of the utility industry" and that most regulation is "done by . . . the state Commissions").

62. Id. at 25–26.

63. Id. at 27, 36–38.

64. In addition to state public utility law, PSCs often consider the Public Utility Regulatory Policies Act of 1978 (PURPA) as persuasive authority. PURPA is a federal statute that requires PSCs to "consider and determine" several standards, including cost of service, fuel sources, and generation technology. Id. at 14, 38.

65. Id. at 25.

66. Id. at 3.

67. Id.

territories, and in return, utilities acquiesce to regulation of their rates and investments.[68]

Regulators chiefly exercise oversight in the context of a rate case, a formal, multistep proceeding in which a utility requests a certain rate structure or proposes a capital plan that is subject to review before it can be authorized.[69] During ratemaking, PSCs calculate the two drivers of electric rates: revenue requirement and authorized rate of return.[70] The former captures the dollar amount utilities must collect from customers to recover costs and earn a reasonable profit, while the latter reflects the percentage of revenue utilities retain as profit.[71] By law, the rate of return must be "sufficient" for a utility to attract capital under "prudent management."[72]

---

68. Munn v. Illinois, 94 U.S. 113, 126–28 (1877); see also Lazar, supra note 19, at 3.

69. While some states require rate cases to adhere to a fixed schedule, most states allow a utility to initiate the process at any time, so long as it can show that existing rates do not afford "a reasonable opportunity" for "a fair return." Lazar, supra note 19, at 40. Major rate modifications will usually trigger a robust rate case proceeding. Id. at 40–83. Minor rate changes, while often summarily approved, can, however, be subject to prolonged proceedings in which the PSC may ultimately deny the requested modification or merely reaffirm the previously authorized rate. Id. at 40, 46. For context, most utilities file rate cases every two-to-five years. Id. at 40.

70. See Darryl Tietjen, Tariff Development I: The Basic Ratemaking Process, Briefing for the NARUC/INE Partnership (Feb. 1, 2008), https://pubs.naruc.org/pub.cfm?id=538E730E-2354-D714-51A6-5B621A9534CB [https://perma.cc/RW2K-TQR7] (highlighting that the revenue requirement, as the "cost of service" component, and the rate of return, as the "cost of capital" component, are the two "basic components" of utility ratemaking).

71. A utility's revenue requirement is influenced by several factors, including the value of a utility's assets, its cost of debt and equity, and its operating expenses. Coley Girouard, How Do Electric Utilities Make Money?, Advanced Energy Persps. (Apr. 23, 2015), https://blog.aee.net/how-do-electric-utilities-make-money [https://perma.cc/DN53-WHWN]. A utility's recoverable costs often include service, capital, and administrative expenses. Id.

72. Two canonical Supreme Court cases clarify the meaning of "sufficient" as it relates to a utility's allowable return. First, in *Hope Natural Gas Co.*, the Court held that regulators had discretion to set a utility's return pursuant to a "just and reasonable" standard that permitted the utility "to operate successfully, to maintain its financial integrity, to attract capital, and to compensate its investors for the risks assumed." Fed. Power Comm'n v. Hope Nat. Gas Co., 320 U.S. 591, 605 (1944). Subsequently, in *Bluefield Waterworks & Improvement Co.*, the Court clarified that utilities are entitled to "just compensation" but not to profits "such as are realized or anticipated in highly profitable enterprises or speculative ventures." Bluefield Waterworks & Improvement Co. v. Pub. Serv. Comm'n, 262 U.S. 679, 692–93 (1923). Read together, a "reasonable" return is thus one that is "sufficient to assure confidence in the financial soundness of the utility," and allow the utility to "support its credit and . . . raise the money necessary for the proper discharge of its public duties." Id. at 693; see also 64 Am. Jur. 2d Public Utilities § 135 (2022) (restating that a fair and just return is set at a level such that there is "reasonably sufficient . . . confidence in the financial soundness of the utility . . . to raise the money necessary for the proper discharge of its public duties"); Lazar, supra note 19, at 53 ("Legal precedent requires that [the] rate [of return] . . . be sufficient to allow the utility to attract additional capital under prudent management, given the level of risk that the utility business faces.").

An important feature of a rate case is that it is transparent and open to the public.[73] As a result, several intervenors, including customer advocates and environmental groups, among others, typically participate.[74] The utility is often required to accommodate discovery-type requests from these parties and produce the data underlying its capital plans and rate designs.[75] In addition, intervening parties are able to submit briefs containing factual support and/or technical analysis that challenges or substantiates the utility's proposal.[76]

The penultimate step in this process is a hearing in which most stakeholders are afforded the opportunity to present evidence, examine expert witnesses, and provide public testimony on the record before the PSC in a courtroom-like proceeding.[77] After the hearing, it is common for the stakeholders to negotiate a mutually agreeable rate design, which will then be presented to the PSC.[78] The rate case reaches its terminus after the PSC reviews the entire record, deliberates, and issues a final order solidifying the utility's rates of service and return on investment.[79] The PSC's order is subject to judicial review, but courts are generally deferential to regulators.[80]

3. *Understanding the Ratemaking Principles.* — Integral to any rate case are the following three principles, which regulators use to guide their review of a utility's rate plan: (1) prudence, (2) least-cost, and (3) used and useful.[81] While each maintains its own theoretical basis, in practice, there is an interplay between the principles as they are typically applied alongside one another.[82] Ultimately, as Part III will highlight, these key ratemaking principles exist at the theoretical foundation of this Note's argument.

---

73. See Lazar, supra note 19, at 40 (highlighting that the rate case process allows for participation by the public).

74. One such intervenor is often a designated "consumer advocate," a cohort typically housed in the state attorney general's office that serves as an organized body to channel the public's voice and represent customers in a rate case. See id. at 27–28, 42.

75. Id. at 42.

76. Id. at 43.

77. Id. at 42–43.

78. Id. at 45.

79. Id. at 46.

80. PSCs' orders may be appealed to the courts, which are generally deferential to the commission's determination, especially on factual matters. Id. If a PSC's order plainly violates the law, however, a court might reverse or remand. Id.

81. Id. at 86. Please note that the nomenclature used to describe ratemaking principles may vary from jurisdiction to jurisdiction, but the three specific principles discussed throughout this Note—prudence, least-cost, and used and useful—are the terms used in the majority of jurisdictions across the country.

82. See id. ("Cost-plus regulation was adopted as an effective way to regulate monopoly utilities. That is, by allowing only prudently incurred costs associated with used and useful investments and expenses, the regulator addresses the revenue requirement to arrive at just and reasonable rates.").

The first principle—prudence—is the standard PSCs apply when reviewing a utility's capital plan.[83] Prudence is analogous to the "reasonable person standard" in other areas of the law and is typically satisfied if the utility exhibits the judgment "a reasonable utility manager" would exercise in similar circumstances.[84] A utility must demonstrate that its capital plan reasonably accounts for facts that "were or should have been known at the time."[85] While some PSCs conduct a prudence review when a project enters service, others do so before a utility implements a project so that the PSC can provide pre-approval feedback.[86] During their review, PSCs scrupulously examine the project's anticipated costs, intended uses, and technical specifications to assess whether the utility was diligent and consulted reliable data.[87] The prudence analysis also influences whether the utility can recover the project's costs from customers via rates.[88] Traditionally, courts have held that utilities can recover only prudently incurred costs, but not those "which are excessive, unwarranted, or incurred in bad faith."[89] Overall, PSCs are fairly deferential to utilities, so, barring an overt demonstration that upsets the presumption of prudence, the PSC will typically authorize and permit recovery on proposed capital projects.[90]

The second ratemaking principle—least-cost—is rooted in a desire to minimize electricity expenses for the utility and customers.[91] Least-cost typically arises in the context of a utility's integrated resource plan, which contains a technical analysis of the optimal resource mix that will ensure low-cost, reliable service for customers over the long run.[92] Based upon the results of this analysis, a utility will identify whether to acquire additional resources, and if so, from what sources.[93] A PSC will review the

83. Id. at 86–91.

84. Webb et al., supra note 14, at 611.

85. Gulf States Utils. Co. v. La. Pub. Serv. Comm'n, 578 So. 2d 71, 85 (La. 1991).

86. Lazar, supra note 19, at 31.

87. PSCs often rely upon expert consultants to assist in their prudence review. Id. at 91.

88. The prudence standard determines if ratepayers or the utility "will bear the burden of paying for certain investments and expenditures." Mass. Elec. Co. v. Dep't of Pub. Utils., 15 N.E.3d 176, 185 (Mass. 2014).

89. Id. at 184.

90. Lazar, supra note 19, at 52–57.

91. Webb et al., supra note 14, at 616–20.

92. The process for compiling an Integrated Resource Plan (IRP) is not uniform across jurisdictions. Lazar, supra note 19, at 108. Some PSCs require formal IRPs while others do not require them at all. Id. Moreover, some PSCs request that the in-state utility file an IRP even though the commission maintains no formal review or approval process. See also Webb et al., supra note 14, at 616–20 (flagging that legislation in over thirty-six states "expressly identifies cost minimization as a goal of electric utility regulation," with such legislation often including language that requires utilities to "identify the optimal resource mix that will ensure long-term service reliability . . . at the lowest present value life cycle cost").

93. A utility may decide, for example, to build a new power plant or purchase power from other sources to meet its projected resource needs. Lazar, supra note 19, at 108.

utility's resource plan to determine whether it, in fact, provides energy to customers in a manner that comports with least-cost.[94] While there is no magic formula or clear bright line to determine least-cost, the general rule of thumb is that the project must meet "the public's need for energy services . . . at the lowest present value life cycle cost."[95]

The third ratemaking component—used and useful—requires a utility to show that its capital projects are (1) "physically providing services (and are thus 'used')" and (2) "actually needed to provide those services (and are thus 'useful')."[96] The rationale undergirding the used and useful principle is twofold: The "useful" component is an important check against superfluous utility spending, while the "used" component ensures that utilities see capital projects through to the point of in-service completion, that is, when the project begins providing electric service to customers.[97]

In practice, the three ratemaking principles are applied alongside one another. For example, prudence and used and useful commingle to ensure that "utilities are only reimbursed for expenses that were reasonably incurred" on projects that "deliver benefits to customers."[98] Additionally, prudence works alongside least-cost: Utilities must make "prudent efforts . . . to achieve the lowest possible overall costs to . . . customers . . . for the procurement and use of . . . power."[99] Ultimately, these principles intersect in a manner consistent with the overarching goal of utility regulation: "to ensure 'just and reasonable' rates that appropriately balance utilities' need to earn sufficient revenue to maintain their systems and make new investments [to keep] prices low."[100]

II. THE PROBLEM: CLIMATE RESILIENCE IS A NECESSARY ENDEAVOR FOR ELECTRIC UTILITIES, BUT ONE THE SECTOR HAS LARGELY FAILED TO PRIORITIZE

A. *The Utility Sector Has Largely Failed to Combat Future Climate Risk via Adaptation*

Despite the gravity of the climate crisis, many utilities "still don't conduct detailed climate studies" to better "understand [how] increased

94. Id.

95. Vt. Stat. Ann. tit. 30, § 218c(a)(1) (2021).

96. Webb et al., supra note 14, at 614. For a discussion of the used and useful principle, see generally James J. Hoecker, "Used and Useful": Autopsy of a Ratemaking Policy, 8 Energy L.J. 303 (1987) (highlighting that while the used and useful principle has been applied nonuniformly, its central tenet is that it places a burden on utilities to show that a capital project is both needed and functional so as to protect consumers from the cost and risk associated with speculative utility investments).

97. Webb et al., supra note 14, at 614.

98. Id. at 616.

99. Mass. Gen. Laws. Ann. ch. 164, § 94G (West 1998).

100. Webb et al., supra note 14, at 616.

heat, drought, wildfires or flooding can ravage their power grids."[101] As a result, utilities face a significant climate resilience gap in which there is a growing divergence between the protection afforded to existing infrastructure and the level of protection needed to withstand climate change.[102] One study estimates that utilities need to invest over $500 billion to overcome this gap and "future-proof" the grid.[103]

While some utilities purport to be chipping away at this gap, many still base "their analyses on historical weather conditions," or only look at "a few climate impacts[] while ignoring others," or merely focus on "just a few power plants" and not "their systems as a whole."[104] Moreover, these initial, albeit incomplete steps toward resilience have typically only been pursued by the most well-resourced utilities, and often only after they have suffered a climate-related loss.[105]

An embodiment of this phenomenon is PG&E, the nation's largest utility, which services Northern California.[106] For years, PG&E engaged in a good deal of mitigation, but it was not until the devastating 2018 wildfire season that the company afforded comparable attention to adaptation.[107] That season, a high-voltage powerline collapsed and sparked the "Camp Fire," which rapidly engulfed Paradise, CA.[108] 85 people died, and PG&E filed for bankruptcy.[109] Since then, PG&E's troubles have abounded. The company was implicated in the 2021 Dixie Fire,

101. Brad Plumer & Ivan Penn, Climate Crisis Catches Power Companies Unprepared, N.Y. Times (Aug. 6, 2021), https://www.nytimes.com/2021/07/29/climate/electric-utilities-climate-change.html (on file with the *Columbia Law Review*).

102. Patton & Barnes, supra note 44, at 158–59.

103. Rack, supra note 35.

104. Plumer & Penn, supra note 101.

105. See Rack, supra note 35 (highlighting that "[h]igh-profile [climate] events . . . tend to move climate resiliency up the agenda" for utility companies); Herman K. Trabish, As Extreme Weather Spurs Billions in Utility Resilience Spending, Regulators Struggle to Value Investments, Util. Dive (Apr. 25, 2020), https://www.utilitydive.com/news/as-extreme-weather-spurs-billions-in-utility-resilience-spending-regulator/576404/ [https://perma.cc/L577-3GLF] (stating that "[r]esilience is rarely, if ever, part of formal utility planning," but recent climate disasters have pushed "many utilities . . . to be increasingly serious about resilience investments").

106. PG&E is the largest utility by customer count. What Are the 5 Largest U.S. Energy Utilities, Choose Energy (Apr. 18, 2019), https://www.chooseenergy.com/news/article/what-are-the-5-largest-u-s-energy-utilities/ [https://perma.cc/G37X-U94K].

107. See Russell Gold, PG&E: The First Climate-Change Bankruptcy, Probably Not the Last, Wall St. J. (Jan. 18, 2019), https://www.wsj.com/articles/pg-e-wildfires-and-the-first-climate-change-bankruptcy-11547820006 (on file with the *Columbia Law Review*) (discussing that while "PG&E has long accepted the science of climate change" and has "been rapidly shifting to a cleaner energy future," it has failed to "adapt[] to climate change" with the same sense of urgency and proactiveness).

108. Russell Gold & Katherine Blunt, This Old Metal Hook Could Determine Whether PG&E Committed a Crime, Wall St. J. (Mar. 8, 2020), https://www.wsj.com/articles/this-old-metal-hook-could-determine-whether-pg-e-committed-a-crime-11583623059 (on file with the *Columbia Law Review*).

109. Id.

again facing billions in potential liability.[110] During this ongoing saga, PG&E announced, in its first major climate adaptation plan, that it would bury 10,000 miles of above-ground powerlines to reduce the likelihood that such lines could collapse and ignite another fire.[111] This $15 to $30 billion strategy has been criticized, however, because many fault PG&E for not having pursued lower-cost adaptation in advance, which could have saved the company from having to scramble to adapt after-the-fact under frenetic conditions and in the face of intense public and political pressure.[112]

This case study is telling in several regards. First, it is an example of a climate-change-exacerbated disaster.[113] In fact, the underlying environmental conditions that have given rise to PG&E's wildfire woes can be traced back to climate-induced warming and drying conditions—average temperatures in California have increased approximately three degrees Fahrenheit since 1896—which have caused extreme heat waves and droughts that make forests more susceptible to severe wildfires.[114] Sec-

110. See Ivan Penn, PG&E Says It Faces a Federal Inquiry and $1.15 Billion in Losses Over the Dixie Fire, N.Y. Times (Nov. 1, 2021), https://www.nytimes.com/2021/11/01/business/energy-environment/pge-dixie-fire.html (on file with the *Columbia Law Review*) (highlighting that PG&E faces billions in monetary liability—and even criminal charges—arising out of federal and state probes into the company's possible involvement in the Dixie Fire).

111. PG&E Will Bury 10,000 Miles of Power Lines so They Don't Spark Wildfires, NPR (July 21, 2021), https://www.npr.org/2021/07/21/1019058925/utility-bury-power-lines-wildfires-california [https://perma.cc/AN9J-DX53].

112. Critics perceive PG&E's adaptation plan as a largely reactive, grandiose, and exorbitantly expensive effort to appease stakeholders, not a sensible, tailored, and cost-effective way to confront future climate risks. PG&E Seeks $3.6 Billion in Rate Hikes for Wildfire Safety, AP News (July 1, 2021), https://apnews.com/article/ca-state-wire-fires-wildfires-environment-and-nature-business-59f6ee46f16de59d1240f92a5b1a5b99 [https://perma.cc/A5MA-QCYU]; see also David R. Baker, Underground Power Lines Don't Cause Wildfires. But They're Really Expensive, S.F. Chron. (Oct. 21, 2017), https://www.sfchronicle.com/bayarea/article/Underground-power-lines-don-t-cause-wildfires-12295031.php [https://perma.cc/73TV-845U]. But see PG&E Will Bury 10,000 Miles of Power Lines so They Don't Spark Wildfires, supra note 111 (quoting PG&E's CEO Patricia Poppe who, in response to questions about the company's approximately $15 billion dollar plan to bury some of its powerlines, emphasized "[i]t's too expensive not to do it[,] [l]ives are on the line").

113. See Alan Buis, The Climate Connections of a Record Fire Year in the U.S. West, NASA (Feb. 22, 2021), https://climate.nasa.gov/ask-nasa-climate/3066/the-climate-connections-of-a-record-fire-year-in-the-us-west/ [https://perma.cc/ZM4D-WDJ8] (highlighting that climate change has caused the "frequency and severity of heat waves and droughts" to increase, which has, by extension, resulted in more frequent and severe wildfires).

114. Aurora A. Gutierrez, Stijn Hantson, Baird Langenbrunner, Bin Chen, Yufang Jin, Michael L. Goulden & James T. Randerson, Wildfire Response to Changing Daily Temperature Extremes in California's Sierra Nevada, Sci. Advances, Nov. 17, 2021, at 1, 1 (finding that the likelihood of fire occurrence and burned area increase nonlinearly with temperature—a 1°C increase yields a roughly 20% increase in both categories—which implies that by 2040, the number of fires is anticipated to increase by 51 ± 32% and

ond, PG&E's situation is a preview for what other utilities across the country may experience when climate change's impacts collide with the resilience gap. Accordingly, this case study emphasizes the need for utilities to engage in meaningful climate resilience ex ante rather than scramble once the grid is already under duress.

B. *A Few Reasons Why Utilities Have Largely Neglected Climate Resilience*

The discussion below seeks to explain why utilities, like PG&E, have largely failed to protect against future climate risks, and ultimately concludes that it is due to a collective failure by several stakeholders—including legislatures, regulators, and utilities—to prioritize resilience.

1. *Federal and State Legislative Initiatives Have Failed to Encourage Climate Planning.* — A key reason why climate resilience has struggled to take root is that federal and state legislators, to the extent they have even focused on climate change at all, have primarily advocated for carbon-reducing mitigation strategies without a comparable focus on adaptation.[115] For example, the leading federal regulation on air emissions is the Clean Air Act, which the EPA has used as a tool to reduce hazardous pollution;[116] notably, this is a strategy of mitigation, not one of adaptation. Overall, while mitigation may have increased climate awareness and reduced emissions, such strategies have not created a "comprehensive method" for addressing climate change's "effects."[117] In fact, the climate change conversation has mostly focused on "how we're going to regulate carbon out of existence, as opposed to internalizing the risk and deciding that the public interest requires [adaptation to] that risk."[118] As a result, the mitigation-dominated narrative has not permitted adaptation to receive its due attention, and it must therefore be pursued more aggressively than it has been in the past.[119]

---

burned area by 59 ± 33%); see also Wildfires and Climate Change, Ctr. for Climate and Energy Sols., https://www.c2es.org/content/wildfires-and-climate-change/ [https://perma.cc/FFD2-6PK9] (last visited Jan. 1, 2022); FAQ: Climate Change in California, SCRIPPS Inst. of Oceanography, https://scripps.ucsd.edu/research/climate-change-resources/faq-climate-change-california [https://perma.cc/Z37D-FJ8B] (last visited Aug. 12, 2022) (determining that average summer temperatures in California have risen by approximately three degrees Fahrenheit since 1896, with more than half of that increase occurring since the early 1970s).

115. Walton, supra note 17.

116. See 42 U.S.C. §§ 7401–7671q (2018); Summary of the Clean Air Act, EPA, https://www.epa.gov/laws-regulations/summary-clean-air-act [https://perma.cc/RS44-PT79] (last visited Aug. 11, 2022) ("[T]his law authorizes EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare and to regulate emissions of hazardous air pollutants.").

117. Patton & Barnes, supra note 44, at 151–52.

118. Walton, supra note 17.

119. To be clear, the path forward cannot forgo mitigation, for a two-front approach that utilizes both mitigation *and* adaptation is needed to effectively tackle the climate crisis.

To be fair, while some modest adaptation initiatives have been pursued, these efforts have largely failed to meaningfully target the utility sector. For example, in 2018, Congress passed the Disaster Recovery Reform Act, which secures funds for pre-climate disaster adaptation.[120] Thus far, however, these funds have primarily gone toward land management and flood protection.[121] Only $91.3 million of the $1.18 billion in total authorized project costs has been procured for utility-specific infrastructure.[122] Such an amount is wholly insufficient to close the climate resilience gap.[123]

Moreover, while the 2021 Infrastructure Investment and Jobs Act (referred to as "the Act" herein) reflects a long-overdue step toward utility resilience, it is insufficient as a standalone act to fully protect the grid against future climate risk.[124] Overall, the Act encourages utilities to collaborate with DOE, FERC, and other federal agencies by allocating over $50 billion for "innovative approaches" to "harden and enhance grid resilience and reliability."[125] Additionally, the Act authorizes DOE to award grants for resilience projects that "reduce the likelihood and consequences of disruptive events" such as fires, floods, and extreme weather.[126] While these measures are critical adaptation arrows in the resilience quiver, the Act is "unlikely to revolutionize American infrastructure,"[127] because it fails to provide the "hundreds of billions of

120. ABA Section of Env't, Energy, and Res., Environment, Energy, and Resources Law: The Year in Review 2018, at 325, 344 (2019).

121. Building Resilient Infrastructure and Communities FY 2020 Subapplication Status, FEMA, https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities/after-apply/fy-2020-subapplication-status [https://perma.cc/V2VA-SFGH] (last visited Nov. 5, 2021) (showing that flood control is the top "project type" by total infrastructural spending, receiving more than five times the amount of funding allocated for utility-infrastructure protection).

122. Id.

123. See Patton & Barnes, supra note 44, at 158–59. To provide context for the insufficiency of this amount, PG&E—one utility operating in one U.S. service territory—spends $1.4 billion annually on tree trimming. Michael Liedtke, PG&E Will Spend at Least $15 Billion Burying Power Lines, AP News (July 21, 2021), https://apnews.com/article/business-government-and-politics-527e93e58c6ac7736488d8cd60003f86 [https://perma.cc/5WPC-HWE4].

124. Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, §§ 40101–40113, 135 Stat. 429, 923–48 (2021); see also R. Neal Martin, Energy & Sustainability Washington Updates—January 2022, Nat'l L. Rev. (Dec. 30, 2021), https://www.natlawreview.com/article/energy-sustainability-washington-updates-january-2022 [https://perma.cc/3L9Q-48U8].

125. Infrastructure Investment and Jobs Act § 40103(b)(3); see also Fact Sheet: The Bipartisan Infrastructure Deal, The White House (Nov. 6, 2021), https://www.whitehouse.gov/briefing-room/statements-releases/2021/11/06/fact-sheet-the-bipartisan-infrastructure-deal/ [https://perma.cc/3H4C-QEVS].

126. Infrastructure Investment and Jobs Act § 40101(a)–(c).

127. Li Zhou, The Bipartisan Infrastructure Law Is Both Historic and Not Nearly Enough, Vox, https://www.vox.com/22770447/infrastructure-bill-democrats-biden-water-broadband-roads-buses [https://perma.cc/DVV3-PXL3] (last updated Nov. 15, 2021).

federal and private funds" needed to fully upgrade the grid to withstand climate change.[128] Thus, in the absence of subsequent and comparably sweeping legislation, utilities will continue to face the resilience gap and remain vulnerable to impending climate threats.[129]

At the state level, legislatures have also largely failed to push meaningful adaptation initiatives. States' focus has primarily been on mitigation via Renewable Portfolio Standards (RPS), which require that a specific percentage of electric generation emanate from renewables.[130] Additionally, while some states claim to be prioritizing resilience, any such action has largely taken the form of open-ended, aspirational initiatives that lack bite, especially as it relates to the electric sector. For example, many governors have signed compacts to explore joint "opportunities to regionally coordinate resiliency and adaptation planning efforts,"[131] and several other states have created task forces devoted to providing guidance on adaptation planning.[132] Despite the rhetorical allure of these strategies, they have, so far, only generated minimal adaptation efforts on the ground.

Thus, because federal and state lawmakers have either largely failed to prioritize resilience or are just now taking first steps to address the matter, a dearth of coherent adaptation-promoting regulations has allowed the climate resilience gap to further expand.

2. *State Regulators Have Failed to Broaden Ratemaking Principles to Compel Resilience.* — Just as federal and state legislators have largely failed to compel resilience, so too have state PSCs. There is a view that "[w]e still have not yet confronted [mitigation] on a state by state regulatory basis."[133] This is surprising in light of the myriad other ways regulators exert close control over utilities, especially as it relates to rates and investments.[134] Ultimately, however, the issue stems not from an intrinsic

---

128. Devashree Saha, Tom Cyrs, Jillian Neuberger & Katrina McLaughlin, U.S. Infrastructure Bill Is Good, but Not Enough to Transform the Electricity Grid, World Res. Inst. (Aug. 9, 2021), https://www.wri.org/insights/us-infrastructure-bill-good-not-enough-transform-electricity-grid [https://perma.cc/7WVN-AP3Y].

129. Id.

130. RPS initiatives have recently expanded. Over ten states have now committed to 100% renewable generation by 2050. State Renewable Portfolio Standards and Goals, Nat'l Conf. of State Legislatures (Aug. 13, 2021), https://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx [https://perma.cc/3L5Q-NBFH].

131. New England Governors and E. Canadian Premiers, 42nd Conference Res. 42-1, Resolution Concerning Adaptation (Aug. 13, 2018), https://scics.ca/en/product-produit/resolution-42-1-resolution-concerning-adaptation/ [https://perma.cc/2HKP-X5NQ].

132. ABA Section of Env't, Energy, and Res., supra note 120, at 345–46 (discussing climate change task forces adopted in Alaska, California, Colorado, Hawaii, Massachusetts, and Rhode Island).

133. Walton, supra note 17.

134. See generally Lazar, supra note 19 (highlighting the PSC's role in overseeing the core components of a utility's business, including prices and terms of service, quality standards, and technical design specifications for generation infrastructure).

flaw in the existing regulatory regime, but instead because regulators have largely remained anchored to notions of prudence, least-cost, and used and useful that fail to capture baseline environmental shifts induced by climate change.[135]

For example, the prudence standard continues to be applied in a manner that validates a utility's use of historical climate data as the basis for designing new infrastructure.[136] Accordingly, a utility is able to set its grid specifications to withstand historic average temperatures, precipitation, and extreme weather, and, assuming the utility employs sound decisionmaking, most PSCs will find the approach consistent with prudence, which merely requires a *reasonable* approach, not necessarily *the best* one.[137] This application is problematic, however, because what was once reasonable may now be unreasonable in light of climate change.[138]

In addition to prudence, regulators adopt a similarly myopic, short-to-medium term perspective that fails to recognize climate resilience as a long-term, cost-saving strategy.[139] A recent McKinsey & Co. report highlights the cost effectiveness of resilience, suggesting that ex ante climate adaptation is roughly $550 million cheaper for the average utility relative to delaying adaptation until 2050.[140] It should thus no longer be the case

135. Webb et al., supra note 14, at 609–24 (discussing how these ratemaking principles "*could* be relied on to advance climate resilience planning," which suggests that the problem is not an intrinsic one with the ratemaking principles, but rather stems from the way in which the principles have been applied in a given rate case (emphasis added)).

136. Id.

137. Id.; see also Heather N. Jarvis, Keeping the Lights On—At All Costs?: Imploring Consistent Prudence Review and a Prudence Standard that Includes Demand Response and Responsible Portfolio Management, 29 Vt. L. Rev. 1037, 1042 (2005) (emphasizing that the prudence standard "give[s] substantial deference to the judgment of utility management" and merely requires that the action taken be consistent with that of a "reasonable, professional utility manager . . . in the situation under scrutiny," a standard that clearly demands far less than perfection).

138. See Plumer & Penn, supra note 101 ("[W]ith global warming fueling increasingly extreme weather, the past may not be the best gauge of what's coming."); Chrobak, supra note 36 ("In just a decade . . . the climate has shifted so drastically that the frequency of past extreme events is no longer a reliable predictor [of future conditions]."));.

139. Brody et al., supra note 51 (discussing that the high, upfront sticker price associated with infrastructural adaptation has deterred meaningful resilience efforts despite compelling evidence that suggests climate adaptation can be cost-effective).

140. See id. McKinsey reaches this conclusion by conducting a cost-benefit analysis for the average utility. First, McKinsey estimates that utilities have suffered an average loss of $1.4 billion from storm damage over the last twenty years. Next, McKinsey estimates that this $1.4 billion baseline will increase to $1.7 billion by 2050. Taking the difference, McKinsey suggests that utilities could spend $300 million in the present period to adapt the grid and avoid such storm-related damage in the future. If the utility delays adaptation, however, McKinsey estimates that resilience could cost the utility $850 million by 2050 (i.e., midpoint of $700 million to $1 billion). Taking the difference between $850 and $300 million, McKinsey concludes that a utility could save $550 million by engaging in ex ante climate resilience. Id.

that regulators view traditional practices as consistent with the least-cost principle when such practices are *more costly* than proactive adaptation.

Likewise, PSCs have failed to adopt a broadened perspective on the used and useful principle. Currently, a utility can recover capital costs so long as the project is necessary to meet demand (i.e., useful) and in service (i.e., used).[141] This formulation requires regulators to ask whether projects are used and useful upon completion—not whether such projects will continue to be so—which critically ignores climate change's ability to render existing infrastructure useless and unusable in the future.[142] For example, forecasts indicate that many existing powerplants could be flooded by sea level rise, which would, in the absence of adaptation, make them useless and unusable.[143] Thus, so long as regulators continue to shortsightedly apply the used and useful principle in a manner that fails to capture these anticipated impacts, utilities may be unable to provide used and useful service in a climate-enhanced future.

The conclusion, therefore, is not that the existing ratemaking principles are intrinsically flawed, but merely that such principles are applied narrowly in a manner that fails to capture anticipated climate impacts. Thus, in the absence of some mechanism that compels a forward-looking application of the ratemaking components, the climate resilience gap will continue to loom over the industry and jeopardize critical infrastructure and public safety.[144]

C. *The Current Scholarship in This Area Fails to Solve the Problem*

Just as federal and local legislators and regulators have largely failed to compel resilience,[145] so too has the academic community. In general, the scholarship in this area can be broken down into roughly six buckets, all of which ultimately suffer from at least one critical shortcoming.

First, current scholarship maintains a pro-mitigation bias.[146] While mitigation and adaptation can (and should) be studied simultaneously, research has predominantly focused on mitigation with calls to reduce emissions, which has therefore afforded relatively less airtime to discus-

---

141. Lazar, supra note 19, at 91.

142. Id.; see also supra section I.A.

143. Brody et al., supra note 51.

144. See supra section II.A.

145. See supra sections II.B.1–.2.

146. E.g., Steven Ferrey, Sustainable Energy, Environmental Policy, and States' Rights: Discerning the Energy Future Through the Eye of the Dormant Commerce Clause, 12 N.Y.U. Env't L.J. 507, 522–39 (2004) (providing an example of the mitigation-dominated narrative in the current scholarship); Parker-Flynn, supra note 47, at 5 ("The literature concerning the future of legal regimes in a climate-changed world has only begun to address the integration of mitigation and adaptation."); Julietta Rose, The PURPA Haze: Clearing the Way for PURPA Implementation in a Changed Energy System, 47 Ecology L.Q. 545, 555 (2020) (illustrating the prominence of climate mitigation in academic research).

sions about adaptation.[147] Second, the research that has addressed adaptation often bypasses utilities and instead focuses on general strategies like zoning laws, building codes, and land usage restrictions.[148] Third, scholarship has explored climate and statistical modeling, which is an important input for the climate-planning puzzle, but not the ultimate solution.[149] Fourth, a bucket of technological research advocates for new grid equipment like microgrids and decentralized energy infrastructure, but this research lacks a mechanism to compel the adoption of such technologies.[150] Fifth, economic research advocates for market-based incentives, such as subsidies, tax benefits, and insurance perks, to compel private actors to pursue adaptation, yet such inducements attempt to influence behavior without any binding component.[151]

---

147. See supra sections II.A–.B.

148. See Sarah J. Adams-Schoen, Beyond Localism: Harnessing State Adaptation Lawmaking to Facilitate Local Climate Resilience, 8 Mich. J. Env't & Admin. L. 185, 192 (2018) (arguing that local land use and zoning laws are an effective method to develop adaptive climate change solutions); Sarah Adams-Schoen & Edward Thomas, A Three-Legged Stool on Two Legs: Recent Federal Law Related to Local Climate Resilience Planning and Zoning, 47 Urb. Law. 525, 528 (2015) ("In the United States, municipal governments have made significant contributions to adaptation planning . . . at least as compared to federal and state governments."); Andrea McArdle, Local Green Initiatives: What Local Governance Can Contribute to Environmental Defenses Against the Onslaughts of Climate Change, 28 Fordham Env't L. Rev. 102, 103–04 (2016) (noting a variety of local government mechanisms, including the setting of land use policy, that are capable of addressing climate change in an adaptive manner).

149. See supra section I.A.3. See generally Mathaios Panteli & Pierluigi Mancarella, Modeling and Evaluating the Resilience of Critical Electrical Power Infrastructure to Extreme Weather Events, 11 IEEE Sys. J. 1733 (2017) (outlining a conceptual framework and simulated statistical model that can be used to project and study future climate conditions).

150. See Meredith Hiller & Stephen J. Humes, Resilience in the Utility Industry: Working Against the Rising Tides, 31 Nat. Res. & Env't 12, 13 (2017) (highlighting the technical- and engineering-based means by which utility companies are modifying infrastructure to combat anticipated climate effects); Kevin B. Jones, Sylvia J. S. Bartell, Daniel Nugent, Jonathan Hart & Achyut Shrestha, The Urban Microgrid: Smart Legal and Regulatory Policies to Support Electric Grid Resiliency and Climate Mitigation, 41 Fordham Urb. L.J. 1695, 1753–55 (2014) (discussing possible technological solutions for cities facing magnified climate exposure).

151. See Alex Baumber & Graciela Metternicht, Using Market-Based Instruments to Enhance Climate Resilience, *in* The Palgrave Handbook of Climate Resilient Societies 2163, 2170 (R.C. Brears ed., 2021) (describing how market-based incentives might influence behavior relating to climate change, including "discourag[ing] emissions-intensive activities[,] . . . incentiviz[ing] the use of low-emissions technologies[,] . . . promot[ing] land uses that sequester carbon[,] . . . or enhanc[ing] the adaptive capacity of communities affected by climate change"); Kenneth W. Costello, Electric Power Resilience: The Challenges for Utilities and Regulators, Yale J. on Reg. Bull. (Nov. 8, 2019) (highlighting that "[i]n a market-based environment, the resiliency of electric service will depend more on the value that consumers place on different levels of resilience"); Inara Scott, Incentive Regulation, New Business Models, and the Transformation of the Electric Power Industry, 5 Mich. J. Env't & Admin. L. 319, 324 (2016) (suggesting that the best way to encourage a

In light of the foregoing, the most promising scholarship attempts to identify methods by which actors can be obligated to engage in climate resilience, and it is no surprise that imposing such obligations is most commonly explored within the legal arena. In general, the legal literature tends to encourage resilience via two distinct channels: tort *or* regulatory law.[152] The tort scholarship focuses on enhancing plaintiffs' ability to hold a utility negligent for climate-related injuries.[153] This approach suffers, however, from a few critical shortcomings. First, its power is limited because it is an ex post tool that requires plaintiffs to suffer an injury before a suit can be brought.[154] Additionally, climate change's complexity often frustrates plaintiffs who must prove that a utility's conduct was a proximate cause—a required element in tort—of the resulting harm.[155] In terms of the literature on regulatory law, the responsibility for promoting resilience is often assigned to federal or state agencies.[156] The top-down federal approach benefits from centralized oversight and uniform standards but can be less nimble in terms of being able to tailor solutions to geographically specific climate impacts.[157] The state

---

utility to focus on climate change may be to recognize "that regulation creates incentives, and incentive-based regulation can and should be used to further the regulatory goals");.

152. For discussions of tort law, see generally David A. Grossman, Warming Up to a Not-So-Radical Idea: Tort-Based Climate Change Litigation, 28 Colum. J. Env't L. 1 (2003) (arguing that traditional torts like public nuisance and products liability might be effective litigation theories under which polluters can be held to account); David Hunter & James Salzman, Negligence in the Air: The Duty of Care in Climate Change Litigation, 155 U. Pa. L. Rev. 1741 (2007) (discussing how tort's duty and breach elements might apply in the context of climate change litigation); Douglas A. Kysar, What Climate Change Can Do About Tort Law, 41 Env't L. 1 (2011) (highlighting that tort actions against polluters might help incrementally expand tort doctrine to permit broader challenges capable of addressing climate change); Jim Rossi & Michael Panfil, Climate Resilience and Private Law's Duty to Adapt, 100 N.C. L. Rev. 1135 (2022) (emphasizing that tort liability should attach to public utilities that fail to institute climate adaptation measures). For discussions of regulatory law, see generally Adam D. Orford, Tools for Regulators in a Changing Climate: Proposed Standards, State Policies, and Case Studies From the Western Grid, 32 Geo. Env't Rev. 227 (2020) (referencing different regulatory regimes and their corresponding ability to effectuate climate resilience).

153. City of Oakland v. BP PLC, 969 F.3d 895, 901 (9th Cir. 2020) (describing how "[t]wo California cities brought actions in state court alleging that the defendants' production and promotion of fossil fuels is a public nuisance under California law").

154. See Richard A. Epstein & Catherine M. Sharkey, Cases and Materials on Torts 143–44 (12th ed. 2020); infra section III.C.1.

155. Kysar, supra note 152, at 17 (highlighting that plaintiffs may struggle to establish a sufficient causal nexus in the climate change context because pollution "begin[s] as largely harmless" before "dispersing throughout the atmosphere, warming the planet's surface, and ultimately triggering a laundry list of complex and potentially harmful ripple effects throughout all natural systems").

156. See supra notes 59–60 and accompanying text.

157. Jonathan Schneider & Jonathan Trotta, What We Talk About When We Talk About Resilience, 39 Energy L.J. 353, 400 (2018) ("The diffusion of responsibility over the electric grid, and the dramatically different challenges faced in each region of the country call for a multi-faceted and nuanced response to the resilience challenge . . . .").

approach benefits from the fact that PSCs are already intimately engaged with utilities via a regulatory compact and are also, in theory, more familiar with jurisdiction-specific climate risks. On the downside, however, PSCs have, thus far, failed to wield ratemaking authority to promote resilience.[158] Ultimately, the legal scholarship suffers by treating the tort and regulatory approaches as separate, siloed doctrinal mechanisms. The sections that follow propose a solution that breaks down this barrier and allows the benefits of tort and regulatory law to commingle and synergistically promote resilience.

III. THE SOLUTION—INJECTING TORT'S FORESEEABILITY PRINCIPLE INTO RATEMAKING

The previous sections have highlighted that utilities, regulators, and legislators—despite being aware of and possessing the know-how to alleviate future climate risk—have largely remained steadfast in their backward-looking approach to infrastructure planning. As a result, adaptation has not been prioritized, which has left the grid especially exposed to climate change. To rectify this problem, this Note suggests that regulatory law could benefit from inheriting a fresh, forward-looking legal doctrine, such as that provided by tort law's foreseeability principle. Specifically, this Note suggests that foreseeability be injected alongside the ratemaking principles of prudence, least-cost, and used and useful so that regulators no longer apply such principles in their customary, retrospective manner, but instead, adopt a forward-looking perspective that accounts for climate change. Under this modified framework, regulators and utilities would be required to consider foreseeable climate threats at the outset of the ratemaking process, which would ensure that proposed infrastructure plans include some quantum of ex ante adaptation. Ultimately, this approach would solidify resilience as a top priority for regulators and utilities, which would reflect a critical first step toward reducing the grid's vulnerability to climate risk.

A. *Pursuing Resilience via State Utility Regulation Rather Than Legislation*

Part II highlighted that legislative and regulatory efforts have, thus far, been insufficient to generate climate resilience.[159] It must be emphasized, however, that the failure to promote resilience is not due to an intrinsic flaw in the legislative or regulatory regime but is instead largely because these entities have applied existing law in a manner that fails to capture climate-induced shifts in baseline weather patterns.[160] Thus, a strategy to catalyze climate resilience need not reshape the fundamental

---

158. See Webb et al., supra note 14.

159. See supra section II.B.

160. See supra section I.A.2.

legislative or regulatory structure but must instead identify a legal mechanism capable of changing how existing law in this area is applied.

In terms of identifying the most conducive point of entry for such a resilience-generating legal mechanism, this Note circles the state PSC for a few key reasons.[161] First, as it relates to utility planning and grid matters, PSCs likely possess a greater degree of technical competence—many commissioners have utility sector experience—relative to political representatives.[162] Second, since PSCs are authorized to oversee utilities' rates and infrastructure plans, climate resilience is already within their legal mandate.[163] By contrast, Congress has yet to empower federal agencies to directly regulate utility resilience, so existing law would need to be expanded or new legislation would need to be passed before federal agencies could enter this sphere.[164] Third, PSCs are already in close contact with utilities via ratemaking and can therefore rely upon pre-existing channels of communication that legislative and federal bodies have yet to penetrate to the same extent.[165] Fourth, relative to legislators or federal officials who sit at a distance, PSCs are well postured to understand local climate risks and grid vulnerabilities. Finally, given that climate change is dynamic, PSCs are likely better suited to nimbly change course in response to shifting climate realities relative to potentially slower-moving

161. To be clear, regulatory and legislative strategies can be pursued concurrently, but blending the two approaches in a coherent framework is beyond the scope of this Note.

162. William D. Kerr, State Regulation of Public Utilities, 53 Annals Am. Acad. Pol. & Soc. Sci. 19, 20 (1914); see also Meet the Commissioners, N.Y. State Dep't Pub. Serv., https://www3.dps.ny.gov/W/PSCWeb.nsf/All/553FBA3F3EEF7FBD85257687006F3A6D [https://perma.cc/X5QF-96DL] (last updated Aug. 23, 2022); Position Description: Florida Public Service Commissioner, Fla. Pub. Serv. Comm'n Nominating Council, http://www.leg.state.fl.us/data/committees/joint/pscnc/PSC_Position_Description.pdf [https://perma.cc/FC7V-UMJC] (last visited Jan. 7, 2022).

163. See supra section I.C (discussing the legal mandate that guides PSCs' interactions with utilities).

164. Even though utility resilience is largely an intrastate matter, federal regulation would likely be permitted under the Commerce Clause given the extent to which grid reliability impacts interstate economic activity. Thus, as it relates to federal oversight of utility resilience, the primary hurdle is largely statutory, not constitutional. That said, even though Congress could take such legislative action, a series of practical hurdles, including issues of timing, politicking, and implementation, could delay engagement on the subject, whereas PSCs are already set up for the job. See 16 U.S.C. §§ 791–828c (2018) (listing applicable federal regulations).

165. While utilities tend to be in close contact with state legislatures, such contact often occurs in the context of lobbying and campaigning. PSCs, however, while not immune to such potentially perverse influences, are likely to be more removed from political processes and are therefore more conducive to good faith engagement and oversight. See Leah Stokes, Short Circuiting Policy: Interest Groups and the Battle Over Clean Energy and Climate Policy in the American States 7–9, 243 (2020) (highlighting that while some utilities have funneled support to local politicians and may thus be "empowered with sufficient influence over *legislators*," research suggests that "*professionalized PUCs*" may be relatively "less likely to suffer from [such] interest group capture" (emphasis added)).

legislative and federal entities.[166] Ultimately, "[g]iven their capabilities and knowledge," PSCs are "well positioned to work with utilities to help them make cost-effective investments in resiliency."[167]

B. *Breaking the Barrier: Modifying the Ratemaking Regime to Accommodate Tort Law*

Having circled the PSC as the ideal entity to drive climate resilience, this section sketches a legal mechanism that commissioners can deploy in furtherance of this end.

In terms of available legal mechanisms, some proposals have attempted to push utility resilience by leveraging *either* state utility law *or* tort law.[168] Despite homing in on two promising doctrines, the flaw with such a bifurcated approach is that regulatory and tort law each maintain shortcomings that limit the degree to which either is, on its own, sufficiently capable of compelling utility resilience. For example, regulatory law is robust and powerful, but its lack of an explicit, forward-looking principle tied to climate change is largely to blame for the resilience gap that looms over the utility industry.[169] By contrast, tort law possesses such a forward-looking element vis-à-vis its foreseeability principle, but the doctrine lacks the robust institutional network afforded by the regulatory regime. Thus, while regulatory and tort law each offer their respective benefits, the two approaches are likely more powerful together than they are apart.

Accordingly, this Note takes the position that tort law's foreseeability principle should be injected into the ratemaking process alongside prudence, least-cost, and used and useful. This application would fill the vacuum that currently permits PSCs and utilities to engage in capital planning without an explicit, forward-looking view toward climate change. Ultimately, allowing the two doctrines to commingle permits each to fill gaps in the other and generate synergies for climate resilience.

---

166. David E. Lewis, Making Government Work Part I: Dispelling Myths About Civil Service, Vand. Univ. (Jan. 11, 2021), https://www.vanderbilt.edu/unity/2021/01/11/making-government-work-part-i-dispelling-myths-about-civil-service/ [https://perma.cc/H42H-AUPK] ("[F]ederal agencies can be bureaucratic–slow, unresponsive, and impenetrable."); see also James Wilson, The Rise of the Bureaucratic State, 41 Pub. Int. 77, 98 (1975) ("Regulatory agencies are slow to respond to change . . . .").

167. Brody et al., supra note 51.

168. See, e.g., Webb et al., supra note 14, at 581 (discussing tort and regulatory law as two "separate legal bases" to address climate change).

169. In some respects, but typically not in the context of climate change, the regulatory regime is forward-looking. For example, utilities project electricity demand with a prospective focus that accounts for anticipated changes in population, industrial activity, and housing supply, among other factors. See, e.g., ConEdison, Inc., Long-Range Plan: Our Electric System, A Comprehensive View of Our Electric System Through 2050, at 25–27 (2022), https://www.coned.com/-/media/files/coned/documents/our-energy-future/our-energy-projects/electric-long-range-plan.pdf [https://perma.cc/D8D7-UNCH].

C. *Modifying the Existing Regulatory Regime—Legal Mechanics and Anticipated Benefits*

The following sections begin by providing an overview of salient tort doctrine before discussing the mechanics involved with merging tort law into regulatory law.

1. *Understanding the Fundamental Elements of Tort Law.* — The key tenet of tort law is negligence, which is understood as a failure to act with a "level of care that someone of ordinary prudence" would exercise "under the same circumstances."[170] A prima facie negligence claim has four elements: duty, breach, causation, and damages.[171]

First, with respect to duty, a plaintiff must show that the defendant maintained an obligation to avoid unreasonably harming the plaintiff.[172] Such an obligation can arise out of traditional common law principles, may stem from a special relationship between parties, or might be imposed by statute.[173]

Second, a plaintiff must demonstrate that the defendant breached a duty of care, which will be the case if the defendant's act or omission falls below the type of conduct typically exhibited by a reasonably prudent person.[174] To determine breach, most courts utilize the Hand Formula, which was initially outlined by Judge Learned Hand in the landmark *Carroll Towing* case.[175] The Hand Formula requires one to weigh the burden of taking adequate, harm-avoiding precautions (B) versus the mathematical product between the probability that certain harms will occur (P) and the corresponding magnitude of loss (L).[176] Where the precautionary burden exceeds the probability of harm and magnitude of loss (i.e., $B > P \times L$), there will be no breach of duty and the defendant

170. Negligence, Legal Info. Inst., https://www.law.cornell.edu/wex/negligence [https://perma.cc/XK8C-VV5U] (last visited Nov. 10, 2021); see also New Jersey Civil Jury Charge 5.10(A)(1) (rev. May 2019), https://www.njcourts.gov/attorneys/assets/civilcharges/5.10A.pdf?c=A3K [https://perma.cc/BL78-LNC5] ("Negligence may be defined as a failure to exercise, in the given circumstances, that degree of care for the safety of others, which a person of ordinary prudence would exercise under similar circumstances.").

171. Epstein & Sharkey, supra note 154, at 143–44 ("A plaintiff must meet all four requirements to establish the prima facie case.").

172. Id.

173. Restatement (Second) of Torts § 315 (Am. L. Inst. 1965); Epstein & Sharkey, supra note 154, at 144.

174. Epstein & Sharkey, supra note 154, at 144.

175. The Hand Formula's methodology was codified in the Restatement (Third) of Torts, which outlines the following considerations as it relates to foreseeability: (1) What was the foreseeable likelihood that the person's conduct would result in harm?; (2) What was the foreseeable severity of any harm that may ensue?; (3) What precautionary burden was needed to eliminate or reduce the risk of harm? See Restatement (Third) of Torts: Liab. for Physical & Emotional Harm § 3 (Am. L. Inst. 2010); see also United States v. Carroll Towing Co., 159 F.2d 169, 173 (2d Cir. 1947).

176. *Carroll Towing Co.*, 159 F.2d at 173.

will not be found negligent for the plaintiff's injury.[177] By contrast, if the precautionary burden is less than the probability of harm and gravity of loss (i.e., $B < P \times L$), the defendant may be held negligent for failing to take reasonable action to avert the harm.[178]

Third, the causation element seeks to determine whether the defendant's conduct contributed to the plaintiff's injury.[179] To discern whether such a nexus exists, most courts apply Judge Benjamin Cardozo's framework from the landmark *Palsgraf* case, which asks: "[B]y the exercise of prudent foresight, could the result be foreseen?"[180] As a practical matter, Cardozo's framework is applied sequentially after an injury has occurred, but its core theoretical component is the forward-looking concept of foreseeability.[181] Cardozo's formulation thus calls upon the fact finder to adopt the defendant's perspective from before the plaintiff's injury occurred and ask whether the suffered harm was within the ambit of reasonably foreseeable outcomes such that the defendant should have considered it and taken proactive steps to prevent it.[182] A defendant, then, who fails to avert such a foreseeable injury can be deemed negligent.[183]

Fourth, the damages element considers whether the plaintiff suffered a cognizable harm as a result of the defendant.[184]

2. *Injecting Tort's Foreseeability Into the Regulatory Regime.* — In light of this legal framework, this Note next maps tort's fundamental elements onto the utility regulatory regime.[185] As a starting point, tort's breach prong, which reviews a defendant's conduct for prudence, serves as a natural bridge to the prudence principle in utility ratemaking. The doctrines are fairly analogous, for they outline the same baseline standard of care: that which a reasonably "prudent person" would exercise "under the same or similar circumstances to avoid or minimize risks of harm to others."[186] At a foundational level, both tort and regulatory law regard

---

177. See id.

178. See id.

179. Epstein & Sharkey, supra note 154, at 144. For the purposes of this Note, it is not necessary to detail the customary two-step causation analysis (i.e., cause-in-fact and proximate cause).

180. Palsgraf v. Long Island R.R. Co., 162 N.E. 99, 104 (N.Y. 1928); see also Restatement (Third) of Torts: Liab. for Physical & Emotional Harm § 29.

181. *Palsgraf*, 162 N.E. at 104.

182. See id.

183. See id.

184. A cognizable harm in tort is often a financial or personal injury. Epstein & Sharkey, supra note 154, at 144.

185. As section III.C.1 outlined, duty is the first element of a tort. Additionally, as section I.C.1 highlighted, utilities maintain a duty to serve pursuant to the regulatory compact. Accordingly, tort's duty element is already present in customary regulatory law and need not be explored further herein.

186. Dan B. Dobbs, Paul T. Hayden & Ellen M. Bublick, The Law of Torts § 127 (2d ed. 2011).

the prudence standard as a safeguard against "[u]nreasonable risk-taking."[187]

Despite sharing a theoretical conceptualization of prudence, the principle is applied differently in tort and regulatory law, particularly as it relates to the temporal perspective adopted when reviewing conduct.[188] For example, since tort's elements are conjunctive, there is a relationship between the concepts of prudence and foreseeability such that when these elements are applied to a fact pattern, prudence effectively embraces foreseeability's forward-looking perspective.[189] Dan Dobbs, Paul Hayden, and Ellen Bublick's treatise on torts confirms this conceptual interplay, indicating that the "*reasonable person* exercises care only about the kinds of harm that are *foreseeable*."[190] As a result, because tort's prudence and foreseeability components are intertwined, the discipline enjoys a degree of temporal nimbleness that makes it an invaluably flexible tool across myriad contexts, especially those that require a downrange focus, like climate change.[191]

By contrast, and as section II.B.2 emphasized, regulatory law has customarily applied prudence narrowly and often without a prospective focus, particularly in the context of climate change. This is because regulatory law, unlike tort law, is largely without an explicit forward-looking principle capable of being applied to issues of climate change and resilience.

Thus, with the overarching goal of closing the climate resilience gap in the utility sector, regulatory law can clearly benefit from tort's foreseeability principle. Accordingly, this Note advocates for foreseeability to be imported into regulatory law as an explicit ratemaking component to support notions of prudence, least-cost, and used and useful, which together, can supply a critical prospective force capable of channeling regulators' focus toward future climate risks.

---

187. Id.

188. See supra sections II.B.2, III.C.1.

189. See William L. Prosser, Handbook of the Law of Torts 170, 175–78 (1941) (explaining that the standard for negligence is whether a reasonably prudent person in the defendant's position would have foreseen, anticipated, and/or guarded against the consequences of the given act); supra section III.C.1.

190. Dobbs et al., supra note 186, § 127 (emphasis added).

191. See Robert Meltz, Cong. Rsch. Serv., RL 32764, Climate Change Litigation: A Survey 26 (2009) (highlighting an example where plaintiffs, whose property was damaged by Hurricane Katrina, struggled to prove the counterfactual that emissions by certain oil, coal, and chemical companies caused Hurricane Katrina to be more intense than it otherwise would have been). For a broader discussion on the applicability of prudence and foreseeability in the climate change context, see generally Grossman, supra note 152 (applying tort's elements to climate change); Rossi & Panfil, supra note 152 (describing how tort liability might extend to cover failures to adapt to climate change); Webb et al., supra note 14 (discussing the ability of tort law to accommodate climate change litigation theories).

In practice, this blended approach will encourage regulators to ask two critical, forward-looking questions: (1) Is the utility's service territory exposed to reasonably foreseeable climate risks?[192] If so, (2) has the utility prudently and proactively incorporated cost-effective, adaptive designs in its infrastructure plan to respond to, and reduce the threat posed by, such climate risks? To answer these questions, regulators will borrow the Hand Formula from tort law and use it as a benchmark to gauge reasonable utility conduct.[193] The Hand Formula will help regulators determine whether a utility's proposed capital project is consistent with forward-looking notions of prudence, least-cost, and used and useful. As applied, the Hand Formula will validate a utility's inclusion of adaptive measures whenever the burden of taking precautions is less than the product between the probability of incidence and the magnitude of harm (i.e., $B < P \times L$).[194]

Ultimately, with foreseeability woven into ratemaking, utilities will no longer be able to rely upon backward-looking climate data to develop infrastructure plans and will instead be required to utilize forward-looking projections that capture climate change's impact on baseline environmental patterns.[195] This change in approach will, after rounds of forward-looking rate cases, chip away at the climate resilience gap and reduce the grid's exposure to climate risk.[196]

3. *An Illustrative Example of the Ratemaking Process With an Explicit Foreseeability Component.* — This section provides an action shot of the tort-enhanced regulatory framework. This example assumes that a utility is contemplating the design specifications for a new, $1 billion power plant. As a major capital project, the utility's proposal will be subject to PSC review in a formal rate case proceeding.[197]

As its first step, the utility, anticipating the PSC's forward-looking review, will commission a downscaled, probabilistic climate model to gauge future risks in its service territory.[198] The utility can then generate a probability-weighted list of certain climate events based on the likelihood that each event will occur and its corresponding magnitude of loss.[199]

192. See Marjanac & Patton, supra note 16, at 282–83 (suggesting that with downscaled climate science, "the proximate cause evaluation will likely focus on the foreseeability of the impacts of climate change" and "the law may [thus] seek to determine whether the impacts of climate change could or should have been reasonably anticipated or forecast by the defendant").

193. See supra section III.C.1.

194. See supra section III.C.1.

195. See supra sections I.A.2, I.B.

196. See supra sections I.A.2, I.B.

197. See supra sections I.C.2–.3.

198. The utility should ensure that, like the NCA4, its climate data reflects a multi-scenario analysis under varying levels of warming and climate conditions. See supra section I.A.3.

199. See supra section I.A.3.

These estimates will supply the Hand Formula's "P" and "L" variables, respectively.[200] Next, the utility will analyze whether the power plant maintains the requisite design specifications to confront certain climate risks.[201] To the extent the utility identifies threats which the power plant may not be capable of tolerating, the utility will study additional adaptation measures and their associated costs. This estimate will generate the Hand Formula's remaining input, "B," which measures the burden of taking additional adaptive precautions.[202] With the Hand Formula fully populated, the utility will be able to determine whether it is cost-effective to expend additional resources to further adapt the power plant; this will be the case whenever the burden of doing so is exceeded by the probability of risk and magnitude of harm (i.e., $B < P \times L$).[203] To the extent the Hand Formula indicates the power plant is over- or under-adapted, the utility can tweak the project's design before submitting a final proposal to the PSC for review in the context of a rate case.[204]

Upon receiving the proposal, the PSC will initiate its review in light of the explicitly forward-looking ratemaking principles, which include prudence, least-cost, used and useful, and *foreseeability*.[205] In applying these principles, regulators will study whether the utility (1) is using reasonable methods and reliable data to compile its infrastructure plan and (2) is sufficiently considering and responding to foreseeable climate risks with cost-efficient adaptive designs.[206]

Following this outline, regulators will first scrutinize the utility's downscaled climate forecast by reviewing its underlying sources and methods. Next, assuming the data is reliable, regulators will run their own calculations under the Hand Formula to independently verify the utility's cost-benefit analysis and determine whether the project's design is consistent with the ratemaking principles. Beginning with a forward-looking notion of prudence, the PSC will determine whether the utility's plan adopts the necessary quantum of reinforcements to tolerate future climate risks. If the PSC finds that the utility embraced adaptation wherever doing so was less costly than the probability of risk and magnitude of loss (i.e., $B < P \times L$), the PSC will likely conclude that the design satisfies the prudence standard. If, however, the PSC finds that the utility miscalculated the costs or benefits of certain precautions or failed to consider

200. See supra section III.C.1.

201. It is likely that the utility will enlist the help of consultants on this matter. Lazar, supra note 19, at 91.

202. See supra section III.C.1.

203. See supra section III.C.1.

204. In fact, a key benefit of front-loading this calculation at the outset of the infrastructure design process is that it would allow the utility to make modifications before submitting a final proposal to the PSC.

205. See supra section III.C.2; supra section I.C.3 (describing prudence, least-cost, and used and useful).

206. See supra section III.C.2.

some cost-effective adaptations, the utility will fail its prudence review. In such a circumstance, the PSC will send the utility back to the drawing board to make the requisite edits to its design plan.

With regard to the least-cost principle, the PSC will similarly rely upon the Hand Formula to determine whether the utility's plan adequately incorporates long-term, cost-saving precautions.[207] Foreseeability strengthens traditional notions of least-cost because regulators will not merely ask whether the utility's project satisfies the standard under present circumstances but rather whether the project, viewed from a forward-looking perspective, *will be* cost-effective in light of future climate risks.[208] As applied, regulators will conclude that a utility that fails to integrate cost-effective resilience into its design plans is not compliant with the least-cost ratemaking standard.

With regard to used and useful, regulators will first confirm that the power plant is needed to satisfy future consumer demand.[209] Foreseeability is critical in this review because it is only by utilizing forward-looking data that utilities and regulators can accurately gauge whether future electricity demand—which is anticipated to increase due to warming—necessitates the project.[210] Regulators will next ensure that the power plant's design is sufficiently adapted such that it will remain useful in the long term. As applied, if the utility either misjudges future demand or inadequately designs its power plant, the PSC will question the project's future useability and/or usefulness and require the utility to modify its proposal accordingly.

Overall, this example illustrates that a foreseeability-enhanced regulatory regime supports the use of forward-looking climate data in infrastructure planning. This framework also offers tools, such as the Hand Formula, with which regulators and utilities can efficiently differentiate cost-effective adaptation strategies from those that are unnecessary or impractical. Additionally, by introducing foreseeability at the outset of a rate case, a utility will have the opportunity to modify a design proposal based upon constructive feedback from the PSC before proceeding too far into the project's implementation stage. Ultimately, the modified ratemaking framework will effectively push utilities and regulators to bolster their defenses against future climate risk, which will

207. See supra section I.C.3.

208. Brody et al., supra note 51; see also U.S. Glob. Change Rsch. Program, supra note 12, at 53.

209. See supra section I.C.3.

210. U.S. Glob. Change Rsch. Program, supra note 12, at 71 ("Rising temperatures are projected to . . . drive greater use of air conditioning and increase electricity demand[,] . . . [which] is offset only marginally by the relatively small decline in electricity demand for heating."); see also supra section I.C.3.

gradually help chip away at the resilience gap looming over the industry.[211]

4. *The Theory in Practice: A Case Study on Consolidated Edison and the NYPSC.* — The aforementioned hypothetical sketches this Note's proposed framework in action. The case study below, however, offers an actual example, which, while not perfectly tracking this Note's proposition, is nonetheless helpful in illustrating that a forward-looking ratemaking process is feasible, pragmatic, and effective in catalyzing climate vulnerability planning.

In 2012, Superstorm Sandy brought unprecedented wind and flooding to New York.[212] Manhattan suffered a fourteen-foot storm surge that inundated Consolidated Edison's (ConEdison) grid and caused over one million electric outages.[213] Shortly thereafter, ConEdison petitioned the New York Public Service Commission (NYPSC) to increase electric rates by over $400 million and collect $1 billion for weather-related grid improvements.[214] Rather than proceed in a typical rate case, however, the NYPSC was compelled—largely at the urging of third-party intervenors—to expand the scope of the proceeding and authorize a dual-track process that specifically addressed ConEdison's climate vulnerability alongside the standard focus on rates.[215] Under this approach, ConEdison agreed to commission a first-of-its-kind climate change vulnerability study to analyze local climate risk and conduct a plant-by-plant resilience assessment in light thereof.[216]

ConEdison initiated its vulnerability assessment by gathering forward-looking climate data from several reliable sources, including the

211. One item to consider is the uncertainty inherent in relying upon climate projections to inform adaptation planning. Regulators may, for example, want to establish a buffer zone of acceptable levels of resilience within which there is some built-in forgiveness for a utility that, acting in good faith and relying upon credible forecasts, over- or under-incorporates adaptation measures.

212. John P. Rafferty, Superstorm Sandy, Encyc. Britannica, https://www.britannica.com/event/Superstorm-Sandy [https://perma.cc/L2G9-LZ9D] (last updated Oct. 12, 2021).

213. Press Release, ConEdison, Inc., Hurricane Sandy Update: Con Edison's Restorations on Track for Storm Customers (Nov. 11, 2012), https://investor.conedison.com/news-releases/news-release-details/hurricane-sandy-update-con-edisons-restorations-track-storm [https://perma.cc/4KLR-2NS3].

214. Elanor Stein, Judging and Mediating for the "Long" Emergency: Superstorm Sandy, New York State's Regulatory Response to the Climate Change Crisis, and Reforming the Energy Vision, *in* Crisis Lawyering: Effective Legal Advocacy in Emergency Situations 189, 190–91 (Ray Brescia & Eric K. Stern eds., 2021); see also Christine A. Fazio & Ethan I. Strell, New York State Leading on Utility Climate Change Adaptation, N.Y.L.J. 1, 1 (Feb. 27, 2014) (on file with the *Columbia Law Review*).

215. Stein, supra note 214, at 198; see also Fazio & Strell, supra note 214, at 1.

216. Michael B. Gerrard, An Environmental Lawyer's Fraught Quest for Legal Tools to Hold Back the Seas, 149 Daedalus 79, 90 (2020); see also Fazio & Strell, supra note 214, at 2–3.

NCA4 and Columbia University climatologists.[217] ConEdison and a "study team" of consultants downscaled the climate data to its New York service territory, generated probabilistic models under multiple warming scenarios, and evaluated trends through 2080.[218] From this long-term data, ConEdison concluded that its infrastructure was vulnerable to climate-induced changes to temperature, humidity, and sea level rise, as well as their associated impacts, which ranged from *increased* asset deterioration, system load, and flooding to *decreased* generation capacity and system reliability.[219] ConEdison then calculated the financial risks associated with these threats, finding, for example, that decreased capacity and increased load would cost the company between $1.3 billion and $4.6 billion by 2050.[220] Having estimated the future costs of climate change, ConEdison then had to determine whether it was cost-effective to adapt its grid.[221] Using what amounted to a Hand Formula-type analysis, ConEdison determined that it was worthwhile to proactively spend more than $1 billion to reinforce certain weak points in the grid rather than run the risk of a multi-billion dollar loss in the future.[222]

ConEdison captured its contemplated adaptation strategies in an "Implementation Plan," which included, for example, proposals to construct new storm walls, pumps, and submersible equipment to ensure grid reliability under conditions of flooding.[223] Moreover, the Implementation Plan adopted the "FEMA plus 3" design standard, which requires infrastructure to withstand FEMA's 100-year flood projections *plus* three additional feet of buffer for good measure.[224] Since 2013, ConEdison has been fairly diligent in executing its Implementation Plan.[225] In addition, ConEdison has also solidified a new design protocol that relies upon prospective climate forecasts, which signals the company's commitment to resilience going forward.[226]

---

217. ConEdison, Climate Change Vulnerability Study 17–18 (2019), https://www.coned.com/-/media/files/coned/documents/our-energy-future/our-energy-projects/climate-change-resiliency-plan/climate-change-vulnerability-study.pdf?la=en [https://perma.cc/8KRN-6M9E] [hereinafter ConEdison, Vulnerability Study].

218. Id.

219. Id. at 5–6, 39.

220. Id. at 4.

221. Id. at 62–64.

222. Our Climate Change Resilience Plan, ConEdison, https://www.coned.com/en/our-energy-future/our-energy-vision/storm-hardening-enhancement-plan [https://perma.cc/8VRE-5XV2] [hereinafter ConEdison, Resilience Plan] (last visited Aug. 11, 2022).

223. Plumer & Penn, supra note 101.

224. Fazio & Strell, supra note 214, at 2 (noting that the three-foot buffer is subject to ongoing review and may be modified in light of updated climate data).

225. See ConEdison, Resilience Plan, supra note 222 (noting ConEdison's ongoing commitment to both risk analysis and investing to reduce customer interruptions).

226. ConEdison, Vulnerability Study, supra note 217, at 8.

Ultimately, ConEdison's work with the NYPSC is recognized as the "gold standard" in terms of climate resilience.[227] In fact, as a postscript to ConEdison's 2012 rate case, New York legislatures amended the state's public service laws in 2021—largely in response to repeated climate disasters since Superstorm Sandy—to codify the forward-looking resilience process previewed during ConEdison's rate proceeding.[228] The New York State Assembly "declare[d] that, due to the rise in storm intensity, and effects of climate change, dedicated storm hardening programs need to be developed and implemented throughout New York State to reduce damage and costs from future weather events."[229] Specifically, the new amendment requires New York's electric utilities to prepare a climate change vulnerability study that includes storm hardening and resilience measures responsive to ten- and twenty-year climate threats and explain how such measures "mitigat[e] the impacts of climate change [on] utility infrastructure."[230] Additionally, in its vulnerability study, the utility must provide detailed plans as to how it intends to incorporate climate analysis into its normal-course design practice for new and existing infrastructure.[231] Each utility is required to submit their vulnerability study to the NYPSC, which is authorized to review the analysis and consider whether "it is in the public interest to approve or modify the plan."[232] To make such a determination, the law affords some discretion to the NYPSC but also requires it to consider several criteria, including the extent to which the plan is a reasonable and feasible way to mitigate "the impacts of climate change, reduce restoration costs and outage times associated with extreme weather events, and enhance reliability."[233] Additionally, the NYPSC must scrutinize the estimated costs, benefits, and annual rate impacts associated with the utility's plan, as well as its implementation timeline.[234] Moreover, New York's amended public service law contains a key provision that requires the NYPSC to hold a public hearing in which third-party intervenors can comment on each utility's vulnerability study.[235] Furthermore, the amended state law ensures that climate resilience remains a top priority for New York's utilities

---

227. Plumer & Penn, supra note 101.

228. N.Y. Pub. Serv. Law § 66 (McKinney 2021); see also id. § 73.

229. S. 4824A, 2021 Leg., 237th Sess. (N.Y. 2021).

230. Pub. Serv. § 66 (29)(a)–(c).

231. Id.

232. Id. § 66(29)(e).

233. Id. § 66(29)(d)(vii). These general goals are part of a more specific, multi-prong strategy that includes tactics such as "vegetation management, improvements to system management practices, undergrounding of distribution and transmission lines, replacement of obsolete cables[,] . . . automation and circuit reconfiguration, [and] . . . distributed energy resources." Id.

234. Id. § 66(29)(i)–(vi).

235. Id. § 66(29)(e); see supra section III.C.4 (discussing the integral role third-party intervenors played in compelling the NYPSC to establish the dual-track process to review resilience in ConEdison's 2012 rate case).

by requiring a refreshed climate resilience plan every five years, each time subject to NYPSC review and approval.[236]

Overall, while there are a few differences between the New York State Assembly's pro-climate resilience amendment and this Note's proposal—especially as it relates to the inclusion of tort law's foreseeability language, the interplay between forward-lookingness and ratemaking, and usage of the Hand Formula—the amendment and this Note's proposal are both similar in terms of effectively compelling prospective infrastructure planning and proactive resilience. Thus, it is a strong vote of confidence for this Note's proposal that New York, a leader in the fight against climate change, independently and subsequent to this Note's conceptualization, codified a largely similar regulatory process aimed at compelling utility resilience.

5. *Anticipated Counterarguments and Rebuttals.* — The section below attempts to anticipate and engage with a few expected counterarguments.

The first of such counterarguments is likely to criticize foreseeability as an unworkably nebulous standard. Opponents will highlight that determining the "right" level of foreseeability—the point at which a climate event is deemed sufficiently probable to require proactive adaptation—is merely a subjective line-drawing exercise.[237] One way to circumvent such subjective influences, however, is to embrace the Hand Formula, which offers an objective methodology that regulators can use to determine whether adaptive measures should be pursued without having to reference a foreseeability threshold.[238] For example, if there is a 5% chance that a particular climate event will occur in the next thirty years, and the Hand Formula calculates that the benefits of ex ante adaptation exceed the costs by $1 billion, regulators will deem the project worthwhile. This example illustrates that regulators need not rely upon a subjective foreseeability threshold to determine whether certain resilience projects should be pursued and instead can utilize the Hand Formula's neutral cost-benefit framework.

A second counterargument is likely to raise another line-drawing challenge and ask: To what level of technical specification must a utility's infrastructure conform? Critics will suggest that proactive resilience re-

236. Pub. Serv. § 66(29)(f).

237. Some critics may further stress that setting a threshold for foreseeability is even more prone to subjectivity because many climate events maintain a low risk of occurrence but carry a significant magnitude of harm. These black swan-type incidents can frustrate regulators because it can be difficult to determine whether adaptations for such low-likelihood risks are cost-effective. See Laurie Goering, As Climate Impacts Surge, UN Science Report to Examine 'Black Swan' Events, Reuters (July 20, 2021), https://www.reuters.com/article/us-climate-change-science-impacts-trfn/as-climate-impacts-surge-un-science-report-to-examine-black-swan-events-idUSKBN2EQ20R [https://perma.cc/6SWG-KQE2].

238. See supra sections III.C.1–.3.

quires PSCs to make subjective judgments about how conservatively or aggressively a utility should protect against future climate risks.[239] In rebuttal, this Note suggests that PSCs can avoid having to directly set any such adaptation standard and can instead rely upon System Reliability Standards (SRSs),[240] which are well-established facets of current utility regulation.[241] In short, SRSs prescribe a level of reliability, typically measured by an allowable number and/or duration of service outages, that utilities cannot exceed without violating the regulatory compact.[242] For example, Puget Sound Energy, an electric utility in Washington State, cannot incur more than 1.30 non-major storm power outages per year per customer without violating the state's SRS.[243] Puget must therefore ensure that its design specifications on grid infrastructure are sufficient to satisfy the requisite level of reliability proscribed by the SRS.[244] Thus, in the context of climate resilience, regulators will not necessarily need to set a specific technical threshold for design adaptations because SRSs will implicitly dictate the level of resilience that utilities must account for in their infrastructural design plans.[245]

Critics may also question whether climate models are sufficiently reliable to inform resource allocation and resilience planning. In response, this Note argues that while there will always be some degree of uncertainty when predicting future states of being, climate modeling has proven to be a generally dependable method of projecting certain climate events.[246]

---

239. Ultimately, the level of protection regulators require for critical infrastructure can materially affect the utility's precautionary burden. For example, it is more costly in terms of building materials, labor, time intensity, and so forth for a utility to, at least in theory, comply with a technical standard that requires new infrastructure be built five feet above twenty-five-year sea level projections as opposed to only three feet above that same standard. This will influence the Hand Formula and, by extension, inform when specific adaptation measures may be prudent.

240. For reference, the term "System Reliability Standards" (SRSs) is synonymous with "System Reliability Indices" (SRIs).

241. See Lee Layton, Electric System Reliability Indices, Univ. Nev. Las Vegas Coll. Eng'g (2004), http://www.egr.unlv.edu/~eebag/Reliability_Indices_for_Utilities.pdf [https://perma.cc/KV3X-EWYE].

242. Id.

243. For context, in 2021, Puget realized 1.35 such outages per customer and therefore failed to satisfy the SRS. See 2021 Service Quality Report Card, Puget Sound Energy, https://www.pse.com/pages/customer-service-guarantees [https://perma.cc/96EQ-FUUC] (last visited Aug. 9, 2022). By contrast, in 2020, Puget realized 1.24 such outages per customer and therefore satisfied the SRS. See 2020 Service Quality Report Card, Puget Sound Energy, https://www.pse.com/pages/customer-service-guarantees [https://perma.cc/Q28Z-WYNJ] (last visited Jan. 2, 2022).

244. See supra note 243 and accompanying text.

245. Of course, regulators could modify existing reliability standards as a way to drive climate resilience. While this would not avoid the sort of line-drawing criticism to which this Note responds, regulators could reduce the allowable number of outages or duration of service downtime as a way to compel utilities to spend more on resilience.

246. See Marjanac & Patton, supra note 16, at 265–66 ("Through the detailed study of the causes and factors that influence extreme weather, and by modelling the influence of

In fact, many climate experts emphasize that climate modeling has reached a degree of sophistication such that some "specific risks and impacts from climate change" can be "foresee[n] with statistical certainty."[247] Accordingly, there is a sense among many climatologists that risk detection, attribution research, downscaling, and probabilistic modeling are sufficiently reliable "to support a wide variety of applications, including . . . policy, planning, and legal functions."[248] One need not look further than the ConEdison case study for an example in which such data was used to inform the "gold standard" of vulnerability assessments.[249] There are also examples of major corporations outside the utility sector that have relied upon detailed climate projections to inform adaptation planning. For example, Walmart has commissioned several predictive climate reports and used the findings to adopt tailored supply-chain plans that bolster the company's operations against long-term climate risk.[250] Thus, while climate projections will always contain a margin of error, such projections are likely to be more reliable predictors of future climate risk than most other alternatives and should therefore be trusted to inform climate resilience planning.

Another counterargument likely asks why this Note rejiggers the regulatory regime when some jurisdictions—like the NYPSC in ConEdison's 2012 rate case—have been able to promote resilience from within the existing regulatory framework.[251] In response, this Note suggests that an ad hoc approach to resilience, despite being capable of obtaining some pro-resilience victories, suffers from a few fundamental shortcomings. First, if climate resilience is not firmly institutionalized in the state's regulatory laws, the decision to address climate resilience will be left to the discretion of the PSC and will thus not be an automatic facet of ratemaking. The ConEdison case study illustrates this phenomenon because it is likely that without the fortuitous presence of tenacious third-party intervenors, the NYPSC would not have adopted the

---

long-term climatic forcings, scientists are now able to better understand the drivers of extreme weather, and quantify the extent to which climate change shifts the goalposts of expected weather patterns." (citations omitted)). For a broader discussion of attribution science and its role in climate change litigation, see generally Michael Burger, Jessica Wentz & Radley Horton, The Law and Science of Climate Change Attribution, 45 Colum. J. of Env't L. 57, 69–76 (2020) ("Due to advances in parallel computing[,] [climate models] can be run rapidly and at high spatial resolution, yielding quick results. Indeed, when . . . combined with forecasts of [environmental] variables . . . such as sea surface temperature, results can be made available in advance of actual events.").

247. Marjanac & Patton, supra note 16, at 282–84.

248. See Burger et al., supra note 246, at 65 (surveying the current state of detection and attribution research and noting remaining constraints and gaps).

249. See supra section III.C.4.

250. Climate Change, Walmart, https://corporate.walmart.com/global-responsibility/sustainability/planet/climate-change [https://perma.cc/K5WV-HZ74] (last visited Aug. 9, 2022).

251. See supra section III.C.4.

special dual-track proceeding to specifically address ConEdison's climate vulnerability.[252] Second, jurisdictions that lack an explicit resilience focus will likely be unable to compel en masse resilience among the state's utilities. This shortcoming is also evident in the ConEdison example: The NYPSC issued a resilience order to National Grid and PSEG, but since ConEdison was the only utility of the three involved in a rate case at the time, the order had no binding effect on either National Grid or PSEG.[253] It therefore seems clear that an explicit codification of a regulatory resilience mechanism is preferred over the ad hoc approach because it removes any discretional component associated with adaptation planning, and it also ensures that such planning is actively pursued by all major utilities in a state. And finally, for those critics that still cite the 2012 ConEdison rate case as evidence that the ad hoc approach can suffice, such critics should be directed to the amendments made to New York's public service laws in 2021 that largely codify the 2012 proceeding in what is effectively a legislative concession that a firmly institutionalized process is more desirable relative to the ad hoc approach.[254]

A further criticism, likely arising from tort lawyers, is that introducing tort principles into utility regulation may partially close off tort law's remedial outlet. To counter this claim, this Note suggests that weaving tort principles into ratemaking effectively requires utilities to satisfy a higher standard of conduct ex ante, which might potentially prevent some negligent behavior from occurring ex post. By extension, there will likely be fewer tort suits, which has the benefit of saving otherwise would-be litigants the time, money, and complexity of litigating a negligence claim. Moreover, even if tort law's presence in the regulatory regime fails to avert utility negligence, tort law is still available to plaintiffs in its traditionally remedial form.[255] All this considered, tort's presence in regulatory law is unlikely to crowd out traditional tort law.

---

252. Id.

253. See, e.g., Petition of the City of New York, Environmental Defense Fund, Natural Resources Defense Council, and Sabin Center for Climate Change Law to Comprehensively Study the Impacts of Climate Change on Utility Infrastructure, Matter 21-M-0199, at 11–17 (filed Mar. 19, 2021), https://documents.dps.ny.gov/search/Home/ViewDoc/Find?id=%7BA15DE203-B035-4332-95D0-1FD5688FC7DC%7D&ext=pdf [https://perma.cc/74BU-9Q24] (advocating for the NYPSC to impose similar obligations on New York's other utilities).

254. N.Y. Pub. Serv. Law §§ 66, 73 (McKinney 2022).

255. Nonetheless, critics might further suggest that plaintiffs may struggle to hold a utility negligent ex post if that utility is acting in a manner authorized by the PSC. In practice, however, it is doubtful that a PSC's determination of reasonableness will have preclusive effects in tort. Ratemaking and general negligence exist in fundamentally different spheres: The former is overseen by PSCs and involves matters of rates and capital plans, while the latter is overseen by juries and judges and involves matters of fact and law. Some such matters are even assigned to bankruptcy judges who are left to clean up messy situations in which a utility that may have largely neglected resilience is implicated in a climate-related disaster from which tort litigation abounds. In re PG&E Corp., 617 B.R.

An additional counterargument is likely to take issue with the fact that resilience imposes a financial burden upon customers who pay for adaptation via utility-cost recovery. In response, this Note suggests that while front-loading resilience may be an expensive endeavor, it is ultimately the ratepayers themselves who directly benefit in the form of enhanced service reliability.[256] Additionally, while proactive resilience may require up-front rate increases, such measures are likely cost-saving for customers in the long term: It prevents ratepayers from having to expend resources to rebuild or adapt an insufficiently weatherized project that is destroyed or damaged in a climate-enhanced event.[257] Ultimately, resilience is necessary to promote long-term grid reliability, but it unavoidably carries a financial cost. This Note, however, carefully shapes the ratemaking principles to safeguard customers and ensure that utilities only recover costs for prudent, cost-effective adaptation measures, not those that are extravagant or inefficient.[258]

A final counterargument is likely to question why PSCs should drive climate resilience over federal agencies. Critics of the state approach will likely emphasize that FERC, for example, should lead the resilience effort because of its superior institutional resources and ability to provide uniform guidance. To be clear, this Note's proposal does not discourage federal assistance, but there are nonetheless several reasons why PSCs may be the preferred catalysts for climate resilience. First, PSCs already serve as utilities' primary oversight bodies,[259] which thereby reduces any disruption that might arise if federal agencies were to involve themselves more intimately in utility oversight. Second, PSCs are, relative to federal agencies, theoretically closer to—and therefore better postured to understand—local climate threats and utility vulnerabilities.[260] Third, federal agencies will likely require additional grants of statutory authority before being able to regulate utility resilience, which, given the political division around matters of climate change, may further delay adaptation efforts.[261] Fourth, federal agencies can be notoriously slow-moving relative to PSCs, which can be more nimble and less bureaucratic.[262] Ultimately, while federal support is welcomed in the matter of utility resilience, PSCs are likely the best-suited entity to spearhead this initiative.

671, 673 (Bankr. N.D. Cal. 2020) (approving Chapter 11 Plan following numerous damage claims filed after the 2015 to 2018 Northern California wildfires).

256. For a broader discussion on the relationship between resiliency, reliability, and utilities' tort liability, see Webb et al., supra note 14, at 593.

257. See Brody et al., supra note 51.

258. See supra sections III.C.2–.3.

259. See supra section I.C; supra notes 59–61.

260. See supra section III.A.

261. See supra section III.A; supra notes 163–166.

262. See Lewis, supra note 166.

CONCLUSION

The climate crisis has come to a head, and it is at this critical juncture where present actions will define society's ability to navigate a future rife with enhanced climate risk. As this Note has demonstrated, the electric grid is simultaneously one of the nation's most fundamental infrastructural components and one of the most susceptible to climate threats. In light of this reality, utilities and regulators alike have shown surprisingly little initiative to refresh traditional practices with those that acknowledge and adapt to climate vulnerabilities. As a result, the grid remains exposed to a series of cascading threats that do not just jeopardize service reliability but also endanger markets, supply chains, and society's basic, quotidian functions.

In a step toward rectifying this situation, this Note identifies that state utility regulators maintain powerful tools capable of influencing a utility's behavior, but such tools have seldom been wielded to compel climate adaptation. Accordingly, this Note scans the legal landscape for a doctrine capable of invigorating and encouraging regulators to apply their ratemaking tools in a manner that acknowledges future climate risks. This Note ultimately pinpoints tort law's foreseeability principle as offering the critical forward-looking component that is largely absent in the regulatory compact. Thus, this Note proposes that foreseeability be integrated into the regulatory regime as an explicit ratemaking principle alongside prudence, least-cost, and used and useful. Under this framework, regulators will be required to review a utility's proposed rate design and capital plan with an eye toward future climate impacts. Correspondingly, utilities will thereby be compelled to study climate risks and adaptive measures when engaging in future business planning. Ultimately, this approach leaves little room to neglect climate resilience, which therefore provides a sense of optimism that regulators and utilities can begin to surmount the climate resilience gap and take steps toward a more reliable future.