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UNIVERSITY OF TULSA COLLEGE OF LAW

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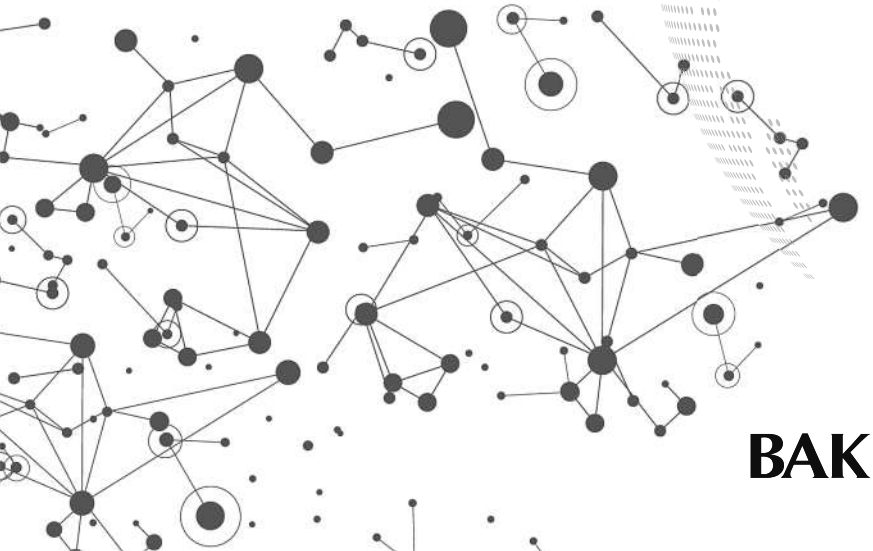

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COMMITTEE REPORTS

Neither the reports of the Energy Bar Association Committees nor the annual review of the Canadian energy law developments are included in the print version of the Journal. Rather they are published online on the EBA's website at www.felj.org. Persons citing to the reports should use the following format: [Title of Report], 45 Energy L.J. [page number] Online (2024), [link to report]. Included in the full electronic version of the Energy Law Journal, Volume 45, No. 1, are the following reports:

Compliance and Enforcement

Gas, Oil and Liquids Steering

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Rising Star in Energy Award

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2023 Serena A. Rwejuna

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2019	Robert S. Fleishman
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2001	Congressman John D. Dingell

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This Award was created in memory of Paul Nordstrom, a past President of the Energy Bar Association (EBA) and motivating force in the organization of the Charitable Foundation of the EBA (CFEBA). The first award was given to Paul posthumously. It is an award to honor and to recognize exemplary long-term service or a particularly significant example of public service by a current or past member to the community through the EBA, the CFEBA, or the Foundation of the Energy Law Journal. Exemplary community service outside of these organizations may also be considered as a criterion for the Award.

2023	Rick Smead
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This Award was created in memory of Jason F. Leif, a past President of the Energy Bar Association (EBA), a past President of the Houston Chapter of the EBA, and a motivating force in the revitalization of the Houston Chapter. This award honors and recognizes exemplary long-term service, or one or more particularly significant examples of service, by an EBA member to one or more of the EBA Chapters, enhancing the role of the EBA Chapters in representing EBA's values and character at the regional level. Exemplary service to the community in connection with EBA Chapter activities may also be considered. The EBA Board created this award in 2018, and voted unanimously to honor Jason as the first recipient of the Award.

2024	Freddi L. Greenberg
2023	Kelli Cole
2022	Jason Marshall
2021	Cynthia Brown Miller
2020	Crystal McDonough
2019	Daniel T. Pancamo
2018	Jason F. Leif

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The Champion for Diversity and Inclusion Award, is given to a Member who has embodied the principles of the Diversity and Inclusion Policy through their actions in the Associations and/or their professional career. The award is granted as deemed warranted by the EBA Board and may, or may not, be granted annually. Emma Hand was named as the first recipient of this award.

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2021	Sherry Quirk
2020	Chief Judge Carmen A. Cintron
2019	Emma Hand

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DIVERSITY AND INCLUSION POLICY

The Energy Bar Association (EBA), the Charitable Foundation of the Energy Bar Association (CFEBA), and the Foundation of the Energy Law Journal (FELJ) are committed to the goals of fostering an inclusive and diverse membership and increasing diversity across all levels of the Associations. Attorneys, energy professionals and students with varied and diverse characteristics practicing in the energy field are welcome to join our ranks, regardless of race, creed, color, ethnicity, Native American, Alaska, or Hawaiian Native tribal membership or descendance, gender (including gender identity or expression), sexual orientation, family and marital status (including pregnancy), family responsibilities, religion, national origin, age, personal appearance, political affiliation, veterans status, disability, source of income (government, solo, corporate, firm practice), or place of residence or business (geographic diversity) and are encouraged to become active participants in the Associations' activities.

PRESIDENT'S MESSAGE

By the time this edition of the Energy Law Journal (Journal) is published, my term as President of the Energy Bar Association (EBA) will have ended. Having anchored my term to a renewed focus on education and membership, I reflect with pride on all that we accomplished this year. The EBA successfully bolstered its educational programming by featuring forty-six events that collectively reached nearly 2,500 registrants and launched the new EBA OnDemand learning system with a catalog of sixty courses. Membership grew as well, with 1,807 members as of year-end 2023, reflecting an increase of 9% over year-end 2022.

As always, the Journal is critical to furthering the educational efforts of the EBA, and this edition is no exception. To keep EBA members apprised of developments in technology and analytical tools, this edition of the Journal includes two pieces on artificial intelligence (AI). Eugene Lee and Wesley Leeroy's piece, "How AI Tools Can Help Diagnose Market Dynamics and Curb Market Power Abuse as the Nation's Power Supply Transitions to Renewable Resources," describes the authors' AI-driven analysis of the renewable energy transition and its implications for regulation of seller market power. Daniel Slate, Alexandre Parisot, Liang Min, Patrick Panciatici, and Pascal Van Hentenryck's article, "Adoption of Artificial Intelligence by Electric Utilities," explores considerations for responsibly and effectively deploying AI within the electric industry, particularly in light of the potential impacts of AI on energy markets and national security. It assesses both the opportunities and challenges for electric utility use of AI, as well as its role in accelerating renewable deployment.

The two remaining articles in this edition of the Journal also provide thought-provoking scholarship on timely topics. Janice Beecher, Harvey Reiter, and Jeffrey Watkiss's article, "Regulatory Imperative to Ensure Utility Climate Resilience Planning," discusses the tools available to energy regulators to spur utility action on climate resilience and adaptation. These tools include rulemaking powers that can be utilized to institute resilience planning requirements and ratemaking tools for climate resilience and cost recovery. Finally, Robert Fleishman, Emma Hand, Mosby Perrow, and Dr. Diana Hernández's essay, "Energy Insecurity – What Is It, and Why Does It Matter?," explains and explores issues associated with energy insecurity.

I would like to thank the members of the EBA Board of Directors, the Charitable Foundation of the Energy Bar Association Board of Directors, the Foundation of the Energy Law Journal Board of Directors, EBA committee members, EBA staff, and the countless other EBA volunteers, each of whom make the EBA a truly great organization. Finally, I would like to thank the EBA membership for the privilege of serving as your President.

Sincerely,
David Martin Connelly
President, Energy Bar Association

EDITOR IN CHIEF'S PAGE

Entering the 2023 season, the Detroit Lions were the only NFL team in existence at the time of the first Super Bowl never to have played in, much less won a Super Bowl. That statement, unfortunately, is still true in 2024.

The Super Bowl, in fact, did not exist when the Detroit Lions won the NFL championship on December 28, 1957. I had just turned seven a few weeks earlier. The Lions would not win another playoff game for thirty-four years. I was a month past my forty-first birthday when the Lions defeated the Dallas Cowboys in early January, 1992.

Luckily, I did not have to wait as long for the next playoff victory. That came a mere thirty-two years later when the Lions beat the Los Angeles Rams in a first round playoff game in January. The following Sunday, they defeated the Tampa Bay Buccaneers.

The last paragraph is not a misprint. This Editor-in-Chief's Page, like the articles in the Journal, has been cited-checked for accuracy. In the six months since issuance of the last edition of the Journal, these games were surely among the most newsworthy of the events I'll recount in the current edition's Editor in Chief's Page. The week that followed was less magical. The Lions blew a 24-7 halftime lead to the San Francisco 49ers in a game that sent the winner to the Super Bowl and have now gone sixty-seven years without winning a road playoff game. But still, two playoff wins in a single season!

Well, enough about the Detroit Lions. We've got a lot to catch up on in the world since the last edition of the Journal. My semi-annual trip down memory lane follows.

Nominees for Three FERC Commissioner Vacancies

Many observers thought that with the departure of Commissioner Danly, and Commissioner Clements's announcement that she was not seeking renomination for another term, FERC would be down to two commissioners, i.e., without a working quorum, as early as July, but no later than January 3, 2025, when the current term of Congress ends. But in something of a surprise announcement, President Biden nominated two Democrats – Judy Chang and David Rosner – and one Republican – Lindsay See, to fill the Commission's three openings.[1] And it appears that these individuals might be confirmed by the time this edition goes online.

Federal and State Criminal indictments of former Ohio PUC Chair

Sam Randazzo, the former chair of the Public Utilities Commission of Ohio, was charged by the U.S. government in November, 2023 with eleven felony

1. Press Release, President Biden Announces Three FERC Nominees, FERC (Feb. 29, 2024), https://www.ferc.gov/news-events/news/president-biden-announces-three-ferc-nominees.

counts[2] in connection with an alleged bribery scheme involving FirstEnergy. Then, in February, Ohio's attorney general also filed felony indictments against Randazzo and former FirstEnergy officials over the same bribery scandal, including an allegation that Randazzo took $4.3 million in bribes from FirstEnergy in connection with actions favorable to FirstEnergy that Randazzo then took as chairman of the PUC. These alleged actions included support for Ohio House Bill 6 that provided $1.6 billion in subsidies to Ohio utilities, including FirstEnergy.[3] On April 9, 2024, Randazzo was found dead, hanging from a rope in a Columbus warehouse, the coroner confirming his death as a suicide.[4]

Worst Fire in Texas History

The Smokehouse Creek fire in late February, the largest in Texas history and one of the largest in U.S. history, destroyed more than a million acres – about 2,000 square miles – of farm and grazing land and thousands of cattle "in the heart of Texas cattle country."[5] In early March, Xcel Energy, a large utility with significant operations in Texas, acknowledged its power lines and equipment "appear to have been involved in an ignition of the [] fire," a conclusion shared by Linda Moon, assistant director of the Texas A&M Forest Service.[6]

"Char Miller IV, a professor of environmental analysis at Pomona College, said global warming is intensifying cycles of weather 'whiplash' like the Texas panhandle has experienced, with extreme rainfall fueling plant growth and then extreme heat and drought turning it to kindling."[7] What is the responsibility utilities and state regulators have to develop resilience plans in the face of increasing climate risks? That is the subject of an article I co-wrote with Dan Watkiss and Janice Beecher for this volume of the Journal.

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2. Press Release, *Grand jury indicts former state public utilities chairman for federal bribery, embezzlement crimes*, United States Attorney's Office, Southern District of Ohio (Dec. 4, 2023), https://www.justice.gov/usao-sdoh/pr/grand-jury-indicts-former-state-public-utilities-chairman-federal-bribery-embezzlement

3. Laura A. Bischoff, *Ohio House Bill 6 case: Who is Sam Randazzo?*, COLUMBUS DISPATCH (Feb. 12, 2024), https://www.dispatch.com/story/news/state/2024/02/12/long-time-attorney-sam-randazzo-is-facing-state-and-federal-charges/72570695007/.

4. Marty Schladen, *Indicted former Ohio utility chair Sam Randazzo reported dead by suicide*, OHIO CAP. J. (Apr. 9, 2024), https://ohiocapitaljournal.com/2024/04/09/indicted-former-ohio-utility-chair-sam-randazzo-reported-dead-by-suicide/.

5. Scott Dance, *A massive Texas wildfire is finally dying down. Its impact could last years*, WASH. POST (Mar. 6, 2024), https://www.washingtonpost.com/weather/2024/03/05/texas-wildfire-impact-cattle-farmers-agriculture/.

6. Brianna Sacks, *Xcel Energy power equipment caused huge Texas fire, investigators say*, WASH. POST (Mar. 7, 2024), https://www.washingtonpost.com/climate-environment/2024/03/07/smokehouse-creek-texas-fire-cause-xcel/.

7. *Id.*

Climate Change

Could a Giant Parasol in Outer Space Help Solve the Climate Crisis? That was the provocative title of a February 2, 2024 article in the New York Times.[8] As recounted by Times reporter Cara Buckley, in 1989:

> James Early of the Lawrence Livermore National Laboratory suggested a 'space-based solar shield' positioned near a fixed point between the Earth and the sun called Lagrange Point One, or L1, some 932,000 miles away, four times the average distance between the Earth and the moon. There, the gravitational pulls from the Earth and sun cancel each other out."[9]

Since then, Buckley reported, other scientists from the University of Arizona, the Asher Space Research Institute at Technion-Israel Institute of Technology, the University of Hawaii and the University of Utah have made similar proposals. Their proposals would potentially reduce temperatures on Earth, at least temporarily and "would help stabilize the climate, supporters of the idea say, while other climate mitigation strategies were being pursued."[10]

The appeal of these seemingly exotic strategies has increased with the sobering statistics about global temperature increases. As the National Oceanic and Atmospheric Administration's chief scientist, Dr. Sarah Kapnick, remarked:

> Not only was 2023 the warmest year in NOAA's 174-year climate record — it was the warmest by far. A warming planet means we need to be prepared for the impacts of climate change that are happening here and now, like extreme weather events that become both more frequent and severe. We will continue to see records broken and extreme events grow until emissions go to zero. Government policy can address both emissions, but also actions to reduce climate impacts by building resilience.[11]

Antitrust in the News Again

In my fall Editor in Chief's Page, I mentioned that the Department of Justice's Antitrust Division and the Federal Trade Commission, the nation's two antitrust enforcement agencies, had proposed a new set of merger guidelines. Those were finalized in December, 2023 with some limited modifications made in response to comments the agencies received.[12] Some of the changes from the 2010 horizontal and 2020 vertical merger guidelines were: "lowering the post-transaction thresholds that trigger a presumption of harm," greater focus on "the loss of

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8. Cara Buckley, *Could a Giant Parasol in Outer Space Help Solve the Climate Crisis?*, N.Y. TIMES (Feb. 2, 2024), https://www.nytimes.com/2024/02/02/climate/sun-shade-climate-geoengineering.html?unlocked_article_code=1.SU0.NS-d.xqNCw6aEPCcp&smid=nytcore-android-share.

9. *Id.*

10. *Id.*

11. *2023 was the world's warmest year on record, by far*, NOAA NEWS (Jan. 12, 2024), https://www.noaa.gov/news/2023-was-worlds-warmest-year-on-record-by-far.

12. Press Release, Federal Trade Commission and Justice Department Release 2023 Merger Guidelines, FTC (Dec. 18, 2023), https://www.ftc.gov/news-events/news/press-releases/2023/12/federal-trade-commission-justice-department-release-2023-merger-guidelines.

potential competition," "serial acquisitions" and evidence of a "trend toward concentration."[13] When the 2010 horizontal merger guidelines were adopted by DOJ and the FTC, FERC declined to follow suit, choosing to continue applying the horizontal merger guidelines the FTC and DOJ had adopted in 1992.

Whether FERC will revisit that decision in light of the new guidelines remains to be seen. But there has been plenty of other activity on the antitrust front. March, 2024 was a particularly busy month for antitrust.

On March 21, 2024, the Justice Department, joined by sixteen state attorney generals, filed an antitrust suit against Apple, charging it under the Sherman Act with monopolization of the smartphone market in the U.S. The complaint alleges that " iPhone dominates more than 70 percent of the high-end smartphone market" and that Apple maintains its monopoly by a number of means, including making it harder if not impossible to utilize the iPhone with smartwatches produced by other manufacturers or for owners of other types of smartphones to share messages with iPhone owners securely or with the same quality.[14] "As a result," said Attorney General Merrick Garland, "iPhone users perceive rival smartphones as being lower quality because the experience of messaging friends and family who do not own iPhones is worse — even though Apple is the one responsible for breaking cross-platform messaging."[15] As an Android owner, I have heard precisely this "your Android is inferior" argument from my iPhone-owning family members. Now I can respond to them that my phone is not inferior, and that iPhone is to blame.

Less than a week before the Apple suit was filed, "the National Association of Realtors announced . . . a settlement with groups of homesellers, agreeing to end landmark antitrust lawsuits by paying $418 million in damages and eliminating rules on commissions."[16] As CNN put it, "[t]he 6% commission, a standard in home purchase transactions, is no more."[17] An analysis by TD Cowens Insights suggests that realtor commissions might drop by 25% as competing realtors may now offer flat fee services and discount brokerage companies may expand.[18]

And still earlier in the month, JetBlue and Spirit Airlines abandoned their planned merger following a successful Justice Department suit challenging their

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13. *Federal Merger Enforcement Year in Review: 2023*, THOMSON REUTERS PRACTICAL LAW (Feb. 5, 2024), https://content.next.westlaw.com/practical-law/document/Iaeff496ba98311ee8921fbef1a541940/Federal-Merger-Enforcement-Year-in-Review-2023?viewType=FullText&transitionType=Default&contextData=(sc.Default)#co_anchor_a283109.

14. Cristiano Lima-Strong & Perry Stein, *Justice Department, states accuse Apple of holding a smartphone monopoly*, WASH. POST (Mar. 21, 2024), https://www.washingtonpost.com/technology/2024/03/21/apple-doj-antitrust-lawsuit-smartphone/.

15. *Id.*

16. David Goldman & Anna Bahney, *The 6% commission on buying or selling a home is gone after Realtors association agrees to seismic settlement*, CNN (Mar. 15, 2024), https://www.cnn.com/2024/03/15/economy/nar-realtor-commissions-settlement/index.html.

17. *Id.*

18. *Id.*

merger under the Clayton Act.[19] The government had alleged, and a federal district court judge had agreed, that the merger would unreasonably diminish competition between low-fare air carriers to the detriment of airline passengers.[20]

The antitrust blockbuster, though, was a rule issued by the Federal Trade Commission on April 23, 2024. It bars as an unfair method of competition all new employer non-compete agreements with workers, including senior executives.[21]

No Longer With Us

Rosalynn Carter

Rosalynn Carter, former First Lady and wife of President Jimmy Carter for seventy-seven years, died at her home in Plains, Georgia on November 19, 2023, shortly after the prior edition of this Journal went online. Mrs. Carter was ninety-six.[22] "She frequently attended Mr. Carter's cabinet meetings and traveled abroad to meet with heads of state in visits labeled substantive, not ceremonial. She often sat in on the daily National Security Council briefings held for the president and senior staff."[23] Long before Hillary Clinton made headlines for her work on health care legislation, New York Times columnist Tom Wicker wrote that Rosalynn Carter may have been "the most powerful first lady since Edith Bolling Wilson virtually took over for a stricken president," i.e., Woodrow Wilson.[24] It was at Carter's urging that the office of first lady became a formal federal position with funding for a staff.[25]

Charles Fried

Charles Fried, a conservative who served as Solicitor General under President Reagan and unsuccessfully urged the reversal of *Roe v. Wade*, but who years later, in an essay penned months before the *Dobbs* decision, maintained that overturning *Roe v. Wade* "would be an act of constitutional vandalism – not conservative, but reactionary," passed away at the age of eighty-eight on January 23, 2024.[26] A law professor and ethicist who began teaching at Harvard Law School in 1961, Fried spent four years as Solicitor General where he argued twenty cases before the Supreme Court and served later as a judge in the Massachusetts court system while

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19. Press Release, Justice Department Statements on JetBlue Terminating Acquisition of Spirit Airlines, U.S. Just. Dep't (Mar. 4, 2024), https://www.justice.gov/opa/pr/justice-department-statements-jetblue-terminating-acquisition-spirit-airlines#:~:text=PRESS%20RELEASE-,Justice%20Department%20Statements%20on%20JetBlue%20Terminating%20Acquisition%20of%20Spirit%20Airlines,-Monday%2C%20March%204.

20. *Id.*

21. Press Release, Fact Sheet on FTC's Proposed Final Noncompete Rule, FTC (Apr. 23, 2024), https://www.ftc.gov/news-events/news/press-releases/2024/04/fact-sheet-ftcs-proposed-final-noncompete-rule.

22. Katharine Q. Seelye, *Rosalynn Carter, First Lady and a Political Partner, Dies at 96*, N.Y. TIMES (Nov. 19, 2023), https://www.nytimes.com/2023/11/29/us/read-rosalynn-carters-full-obituary.html.

23. *Id.*

24. *Id.*

25. *Id.*

26. Brian Murphy, *Charles Fried, legal scholar who bridged law and ethics, dies at 88*, WASH. POST (Jan. 25, 2024), https://www.washingtonpost.com/obituaries/2024/01/25/charles-fried-solicitor-general-dies/.

still teaching law. Originally a supporter of presidential candidate John McCain, he "publicly broke ranks and endorsed Barack Obama after McCain named Sarah Palin as his running mate."[27]

Henry Kissinger

Henry Kissinger, who served as both national security advisor and secretary of state under President Nixon (and, for a time in both roles simultaneously) died at the age of 100 at his home in Connecticut on November 29, 2023. Kissinger, known as a practitioner of realpolitik – "using diplomacy to achieve practical objectives rather than advance lofty ideals" – was both credited for his diplomatic role in opening formal relations between the U.S. and China and vilified for his behind the scenes machinations leading to the bombing of Cambodia[28] and the "destabilize[ation] of the democratically elected government of Salvador Allende in Chile."[29] Kissinger remained an active force in international affairs up to the time of his death. Only a few months before he died, Kissinger was meeting with "Chinese leader Xi Jinping in Beijing, as bilateral relations [between China and the U.S.] were at a low point."[30]

Steve Lawrence

Steve Lawrence passed away at the age of eighty-eight on March 7, 2024. For those of the ELJ's readers old enough to remember him, the reaction to Steve Lawrence's death might well have been, "I didn't realize he was still alive." Other, younger readers will probably ask, "Who was Steve Lawrence?" Well in his time, Lawrence, born Sydney Liebowitz, was a world famous singer, an Emmy and Grammy winner and part of a duo with his wife Eydie Gormé, with whom he shared the stage on TV, in movies, on Broadway and in Las Vegas for half a century.[31]

Norman Lear

Active until the end, Norman Lear died on December 5, 2023 at the age of 101. It is no exaggeration to say that Lear revolutionized television comedy in the 1970s and 1980s. As Lear put it, before then, "the biggest problem any family faced was 'Mother dented the car, and how do you keep Dad from finding out'; 'the boss is coming to dinner, and the roast's ruined.' The message that was sending out was that we didn't have any problems."[32] Boy did the characters on his shows have problems. As the New York Times put it, his "crowning achievement

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27. *Id.*

28. Nancy Benac, *Henry Kissinger, secretary of state under Presidents Nixon and Ford, dies at 100*, AP (Nov. 30, 2023), https://apnews.com/article/henry-kissinger-obit-secretary-of-state-d7d289c3a0b911ed9b863c219cee77e8.

29. Josh Meyer, *Think Trump, Biden had a lot of classified docs? Not compared to Henry Kissinger*, USA TODAY (Dec. 1, 2023), https://www.usatoday.com/story/news/politics/2023/12/01/henry-kissinger-declassified-obituary/71759798007/.

30. Benac, *supra* note 28.

31. Adam Sweeting, *Steve Lawrence Obituary*, THE GUARDIAN (Mar. 10, 2024), https://www.theguardian.com/music/2024/mar/10/steve-lawrence-obituary.

32. Richard Severo & Peter Keepnews, *Norman Lear, Whose Comedies Changed the Face of TV, Is Dead at 101*, N.Y. TIMES (Dec. 6, 2023), https://www.nytimes.com/2023/12/06/arts/television/norman-lear-dead.html.

was All in the Family" and "his greatest creation" was Archie Bunker, "an unapologetic bigot" who actor Carroll O'Connor managed to make "strangely likeable." And several of the spinoffs of *All in the Family*, like *Maude* and *The Jeffersons* tackled issues still at the forefront today: racial discrimination, abortion, addiction.[33] In his later years, Lear founded, and remained active in People for the American Way, wrote for *South Park* into the 2000s, won Emmys at the ages of ninety-seven and ninety-eight and was working on a reboot of his earlier hit, *Mary Hartman, Mary Hartman* at the time of his death.

Joseph Lieberman

A Connecticut senator for twenty-four years and the first Jewish vice presidential candidate from a major party, Joseph Lieberman died at age eighty-two on March 27, 2024. After serving as Al Gores' running mate in 2000, Lieberman famously angered fellow Democrats when he endorsed his longtime friend, Republican Senator John McCain, for the presidency in 2008, but later voted for President Obama and for President Biden. He co-founded the "No Labels" movement as a means to promote bipartisan compromise, but insisted there would not be a "No Labels" presidential candidate "if we think this will help reelect Trump," warning that "what he's really a threat to is the rule of law, which is the great guarantor of our freedom, of order, of our prosperity, of everything."[34] Not long after his death, No Labels announced that it would not be fielding a presidential candidate in 2024.

Alexei Navalny

On February 16, 2024, Alexei Navalny, the popular Russian opposition leader who returned from exile and survived a poisoning only to be imprisoned on dubious charges, was found dead in his prison cell in a remote Artic prison colony. Government officials attributed his death to a "blood clot," but many suspected that his death was a murder ordered by Russian President Vladimir Putin.[35] More than a week passed following his death during which time authorities refused to turn over his body to Navalny's mother unless she agreed to hold the funeral, a demand she refused.[36]

O.J. Simpson

Heisman Trophy winner, record-setting NFL running back, Hertz pitchman, movie star, TV sports commentator, accused killer, convicted armed robber. Orenthal James "O.J." Simpson, who was all of those things, succumbed to cancer and died at the age of seventy-six on April 11, 2024. Nearly thirty years ago, his controversial acquittal on charges that he had murdered his ex-wife Nicole Simpson and her friend Ronald Goldman followed non-stop TV coverage of what many called the trial of the century. Although acquitted of criminal charges, Simpson

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33. *Id.*

34. Jake Tapper, et al., *Former Sen. Joe Lieberman dies at 82*, CNN (Mar. 27, 2024), https://www.cnn.com/2024/03/27/politics/joe-lieberman/index.html.

35. *Death and Funeral of Alexei Navalny*, WIKIPEDIA, https://en.wikipedia.org/wiki/Death_and_funeral_of_Alexei_Navalny.

36. Robyn Dixon & Souad Mekhennet, *Aide to Navalny says prisoner swap was in the works before his death*, WASH. POST (Feb. 26, 2024), https://www.washingtonpost.com/world/2024/02/26/navalny-russia-prisoner-swap-krasikov/.

was later found civilly liable for their wrongful deaths. A decade after that civil verdict, Simpson was tried and convicted of armed robbery, a crime for which he served nine years of a thirty-three year sentence.[37]

Putin's "election" and ISIS-K Terrorist Attack on Moscow Concertgoers

In an "election" in which the still eligible "opponents" mounted no campaigns, any bona fide opposition candidates were disqualified, or in the case of Navalny, dead, Vladimir Putin won another term as Russia's president. After his election, the US government issued "a public warning . . . that it had learned of 'imminent plans to target large gatherings in Moscow' by terrorists.'"[38] But on March 19, 2024, Putin dismissed the warnings as an "attempt to scare and intimidate our society."[39] Three days later, on March 22, ISIS-K terrorists stormed a nearly full 6,200-seat concert hall in suburban Moscow shooting hundreds of attendees, then setting fire to the concert hall. The attack left 137 dead and more than 180 injured. Although ISIS-K admitted responsibility – no, *claimed credit* – for the massacre, Putin maintained that the perpetrators were supported by Ukraine[40] and ordered more indiscriminate missile strikes on Ukrainian cities.

Haiti's Descent into Chaos

Things have only gotten worse for the people of the long-troubled nation of Haiti since its democratically elected President Jovenel Moïse was assassinated in 2021. His prime minister, Ariel Henry, assumed power, but used the claim of "logistical problems" to delay elections multiple times. His announcement last year that elections wouldn't be held until 2025 led to increased gang violence – killings, rapes and kidnapping – in a country already largely under the control of rival gangs. Those groups were calling for Henry's resignation when he was in Puerto Rico. Unable to return, he announced his resignation. This time, unlike in the past, the U.S. has not sent in troops to prop up the government.[41]

More gun violence at Kansas City Post-Super Bowl Victory Celebration

"Twelve people brandished firearms and at least six people fired their weapons," resulting in one person being killed and twenty-two others injured at a Feb.

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37. Russell Lewis, et al., *O.J. Simpson, football legend acquitted of notorious killings, dies at 76*, NPR (Apr. 11, 2024), https://www.npr.org/2024/04/11/1244097564/oj-simpson-football-nicole-brown-ronald-goldman-white-bronco.

38. Shaun Walker, et al., *Did Ukraine war lead Russian security services to neglect Islamist threat?*, THE GUARDIAN (Mar. 24, 2024), https://www.theguardian.com/world/2024/mar/24/did-ukraine-war-russian-security-services-neglect-islamist-threat-moscow.

39. *Id.*

40. Dasha Litvinova & Kostya Manenkov, *How the deadliest attack on Russian soil in years unfolded over the weekend*, AP (Mar. 25, 2024), https://apnews.com/article/russia-attack-concert-hall-putin-islamic-state-f6f89c4c39965da6c11c3c111053f0e2.

41. Patrick Smith & Char Adams, *What to know about the crisis of violence, politics and hunger engulfing Haiti*, NBC NEWS (Mar. 13, 2024), https://www.nbcnews.com/news/world/haiti-crisis-what-know-president-violence-government-rcna143000.

14, 2024 parade in Kansas City to celebrate the Chiefs' Super Bowl victory.[42] The possession of these deadly weapons in the crowded public space, even their concealment, violated no Missouri law. State law in Missouri not only places virtually no limitations on the possession or concealment of firearms, even in crowded public spaces and even if those possessing the weapons are teenagers, it expressly preempts most local ordinances that might place restrictions on concealed carry of guns.[43] But three men who supplied some of these weapons to the teenagers who brandished and fired them have been charged with illegal gun trafficking under *federal* law.[44]

Key Bridge collapse

Early in the morning of March 26, 2024, a freighter that had lost control ran into the Key Bridge in Baltimore, causing the bridge's total collapse. Seven construction workers were on the bridge at the time of its collapse. One was recovered alive from the water. The other six tragically drowned. After a mayday alert from the freighter, bridge operators had only moments' notice, insufficient time to warn the construction workers. But the bridge operators were able to close down traffic from crossing the bridge, preventing an even bigger catastrophe. The bridge will take years to replace and its collapse will cause major disruption of shipping in the Port of Baltimore, one of the largest ports in the United States.[45]

Mayorkas impeachment

Alejandro Mayorkas became the first Cabinet secretary to be impeached since the late 1880s when, by the narrowest of margins, the House of Representatives voted to impeach the head of the Department of Homeland Security (DHS) on grounds that he had failed to enforce the nation's immigration laws.[46] There is no small irony in this.

During Mayorkas's term as Secretary, the U.S. has "apprehended an average of 2 million migrants a year who crossed the U.S. Mexico border illegally since Biden took office, the highest the Border Patrol has ever recorded."[47] And Mayorkas *has* been sued for failing to follow immigration law. But he was sued for

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42. Minyvonne Burke & Michael Kosnar, *3 men face federal firearms charges in Kansas City Chiefs Super Bowl parade shooting*, NBC NEWS (Mar. 13, 2024), https://www.nbcnews.com/news/us-news/3-men-face-federal-firearms-charges-kansas-city-chiefs-super-bowl-para-rcna143285.

43. Natalie Wallington, *Does Missouri law or Kansas City ordinance prohibit minors from carrying firearms?*, KANSAS CITY STAR (Feb. 20, 2024), https://www.kansascity.com/news/local/article285716041.html#storylink=cpyhttps://www.kansascity.com/news/local/article285716041.html.

44. Burke & Kosnar, *supra* note 42.

45. Kathleen Magramo, et al., *The latest on the Baltimore Key Bridge collapse*, CNN (Mar. 27, 2024), https://www.cnn.com/us/live-news/baltimore-key-bridge-collapse-03-27-24/index.html.

46. Rebecca Santana*, The House has impeached the Homeland Security secretary. Here's what you should know and what's next*, AP (Feb. 13, 2024), https://apnews.com/article/mayorkas-impeachment-border-immigration-congress-3bff388c2f0d1cc718f43d901bc50690.

47. Maria Sacchetti, *U.S. appeals court keeps block on Texas Immigration law*, WASH. POST (Mar. 27, 2024), https://www.washingtonpost.com/immigration/2024/03/27/texas-immigration-law-federal-appeals-court/.

denying asylum seekers their rights under U.S. law and international treaties. The suit alleges that DHS has violated asylum law by imposing asylum restrictions similar to Trump Administration rules that had previously been enjoined.[48]

The House of Representatives delivered their two articles of impeachment to the Senate on April 17, 2024. The next day, after having been sworn in as jurors, the Senate dismissed the charges, granting, in effect, motions to dismiss the case for failure to state a cause of action.[49]

The war in Gaza, Iran Attacks Israel

Israel's war on Hamas terrorists governing Gaza is in its eighth month. After considerable foot dragging, in March, a U.N. office released its preliminary findings of "clear and convincing evidence" that Hamas terrorists had raped, gang-raped, tortured and mutilated Israeli women during their October 7th attack.[50] And one of the released captives, forty-one year old Amit Soussana, recounted her torture at gunpoint and rape at the hands of her Hamas captors.[51] Hamas operatives continue to operate out of hospitals, using fellow Palestinians as human shields. Thousands of Gazan civilians have died (although on May 8 the UN cut in half its estimated number of women and children killed there),[52] caught in the crossfire between the Israeli army and Hamas terrorists, bringing protests around the world that Israel is not doing enough to protect civilians or facilitate the delivery of food and medicine into Gaza. Thousands of Israelis have called for the resignation of hugely unpopular Israeli Prime Minister Benyamin Netanyahu.

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48. Under Article 31 of the 1951 Refugee Convention, signatories (including the U.S) "shall not impose penalties, on account of their illegal entry or presence, on refugees who, coming directly from a territory where their life or freedom was threatened . . . provided they present themselves without delay to the authorities and show good cause for their illegal entry or presence." G.A. Res. 429 (V) Status of Refugees, at 29 (Dec. 14, 1950). This principle is reflected in section 208 of the Immigration and Naturalization Act, which expressly provides that any noncitizen "who is physically present in the United States or who arrives in the United States (*whether or not at a designated port of arrival*. . . .)" may apply for asylum unless the noncitizen is subject to a statutory exception. Immigration Naturalization Act § 208(a)(1), 8 U.S.C. § 1158(a)(1) (emphasis added). Trump era rules that restricted who could qualify for an asylum were enjoined. E. Bay Sanctuary Covenant v. Barr, 519 F. Supp. 3d 663, 668 (N.D. Cal. 2021). A subsequent DHS rule issued under Secretary Mayorkas, *Circumvention of Legal Pathways*, has been challenged as an equally unlawful restriction on asylum applications with only cosmetic changes. 88 Fed. Reg. 31314 (to be codified at 8 CFR pt. 208). *East Bay Sanctuary Covenant v. Biden*, NAT'L IMMIGRANT JUST. CTR. (Aug. 4, 2023), https://immigrantjustice.org/court_cases/east-bay-sanctuary-covenant-v-biden; *see also E. Bay Sanctuary Covenant v. Biden*, 93 F.4th 1130, 1131-36 (9th Cir. 2024) (dissent).

49. Luke Broadwater, *Senate Dismisses Impeachment Charges Against Mayorkas Without a Trial*, N.Y. TIMES (Apr. 17, 2024), https://www.nytimes.com/2024/04/17/us/politics/senate-alejandro-mayorkas-impeachment-charge.html?unlocked_article_code=1.lE0.j7sX.1fwXes8RY37C.

50. Lauren Izso, et al., *Israeli woman who was held hostage by Hamas speaks out on her abduction and sexual assault in Gaza*, CNN (Mar. 27, 2024), https://www.cnn.com/2024/03/26/middleeast/amit-soussana-israeli-hostage-hamas-sexual-assault-intl/index.html; *see also Screams before Silence* (Apr. 15, 2024), https://www.youtube.com/watch?v=zAr9oGSXgak&t=3s.

51. *Id.*

52. *UN Halves Its Estimate of Women and Children Killed in Gaza*, FOUND. FOR DEFENSE OF DEMOCRACIES (May 11, 2024), https://www.fdd.org/analysis/2024/05/11/un-halves-its-estimate-of-women-and-children-killed-in-gaza/.

Although it has been relying for years on its terrorist proxies – Hamas, Hezbollah and Yemen's Houthies to wage continual war on Israel – on April 12, 2024, Iran conducted its first direct attack on Israel, launching over three hundred drones, cruise missiles and ballistic missiles. Nearly all were intercepted by Israel, the United States, the United Kingdom, Jordan and Saudi Arabia.[53] A few days later, Israel conducted a limited strike on an Iranian military site.

The Civil War in Sudan

While the death of civilians in Gaza has dominated the news for months, most recently with stories about college campus protests (some turned violent and anti-semitic),[54] little attention has been directed to the much larger civilian tragedy unfolding in Sudan, a nation of 49 million persons that has seen 8 million forced from their homes by the civil war between the government and the paramilitary terrorist group, Rapid Support Services (RSF).[55] Hunger is an enormous problem. "Within Sudan, WFP [World Food Program] trucks have been blocked, hijacked, attacked, looted and detained," inflation is over 260%, cholera is widespread and "15 million people cannot access any health care."[56] And in neighboring Chad, 1.1 million Sudanese refugees face starvation as money to feed them has run out.[57]

Assassination plot on U.S. soil thwarted

A blockbuster front-page story in the Washington Post links India's spy service and higher ups within India's government to an FBI-thwarted attempt to assassinate Indian Sikh separatist Gurpatwant Singh Pannun in New York.[58]

Court cases that made the news

Frozen embryos held to be persons under Alabama law

On February 16, 2024, the Alabama Supreme Court issued its decision in *LePage and LePage v. The Center for Reproductive Medicine, P.C.*[59] In a ruling not only suffused with, but expressly reliant upon Christian religious scripture, the court found that frozen embryos were persons. In the immediate aftermath of the decision, a number of fertility clinics in the state shut down their invitro fertiliza-

53. Francesca Gillett, *US and EU eye new sanctions on Iran after attack on Israel*, BBC NEWS (Apr. 16, 2024), https://www.bbc.com/news/world-middle-east-68832045.

54. Mitch Albom, *Let's be clear on what these campus protests are really about*, Det. Free Press (May 5, 2024), https://www.freep.com/story/sports/columnists/mitch-albom/2024/05/05/college-campus-protests-israel-palestine-gaza-war-students/73572021007/.

55. Diana Zeyneb Alhindawi & Katharine Houreld, *Hunger stalks war-ravaged Sudan*, WASH. POST (Apr. 1, 2024), https://wapo.st/3PT2lfW.

56. *Id.*

57. *Id.*

58. Greg Miller et al., *An assassination plot on American soil reveals a darker side of Modi's India*, WASH. POST (Apr. 29, 2024), https://www.washingtonpost.com/world/2024/04/29/india-assassination-raw-sikhs-modi/.

59. LePage v. Ctr. for Reprod. Med., P.C., No. SC-2022-0515, 2024 WL 1947312 (Ala. Feb. 16, 2024).

tion (IVF) programs because the risk of mishandling a frozen embryo would subject the clinics and their employees to criminal charges, including manslaughter.[60] Tax lawyers, though, were quick to advise clients in Alabama that each frozen embryo, as a person, could be claimed as dependent and qualify for a tax exemption.

Wayne LaPierre and the NRA found liable for corruption

The National Rifle Association and its longtime leader, Wayne LaPierre were found liable by a New York jury of misusing the donations of NRA members, ignoring whistleblowers and including false information in state filings.[61] LaPierre, who resigned from the NRA on the eve of trial for what he said were health reasons, was found to have engaged in "lavish spending on perks such as chartered private flights and acceptance of expensive gifts," and will have to repay the organization over four million dollars.[62]

Mississippi Police "Goon Squad" convictions

Hunter Elward and Jeffrey Middleton, two white Mississippi police officers who were part of a self-named "goon squad" who terrorized black Mississippians for years, received prison sentences of twenty and seventeen years, respectively, for their torture and sexual abuse of two Black men. "The two victims, Michael Corey Jenkins and Eddie Terrell Parker, were brutalized while held captive and handcuffed during a two-hour ordeal that started when the six officers invaded their home and ended with Jenkins shot in the mouth," reported Reuters.[63] The other four officers had also pleaded guilty and received long sentences.[64]

Free Speech issues

- **When Does Government Cross the Line from Articulation of Gov't Policy to Impingement on Free Speech?**

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60. Aria Bendix, *Three Alabama clinics pause IVF services after court rules that embryos are children*, NBC NEWS (Feb. 21, 2024), https://www.nbcnews.com/health/health-news/university-alabama-pauses-ivf-services-court-rules-embryos-are-childre-rcna139846. Little more than a month later, the Florida Supreme Court allowed a six-week abortion ban to go in to effect, *Planned Parenthood of Sw. & Cent. Fla. v. State*, No. SC2022-1050, 2024 WL 1363525 (Fla. Apr. 1, 2024) and, another week later, the Arizona Supreme Court revived an 1864 law criminalizing abortion at any time after conception, with the only exception being a threat to the life of the mother. *Planned Parenthood of Ariz., Inc. v. Mayes*, 545 P.3d 892 (Ariz. 2024).

61. Allison Elyse Gualtieri, *U.S. Jury finds Wayne LaPierre, NRA liable in corruption civil case*, CBS NEWS (Feb. 23, 2024), https://www.cbsnews.com/news/jury-returns-verdict-in-wayne-lapierre-nra-corruption-civil-case/.

62. *Id.*

63. Brendan O'Brien & Steve Gorman, *Two Mississippi officers sentenced in federal 'Goon Squad' torture case*, REUTERS (Mar. 20, 2024), https://www.reuters.com/world/us/six-former-mississippi-police-officers-be-sentenced-federal-assault-case-2024-03-19/#:~:text=Two%20white%20former%20Mississippi%20sheriff's,abuse%20of%20two%20Black%20men.

64. Emma Tucker, et al., *'A momentous day': All 6 rogue Mississippi officers got long prison sentences in 'Goon Squad' torture of 2 Black men*, CNN (Mar. 21, 2024), https://www.cnn.com/2024/03/21/us/mississippi-officers-sentencing-goon-squad-thursday/index.html.

On Monday, March 18, 2024, the Supreme Court heard argument in *Murthy v. Missouri.* The case brought by the attorney generals of Missouri and Louisiana, as well as several individuals, who claimed they were injured by the federal government's "encouragement of social media companies to remove content deemed misinformation or disinformation."[65] The government's actions, they argued, crossed the line from permissible persuasion efforts to impermissible coercion. The case reached the high court when the government successfully got the Court to block the injunction placed on the FBI and CDS by a panel of the Fifth Circuit, which had found the government's actions violated the First Amendment.[66] Although a decision had not been reached at the time of publication, accounts of the oral argument suggested that most of the Justices were skeptical of the states' claims that the government's warnings to social media companies to be wary of misinformation being spread about vaccines or to influence elections were coercive.[67]

- **More State Regulation of "Divisive" Speech**

Earlier in March, the Eleventh Circuit held that Florida's Stop Woke Act went beyond coercion of private speech with its provisions regulating workplace trainings on race, color, sex and national origin. "By limiting its restrictions to a list of ideas designated as offensive, the court wrote, "the Act targets speech based on its content. And by barring only speech that endorses any of those ideas, it penalizes certain viewpoints — the greatest First Amendment sin."[68] "Also referred to as the "Individual Freedom Measure," the "Stop Woke Act" prohibits trainings in workplaces, public schools, colleges and universities that could lead someone to feel guilty or ashamed about the historic actions of their race or sex."[69]

Not to be outdone by Florida, Alabama Governor Kay Ivey signed into law what the state called the "divisive concepts" bill on March 20, 2024. In its original

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65. Matt Naham, *'Maybe I'm naive': Kavanaugh, Kagan combat Alito with real-world experience after New York Times nightmare scenario raised in social media 'censorship' case*, LAW & CRIME (Mar. 18, 2024), https://www.msn.com/en-us/news/us/maybe-i-m-naive-kavanaugh-kagan-combat-alito-with-real-world-experience-after-new-york-times-nightmare-scenario-raised-in-social-media-censorship-case/ar-BB1k6uVV?ocid=entnewsntp&pc=U531&cvid=3b3f192d785644d7981e1db413562e7d&ei=35.

66. *Murthy v. Missouri (Formerly Missouri v. Biden)*, BRENNAN CTR. FOR JUST. (Dec. 27, 2023), https://www.brennancenter.org/our-work/court-cases/murthy-v-missouri-formerly-missouri-v-biden.

67. Ann E. Marimow & Cat Zakrzewski, *Supreme Court likely to reject limits on White House social media contacts*, WASH. POST (Mar. 18, 2024), https://www.washingtonpost.com/politics/2024/03/18/supreme-court-social-media-free-speech-biden/; Lawrence Hurley, *Supreme Court leans against limiting Biden administration contacts with social media platforms*, NBC NEWS (Mar. 18, 2024), https://www.nbcnews.com/politics/supreme-court/supreme-court-tackles-government-coercion-claims-social-media-nra-case-rcna143391; Andrew Chung & John Kruzel, *US Supreme Court seems wary of curbing US government contacts with social media platforms*, REUTERS (Mar. 18, 2024), https://www.reuters.com/world/us/supreme-court-scrutinizes-us-government-contacts-with-social-media-platforms-2024-03-18/.

68. *Honeyfund.com, Inc. v. Governor*, 94 F.4th 1272, 1277 (11th Cir. 2024).

69. Anumita Kaur, *Appeals court blocks Fla. 'Stop Woke Act,' says it's a 'First Amendment sin'*, WASH. POST (Mar. 5, 2024), https://www.msn.com/en-us/news/us/appeals-court-blocks-fla-stop-woke-act-says-it-s-a-first-amendment-sin/ar-BB1jl27r?ocid=entnewsntp&pc=U531&cvid=6d1ab5c8a0d543e587417c032cdae28e&ei=23.

version, the teaching of divisive concepts banned by the law would even have included teaching about slavery.[70] The law not only bans diversity, equity and inclusion offices, programming and training in public colleges and other state agencies. "Educators who knowingly 'compel' students to believe certain banned ideas . . . could be terminated or disciplined at the discretion of college and school board leaders."[71]

Trump Litigation Galore

2016 election interference. The first of four felony trials involving the former president began on April 15, 2024. That case, in New York state court, involves charges that Trump had ordered hush money payments to adult film star Stormy Daniels to keep her quiet about their affair only days in advance of the 2016 presidential election and then sought to cover up the scheme to advance his election prospects.[72] As of the online publication date of this edition of the Journal, the trial was still in progress and Trump had been fined for nine violations of the Judge's gag order.[73]

2020 Election interference. Following a district court decision rejecting Trump's claim of absolute immunity from criminal prosecution in his election interference case, a unanimous three judge panel of the D.C. Circuit Court of Appeals denied his appeal, but kept in place its order suspending trial court proceedings pending action by the Supreme Court.[74] Among the Trump attorneys' arguments rejected by the court: that, while in office a president could order the assassination of a political rival and would enjoy absolute immunity from prosecution unless that president had already been impeached and then convicted by the Senate.[75] Trump subsequently sought review in the Supreme Court, which granted certiorari and heard arguments in April.[76]

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70. Rebecca Griesbach, *Alabama Gov. Kay Ivey signs DEI bill into law: What the 'divisive concepts' ban will do*, AL.COM (Mar. 22, 2024), https://www.al.com/news/2024/03/alabama-gov-kay-ivey-signs-dei-bill-into-law-what-the-divisive-concepts-ban-will-do.html#:~:text=The%20law%20lists%20eight%20so,the%20accurate%20teaching%20of%20history.

71. *Id.*

72. New York v. Donald J. Trump (Indictment), https://apnews.com/article/trump-indictment-full-document-640043319549.

73. Michael R. Sisak, et al., *Judge holds Trump in contempt, fines him $9,000 and raises threat of jail in hush money trial*, PBS NEWS HOUR (Apr. 30, 2024), https://www.pbs.org/newshour/politics/judge-holds-trump-in-contempt-fines-him-9000-and-raises-threat-of-jail-in-hush-money-trial.

74. U.S. v. Trump, No. 23-3228, 2024 WL 448829 (D.C. Cir. Feb. 6, 2024.

75. Rebecca Beitsch, *Trump team argues assassination of rivals is covered by presidential immunity*, THE HILL (Jan. 9, 2024), https://thehill.com/regulation/court-battles/4398223-trump-team-argues-assassination-of-rivals-is-covered-by-presidential-immunity/#:~:text=Former%20President%20Trump's%20legal%20team,broad%20immunity%20to%20criminal%20prosecution.

76. Alexandra Hutzler, *'Surprising' and 'disturbing': Legal experts react to Supreme Court arguments on Trump's immunity claim*, ABC NEWS (Apr. 30, 2024), https://abcnews.go.com/Politics/surprising-disturbing-legal-experts-react-supreme-court-arguments/story?id=109748598.

Sexual abuse and defamation punitive damages verdict. In the second sexual abuse/defamation case brought by E. Jean Carroll, another jury found Trump liable, this time awarding Ms. Carroll nearly $100 million in actual and punitive damages after interest is included.[77] Trump has appealed the verdict.

Georgia election interference case. A broad ranging election interference case in Georgia involving more than a dozen defendants, including the former president, came to a grinding halt while hearings were held over the contention by one defendant that Fulton County District Attorney Fani Willis's affair with retained counsel, Nathan Wade, had financially benefited her to the detriment of the defendant. The trial court heavily criticized Willis for her poor judgement, but did not disqualify her provided that Mr. Wade was removed from the case. Wade resigned immediately thereafter.[78] No trial date has been set.

Fourteenth Amendment ballot eligibility case. In early March, the Supreme Court reversed an opinion of the Colorado Supreme Court that would have removed Trump from the Colorado ballot under the Fourteenth Amendment's provision barring insurrectionists who previously held office from holding office in the future unless expressly authorized by Congress. That provision of the Constitution, the Court held, did not apply to *state* disqualification of would-be *federal* office holders. "Because," it said, "the Constitution makes Congress, rather than the States, responsible for enforcing Section 3 against federal officeholders and candidates, we reverse."[79]

Document retention and cover-up case. Rebuked by a unanimous panel of the Eleventh Circuit for her handling of an earlier phase of the case[80] that needlessly delayed proceedings, Trump appointee Eileen Cannon continues to preside over the federal trial charging Trump with multiple violations of the Espionage Act and its cover up for intentionally withholding and then hiding his possession of many classified and national security documents. No trial date has yet been set in that case.

Financial Fraud case. Following a bench trial, the former president, his sons and the Trump Organization were found liable for a broad range of fraudulent business practices and the state of New York was awarded over $380 million which, plus interest, put their collective liability at over $450 million. The day

77. Aysha Bagchi, *'This case was not close': Why E. Jean Carroll says Trump sex abuse verdict should stand*, USA TODAY (Mar. 21, 2024), https://www.usatoday.com/story/news/politics/2024/03/21/carroll-trump-sexual-abuse-rape-defamation-appeal/73034031007/.

78. Olivia Rubin & Lucien Bruggeman, *DA Fani Willis allowed to stay on Georgia election case after lead prosecutor resigns*, ABC NEWS (Mar. 15, 2024), https://abcnews.go.com/US/judge-trump-election-case-expected-rule-today-effort/story?id=106227075.

79. Trump v. Anderson, 601 U.S. 100 (2024) ("This appeal requires us to consider whether the district court had jurisdiction to block the United States from using lawfully seized records in a criminal investigation. The answer is no.").

80. Trump v. United States, 54 F.4th 689 (11th Cir. 2022).

that Trump was to come up with a bond for that amount needed to protect his appellate rights, an appeals court reduced the size of the bond to $175 million.[81]

They said that?

"*I chose the team here at Smile Texas because they're the best*."

South Dakota Governor and self-described puppy killer,[82] Kristi Noem, in a bizarre five minute infomercial[83] praising a Texas cosmetic dental surgery practice that had done work on her teeth. A South Dakota legislator has since called for an investigation into whether Noem had been paid by the dental office for her endorsement. She has also been sued by the consumer group Travelers United, which alleged in its complaint that the governor had "advertised a product or service without disclosing that she has a financial relationship with that company."[84] Since the release of her infomercial, four Indian tribes in South Dakota have declared the governor a *persona non grata*, unwelcome on their tribal lands.[85] But it would be unfair to blame Smile Texas for this; at least from the photographs their work on her teeth looked quite good.

"Somebody said to me 'Alina, would you rather be smart or pretty?' and I said 'Oh easy, pretty . . . I can fake being smart.'"

Alina Babba, attorney for presidential candidate Donald Trump.[86]

"It depends on context."

Answers of the Presidents of Harvard, Penn and MIT to the question posed by N.Y. Rep. Elise Stefanik: Would a call for the genocide of Jews violate the

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81. Katrina Kaufman & Graham Kates, *Trump's bond is now $175 million in fraud case. Here's what the New York attorney general could do if he doesn't pay*, CBS NEWS (Mar. 25, 2024), https://www.cbsnews.com/news/trump-bond-deadline-payment-new-york-fraud-case/.

82. Emma Colton, *Defiant Kristi Noem defends killing farm pup amid criticism from Dems, GOP*, FOX NEWS (Apr. 28, 2024), https://www.foxnews.com/politics/kristi-noem-defends-killing-puppy-despite-bipartisan-outrage-people-looking-for-leaders.

83. @KristiNoem, X (Mar. 11, 2024, 10:30 PM), https://twitter.com/KristiNoem/status/1767392635944059202.

84. Zoë Richards, *Kristi Noem faces lawsuit after promoting Texas dentist on social media*, NBC NEWS (Mar. 13, 2024), https://www.nbcnews.com/politics/politics-news/kristi-noem-faces-lawsuit-promoting-texas-dentist-social-media-rcna143325?cid=referral_taboolafeed.

85. Makenzie Huber, *Gov. Kristi Noem banned from fourth South Dakota reservation*, S.D. SEARCHLIGHT (Apr. 12, 2024), https://southdakotasearchlight.com/2024/04/12/sd-kristi-noem-banned-reservation-rosebud-oglala-lakota-cheyenne-river-standing-rock-sioux/.

86. Mike Bedigan, *Trump lawyer Alina Habba's past comments on faking being smart resurface as she struggles through defence*, INDEPENDENT (Jan. 19, 2024), https://www.the-independent.com/news/world/americas/us-politics/alina-habba-trump-lawyer-court-b2481296.html.

schools' anti-bullying guidelines? Their equivocating answers drew broad condemnation from Republicans and Democrats, leading to the resignation of Penn's president Magill and the firing of Harvard's president Gay.[87] Stefanik's fellow N.Y. representative, but ideological opposite, Rep. Ritchie Torres, remarked that Stefanik's question demonstrated that "even a broken clock is right twice a day."[88]

"*Ladies and gentlemen, please rise for the horribly and unfairly treated Jan. 6 hostages*."

Announcer at March Ohio political rally for Presidential candidate Trump referring to convicted felons in prison for their violent attacks on the U.S. Capitol and its police officers on January 6, 2021.[89] What followed was a rendition of the national anthem by the "J6 Choir" – a recording by the convicts who stormed the Capitol.[90]

"Mr. Biden would likely present himself to a jury, as he did during our interview of him, as a sympathetic, well-meaning, elderly man with a poor memory."
"[Y]ou have – appear to have a photographic understanding and, and recall of the house."

The first quote is from the Special Counsel Robert Hur's report explaining his decision not to recommend against prosecution of President Biden in connection with his retention of classified documents.[91] The second quote is from the transcript of Hur's October 8, 2023 interview of the President.[92]

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87. Stephanie Saul & Anemona Hartocollis, *College Presidents Under Fire After Dodging Questions About Antisemitism*, N.Y. TIMES (Dec. 6, 2023), https://www.nytimes.com/2023/12/06/us/harvard-mit-penn-presidents-antisemitism.html#:~:text=1.8k-,College%20Presidents%20Under%20Fire%20After%20Dodging%20Questions%20About%20Antisemitism,for%20the%20genocide%20of%20Jews..

88. Annie Karni, *Questioning University Presidents on Antisemitism, Stefanik Goes Viral*, N.Y. TIMES (Dec. 7, 2023), https://www.nytimes.com/2023/12/07/us/politics/elise-stefanik-antisemitism-congress.html.

89. Rex Huppke, *Trump's 'blood bath' threat wasn't even the most dangerous thing he said all weekend*, USA TODAY (Mar. 18, 2024), https://www.msn.com/en-us/news/opinion/trump-s-blood-bath-threat-wasn-t-even-the-most-dangerous-thing-he-said-all-weekend/ar-BB1k6qkw?ocid=entnewsntp&pc=U531&cvid=d9f52158d844431d8db132adabb77e83&ei=32.

90. Zac Anderson, *Trump saluted the J6 Prison Choir. How he is trying to rewrite history of deadly Capitol riot*, USA TODAY (Mar. 20, 2024), https://www.usatoday.com/story/news/politics/elections/2024/03/20/donald-trump-jan-6-hostages-campaign/73023337007/.

91. U.S. DEP'T OF JUST., REPORT OF THE SPECIAL COUNSEL ON THE INVESTIGATION INTO UNAUTHORIZED REMOVAL, RETENTION, AND DISCLOSURE OF CLASSIFIED DOCUMENTS DISCOVERED AT LOCATIONS INCLUDING THE PENN BIDEN CENTER AND THE DELAWARE PRIVATE RESIDENCE OF PRESIDENT JOSEPH R. BIDEN, JR., 219 (Feb. 5, 2024), https://www.justice.gov/storage/report-from-special-counsel-robert-k-hur-february-2024.pdf.

92. Recorded Interview between Special Counsel Robert Hur, Deputy Special Counsel Marc Krickbaum, Assistant Special Counsel, Supervisory Special Agent, Special Agent, Edward Siskel, Richard Sauber, Rachel Cotton, David Laufman, & President Joseph R. Biden, Jr., at 47 (Oct. 8, 2023), https://democrats-judiciary.house.gov/uploadedfiles/doj-hjc-hur-0000033-0000191.pdf.

"I was horrified.
I was shocked."

Respective statements of U.N. Secretary General António Guterres[93] and Commissioner General of UNRWA,[94] Philippe Lazzarini, upon learning of evidence that at least a dozen UNRWA staff members had aided, as well as directly participated in the Hamas massacre of Israelis on October 7.[95]

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93. *UNRWA to investigate allegations 'several' staffers played role in 7 October attacks*, UN NEWS (Jan. 26, 2024), https://news.un.org/en/story/2024/01/1145942 [hereinafter *UNRWA to Investigate*].

94. *UNRWA chief 'shocked' after countries pause funding*, REUTERS (Jan. 27, 2024), https://www.reuters.com/world/middle-east/unrwa-chief-shocked-after-countries-pause-funding-2024-01-27/. UNWRA refers to the United Nations Relief and Works Agency for Palestine Refugees. It is an unusual agency in two respects. It is the only U.N. agency devoted to the care of Palestinian refugees. The United Nations High Commissioner for Refugees (UNHCR) is the United Nations agency that handles refugee resettlement for all other refugees. *See* Office of the Secretary-General's Envoy on Youth, *Office of the United Nations High Commissioner for Refugees*, UNITED NATIONS, https://www.un.org/youthenvoy/2013/09/office-of-the-united-nations-high-commissioner-for-refugees/ (last visited May 6, 2024). What also makes UNWRA unique is that, unlike UNHCR, it has no role in promoting resettlement of refugees. On the contrary, it defines Palestinian "refugees" as "persons whose normal place of residence was Palestine during the period 1 June 1946 to 15 May 1948, and who lost both home and means of livelihood as a result of the 1948 conflict. Palestine Refugees, and descendants of Palestine refugee males, including legally adopted children, are eligible to register for UNRWA services." UNRWA, CONSOLIDATED ELIGIBILITY AND REGISTRATION INSTRUCTIONS (Jan. 1, 2009), https://www.unrwa.org/sites/default/files/2010011995652.pdf. When the Agency began operations in 1950, it was responding to the needs of about 750,000 Palestine refugees," coincidentally, about the same number of Jews who fled or were forced to leave Egypt, Lebanon, Syria, Iraq, Yemen, Libya, and Morocco during that same period. Arthur J. Goldberg, *Resolution 242: After 20 Years*, SEC. INTS., NAT'L COMM. ON FOREIGN POL'Y (Apr. 2002). The UN considers them to be refugees, too. Auguste R. Lindt, UN High Commissioner for Refugees, Report of the UNREF Executive Committee, Fourth Session – Geneva (Jan. 29, 1957 – Feb. 4, 1957); E. Jahn, Office of the UN High Commissioner, Document No. 7/2/3/Libya (July 6, 1967). "Today, some 5.9 million Palestine refugees are eligible for UNRWA services." *See*, UNRWA, Palestinian Refugees, https://www.unrwa.org/palestine-refugees (last visited May 11, 2024). By contrast, the number of Jewish refugees from neighboring Arab countries has not grown. These refugees resettled in a number of countries, principally in the U.S. and Israel. This follows from the terms of Article I(c)(3) of the 1951 U.N. Convention and Protocol Relating to the Status of Refugees, which provides that a person is no longer a refugee if, for example, he or she has "acquired a new nationality, and enjoys the protection of the country of his new nationality." Our own Immigration and Nationality Act (INA) provides that "derivative refugee status may only be extended to the spouse or minor child of such a refugee" and "an alien who was firmly resettled in any country is not eligible to retain refugee status." Why descendants of Palestinian refugees, generations removed should be considered refugees has been the subject of significant discussion. *Lawmakers & Aid Experts Call to Replace UNRWA at Geneva Summit*, UN WATCH (Feb. 27, 2024), https://unwatch.org/lawmakers-aid-experts-call-to-replace-unrwa-at-geneva-summit/. Take for example the UN-funded UNRWA "refugee" camps in Jordan. More than half of Jordan's 6.3 million residents are of Palestinian origin. And any resident of Jordan in December 1949, other than Jews, was given full Jordanian citizenship in 1954. *Stateless Again: Palestinian-Origin Jordanians Deprived of their Nationality*, HRW (Feb. 1, 2010), https://www.hrw.org/report/2010/02/01/stateless-again/palestinian-origin-jordanians-deprived-their-nationality. Yet, ten UNRWA refugee camps still operate today in Jordan. Amman New Camp, UNRWA (Apr. 2023), https://www.unrwa.org/where-we-work/jordan/amman-new-camp. There are still 48 other Palestinian "refugee" camps in Syria, Lebanon, the West Bank and Gaza – neither Syria nor Lebanon has ever offered the multigenerational residents of these camps the right to become citizens.

95. Ronen Bergman & Patrick Kingsley, *Details Emerge on U.N. Workers Accused of Aiding Hamas Raid*, N.Y. TIMES (Jan. 28, 2024), https://www.nytimes.com/2024/01/28/world/middleeast/gaza-unrwa-hamas-israel.html.

Horrified, certainly. This evidence prompted the U.N. to launch an investigation and make referrals for potential criminal prosecution.[96] It also prompted the U.S. and nine other nations to suspend their funding of UNRWA.[97]

But shocked? One of the released Hamas hostages had stated months earlier that he had been held captive by an UNRWA schoolteacher.[98] Hamas operatives are everywhere in Gaza. Ahmed al-Kahlout, manager of the Kamal Adnan hospital in northern Gaza hospital, admitted that he was not only aware of Hamas presence in Gazan hospitals, but was himself a Hamas commander and that "I know 16 employees in the hospital — doctors, nurses, paramedics and clerks — who also have different positions in the Qassam Brigades."[99] And the UNRWA chief has surely known for years that UNRWA-funded schools taught that Israel was the enemy and that its school administrators had received requests that teachers be excused from work so they could participate in military training exercises.[100] And he must have known that, since the start of the war, the Israeli military had produced evidence that several UNRWA schools housed weapons and contained entrances to Hamas underground tunnels.[101] A subsequent U.N.-sponsored report found "instances of [UNRWA] staff publicly expressing political views, host-country textbooks with problematic content being used in some UNRWA schools, and politicized staff unions making threats against UNRWA management and causing operational disruptions," the textbook content constituting a "grave violation of neutrality."[102]

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96. *UNRWA to Investigate*, *supra* note 93.

97. Annabelle Timsit, et al., *Why countries are pulling funding from the U.N. agency for Palestinians*, WASH. POST (Jan. 29, 2024), https://www.washingtonpost.com/world/2024/01/28/unrwa-funding-suspensions-hamas-gaza-israel/.

98. Bergman & Kingsley, *supra* note 95.

99. Ari Blaff, *Gaza Hospital Boss Admits He's a Hamas Commander, Used Medical Facility as Terror Base*, National Review (Dec. 19, 2023), https://www.nationalreview.com/news/gaza-hospital-boss-admits-hes-a-hamas-commander-used-medical-facility-as-terror-base/.

100. Harel Afargan, LinkedIn, https://www.linkedin.com/posts/harel-afargan-7a9a07158_freegazafromhamas-hamasisis-defundunrwa-ugcPost-7157091277879009280-Jpdh?utm_source=share&utm_medium=member_android (last visited Apr. 29, 2024).

101. Carrie Keller-Lynn & David Luhnow, *Intelligence Reveals Details of U.N. Agency Staff's Links to Oct. 7* Attack, WALL ST. J. (Jan. 29, 2024), https://www.wsj.com/world/middle-east/at-least-12-u-n-agency-employees-involved-in-oct-7-attacks-intelligence-reports-say-a7de8f36; Yoni Ben Menachem, *UNWRA's Connection to Terrorism in Gaza*, JERUSALEM CTR. FOR PUB. AFFS. (Jan. 11, 2024), https://jcpa.org/unrwas-connection-to-terrorism-in-gaza/.

102. Final Report For The United Nations Secretary-General – Independent Review of Mechanisms and Procedures To Ensure Adherence By UNRWA To The Humanitarian Principle Of Neutrality, U.N. 5, 29 (Apr. 22, 2024), https://www.unrwa.org/sites/default/files/content/resources/unrwa_independent_review_on_neutrality.pdf

"It is absolutely true we see, directly coming from Russia, attempts to mask communications that are anti-Ukraine and pro-Russia messages, some of which we even hear being uttered on the House floor."

Remarks of Mike Turner, the chairperson of the US House intelligence committee, about statements by some members of his party.[103]

"I think providing aid to Ukraine right now is really important, I really do. I believe the intel and the briefings we have gotten. I believe Xi and Vladimir Putin and Iran really are an axis of evil. I think Vladimir Putin would continue to march through Europe if he were allowed. I think Putin would go to the Baltics or have a showdown with Poland are one of our other NATO allies. To put it bluntly, I would rather send bullets to Ukraine than American boys. My son is going to the Naval Academy this fall. This is not a joke. We can't play politics with this. I am giving an opportunity for every member of the House to vote their conscience on this, and I think that is the way this institution is supposed to work. I am willing to take personal risk for that and history will judge us.[104] *"*

House Speaker Mike Johnson explaining his about-face on aid to Ukraine, Israel and Taiwan. After months of blocking a vote on a Senate bill to provide aid to these countries, and at risk of his speakership, Johnson allowed House votes on separate multi-billion dollar aid packages for these countries, each of which passed by large margins.[105]

The Trump Quote Machine

"No, I would not protect you. In fact, I would encourage them to do whatever the hell they want."

February 10, 2024 speech by presidential candidate Trump suggesting that he would disregard the mutual defense provisions of the NATO treaty and encourage Russia to attack NATO members that didn't meet their defense spending obligations.[106]

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103. Ramon Antonio Vargas, *House intelligence chair says Republicans are 'absolutely' repeating Russian propaganda*, THE GUARDIAN (Apr. 8, 2024), https://www.theguardian.com/us-news/2024/apr/08/republican-mike-turner-russia-propaganda.

104. *House Speaker Mike Johnson News Conference*, CPSAN (Apr. 17, 2024), https://www.c-span.org/video/?535006-1/house-speaker-mike-johnson-news-conference.

105. Garrett Ross, *Playbook PM: How Mike Johnson came around on Ukraine*, POLITICO (Apr. 23, 2024), https://www.politico.com/newsletters/playbook-pm/2024/04/23/how-mike-johnson-came-around-on-ukraine-00132333.

106. Marianne LeVine, *Trump says he'd disregard NATO treaty, urge Russian attacks on U.S. allies*, WASH. POST (Jan. 12, 2024), https://www.washingtonpost.com/politics/2024/02/10/trump-nato-allies-russia/.

"When there's a crash − I hope it's gonna be during this next 12 months, because I don't want to be Herbert Hoover."

Presidential candidate Donald Trump speaking to interviewer Lou Dobbs.[107]

The Civil War "could have been negotiated"

Trump statement at a January 2024 campaign event in Newton, Iowa.[108]

"Some people call them prisoners. I call them hostages. Release the J6 hostages, Joe"

Trump statement at the same January 2024 campaign event in Newton, Iowa.[109]

"There's nobody that's better, smarter or a better leader than Viktor Orban."

March 7, 2024 remarks of presidential candidate Trump to guests at Mar-a-Lago. The former president, in an apparent nod to the Hungarian leader's autocratic approach, went on to say Orban is "a noncontroversial figure because he says, 'This is the way it's going to be,' and that's the end of it. Right? He's the boss. No, he's a great leader."[110]

"Any Jewish person that votes for Democrats hates their religion, they hate everything about Israel, and they should be ashamed of themselves."

The latest in a long history of antisemitic remarks from presidential candidate Trump drew a rebuke from the head of the ADL,[111] as well as understandable outrage from a number of Jewish politicians.[112]

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107. David Jackson, *Donald Trump says he hopes economy tanks this election year 'because I don't want to be Herbert Hoover'*, USA TODAY (Jan. 9, 2024), https://www.usatoday.com/story/news/politics/elections/2024/01/09/donald-trump-hopes-economy-crashes-in-2024/72159263007/.

108. Gregory Krieg & Veronica Stracqualursi, *Trump says Civil War 'could have been negotiated'*, CNN (Jan. 7, 2024), https://www.cnn.com/2024/01/06/politics/trump-civil-war-negotiated/index.html.

109. Adam Gabbatt, *Trump's novel take on January 6: calling convicted rioters 'hostages'*, THE GUARDIAN (Jan. 13, 2024), https://www.theguardian.com/us-news/2024/jan/13/trump-january-6-rioters-hostages.

110. Maegan Vasquez, *Trump meets with Orban, Hungary's autocratic leader*, WASH. POST (Mar. 9, 2024), https://www.washingtonpost.com/politics/2024/03/09/trump-viktor-orban-autocrat/.

111. Maura Zurick, *White House Rips Donald Trump's Comments on Jews Who Back Democrats*, NEWSWEEK (Mar. 18, 2024), https://www.newsweek.com/white-house-rips-donald-trumps-comments-jews-who-back-democrats-1880626.

112. Andrew Solender, *Jewish lawmakers rage at Trump's "revolting" comments*, AXIOS (Mar. 18, 2024), https://www.axios.com/2024/03/19/trump-israel-democrats-jewish-lawmakers ("[R]evolting, repugnant, and reprehensible," said Rep. Dean Phillips; [A] "truly hateful man who's trying everything in his power to get Americans to hate each other," said Rep. Becca Balint; "[P]articularly disgraceful and dangerous at a time when Jews are facing dangerous levels of antisemitism nationwide," said Rep. Kathy Manning; "[T]his is the guy who saw

"They are 'unbelievable patriots' and 'hostages.'"

Remarks of the presumptive Republican presidential nominee describing the hundreds of rioters and insurrectionists now in prison after conviction or guilty pleas after storming the Capitol on January 6, 2021. [113]

"They are not people, in my opinion."

Remarks of the presumptive Republican presidential nominee describing migrant families fleeing violence and poverty.[114]

"Now, if I don't get elected, it's going to be a blood bath for the whole — that's going to be the least of it."

Remarks of presidential candidate Trump at a campaign rally in March, 2024.[115]

'very fine people on both sides' of an antisemitic riot and entertained the neo-Nazi Holocaust denier Nick Fuentes over at his house at Mar-a-Lago for dinner," noted Rep. Jamie Raskin).

113. Anjali Huynh & Michael Gold, *Trump Says Some Migrants Are 'Not People' and Predicts a 'Blood Bath' if He Loses*, N.Y. TIMES (Mar. 16, 2024), https://www.nytimes.com/2024/03/16/us/politics/trump-speech-ohio.html.

114. *Id.*

115. *Id.* Immediately after the speech, the candidate's spokesperson offered the dubious explanation that he was only referring to a bloodbath for American autoworkers. David Cohen, *Reaction to Trump's speech: When is 'a bloodbath' not a bloodbath?*, POLITICO (Mar. 17, 2024), https://www.politico.com/news/2024/03/17/trump-bloodbath-turner-cassidy-rounds-00147465; Lee Moran, *Former GOP Gov. Calls 'B.S.' On New Trump Spin With Chilling Hitler Comparison*, HUFFINGTON POST (Mar. 18, 2024), https://www.msn.com/en-us/news/politics/former-gop-gov-calls-b-s-on-new-trump-spin-with-chilling-hitler-comparison/ar-BB1k4twX?ocid=entnewsntp&pc=U531&cvid=d9f52158d844431d8db132adabb77e83&ei=61

Concluding thoughts

A volunteer organization like the ELJ cannot survive without either financial support from contributors or the efforts of the many volunteers needed to do the day-to-day work of the organization. The ELJ has been fortunate enough for decades to enjoy the financial support of the EBA and of the many EBA members who contribute individually to the Foundation of the Energy Law Journal. Now in its fifth decade of existence, the ELJ also counts on the huge contributions of time and effort from the student editors at Tulsa's College of Law as well as the support of the law school. And as one of the few peer-reviewed law journals, we also depend on a core of dedicated peer review editors who comb over articles, student notes, committee reports, book reviews and more each edition, offering their valuable comments, insights and editing suggestions. Our authors are also volunteers, and I have found that, despite, or maybe *because* of the extra work involved in writing for a peer-reviewed Journal, they have appreciated the process and the better product it produces. My best wishes to student editor-in-chief, Madison Plumhoff, as she enters the legal profession. She has much to be proud of with the publication of this volume of the ELJ.

Harvey Reiter
May 2024
Washington, D.C.

IN MEMORIAM: DONALD R. ALLEN

Donald R. Allen, a Founding Partner of Duncan & Allen LLP, died quietly and comfortably on January 19 at Sunrise at East 56th in Manhattan after a ten-year struggle with Parkinson's Disease.

A native of southern California, Don began his career in Washington, D.C. after college at Cornell and law school at UCLA. Inspired by President John F. Kennedy's call to "ask not what your country can do for you, but what you can do for your country," Don joined the Executive Office of the President, Bureau of the Budget, in 1967 where he assisted in coordinating policies, budgets and legislative matters pertaining to federal energy and water resource development. In 1969, he joined the small natural resource law firm of Ely & Duncan as an associate where he was first exposed to an exciting practice of domestic and international resource law. In 1970, together with name partner Emerson Duncan and fellow associate Patrick Mitchell, he formed the law firm that is now Duncan & Allen, specializing in the counseling and representation of municipal and cooperative electric systems.

Don quickly rose in prominence and became one of the premier attorneys of the "public power bar" in Washington, D.C. While the new law firm became a leader in its field domestically, in 1972 it opened its first overseas office – in Kinshasa, Zaïre (now the DRC) – which was followed by the opening of offices in Abidjan, Côte d'Ivoire, and Nairobi, Kenya. The firm developed an exotic, innovative and respected international practice that continued until the spin-off of those offices in the late 1980s and beyond.

Don managed the Duncan & Allen law firm during much of his career and developed a specialization in electric transmission law. He was instrumental in numerous innovative projects and cases to expand access to electric transmission service in order to lower the cost of electricity for consumers. After FERC adopted its Order 888 in 1996, requiring transmission owners to adopt and implement open-access transmission tariffs, Don published and annually updated a compendium of all FERC and federal court decisions interpreting the requirements of Order 888. His two-volume Order 888 Handbook became the must-have reference source for legal practitioners dealing with electric transmission issues. Don guided the groundbreaking entry into the electric power business – as the first wholesale electric power broker – of Citizens Energy Corporation founded by Joe Kennedy. Don became the lead outside electric power counsel to Citizens, in which capacity he spearheaded several of its innovative investment projects to expand electric transmission service in constrained areas and distribute the profits to low-income electricity users. Throughout much of his legal career, Don was actively involved in supporting the Energy Bar Association.

A lover of the opera, symphony and art, Don was drawn to New York City where he spent increasing amounts of time from the mid-1970s on, finally making his home at Battery Park City in 2014. Proud of his Norwegian ancestry, Don organized an extended family reunion in Lillehammer, Norway, in 2010. In the early 2000s, when his daughter's family was living in Geneva, he began renting the Villa Lo Scrogio in Sarteano, Italy for family vacation reunions. He fell in love with Italy, bought and renovated a small town home in Sarteano (Tuscany), and spent his later active years between there and New York.

Don married Valerie French in February of 1962. They had two children and divorced in 1974. Don subsequently remarried twice but happily spent his last twenty years with Mildred Munich of Floral Park, Long Island. He is survived by his daughter Signe (Allen) Williamson and his son John French Allen and four grandchildren.

IN MEMORIAM: JEROME M. FEIT

Jerome Feit, ninety-three, a long-time Solicitor and Deputy Solicitor of the Federal Energy Regulatory Commission, passed away peacefully on March 10, 2024. Dedicating his entire career to public service, Mr. Feit, as he was universally known by his Solicitor's Office employees, worked as a lawyer for forty-three years, ending with his retirement as FERC Solicitor. During his seventeen years at FERC, Mr. Feit played a role in literally hundreds of FERC appeals. Notable cases Mr. Feit shepherded through the appeals courts include the successful defenses of landmark FERC orders, including Order No. 888 (*Transmission Access Policy Study Group v. FERC,* 225 F.3d 667 (D.C. Cir. 2000), *aff'd sub. nom, New York v. FERC,* 535 U.S. 1 (2002)), Order No. 636 (*United Distribution Cos. v. FERC,* 88 F.3d 1105 (D.C. Cir. 1996), and Order No. 436 (*Associated Gas Distributors v. FERC,* 824 F.2d 981 (D.C. Cir. 1987). Mr. Feit was also a mentor to dozens of attorneys who learned under his tutelage in the Solicitor's Office and moved on to successful careers in private practice, in industry, and in state and federal government roles.

A proud native of Brooklyn, Mr. Feit graduated from Brooklyn's Jefferson High School in 1947, New York University in 1951, and NYU Law School in 1954. He began his career at the New York City Rent Control Commission. After moving to Washington, DC in 1956, he served at the Department of Justice, where he was an Assistant to the Solicitor General and Deputy Chief of the Appellate Section of the Criminal Division. Mr. Feit argued before the U.S. Supreme Court thirteen times, including several important Supreme Court cases. These include major criminal law precedents such as *United States v. Dege,* 364 U.S. 51 (1960) and *Pope v. United States,* 392 U.S. 651 (1968). In 1983, he won the Justice Tom C. Clark Award for Outstanding Government Lawyer.

Mr. Feit will be remembered by those who work with him for his depth of knowledge concerning federal appeals, his willingness to share that knowledge, his pleasant demeanor, and subtle wit.

A dedicated husband, father, and grandfather, Mr. Feit is survived by his wife of seventy years, Rosalind; his sons Adam and Josh; his daughter-in-law Krista; and his grandchildren Cory and Natalie.

IN MEMORIAM: KEVIN B. JONES

On January 29th, the energy community and Vermont Law and Graduate School lost one of its leaders. Kevin B. Jones, Director of the Institute for Energy and the Environment and Professor of Energy Technology and Policy, passed suddenly while teaching. Kevin leaves behind his partner of nearly three decades, Rachel Levin, and two beloved Old English sheep dogs. He is survived by his three siblings, Deborah, Mark, and Andrea, and three nieces and nephews.

Kevin received a PhD from Rensselaer Polytechnic Institute's Lally School of Management and Technology, a master's from the LBJ School of Public Affairs at the University of Texas at Austin, and a BS from the University of Vermont. Kevin's professional life was spent working in the electricity industry. He started at Central Vermont Public Service Corporation working on rates and planning, before serving as the Director of Power Market Policy at Long Island Power Authority; Associate Director of Energy Practice at Navigant Consulting Inc./Resource Management International; and Director of Energy Policy for the City of New York. During his time at LIPA, Kevin was instrumental in the development of the Cross Sound and Neptune Cables.

Kevin spent fourteen years working at and leading the Institute for Energy and the Environment. He arrived as a DOE-funded Smart Grid Fellow in 2010, before becoming the Deputy Director in 2012, and assuming the position of Director in 2018. Under Kevin's leadership, the IEE cemented its position as the nation's leading clean energy law and policy program. Kevin created and led the Energy Clinic for a decade, providing services to clients seeking to meet local energy needs with reliable, clean, and affordable resources. He created and led the annual Global Field Study class to Cuba, where students learned how the country is transforming its agricultural and energy systems to be more sustainable. He revamped the summer energy program, adding classes on offshore wind permitting and clean transportation. He also helped create the annual Alumni in Energy Symposium to bring together VLGS alumni working in the energy field.

Kevin's legacy is seen in the legion of students that he taught and mentored. His advocacy, teaching, and mentorship changed lives. Many of his former students were introduced to energy law by him and stayed in energy law because of his passion and commitment to making a more just and equitable world. His door was always open to any student who had a question, a request, or just needed someone to listen.

Kevin worked tirelessly to help graduates land their first and second jobs. He leveraged his considerable contact list to make connections and offer recommendations. He knew that the world needs more just, clean energy advocates and made it his mission to help his students make good change.

Vermont Law and Graduate School has established the Kevin B. Jones Fund to support the continued development and advancement of America's clean energy leaders. The fund will support student academic and professional development opportunities.

Donations can be made at https://www.givecampus.com/schools/VermontLawSchool/the-kevin-b-jones-fund.

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ADOPTION OF ARTIFICIAL INTELLIGENCE BY ELECTRIC UTILITIES

Daniel D. Slate, Alexandre Parisot, Liang Min, Patrick Panciatici & Pascal Van Hentenryck[*]

Synopsis: Adopting Artificial Intelligence (AI) in electric utilities signifies vast, yet largely untapped potential for accelerating a clean energy transition. This requires tackling complex challenges such as trustworthiness, explainability, privacy, cybersecurity, and governance, balancing these against AI's benefits. This article aims to facilitate dialogue among regulators, policymakers, utilities, and other stakeholders on navigating these complex issues, fostering a shared understanding and approach to leveraging AI's transformative power responsibly. The complex interplay of state and federal regulations necessitates careful coordination, particularly as AI impacts energy markets and national security. Promoting data sharing with privacy and cybersecurity in mind is critical. The article advocates for 'realistic open benchmarks' to foster innovation without compromising confidentiality. Trustworthiness (the system's ability to ensure reliability and performance, and to inspire confidence and transparency) and explainability (ensuring that AI decisions are understandable and accessible to a large diversity of participants) are fundamental for AI acceptance, necessitating transparent, accountable, and reliable systems. AI must be deployed in a way that helps keep the lights on. As AI becomes more involved in decision-making, we need to think about who's responsible and what's ethical. With the current state of the art, using generative AI for critical, near real-time decision-making should be approached carefully. While AI is advancing rapidly both in terms of technology and regulation, within and beyond the scope of energy specific applications, this article aims to provide timely insights and a common understanding of AI, its opportunities and challenges for electric utility use cases, and ultimately help advance its adoption in the power system sector, to accelerate the equitable clean energy transition.

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I. INTRODUCTION

In the rapidly evolving landscape of energy systems, the integration of artificial intelligence (AI) stands at the forefront of technological innovation and efficiency. As the world increasingly prioritizes decarbonization and digitalization, AI emerges not just as a tool of convenience, but as a pivotal enabler of these critical transformations. This article delves into the current state of AI adoption within the electric utility sector, exploring a range of practical use cases where AI is already reshaping critical operations, and touches on issues associated with further deployment of AI in the sector. While we focus on electric utilities, much of our discussion has applications to other utilities more generally.

The journey towards widespread AI integration is not without its challenges. While technical complexities and substantial investment requirements are hurdles that utilities face, some of the most significant barriers are regulatory in nature. AI, as a field, continues to evolve rapidly, with regulations being debated and enacted in domains extending beyond energy systems. Although this broader context is pertinent to AI applications in energy systems, our discussion will focus on aspects specific to the energy sector. The technical, operational, economic, and political intricacies of energy systems are often complex, interwoven, and unique in nature. Constructive and informed dialogue among various stakeholders – including regulators, policymakers, operators, and solution providers – is essential for devising relevant solutions.

Our objective with this article is to provide regulators and policymakers with a better and broader understanding of the present issues and challenges related to

AI adoption in the energy sector. We begin with a technical perspective, examining potential applications under investigation and the current state of adoption in utilities. From there, we delve into the common legal and regulatory aspects emerging in discussions among experts. Through this analysis, we aim to stimulate an informed and forward-looking policy debate, one that can pave the way for AI to fully realize its potential in revolutionizing utility operations, supporting decarbonization efforts, and leading the charge towards a more efficient, sustainable, and resilient energy future.

II. CURRENT LANDSCAPE OF AI ADOPTION BY UTILITIES

John McCarthy, considered a founding father of AI, defines it as "the science and engineering of making intelligent machines, especially intelligent computer programs."[1] Loosely speaking, AI is defined as how machines can imitate human intelligence, such as learning from experience. So, very often used interchangeably with AI, machine learning (ML) is the study of data-driven computer algorithms that improve automatically through experience. Deep learning, natural language processing, and neural networks are among the many approaches to machine learning. Definitions for machine learning focus more on data, learning, making predictions and decisions. In this section, we discuss AI/ML as a toolbox of approaches and algorithms that use data to solve interesting electric utility problems.

The utility sector is undergoing a swift digital transformation, leveraging advanced sensors, and deploying advanced computing technologies. While AI techniques, widely successful in various industries, are undergoing pilot programs in the utility sector, the industry's high-reliability standards and rigorous regulations contribute to a conservative and deliberate approach to adopting AI/ML technologies.

EPRI and Stanford University co-hosted a series of meetings in 2021, bringing together over 100 different utilities, universities, national labs, and AI organizations to bring the two industries together and identify opportunities. Through these public events, common themes between challenges and opportunities were identified and pulled together through a set of grand challenges for the AI and electric power industries,[2] which will be discussed in the following sections.

A. Grid-Interactive Smart Communities

Recent research from the Brattle Group estimates the potential of "load flexibility" from many distributed technologies in smart communities – including electric heat pump, electric vehicle managed charging, and demand response – to provide additional services beyond peak capacity reductions, which could total

1. John McCarthy, *What is AI? / Basic Questions*, STAN. UNIV., http://jmc.stanford.edu/artificial-intelligence/what-is-ai/ (last visited Apr. 5, 2024).

2. ELEC. POWER RSCH. INST., FIVE ARTIFICIAL INTELLIGENCE GRAND CHALLENGES FOR THE ELECTRIC POWER INDUSTRY (Sep. 2021), https://www.epri.com/research/products/000000003002022804.

approximately 200 GW by 2030.[3] In communities, customers rarely think about when and how they utilize energy and are unlikely to take advantage of optimization opportunities unless they are simple and easy to use. AI/ML algorithms can assist with many complex optimizations required for seamless implementation and simplification of these tasks to increase the likelihood of success of these initiatives. In addition, AI technologies can support networking communities that interact with the power grid to optimize energy efficiency, load shifting, and usage of low or zero-carbon generation sources for economy-wide decarbonization in a way that is equitable for the entire community.

The energy systems of the future will connect and coordinate operators of communities (homes, buildings, or communities) and power grids sharing the benefits from the advances in AI that could improve community-to-grid-operator communication, optimize cost, improve energy utilization and energy equity for both producers and consumers. For example, NextEra Energy's ControlComm, powered by Autogrid's intelligent demand response optimization system, provides business customers with "opportunities to lower their energy bills by adjusting their energy consumption" "with an automated solution, during times of peak energy demand or high wholesale electricity prices."[4]

B. Energy System Resiliency

Catastrophic events such as the 2021 Texas winter storm event severely disrupt the normal functioning of critical electrical grid infrastructure for significant durations. In 2022, the National Oceanic and Atmospheric Administration identified eighteen separate billion-dollar weather-related disasters in the United States, see Figure 1.

3. Ryan Hledik et al., *The National Potential for Load Flexibility*, BRATTLE GRP. 1, 2, 13 (June 2019), https://www.brattle.com/wp-content/uploads/2021/05/16639_national_potential_for_load_flexibility_-_final.pdf.

4. AUTOGRID, NEXTERA ENERGY SERVICES TEAMS UP WITH AUTOGRID TO OFFER NEW DEMAND RESPONSE PROGRAMS IN PJM (June 21, 2016), https://www.auto-grid.com/news/nextera-energy-services-teams-up-with-autogrid-to-offer-new-demand-response-programs-in-pjm/.

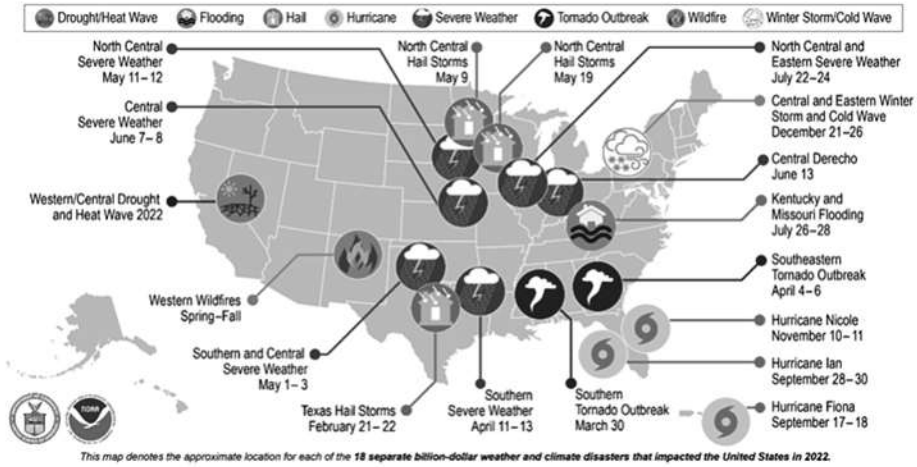

Figure 1. 2022 U.S. Billion Dollar Weather Related Disasters[5]

"From enhancing accuracy in weather forecasts to reducing disaster risks, AI is already helping," according to the World Meteorological Organization (WMO), "which operates a disaster risk reduction program and multi-hazard early warning system that serves countries, communities, and humanitarian agencies."[6] Extreme events can have substantial impacts on the operation of the electrical grid. AI algorithms can help predict anomalies, equipment failure, and potentially damaging events, such as wildfires, before they occur.[7] This would maximize the lifetime of critical generation, transmission, and distribution assets, boosting efficiency, reducing costs, and increasing public safety and customer satisfaction. Another potential application for AI is predicting outages in underrepresented communities by integrating grid, climate, calamity, and social science data. For example, Buzz Solution's PowerAI, deployed at several New York utilities, automates the process of electricity infrastructure inspection using data collection from autonomous drones as well as fault detection using a software platform with predictive analytics.[8]

5. NAT'L CTR. ENV'T INFO., U.S. 2022 BILLION-DOLLAR WEATHER AND CLIMATE DISASTERS (Jan. 2023), https://www.climate.gov/sites/default/files/2023-01/2022-billion-dollar-disaster-map.png.

6. UNITED NATIONS, EXPLAINER: HOW AI HELPS COMBAT CLIMATE CHANGE (Nov. 3, 2023), https://news.un.org/en/story/2023/11/1143187#:~:text=As%20extreme%20weather%20events%20unfold,local%20and%20national%20response%20plans.

7. Jonah Feigleson, *AI's Role in the Fight Against Wildfires*, CTR. FOR GROWTH & OPPORTUNITY AT UTAH STATE UNIV. 2 (MAY 23, 2023), https://www.thecgo.org/benchmark/ais-role-in-the-fight-against-wildfires/.

8. BUZZ SOLUTIONS, POWER AI SOFTWARE PLATFORM 5, https://buzzsolutions.co/powerai/ (last visited Apr. 4, 2024).

C. Environmental Impacts

While AI holds the potential to contribute to a more sustainable world, it also raises concerns about emissions that could contribute to global warming. The training process alone for OpenAI's GPT-3 LLM is estimated to have consumed 1.3 gigawatt-hours of energy, equivalent to the yearly consumption of 120 average U.S. households, and resulted in 552 tons of carbon emissions, matching the annual emissions of 120 U.S. cars.[9] OpenAI's latest model, GPT-4, could be ten times larger.

Leading IT companies are actively procuring renewable energy sources to power their data centers, with Google, for instance, committing to 100% renewable energy for all its cloud regions.[10] However, a significant portion of these data centers remains connected to the grid. The current grid infrastructure faces challenges, evidenced by a prolonged interconnection queue in the United States. The increasing demand for data centers may force utilities to defer the retirement of fossil fuel generation.[11]

Simultaneously, efforts are underway to enhance the energy efficiency of AI tools. In April 2020, MIT introduced a system designed to reduce the energy required for training and running neural networks.[12] Additionally, in July 2020, researchers from Stanford University unveiled the 'experiment impact tracker' and provided recommendations for developers aiming to minimize their carbon footprint.[13] These initiatives reflect a growing awareness of the environmental impact of AI and a commitment to finding sustainable solutions.

D. Intelligent & Autonomous Operations and Maintenance

Automating tasks enables plant operational and grid integration efficiency improvements. It also preserves energy system assets and equipment while enabling energy system operators to focus on the most valuable maintenance, asset management and integration tasks. AI applications such as digital twins, machine learning/reinforcement learning, machine vision, and automatic diagnostics optimize inspection, monitoring, and utilization. For example, research shows the current gearbox cumulative failure rate during twenty years of operation is in the range of 30% (best case scenario) to 70% (worst case scenario). When a component like a gearbox prematurely fails, operation and maintenance (O&M) costs increase, and production revenue is lost. A full gearbox replacement may cost more than $350,000. Researchers are testing a physics-based machine-learning

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9. Alex de Vries, *The growing energy footprint of artificial intelligence*, JOULE (Oct. 10, 2023), https://www.cell.com/joule/abstract/S2542-4351(23)00365-3.

10. GOOGLE DATA CTRS., 24/7 CARBON-FREE ENERGY BY 2030 1, https://www.google.com/about/data-centers/cleanenergy/ (last visited Apr. 4, 2024).

11. Daniel Geiger & Ellen Thomas, *Data Centers are booming. Their need for power is causing utilities to retreat on green energy.*, BUS. INSIDER 4-5 (OCT. 9, 2023), https://www.businessinsider.com/data-centers-energy-demand-utilities-green-renewable-2023-10.

12. Rob Matheson, *Reducing the carbon footprint of artificial intelligence*, MIT NEWS 2 (Apr. 23, 2020), https://news.mit.edu/2020/artificial-intelligence-ai-carbon-footprint-0423.

13. Edmund L. Andrews, *AI's Carbon Footprint Problem*, STAN. UNIV. 2 (Jul. 2, 2020), https://hai.stanford.edu/news/ais-carbon-footprint-problem.

hybrid model that can identify gearbox damage in its early stages and extend its life. If a damaged bearing within a gearbox is identified early, the repair may only cost around $45,000, a savings of nearly 90%.[14] Another example is Palantir Foundry's predictive maintenance & prognostics application, which allows operators to make informed, proactive, and cost-effective maintenance decisions, reducing downtime, improving availability, and optimizing maintenance scheduling. Pacific Gas and Electric uses it to model transformer health and conduct predictive maintenance across 25,000 miles of grid wire.[15]

III. NAVIGATING THE REGULATORY LANDSCAPE

We now turn to regulatory and legal issues associated with the deployment of AI in the electric utility sector. The introduction of AI in power system operations involves profound transformations. Although some of the issues we will mention are not new, they are intensified by AI applications. This in turn requires that we revisit some old questions in light of the value AI may bring and new ways to approach and optimize utility processes. As current regulatory frameworks and associated legal precedents reflect tradeoffs and compromises before this new age of AI, it is only natural there will be changes and evolutions to accompany this transformation, and sometimes on profoundly fundamental aspects.

Later sections will delve into three such issues that warrant revisiting in light of AI applications: data sharing and access, trustworthiness and ethical considerations. Before discussing these issues, however, it is useful to survey the landscape of regulations and regulatory responsibility in this area; the discussion below will focus on the United States and briefly touch on Europe as well.

A. Traditional Energy Regulators and AI

Several factors exist that drive developments in energy law, including changes in the operation and structure of energy markets, entanglement with other areas of law such as environmental law, as well as the development and diffusion of new technology.[16] The latter concerns us here, as artificial intelligence systems are already changing interactions between utilities and regulators and will likely change what regulators decide is reasonable to demand from utilities. At the same time, AI may stretch the capacity of current administrative law to accommodate its features and thus may drive innovations in the law itself.[17]

In the United States, regulators split responsibility for utility regulation between the federal and state levels. The Federal Power Act (FPA) of 1935 is the

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14. Raja V. Pulikollu & Jeremy Renshaw, *EPRI Develops AI Model to Reduce Wind Turbine Operations Cost*, T&DWORLD 5 (Sept. 8, 2021), https://www.tdworld.com/renewables/article/21174662/epri-develops-ai-model-to-reduce-wind-turbine-operations-costs-utilities-see-significant-benefits.

15. PALANTIR, PALANTIR FOR UTILITIES 2, https://www.palantir.com/offerings/utilities/ (last visited Apr. 5, 2024).

16. Joseph T. Kelliher & Maria Farinella, *The Changing Landscape of Federal Energy Law*, 61 ADMIN. L. REV. 611, 613–24 (2009).

17. *See* Alicia Solow-Niederman, *Administering Artificial Intelligence*, 93 S. CAL. L. REV. 633, 694-95 (2020).

authorizing statute that defines the jurisdiction of the Federal Energy Regulatory Commission (FERC).[18] Under the law, the states retain jurisdiction over their internal energy markets (typically regulated by state utility commissions) while the U.S. Congress empowered FERC to regulate interstate energy commerce — in particular, FERC is authorized to regulate the transmission and wholesale selling of electric energy in interstate commerce.[19] FERC assesses whether "any rule, regulation, practice, or contract" that is "affecting" a "rate, charge, or classification" in use by a public utility subject to its jurisdiction is "unjust, unreasonable, unduly discriminatory or preferential."[20] The U.S. Supreme Court has explained that while "FERC has the authority—and indeed the duty—to ensure that rules or practices 'affecting' wholesale rates are just and reasonable,"[21] FERC's jurisdiction is limited to those "rules and practices that *directly* affect the [wholesale] rate."[22] The Court stated this legal rule when it found that demand response programs were a practice meant to reduce wholesale rates, reduce pressure on the grid, and avoid service problems.[23] It is readily foreseeable that deploying AI systems can be adjudged a similar "practice" that will "directly affect" wholesale electricity prices.

Depending on their effect on the wholesale market and whether they may be deemed to increase wholesale competition, even utilities' AI applications that are local or state-situated may also be subject to federal regulation.[24] For example, FERC issued Order No. 881 on December 16, 2021.[25] With this rule, FERC required that utility transmission providers implement ambient-adjusted ratings when calculating the maximum transfer capability of their transmission lines, and also make possible dynamic line rating, giving the transmission providers three years to effect the change. FERC justified this rule in part as fulfilling its own legal requirement under the Federal Power Act to ensure customers are paying rates that are "just and reasonable."[26] For energy transmission, AI promises to enable adjustments to line ratings in real time, whether ambient-adjusted ratings or dynamic line ratings, through automated processing of temperature and weather

18. Federal Power Act, 41 Stat. 1063 (codified as amended at 16 U.S.C. §791a *et seq.*).

19. 16 U.S.C. § 824(b)(1).

20. 16 U.S.C. § 824e(a).

21. FERC v. Elec. Power Supply Ass'n, 577 U.S. 260, 277 (2016).

22. *Id.* at 278 (citing Cal. Indep. Sys. Operator Corp. v. FERC, 372 F.3d 395, 403 (2004)) (internal quotation marks omitted); 16 U.S.C. §§ 824d–824f (2018); *see FERC Rule to Improve Transmission Line Ratings Will Help Lower Transmission Costs*, Docket No. RM20-16 (Dec. 16, 2021), https://www.ferc.gov/news-events/news/ferc-rule-improve-transmission-line-ratings-will-help-lower-transmission-costs. For a detailed discussion of the meaning of "just and reasonable" as glossed by the courts, *see* Steve Isser, *Just and Reasonable: The Cornerstone of Energy Regulation*, (Energy Law and Economics Working Paper 2015-1, 2015); *see also* Sotheby Shedeck, Note *A Clarification on FERC's Discretion in Finding Just and Reasonable Rates in the Electricity Market: Public Citizen, Inc. v. FERC*, 44 Energy L.J. 119 (2023).

23. *Elec. Power Supply Ass'n*, 577 U.S. at 279.

24. *See* Nat'l Ass'n of Regul. Util. Comm'rs v. FERC, 964 F.3d 1177, 1186 (D.C. Cir. 2020).

25. *Managing Transmission Line Ratings*, 177 FERC ¶ 61,179 (2021).

26. 16 U.S.C. §§ 824d–824f (just and reasonable rates)*; see FERC Rule to Improve Transmission Line Ratings*, *supra* note 22; For a detailed discussion of the meaning of "just and reasonable" as glossed by the courts, *see* Isser, *supra* note 22; Shedeck, *supra* note 22.

data and changing conditions on the grid. Transmission providers can thus use AI systems to better meet their regulatory requirements; at the same time, these AI uses will likely be themselves subject to further scrutiny from regulators.

Additionally, to ensure the applicability of the *Mobile-Sierra* doctrine's presumption that contracted rates are "just and reasonable" under the Federal Power Act, regulators should monitor whether AI is ever being used to engage in illegal market manipulation. As the Supreme Court has said, "Like fraud and duress, unlawful market activity that directly affects contract negotiations eliminates the premise on which the *Mobile–Sierra* presumption rests: that the contract rates are the product of fair, arms-length negotiations."[27] If any given entity in the energy industry gained market power through its adoption of AI, this presumption would no longer hold true.

Under the Energy Policy Act of 2005, FERC also certifies and reviews Energy Reliability Organizations "to establish and enforce reliability standards for the bulk-power system," giving regulators broad jurisdiction over electricity reliability standards.[28] These include requirements for electricity system stability and cybersecurity protection.[29] National security and intelligence professionals have opined that AI can help detect and respond in real time to cybersecurity threats.[30] Cyber-attacks and electronic disruptions have been consistently on the rise for years, and longstanding suggestions to disconnect electrical infrastructure from the open internet appear even less feasible than before; to the degree that utilities increasingly deploy AI, they typically become more dependent on broader network connections for access to relevant data sources.[31] Additionally, in an executive order issued October 31, 2023 on "Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence," the White House directed the Department of Energy, alongside many other executive agencies, to assess AI threats to critical infrastructure.[32] The president also directed the Department of Energy to produce and publish a report on "the potential for AI to improve planning, permitting, investment, and operations for electric grid infrastructure and to enable the provision of clean, affordable, reliable, resilient, and secure electric power to all Americans."[33] While its implications and implementing rulemaking are still evolving, the executive order sets rapid deadlines for many of its instructions and can be expected to shape public and private decisions about AI development and deployment in the near future, including in the energy sector.

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27. Morgan Stanley Cap. Grp. Inc. v. Pub. Util. Dist. No. 1 of Snohomish Cnty., Wash., 554 U.S. 527, 554 (2008).

28. 16 U.S.C. § 824o(a(2)-b).

29. *Id*. at § 824o(a)(3-8).

30. Diego Laje, *Securing Critical Infrastructure in the Age of Artificial Intelligence*, AFCEA SIGNAL (Nov. 17, 2023), https://www.afcea.org/signal-media/securing-critical-infrastructure-age-artificial-intelligence.

31. *See* Amy L. Stein, *Regulating Reliability*, 54 HOUSTON L. REV. 1191, 1229–31 (2017), https://houstonlawreview.org/article/3936-regulating-reliability.

32. Exec. Order No. 14,110, 88 Fed. Reg. 75191, 75196, 75199 (§4.1(b), §4.3) (Nov. 1, 2023), https://www.govinfo.gov/content/pkg/FR-2023-11-01/pdf/2023-24283.pdf.

33. *Id.* at 75208 (§5.2(g)(i)).

The judiciary has emphasized, however, that even after the Supreme Court's broad reading of federal jurisdiction, "States retain their authority to impose safety and reliability requirements" without federal interference.[34] State utility commissions are already relying on that authority to surface and regulate utilities' use of AI. Here, public utility commissions are engaged in a familiar regulatory role in which they have long assessed, approved, or denied utilities' adoption of new technology.[35] Utilities report their AI use cases to the commissions, such as intelligent image processing and machine learning to handle millions of images collected by drones deployed to inspect energy systems for issues.[36] AI deployments can help utilities and providers assess the ground truth of their systems and prepare regulatory compliance documents, such as natural disaster mitigation plans.[37] Commissions already assess and adjudicate proposed AI use cases, whether initiated by the utility or suggested by an intervenor prior to the conclusions of an administrative law judge or the final decision of the commission.[38] State utility commissions also already assess whether utilities' algorithmic systems conform to the relevant legal standards in their state.[39] Additionally, regulators and the courts may also find reason to mandate the deployment of artificial intelligence if the safety benefits are such as to create an affirmative duty of care.[40] State energy planning commissions and independent system operators also expect to use new AI systems to improve interconnection queues and to support energy efficiency and demand forecasting efforts, for which they have historically used previous generations of advanced data analysis technologies including neural networks.[41]

At the same time, regulators and legislators around the world face important choices about how exactly to categorize and type artificial intelligence systems: which concepts they apply "for constructing the meaning of AI systems in the law"

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34. *Nat'l Ass'n of Regul. Util. Comm'rs*, 964 F.3d at 1188.

35. *See* Jonas J. Monast & Sarah K. Adair, *Completing the Energy Innovation Cycle: The View from the Public Utility Commission*, 65 HASTINGS L. J. 1345, 1347 (2014).

36. *See, e.g.*, Application of San Diego Gas & Electric Company (U 902 M) to Submit its 2021 Risk Assessment and Mitigation Phase Report SDG&E 1-55–56 (Cal. P.U.C. 2021); *see also* Catherine J. K. Sandoval, *Net Neutrality Powers Energy and Forestalls Climate Change*, 9 SAN DIEGO J. CLIMATE & ENERGY L. 1, 19 (2018) ("Paired with software analytics and artificial intelligence, live video can be a powerful tool to detect grid threats or conditions") (anticipating a similar use case).

37. *See, e.g.*, CAL. PUB. UTIL. CODE § 8386 (wildfire mitigation).

38. *See, e.g.*, Application of Pacific Gas & Electric Company for Approval of Its Mobile Application and Supporting Systems Pilot. (U39e)., 2020 Cal. P.U.C. Decision 20-10-003 (Cal. P.U.C. Oct. 8, 2020)

39. *See, e.g.*, Pennsylvania Public Utility Commission Bureau of Investigation and Enforcement Office of Consumer Advocate Office of Small Business Advocate Philadelphia Industrial and Commercial Gas User Group Grays Ferry Cogeneration Partnership and Vicinity Energy Philadelphia, Inc. James M. Williford v. Philadelphia Gas Works Grays Ferry Cogeneration Partnership and Vicinity Energy Philadelphia, Inc., 2023 WL 8714853 (Pa. P.U.C. 2023) (ratemaking case governed by the just and reasonable standard announced in state law, 66 Pa. C.S. § 1301(a) and §2212(e) and 52 Pa. Code §§ 69.2701–2703, and defined by relevant U.S. Supreme Court precedent; claim against PGW for delegating customer payment plans to an algorithm with claimants arguing this violated 52 Pa. Code § 56).

40. See Amy L. Stein, Assuming the Risks of Artificial Intelligence, 102 B.U. L. REV. 979, 1028 n.275 (2022).

41. Video Interviews with Anonymous Planning and System Operating Officials (Jan. 10, 2024, and January 12, 2024).

carry significant and divergent consequences.[42] For instance, commissioners and administrative law judges will need to assess whether expenditures for AI technologies are capital investments or operating expenses, decisions with substantial implications for rate-making cases.[43] Such decisions will send important signals, given how, under the traditional rate-making formula, utilities' ability to recover capital expenses can be a powerful incentive. Along similar lines, while AI software plausibly fits regulators' past experience with utilities' efforts to modernize and deploy new technology, regulators should take note if utilities are proposing to build their own in-house AI-specific data centers – clearly a capital investment, but a questionable one in light of the traditional least cost standard, given prevailing business best practices argue for contracting out for commercially available cloud and data center services. Regulatory commissions may nonetheless also need to attend to the advantages new technologies offer to early adopters (when costs are typically higher), especially in what appears at present to be the early stages of an artificial intelligence boom.[44]

Regulators themselves often use AI systems to conduct their statutorily-required oversight and we expect this trend to grow. In California, as one scholar has observed, "The regulatory body tasked with ensuring that private utilities meet renewable generation, grid reliability, and emissions reduction goals relies on a mathematical model to identify gaps in energy generation buildout."[45] An additional regulatory AI use case is to detect where compliance may be difficult under the current regulatory scheme and identify or suggest where and when a new rule-making may be needed.[46] Public utility commissioners, administrative law judges, and case intervenors have expressed interest in increasing their use of artificial intelligence to support their oversight work, from drawing on past regulatory decisions to scrutinizing utilities' proposals and models as well as the underlying data that must support them.[47]

Regulators can expect to receive more filings from industry that have been written or at least co-authored by generative AI. Tech companies seeking to en-

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42. Video Interviews with Anonymous Former and Current Regulatory Officials (Dec. 7, 2023, Jan. 10, 2024); *see also* Margot Kaminski, *Regulating the Risks of AI*, 103 B.U. L. REV. 1347, 1347 (2023).

43. This point emerged in conversations with several current and former regulators we interviewed. *See* Monast & Adair, *supra* note 35, at 1356–57.

44. See *id.* at 1359–60. At the same time, a point that emerged in several of our interviews with former and current regulators is a sense of the history of data technologies, whether denominated under the names of predictive analytics, big data, advanced analytics, machine learning, or artificial intelligence. Officials are wary of hype, fads, and over-promising while also interested in leveraging the real-world gains new technology is capable of delivering.

45. Sonya Ziaja, *How Algorithm-Assisted Decision Making Is Influencing Environmental Law and Climate Adaptation*, 48 ECOLOGY L.Q. 899, 924-25 (2021).

46. FED. ENERGY REGUL. COMM'N, STRATEGIC PLAN FY 2018–2022 6 (2018) (describing "algorithmic screens" of market data)*; see also* Cary Coglianese & Lavi M. Ben Dor, *AI in Adjudication and Administration*, 86 BROOKLYN L. R. 791 (2021).

47. Video Interviews with Anonymous Regulatory Officials (Jan. 10, 2024).

courage new nuclear power generation have been exploring training large language models to make the regulatory process cheaper and more efficient.[48] However, with market participants and their attorneys deploying generative AI as they compose and submit regulatory filings, regulators can also expect many of the same challenges the courts are facing. There have already been many documented cases of hapless lawyers relying on AI in their court filings and litigation, only to have the courts discover that many of the sources relied upon as binding or persuasive authority are nonexistent, invented by the AI's "hallucinations."[49]

Regulators can also expect the courts to engage in complementary adjudication of AI-related cases. Recent scholarship suggests that early AI cases seeking both statutory and common law remedies are already helping set incentives and expectations in a regulatory-like function.[50] It will be important for regulators to watch how this caselaw develops —both to identify what principles and harms the judiciary is announcing and recognizing, and to assess where courts are silent about harms, externalities, or other market failures that regulators will need to take up to address.

B. Privacy Regulators as Energy Regulators

By adopting AI systems, utilities may also find themselves subject to additional regulation due to privacy laws. Supranational jurisdictions like the European Union are already implementing comprehensive AI regulation. As of this writing, the European Parliament has just passed the Artificial Intelligence Act, a new regulation soon to come into force that will have substantial implications for both providers and organizations that deploy AI systems.[51]

In the absence of a federal data privacy statute in the U.S., many states have gone ahead with their own legislation, a process we expect to continue. Much of this state legislation is new and the implications have not yet been tested in the courts. For example, in the state of Washington, to the degree that data about a person's health could be inferred from energy use data, utilities deploying AI to data collected in that state may need to confirm they fall within a defined exception of the new My Health My Data Act, coming into full force in 2024.[52] At one extreme, the Indiana Data Privacy Law, set to come into effect January 1, 2026,

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48. Jennifer Hiller, *Microsoft Targets Nuclear to Power AI Operations*, WALL ST. J. (Dec. 12, 2023), https://www.wsj.com/tech/ai/microsoft-targets-nuclear-to-power-ai-operations-e10ff798.

49. *See, e.g.*, Eugene Volokh, *Another Example of a Lawyer-Filed Brief that Apparently Includes Citations Hallucinated by AI*, VOLOKH CONSPIRACY (Nov. 17, 2023, 3:23 PM), https://reason.com/volokh/2023/11/17/another-example-of-a-lawyer-filed-brief-that-apparently-includes-citations-hallucinated-by-ai/.

50. *See* Alicia Solow-Niederman, *Do Cases Generate Bad AI Law?*, 25 COLUM. SCI. & TECH. L. REV. (forthcoming 2024), https://ssrn.com/abstract=4680641.

51. EUR. COMM'N, PROPOSAL FOR A REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL LAYING DOWN HARMONISED RULES ON ARTIFICIAL INTELLIGENCE (ARTIFICIAL INTELLIGENCE ACT) AND AMENDING CERTAIN UNION LEGISLATIVE ACTS (Apr. 21, 2021), https://eur-lex.europa.eu/resource.html?uri=cellar:e0649735-a372-11eb-9585-01aa75ed71a1.0001.02/DOC_1&format=PDF, adopted March 13, 2024, https://www.europarl.europa.eu/doceo/document/TA-9-2024-0138_EN.html. A corrigendum (errata) was published in mid-April: https://www.europarl.europa.eu/doceo/document/TA-9-2024-0138_EN.html.

52. WASH. REV. CODE § 19.373.010(19) (2023).

explicitly exempts public utilities.[53] Some older statutes already regulated utilities' use of customer data, imposing a requirement of anonymity on aggregated data.[54] The variation across states and between countries means that, in some jurisdictions, privacy regulators may find themselves becoming part of the energy regulatory system. In other jurisdictions, energy regulators may be the only ones in a position to provide meaningful oversight and accountability to an industry that holds tremendous data on the private details of millions of customers.[55]

IV. AI DATA PRIVACY AND CYBERSECURITY CHALLENGES

Harnessing the transformation potential of AI and ML hinges critically on data access and sharing, entangled with concerns of privacy, cybersecurity, and regulatory compliance. AI and ML technologies thrive on large datasets, offering insights and predictions with precision far surpassing traditional statistical analyses. The efficacy of AI and ML in utilities is contingent upon the availability of high-quality, relevant data.

A. Critical requirements on utility data and need for clarity

In the utility sector, such data encompasses various sensitive aspects:

1. Privacy and confidentiality: Individual meter readings can unveil personal lifestyle choices or expose confidential economic information about companies. Such individual data is protected by general regulations like GDPR[56] and California Consumer Privacy laws[57], and explicit energy specific privacy laws and regulations. This limits the collection and use of meter data to specific entities and to specific needs and uses. Any other use can require explicit consent. Some AI and ML applications rely on mining large amounts of granular data without a priori identification of relevant features, and are structurally limited by such privacy and confidentiality restrictions;

2. Intellectual property: Operational data can reveal proprietary techniques and processes through reverse engineering. AI and ML prove very effective at identifying underlying patterns and information from available data, and therefore reinforces this risk;

3. Critical Infrastructure Protection: Data security is paramount to prevent malicious attacks on essential utility services. Restricting data access has long been a common practice to limit exposure to this risk. However, in practice, this limits innovation and interoperability, while much of this information (like the physical location of the infrastructure or equipment parameters) can anyway be obtained or estimated through other means. Reliance on data access restriction can then give a false sense of security and prevent focusing efforts on securing

53. IND. CODE § 24-15-1-1(b)(6) (2023).

54. *See, e.g.,* WASH. REV. CODE § 19.29A.100(8) (2023).

55. *See* Kevin Frazier, *Updating the Legal Profession for the Age of AI*, YALE J. ON REG. (Dec. 6, 2023), https://www.yalejreg.com/nc/updating-the-legal-profession-for-the-age-of-ai-by-kevin-frazier.

56. The General Data Protection Regulation, first enacted in 2016, defines data protection rules in the European Union and when data collection impacts EU citizens. Commission Regulation 2016/679, 2016 O.J. (L 119) 1–88.

57. Cal Civ Code § 1798.100 (2020).

high critical data and ensuring physical and cyber-security by more robust techniques and systems.

The discussion around AI, privacy, and data sharing in energy systems is not new but is becoming increasingly critical with AI's growth. Ensuring open and equal access to utility data while meeting the requirements above is vital for fostering transparency and innovation. Stakeholders expect regulatory bodies to provide clear guidelines that facilitate both the protection of sensitive data and the advancement of AI technologies. For lack of clear guidelines, utility data holders will tend to resist sharing data, fearing litigation and exposure.

B. Privacy preserving techniques

Issues of privacy and confidentiality are not specific to the energy sectors, and techniques and frameworks have been developed[58] to allow exploiting the wealth of information in granular data while preserving confidentiality. Much of this is readily applicable to energy data. In applying these techniques, it is essential to guarantee that privacy and confidential information has been effectively obfuscated. Techniques like differential privacy offer a rigorous approach to this question, with several available frameworks to ensure the desired level of protection balancing privacy requirements and the utility of the openly available data for specific use cases. Open-source frameworks can be useful in this context, to provide transparent standards and tools to help certify if data is sufficiently anonymized for sharing.

Whether or not such techniques are used, it is essential to clarify the issue of consent, especially regarding household level data where a large population of individuals are involved. But even for data involving commercial or industrial level customers, obtaining consent for large scale studies and AI applications could be untrackable. Legal clarity on disclosure to third parties and acceptable use is key and needs to be provided by dedicated privacy regulations.[59]

C. Cybersecurity and critical infrastructure protection

Section 215A of the Federal Power Act, most recently amended by the FAST Act of 2015, mandates regulations to prohibit the disclosure of Critical Electrical Infrastructure Information (CEII), as designated by FERC or DOE. The Commission further defined[60] CEII as:

> [S]pecific engineering, vulnerability, or detailed design information about proposed or existing critical infrastructure that:
> **(i)** Relates details about the production, generation, transportation, transmission, or distribution of energy;
> **(ii)** Could be useful to a person in planning an attack on critical infrastructure;
> [. . .]
> **(iv)** Does not simply give the general location of the critical infrastructure.

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58. *See, e.g.,* Georgina Evans et al., *Statistically Valid Inferences from Privacy-Protected Data,* 117 AM. POL. SCI. REV. 1275 (2023).

59. Decision Adopting Rules to Protect the Privacy and Security of the Electricity Usage Data of the Customers of Pacific Gas and Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company, 2011 Cal. P.U.C. Decision 11-07-056 2-3 (Cal. P.U.C. July 28, 2011).

60. 18 C.F.R. § 388.113I(2) (2024).

In the context of data access for AI applications, this broad definition can be interpreted to apply to most if not all detailed data about electric infrastructure and systems. Regulations allow and facilitate voluntary sharing of data between utilities, operators and government entities, taking into account ERO CIP standards. However, beyond these authorized entities, information sharing is severely restricted.

Cybersecurity and protection of critical electric infrastructure is a paramount concern given its strategic nature and importance for national security. While stringent measures are well justified given clear and present threats, in practice, current CEII regulations create a black and white approach to data access which can be considered detrimental to AI innovation and adoption. They make it very difficult for non-utility partners to access realistic data to support R&D and innovation efforts. Here again, striking the right balance between advancement of AI adoption and national security is a key challenge facing regulators and policymakers.

D. A framework to balance confidentiality, cybersecurity and innovation for AI applications

To address these challenges, establishing legal and regulatory frameworks is crucial.

First, one should ensure the collection and secure handling of granular high quality energy data. This requirement will primarily fall onto electric utilities and system operators, especially regarding meter data, which make them the focal point of grid and grid-facing AI applications. For customer facing services, meter data should be accessible to third parties with the customer's consent, under equal conditions but with equally stringent requirements regarding privacy and cybersecurity. The foundations for third party access to granular energy data were developed in the 2010s with the deployment of smart meter and energy efficiency or benchmarking programs.[61] AI and ML has the potential to improve such services greatly, which makes such programs even more critical. In addition, regulatory provisions can mandate that a neutral public entity should have access to this data for transparency and audit purposes. Utilities and such entities can be mandated to release aggregate data through open data transparency programs, again allowing open and equal access to such data to support the development and provision of AI and ML based services.

Facilitating partnerships under confidentiality agreements with research institutions can enable innovation and comprehensive analysis. These institutions should have secure data handling capabilities or access to such facilities. Data owners can also provide dedicated private spaces on their own infrastructure for third parties to deploy their algorithms and test them on confidential and sensitive data. In both cases, however, confidentiality agreements prevent peer reviewed

61. *See, e.g.,* PAC. GAS AND ELEC. CO., Electric Rule No. 25: RELEASE OF CUSTOMER DATA TO THIRD PARTIES (2018), https://www.pge.com/tariffs/assets/pdf/tariffbook/ELEC_RULES_25.pdf; PAC. GAS AND ELEC. CO. ELECTRIC RULE NO. 27: PRIVACY AND SECURITY PROTECTIONS FOR ENERGY USAGE DATA (2012), https://www.pge.com/tariffs/assets/pdf/tariffbook/ELEC_RULES_27.pdf.

published research. Other parties cannot reproduce, benchmark and build upon the developed techniques.

Promoting open benchmark initiatives that encourage the use of both synthetic and real data is therefore essential to support public research and collaborative innovation. Synthetic data alone often lacks the realism necessary for effective AI training. Real data remains indispensable, both for direct use and as a foundation for generating high-quality synthetic datasets. The key is maintaining consistency and realism. One approach is training synthetic models on real datasets while ensuring consistency and maintaining confidential equivalent datasets for verification by authorized entities. Even if they have been obfuscated in terms of private and sensitive information, open benchmarks should strive to be realistic. They should aspire to sufficiently reflect reality such that there is a fair chance techniques developed and tested on them would transpose well on real test datasets. Data holders have a key role both in the elaboration for such open benchmarks in support of research and innovation, and in the evaluation and validation of techniques and algorithms on associated real test data sets. Regulations and policy should not hinder such initiatives and could even support such initiatives, especially when research and innovation efforts are otherwise supported by public funds.

Irrespective of the chosen specific policies, ensuring data quality, reliable collection and access and meeting cybersecurity requirements imply investment in infrastructure and skilled professionals. Cost recovery for the mandates and actions mentioned above is therefore an important aspect of the discussion, especially since the return on investment may not be direct and immediate.

This comprehensive approach to data governance in AI deployment in the utility sector aims to balance the need for data access with the imperative of data protection, fostering an environment conducive to innovation while maintaining privacy and security. This can be used as a basis for discussions between utilities, regulators, policymakers and other stakeholders.

V. TRUSTWORTHINESS: HOW TO ENSURE EXPLAINABILITY, TRANSPARENCY, RELIABILITY AND LIABILITY

Definition of Trustworthiness:

Trustworthiness in the context of AI adoption by electrical power utilities refers to the system's ability to ensure reliability and performance, to inspire confidence and transparency among stakeholders in a context of energy transition with more volatility and an evolving system complexity. It encompasses a combination of factors, including the reliability of the technology, the accountability of AI-generated outcomes and the clarity of decision-making processes. Achieving trustworthiness is essential for fostering acceptance, mitigating risks, and ensuring responsible use of AI in critical decision-making within the energy sector.

Reliability for critical system operation:

A conceptual framework of operational processes for electrical power utilities can be organized as three interacting layers: optimize, control, and protect. AI can be deployed in each of these layers but with increasing need of reliability certification. The protection layer ensures the ultimate integrity of the equipment, operators and the population at large, in this layer, AI solutions must be certified

with the highest standards of reliability which themselves may need to be clearly specified. The control layer ensures the service continuity in line with the regulatory procedures (e.g. LOLE: Loss of Load Expectation). This layer is also fully automated, and AI has significant potential to address the increasing complexity but there is a strong need for establishing and enforcing rigorous validation standards. It is understood that this layer can never account for all possible system conditions, which justifies the existence of the protection layer. The optimize layer implements the market design, maximizing the welfare under physical and engineering constraints managed by the control and protect layers. Here, AI could be transformative by increasing the modeling fidelity and improving risk and uncertainty management. But any AI assisted system must be compliant with market regulations and provide explainability and transparency essential for human operators.

Explainability for multiple stakeholders:

Tailoring explanations to a wide range of stakeholders is integral to building trust. Explainability ensures that AI decisions are understandable and accessible to a large diversity of participants, from technical experts to market designers, regulators and policy makers.

AI systems should have the ability to articulate the rationale behind their decisions or recommendations using the proper ontology for the relevant stakeholders. The AI should generate narratives using the existing and elucidated ontology to capture essential features driving the recommended decisions. Translating AI system complex inferences in clear and interpretable explanations in the cognitive model of humans is a fundamental open research issue. The understanding of human-AI interaction is still in its infancy. Human-Centered AI[62], which promotes a partnership between humans and AI based on the extension of "Thinking Fast and Slow" (Kahneman 2011), is certainly a step in the right direction.

Transparency as a Pillar of Trust:

Transparency is foundational to trust in AI systems. Any AI system should be auditable by independent experts with respect to the reliability criteria mentioned previously. It should also involve communicating the methodologies, data sources, and decision pathways employed by the AI. The benefits of open source and open data should be carefully examined. As a result, these transparent processes will ensure that the fairness, integrity, and reliability of the AI system can be independently verified. This transparency not only builds trust among end-users and regulatory bodies but also fosters a culture of accountability within the organization.

Liability and Accountability in AI Decisions:

Defining liability and accountability procedures has always been fundamental in ensuring the reliability of power system operation. It will be exacerbated by the deployment of AI and increasing complexity.

Most utilities accept responsibility for damages caused by their negligence, but make exceptions for events "outside" of their control. Power shutoffs pose risks beyond economic or property damage. Individuals who depend on powered

62. Adam Dahlgren Lindström et al., *Thinking Fast And Slow In Human-Centered AI*, HAL OPEN SCI. (Feb. 17, 2023), https://inria.hal.science/hal-03991946.

medical equipment, whether at home or in a medical facility are especially vulnerable. Defining 'negligence' in cases where decisions are made based on the advice of an AI assistant is an unresolved issue. As an illustrative example, in the case of PG&E[63] (wildfires caused by power lines), AI could be used to assist in vegetation management and to perform preventive load shedding to avoid wildfires.[64] But what if the AI assistant's advice is wrong, but highly plausible, and causes deaths related to uncontrolled wildfires started by power lines? We can find very similar problems for the "self-driving car." One difficult issue is the need to perform a counterfactual analysis of what the operator would have done without the advice of its AI assistant. In this context, preserving the traces of the interaction between the operator and his AI assistant seems essential. The ability to replay the process for post-mortem analysis is also very important to detect possible malfunctions of the AI technology, in which case the companies responsible for developing the software may also be liable.

New questions are being asked about generative AI and Large Language Models. There are specific risks associated with these general-purpose AI assistants that are not dedicated to specific use cases and technical domains. The paper "Taxonomy of Risks posed by Language Models"[65] identifies twenty-one types of risks. The risk of "Disseminating false or misleading information" (also called hallucinations) is certainly very serious in technical utility-related activities. For the time being, it should be recommended that this type of AI assistant not be used for critical, near real-time decision making, where verification is nearly impossible.

Trustworthiness requires a clear delineation of responsibilities and mechanisms for addressing decision making in assisted AI systems.

VI. ETHICAL CONSIDERATIONS

The rapid and extensive spread of artificial intelligence has motivated a growing scholarly literature on AI ethics.[66] AI systems have also been simultaneously hailed as necessary for addressing climate change and marked as ethically problematic—both for implicitly embedding particular moral judgments, values, and

63. Order Instituting Investigation on the Commissions Own Motion into the Maintenance, Operations and Practices of Pacific Gas and Electric Company (U39e) with Respect to its Electric Facilities; and Order to Show Cause Why the Commission Should Not Impose Penalties and/or Other Remedies for the Role PG&Es Electric Facilities Had in Igniting Fires in Its Service Territory in 2017. 2 (Cal. P.U.C. 2020).

64. *See* John McCormick, *California Utilities Hope Drones, AI Will Lower Risk of Future Wildfires*, WALL ST. J. (Sep. 11, 2020), https://www.wsj.com/articles/california-utilities-hope-drones-ai-will-lower-risk-of-future-wildfires-11599816601.

65. Laura Weidinger et al., *Taxonomy of Risks posed by Language Models*, FAccT '22 ACM CONF. ON FAIRNESS, ACCOUNTABILITY, & TRANSPARENCY 214, 215 (2022).

66. *See, e.g.*, Changwu Huang et al., *An Overview of Artificial Intelligence Ethics*, 4 IEEE TRANSACTIONS ON A.I. 799, 799-800 (2023); *see also* Thilo Hagendorff, *The Ethics of AI Ethics: An Evaluation of Guidelines*, 30 MINDS AND MACHINES 99, 99 (2020) (discussing twenty-two of the ethical principles that have circulated in AI ethics).

biases and for cloaking the real-world uncertainty behind the mathematical approximations that make such models work.[67] The machine learning models that power many contemporary AI implementations have been extolled for the welfare improvements they were or still are expected to deliver.[68] They have also been heavily criticized for the harms they have been observed to cause or are anticipated to bring about, for the exact same reasons arising from how machine learning techniques work in theory and practice.[69] A frequent anxiety about inscrutable AI models is their opacity, which naturally invites calls for greater transparency in both their development and operation as deployed production systems.[70] Utilities and regulators may be able to address some of the ethical concerns (and in Europe, legal requirements) that motivate demands for model transparency and explainability by inviting greater participation and co-development of their AI models.[71] Additionally, although the public is becoming more aware of the threat of AI-driven discrimination, scholars have also suggested that AI can assist in detecting discrimination harms in ways not previously possible.[72] In other words, AI generates both ethical dilemmas and opportunities.

A. Energy Requirements & Environmental Impacts of Artificial Intelligence

Training and operating large machine learning and AI models often takes considerable electricity and thus typically produces substantial emissions.[73] The extent of this issue has led to calls for sustainable approaches to the development and deployment of AI[74] and the integration of environmental ethics into discussions about AI ethics more generally.[75] At the same time, while language models are large, not every AI model is, and many such systems will be relatively small, tailored to a particular, energy-specific use case.[76] Jurisdictions that have sustain-

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67. *See* Sonya Ziaja, *How Algorithm-Assisted Decision Making Is Influencing Environmental Law and Climate Adaptation*, 48 ECOLOGY L. Q. 899, 902, 912–18, 920 (2021); *see also* Amy L. Stein, *Artificial Intelligence and Climate Change*, 37 YALE J. ON REG. 890 (2020) (examining AI's promise in the energy sector).

68. See, e.g., Jon Kleinberg et al., Prediction Policy Problems, 105 AM. ECON. REV. PAPERS & PROC. 491, 494 (2015).

69. *See, e.g.,* CATHY O'NEIL, WEAPONS OF MATH DESTRUCTION: HOW BIG DATA INCREASES INEQUALITY AND THREATENS DEMOCRACY (2016) (other AI challenges include what have been termed algorithmic harms, where software models "exploit consumers' imperfect information or behavioral biases."); *s*ee also Oren Bar-Gill et al., *Algorithmic Harm in Consumer Markets*, 15 J. LEG. ANALYSIS 1, 3 (2023).

70. For skepticism about the efficacy of increasing transparency in algorithmic systems to address their potential harms, *see* Deven R. Desai & Joshua A. Kroll, *Trust But Verify: A Guide to Algorithms and the Law*, 31 HARV. J.L. & TECH. 1, 4-5 (2017); *see generally Joshua* A. Kroll et al., *Accountable Algorithms*, 165 U. PA. L. REV. 633 (2017); *see also* Ziaja, *supra* note 67, at 3.

71. *See* Ziaja, *supra* note 67. For the value of considering legal and ethical imperatives at every stage of software development, including from the very beginning. *See* COURTNEY BOWMAN ET AL., THE ARCHITECTURE OF PRIVACY: ON ENG'G TECHS. THAT CAN DELIVER TRUSTWORTHY SAFEGUARDS (O'Reilly Media, Inc. 2015).

72. Jon Kleinberg at al., *Discrimination in the Age of Algorithms*, 10 J. LEG. ANALYSIS 113 (2018).

73. *See* Stein, *supra* note 67, at 917–18.

74. *See, e.g.*, Aimee van Wynsberghe, *Sustainable AI: AI for Sustainability and The Sustainability of AI*, 1 AI & ETHICS 213, 213-14 (2021).

75. Seth D. Baum & Andrea Owe, *A.I. Needs Env't Ethics*, 26 ETHICS, POL'Y & ENV'T 139 (2022).

76. *See* Stein, *supra* note 67, at 918.

ability or carbon-reduction commitments will need to consider how market participants' use of AI impacts those environmental goals, as AI systems vary, with some promising to advance while others would undermine climate policy objectives.[77] AI may also change the costs associated with sourcing different types of energy; it is not yet clear whether deploying AI might make fossil fuels or renewables more competitive vis-a-vis the other.[78]

B. Ethics and AI Governance

A traditional criterion for government legitimacy is justice, or at least a commitment to it in some form, such as the fair application of the procedures that constitute the rules of everyday life. One of the more troubling (although perhaps philosophically unsurprising) findings among computer science scholars in recent years is that alternative conceptions of fairness are mutually incompatible and cannot be simultaneously implemented in an algorithm's code.[79] Many organizations have taken to establishing AI ethics committees to work to align their AI development efforts with institutional and societal values.[80]

Additionally, those charged with managing electricity grids face the challenge of preventing a range of system disruptions, up to and including energy emergencies, which continue to draw scholarly attention.[81] At the same time, professionals in the military, law enforcement, public health, and disaster and emergency management have been promoting the advantages of artificial intelligence for effective responses during periods of crisis.[82] Yet there are definite risks to the potential junction of AI and emergency response. AI systems are often inscrutable—even to those who program them—and lack traditional accountability

77. *Id.*; *see also* Anders Nordgren, *A.I. and Climate Change: Ethical Issues*, 21 J. OF INFO., COMMC'N & ETHICS IN SOC. 1 (2023) (considering ethical issues arising from how AI could mitigate and/or contribute to climate change).

78. Stein, *supra* note 67, at 919.

79. Jon Kleinberg et al., *Inherent Trade-Offs in the Fair Determination of Risk Scores*, INNOVATIONS IN THEORETICAL COMPUT. SCI. CONF. 8, https://arxiv.org/pdf/1609.05807.pdf (2017).

80. *See, e.g.*, Steven Tiell, *Create an Ethics Comm. to Keep Your AI Initiative in Check*, HARV. BUS. REV. (Nov. 15, 2019), https://hbr.org/2019/11/create-an-ethics-committee-to-keep-your-ai-initiative-in-check; *see also* Jianlong Zhou & Fang Chen, *AI Ethics: From Principles to Practice*, 38 AI & SOCIETY 1, 4, 5 (2023) (listing setting up AI committees as stage two of a three-stage process proposed to operationalize AI ethics).

81. *See, e.g.*, Amy L. Stein, *Energy Emergencies*, 115 NW. U. L. REV. 799 (2020).

82. Wenjuan Sun et al., *Applications of artificial intelligence for disaster management*, 103 NATURAL HAZARDS 2631 (2020); Ferda Ofli et al., *Using Artificial Intelligence and Social Media for Disaster Response and Management: An Overview*, *in* AI AND ROBOTICS IN DISASTER STUDIES (T. V. Vijay Kumar & Keshav Sud, eds., 2020); Nathaniel O'Grady, *Automating security infrastructures: Practices, imaginaries, politics*, 52 SECURITY DIALOGUE 231 (2021); Minho Lee et al., *AI advisor platform for disaster response based on big data*, 35 CONCURRENCY & COMPUTATION PRACT. & EXPERIENCE e6215 (2021); Ania Syrowatka et al., *Leveraging artificial intelligence for pandemic preparedness and response: a scoping review to identify key use cases*, 4 NPJ DIGIT. MED. 96 (2021).

checks,[83] while also frequently encoding biases and leading users to make prejudiced choices.[84] AI may yet offer many advantages when responding to emergencies. Its potential—and in many cases, demonstrated ability—to fuse, process, and respond to vast and disparate data flows have generated considerable optimism about improving or augmenting human decision making under challenging informational conditions. Some of that optimism may prove to be well-founded, but there are also latent risks in delegating high-stakes decisions at critical moments to algorithms.[85] A government that relies on AI can easily claim it does a better job meeting all the legitimating principles detailed in the classic theories of emergency powers: in particular, it would enjoy in even greater degree than a human crisis leader the advantages of better information and speedier response in the face of imminent threats.[86] Yet, relying on AI at times of emergency or crisis would be to fragment what has long been thought a unitary, sovereign decision made by a legitimate human leader — elected by the citizenry or appointed by elected officials — and instead delegate it, at least partially, to a nonhuman, unelected, and likely inexplicable automated entity.

Regulators and policymakers face the task of finding the right balance between efficacy, caution, and the participatory practices that legitimize democratic polities as they strive to ensure the participants in the energy market operate ethically.

VII. KEY TAKEAWAYS AND RECOMMENDATIONS

Adoption of AI by utilities is advancing, yet a vast potential remains untapped. The scope of AI applications in this field is extensive, signaling a transformative era ahead. Policymakers and legal professionals at federal and state levels, including members of public utility commissions and state energy offices, are at the forefront of navigating the complex legal and regulatory landscapes that shape this emerging technology. In doing so, they need to engage in constructive and informed dialogue with other stakeholders to best navigate the complex issues

83. *See* Danielle Keats Citron & Frank Pasquale, *The Scored Society: Due Process for Automated Predictions*, 89 WASH. L. REV. 1 (2014); *see also* FRANK PASQUALE, THE BLACK BOX SOCIETY: THE SECRET ALGORITHMS THAT CONTROL MONEY AND INFO. (2016); *see also* Stein, *supra* note 73, at 937–38.

84. Hammaad Adam et al., *Mitigating the Impact of Biased A.I. in Emergency Decision-Making*, 2 COMMC'NS MED. 149 (2022).

85. *Cf.* Asaf Tzachor et al., *A.I. in a Crisis Needs Ethics with Urgency*, 2 NATURE MACH. INTEL. 365 (2020).

86. JOHN LOCKE, TWO TREATISES OF GOVERNMENT 374–75 (Peter Laslett ed., Cambridge Univ. Press 1988) (1690) (on prerogative); CLINTON ROSSITER, CONSTITUTIONAL DICTATORSHIP: CRISIS GOVERNMENT IN THE MODERN DEMOCRACIES (1963); MICHAEL WALZER, JUST AND UNJUST WARS 251–68 (1977) ("supreme emergency"); John Ferejohn & Pasquale Pasquino, *The Law of the Exception: A Typology of Emergency Powers*, 2 INT'L J. CON. L. 210 (2004); OREN GROSS & FIONNUALA NÍ AOLÁIN, LAW IN TIMES OF CRISIS: EMERGENCY POWERS IN THEORY AND PRACTICE (1st ed. 2006); Daniel Statman, *Supreme Emergencies Revisited*, 117 ETHICS 58 (2006); CLEMENT FATOVIC, OUTSIDE THE LAW: EMERGENCY AND EXECUTIVE POWER (2009); EXTRA-LEGAL POWER AND LEGITIMACY: PERSPECTIVES ON PREROGATIVE (Clement Fatovic & Benjamin Kleinerman eds., 2013); Daniel D. Slate, *Crisis Government's Legitimacy Paradox: Foreseeability and Unobservable Success*, *in* INTERSECTIONS, REINFORCEMENTS, & CASCADES 248 (Daniel Zimmer, Trond Undheim, & Paul N. Edwards eds., 2023).

of privacy, cybersecurity, explainability, transparency, liability, and AI governance and balance them with the transformative benefits of AI.

In the United States, the intersection of state and federal regulations adds layers of complexity. AI applications in utilities, depending on their impact on the wholesale market, national security or broader AI concerns, may fall under federal regulation but states will add their own regulations over safety, privacy and reliability concerns. This reinforces the need for effective dialogue at all levels.

The shift from model-based simulations to data-driven analysis with AI exacerbates existing concerns around data access, privacy, and cybersecurity. Data availability is a pivotal factor in enabling AI and machine learning adoption, and regulations should not unduly hinder access to relevant data. As already permitted by existing regulations, data sharing should be encouraged and facilitated between utilities, system operators and public entities in charge of oversight and energy policy. Collaboration with non-utility stakeholders is complicated under current regulatory frameworks – yet it is critical to mobilize the innovation ecosystem around AI and machine learning which leads the research and development of these new technologies. To create a level playing field and spur collaborative innovation, producing 'realistic open benchmarks'-datasets that are closely aligned with real-world data but modified for privacy and security – is recommended as a critical enabler. These benchmarks would allow for world leading innovation and research in AI without compromising confidentiality and security. This would also allow validation of promising beneficial techniques against real data in partnership with original data owners – provided the "realistic open benchmarks" remain sufficiently similar. Policymakers and regulators should support such initiatives, as the best compromise to balance privacy and security issues against rapid development of AI and global leadership in this new technology.

Achieving trustworthiness in AI is fundamental for its acceptance and responsible use in critical decision-making within the energy sector. Trustworthiness by design is non-negotiable, especially for the most critical applications. A conceptual framework of operational processes for electrical power utilities can be organized as three interacting layers that optimize, control, and protect. AI can be deployed in each of these layers but with the increasing need of reliability certification.

Tailoring AI explanations to various stakeholders and investing in human-AI interaction research are crucial steps in building this trust. Transparency forms the foundation of trust in AI systems. Ensuring that AI systems are auditable by independent experts and communicating their methodologies and decision-making processes are also key steps. In taking them, the potential benefits of open source and open data approaches warrant careful consideration.

Regarding liability and accountability, a critical aspect involves analyzing what decisions would have been made without AI assistance. Preserving interaction traces between operators and AI assistants is vital. Large language models are probabilistic engines that should be coupled with other models before using them in critical, near real-time decision-making. Reliance on AI during emergencies or crises would also represent a paradigm shift in decision-making, as it would

move away from solely human-led processes to a collaborative approach with automated systems. This change raises important questions about accountability and governance.

To tackle these issues and develop effective AI regulations, constructive dialogue among stakeholders, including regulators, policymakers, operators, and solution providers, is essential. This dialogue should balance privacy, cybersecurity, and trustworthiness requirements with AI's benefits. Exchanging best practices and innovative solutions with other industries and countries can enhance this process. Communication and outreach regarding AI deployments are also crucial. As regulators and policymakers engage with industry and academia, it is vital to also communicate with the public, gather stakeholder feedback, and conduct community outreach and transparency initiatives. AI is a new technology and its use and regulations are still very much a work in progress, yet it is already clear it will be instrumental in addressing climate change and the transformation of energy systems.

HOW AI TOOLS CAN HELP DIAGNOSE MARKET DYNAMICS AND CURB MARKET POWER ABUSE AS THE NATION'S POWER SUPPLY TRANSITIONS TO RENEWABLE RESOURCES

Eugene Lee[*] *and Wesley Leeroy*[*]

Synopsis: This study explores the intricate challenges arising from emerging technologies within the energy sector, particularly focusing on the critical juncture when the share of renewables overtakes fossil fuels and other sources in U.S. electricity generation. Using a newly available artificial intelligence (AI) tool, Long Short-Term Memory (LSTM) model, we conduct a comprehensive analysis of multiple regions, including the United States as a whole, to identify the critical threshold at which renewables constitute more than 50% of the energy mix. We delve into the far-reaching implications of this transition for energy regulations, which have traditionally been rooted in a fossil fuel-dominated paradigm. The integration of renewable energy with advanced battery storage technology has revolutionized the energy market, providing electricity sellers with enhanced control over capacity and market influence. These innovations have led to improved flexibility, grid stability, and greater renewable energy use. While this shift offers significant market opportunities, it also raises concerns about market power and the need for updated regulations. The new technology enables the storage of excess electricity during high production times for use during peak demand, highlighting potential market power challenges. Through an insightful case study, we demonstrate how adjustments in energy regulatory frameworks impact market power analysis outcomes. Moreover, we incorporate these empirically derived parameters into a novel AI-powered Agent-Based Model (ABM) designed for energy regulation frameworks. This dynamic model reveals the complex interplay between regulators and regulated companies, emphasizing the need to curtail excessive market power among sellers. Our research contributes to the growing body of literature on AI applications in energy regulatory frameworks, offering valuable policy options for updating existing regulations to accommodate emerging technologies.

This paper is structured into three sections. We will initiate by reviewing the background and then proceed to conduct our analysis, demonstrate AI's application, and explore the findings in subsequent sections. In Section I, we delve into the background of FERC's regulations, its methods, and our modeling. We begin

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by briefly introducing the Federal Energy Regulatory Commission (FERC) and its two pivotal programs – energy merger review and market-based rates (MBR). We provide insights into the evolution of regulations in the electricity market and the rapid growth of renewables. Subsequently, we introduce the Delivered Price Test (DPT), a foundational analytical tool for assessing market power in FERC's regulations. In addition, we examine two contrasting forecasting methodologies: traditional models and recently developed, more advanced AI models, specifically LSTM models and ABM. In our discussion, we highlight the superior accuracy and advanced capabilities of AI models, which have only become available in recent times, and explore their applications in regulatory contexts. In Section II, we embark on our analysis. We initiated the process by applying LSTM through Python coding to our renewables forecasting. We scrutinize the timeline at which the share of renewables is poised to surpass the share of fossil fuels and other sources in electricity generation in multiple regions, including the United States as a whole. Additionally, we analyze a specific case involving the DPT, presenting a novel sensitivity study within the realm of regulations. Our section culminates with the development of an ABM utilizing NetLogo codes powered by AI. In our simulation, we demonstrate the regulatory challenges posed by the rapid growth of renewables and the need to curtail excessive market power from power sellers. In our conclusion, we underscore that the share of renewable energy, boosted by emerging technologies, is expected to surpass the share of fossil fuels and other sources in U.S. electricity generation. We suggest shifting gradually from fossil fuel-based (nameplate capacity) calculations to renewable-based (sales or capacity-plus-battery) calculations as renewables continue their ascent towards dominance across the United States.

I. BACKGROUND FOR FERC'S REGULATIONS AND OUR RESEARCH METHODS AND MODELS

A. Introduction

The need to update regulations within the electricity industry is steadily growing in significance, particularly as renewables take center stage, gradually replacing traditional fossil fuels as the predominant source of electricity generation in the United States.[1]

The electricity market is a natural monopoly, meaning that it is very expensive to build and maintain an electricity grid, and it would be inefficient to have multiple grids competing in the same market. Regulations in the electricity market are designed to prevent natural monopolies from abusing their market power and to ensure that electricity prices are fair and reasonable, and that consumers have access to reliable electricity services. To avoid Enron-type energy crises, academic scholars, legal professionals, and federal and state antitrust officials are increasingly interested in understanding the market power implications of electricity market deregulation and energy mergers, as well as the importance of keeping regulation up to date.

At the federal level, three major agencies collectively shoulder the responsibility for overseeing the energy market: the Federal Trade Commission (FTC), the Department of Justice (DOJ), and FERC. These agencies all closely scrutinize energy mergers. The FTC and DOJ hold joint jurisdiction over merger review through the Hart-Scott-Rodino Antitrust Improvements Act of 1976 (HSR Act).[2] This legislation mandates companies to notify both the FTC and DOJ of specific mergers and acquisitions prior to their completion. Subsequently, the agencies

1. *See* U.S. ENERGY INFO. ADMIN., U.S. REGIONAL ELECTRICITY GENERATION, ELECTRIC POWER SECTOR, (2024) https://www.eia.gov/outlooks/steo/tables/pdf/7dtab.pdf. In 2022, about 4,243 billion kilowatthours (kWh) of electricity were generated at utility-scale electricity generation facilities in the United States. About 60% of this electricity generation was from fossil fuels—coal, natural gas, petroleum, and other gases. About 18% was from nuclear energy and others, and about 22% was from renewable energy sources. However, Northwest region is the first region in the United States where renewables surpassed half the region's electricity generation in 2022.

2. Hart-Scott-Rodino Antitrust Improvements Act of 1976, Pub. L. No. 94-435, 90 Stat. 1387 (codified as amended at 15 U.S.C. §§ 18a-18h).

evaluate the transaction and decide whether further investigation is warranted. If an investigation is initiated, the agencies may issue a request for more detailed information from the involved parties, including information concerning the transaction's competitive implications. While these agencies collaborate closely on merger review, the FTC primarily handles mergers within the electric utility sector, while the DOJ specializes in the oil and gas industry.

FERC, on the other hand, holds specific responsibilities and extensive expertise in the realm of energy and electricity regulation, enabling it to conduct sophisticated analyses for authorizing energy mergers.[3] Empowered by the Federal Power Act (FPA),[4] FERC oversees the wholesale electricity market to prevent the exploitation of market power by natural monopolies. Beyond energy mergers, FERC maintains its market-based rates (MBR) program through which it oversees the wholesale deregulated electricity market. FERC's regulations play a pivotal role in ensuring the fairness and reasonableness of electricity prices while guaranteeing consumers access to a reliable electricity service.

It is worth noting that the methodologies employed by the FTC and DOJ and FERC are not entirely identical. While FERC's approach hinges on structural analysis, examining market shares and Herfindahl-Hirschman Index (HHI) through the Delivered Price Test (DPT), the FTC and DOJ primarily rely on a behavioral approach to mergers.[5] The agencies focus on evaluating the potential and motivation for price hikes. Despite these disparities, nameplate capacity, adjusted by capacity factor, forms a crucial foundation for their horizontal market power analysis. The DOJ and FTC typically initiate their supply curve analysis using nameplate capacity, which denotes the maximum output a power plant can achieve under ideal conditions. FERC, on the other hand, consistently employs its screens and the more advanced DPT, both rooted in nameplate capacity, to assess electricity power seller applications within its merger and MBR programs. Nameplate or seasonal capacity serves as a metric to ascertain market share and gauge the overall energy capacity available within a specific market.[6]

However, the landscape of the energy industry has undergone a significant transformation in recent years, with renewable energy emerging as the fastest-growing source of energy in the United States. With the rapid development of emerging technologies, the capability of battery storage has surged, granting renewable energy sellers greater flexibility to expand their market share beyond their nameplate capacity during peak demand periods. Market power analysts now confront novel challenges. The existing methods may underestimate the actual available energy, creating opportunities for sellers to manipulate their available capacity strategically at specific times and increase their market power.

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3. *See* FERC, COMMISSION MEMBERS AND SENIOR STAFF, https://www.ferc.gov/commission-members-senior-staff/commission-members-and-senior-staff. As of October 2023, the staff of FERC is composed of over 1,200 employees. The staff includes about 200 engineers, 100 economists, lawyers, 150 attorneys, and 10 Administrative Law Judges, and other professionals.

4. Federal Power Act, 16 U.S.C. §§ 791a–828c *(*1976 & Supp. IV 1980).

5. Mark J. Niefer, *Explaining the Divide Between DOJ and FERC on Electric Power Merger Policy*, 33 ENERGY L. J. 505, 515 (2012).

6. Order No. 697, *Market-Based Rates for Wholesale Sales of Electric Energy, Capacity and Ancillary Services by Public Utilities*, 119 FERC ¶ 61,295 at P 343 (2007) (to be codified 18 C.F.R. pt. 35).

The primary focus of this article is to examine FERC's market power analysis within its regulations amid the backdrop of this rapid growth in the renewable energy sector. It is noteworthy that FERC's current energy regulations, especially those related to market share calculations for antitrust purposes, remain grounded in fossil fuel energy, primarily utilizing capacity factor-based calculations, rather than accounting for the evolving landscape of renewable energy through sales-based or capacity-plus-battery-based calculations. This lack of updates by FERC to its market power analysis to reflect the increasing role of renewable power raises concerns that the current capacity de-rate standard may inaccurately reflect the available energy in the market. Recent examples highlight how the current de-rate standard for FERC's market power analysis can distort market share calculations, thereby posing a challenge to the foundations of FERC's regulations.

Given the challenges posed by the rapid growth of renewables, our study endeavors to identify the need for FERC to update its regulations, pinpoint the weaknesses in FERC's current market power analysis, explore potential solutions, and simulate the consequences of regulatory adjustments once renewables achieve dominance across the United States.

B. The Regulations of the US Energy Market and the Challenges

FERC was established in 1977 under the Department of Energy Organization Act, merging the Federal Power Commission and the Bureau of Accounts and Cost Finding from the Interstate Commerce Commission.[7] This restructuring signified a move towards a more consolidated and focused regulatory framework for overseeing the nation's energy markets.

Order No. 888 was a landmark decision by FERC that aimed to promote competition within the electricity market.[8] It relied on the existing 1935 Federal Power Act (FPA) to implement generic unbundling, requiring utilities to separate their generation, transmission, and distribution functions.[9] While Order No. 888 represented a significant step towards competition, FERC's regulatory approach has continued to evolve, adapting to various legislative changes, including the Energy Policy Act of 2005 (EPAct2005). While EPAct2005 did not universally require case-by-case rulings, it introduced additional factors for FERC to consider when determining the appropriate level of regulation for different market segments.[10] Today, FERC stands as one of the United States' most influential energy regulators. Its decisions hold substantial sway over the wholesale electricity market and significantly impact the reliability and affordability of electricity for consumers.[11]

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7. FERC, ABOUT FERC, https://www.ferc.gov/about/what-ferc.

8. Order No. 888, *Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Services by Public Utilities*, 75 FERC ¶ 61,080 at P 1 (1996).

9. *Control of Public Utility Holding Companies*, Pub. L. No. 74-333, 49 Stat. 838 (1935). The Federal Power Act, 16 U.S.C. §§ 791-828(c), passed in 1920 and amended in 1935 and 1986, created FERC as an independent regulatory agency that oversees the natural gas, oil, and electricity markets, regulates the transmission and sale of these energy resources (except for oil), provides licenses for non-federal hydroelectric plants, and addresses environmental matters arising in any of the areas above.

10. Energy Policy Act of 2005, Pub. L. No. 109-58, 119 Stat. 594, 718, 968 (2005).

11. FERC, WHAT FERC DOES, https://www.ferc.gov/what-ferc-does (last visited Mar. 3, 2024).

FERC, functioning as an independent agency, is charged with regulatory oversight over the provision of dependable and cost-effective energy service and the interstate infrastructure facilities that make that possible in the United States. FERC's core responsibilities encompass overseeing the reliability of the bulk power system, the vast interconnected network of power plants and transmission lines that deliver electricity nationwide. Additionally, FERC regulates the interstate wholesale electricity market, where generators sell power to utilities and other buyers, and oversees the interstate transmission of natural gas and oil.

FERC has been pivotal in promoting competition within wholesale electric markets. Market power analysis is a tool FERC employs to evaluate the potential for electricity companies to wield undue influence in the wholesale electricity market. This analysis is utilized in two main programs: the MBR program (section 205 of the Federal Power Act) and the merger review program (section 203 of the Federal Power Act). The premise here is that a seller's pricing practices are linked to its market power. Market power and manipulation can result in exorbitant prices causing harm to consumers, such as occurred during the Enron era abuses. It is FERC's duty to identify and mitigate market power to safeguard the public interest.

Under the MBR program, if a seller fails to pass certain preliminary indicative screens, FERC presumes that the seller possesses market power.[12] The seller can rebut this presumption by demonstrating the absence of market power through a more advanced method, the DPT. In the case of the Merger review program, FERC's market power analysis, including DPT, is employed to assess the potential impact of mergers and acquisitions on competition within the wholesale electricity market. FERC may approve such transactions if they are deemed "consistent with public interest."[13] However, if FERC finds that the merged or acquired entity could exert market power, it may require measures to counteract any anti-competitive effects, including divestitures, asset sales, or behavioral conditions.

To keep its regulations current, FERC has consistently issued orders aimed at fostering competition within wholesale electric markets. For instance, FERC mandated utilities to grant open access to their transmission lines, enabling generators to sell electricity nationwide.[14] FERC also established rules governing market pricing and dispatch, ensuring that wholesale electricity markets operate fairly and efficiently.[15] In recent years, FERC has implemented numerous enhancements to its regulations concerning affiliate and market power analysis.[16] These

12. 119 FERC ¶ 61,295, at P 77.

13. Energy Policy Act of 2005, Pub. L. No. 109-58, § 1289, 119 Stat. 594, 982-3 (2005) (codified as amended 16 U.S.C. 824b (a)(4)).

14. Order No. 888-A, *Promoting Wholesale Competition Through Open Access Non-discriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities*, FERC STATS. & REGS. ¶ 61,220 (1997) (to be codified at 18 C.F.R. pt. 35).

15. FERC, AN INTRODUCTORY GUIDE TO ELECTRICITY MARKETS REGULATED BY THE FEDERAL ENERGY REGULATORY COMMISSION, https://www.ferc.gov/introductory-guide-electricity-markets-regulated-federal-energy-regulatory-commission (last visited Mar. 3, 2024). This guide discusses the basics of wholesale electricity markets regulated by FERC and covers FERC's role in ensuring these markets operate fairly and efficiently.

16. *Evergy Kansas Central, Inc.*, 181 FERC ¶ 61,044 at PP 44-45 (2022).

improvements streamline the process, reduce costs for sellers, and provide the Commission with the necessary data to protect consumers. This new guidance aids sellers in understanding the information required for their market power analyses and how to demonstrate a lack of market power.

Specific examples of recent improvements and new rules include:

In 2007, FERC issued Order No. 697,[17] introducing multiple improvements to the market power analysis process for sellers of electric energy, capacity, and ancillary services. These changes were designed to streamline the process, reduce costs for sellers, and equip FERC with the necessary information to safeguard consumers.

In 2019, FERC issued Order No. 860, which revamped the data collection process for MBR purposes. This order mandated all sellers holding MBR authorization to submit baseline filings to FERC's MBR relational database, streamlining the market power analysis process and simplifying the demonstration of the absence of market power.[18]

In 2021, FERC issued Order No. 881, introducing a new standard for transparency and transmission asset utilization. This order aimed to enhance the accuracy and transparency of transmission line ratings, ultimately promoting efficient power flow management, reducing congestion costs, and enhancing grid reliability.[19]

In 2023, FERC made a pivotal decision in *Evergy*, clarifying that the appointment of an investor's non-independent officer or director to the board of a public utility or public utility holding company constitutes a *per se* finding of control and affiliation.[20] These recent improvements and new rules related to affiliate and market power analysis have rendered FERC's regulations more efficient, effective, and equitable.

Notwithstanding these several regulatory changes, FERC has not updated its basic approach for market power analysis. Over 60% of the energy supply is derived from fossil sources such as crude oil, coal, and natural gas, and FERC's regulations have remained grounded in traditional fossil energy.[21] The heavy dependence on fossil fuels for electricity generation has led to growing concerns about climate degradation, resource depletion, energy security, and volatile fossil energy prices. Motivated by these concerns, renewable (or clean) energy sources, including solar, wind, hydro, and biofuels, have gained unprecedented global attention as viable alternatives to fossil energy.[22]

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17. FERC ¶ 61,295, at P 1 (2007).

18. *Data Collection for Analytics and Surveillance and Market-Based Rate Purposes*, 168 FERC ¶ 61,039 at PP 1-2 (2019).

19. *Managing Transmission Line Ratings*, 177 FERC ¶ 61,179 at PP 3-10 (2022).

20. 181 FERC ¶ 61,044, at PP 44-45.

21. *See generally* Angeliki N. Menegaki & Konstantinos P. Tsagarakis, *Rich enough to go renewable, but too early to leave fossil energy?*, 41 RENEWABLE & SUSTAINABLE ENERGY REVS. 1465, 1465-77 (2015).

22. *See generally* Imran Yousaf et al., *Green investments: A luxury good or a financial necessity?*, 105 ENERGY ECON. 105745 (2022).

In the United States, renewable energy has emerged as the fastest-growing energy source in recent years. In 2022, renewable energy accounted for 22% of total U.S. electricity generation, up from just 10% in 2000.[23] This growth has been propelled by various factors, including decreasing costs due to emerging renewable technology, increased government support, and rising public awareness of the environmental benefits of renewable energy. Over the past decade, the renewable sector has seen an annual growth rate of 5%, surpassing "the fossil fuel sector's growth rate of 1.7%."[24] To address the availability and reliability challenges associated with solar and wind energy, emerging technologies have played a pivotal role in reducing battery costs and expanded development of so-called "hybrid facilities," which combine multiple modes of electricity generation, often pairing renewable technologies like solar photovoltaics and wind turbines with storage systems or small fossil-fueled generators.[25]

In this evolving landscape, there is a dearth of studies that provide clear insights into when renewables will become the dominant energy source and when and in which regions of the nation the 50% renewable threshold will be exceeded. The attainment of the 50% renewable energy threshold signifies a pivotal transformation within the energy sector, bearing profound implications for the FERC's regulatory framework and its assessment of market power. This milestone, endorsed by both the administration [26] and the EIA[27], heralds several critical junctures. Primarily, the achievement of a 50% renewable energy mix marks the transition of renewable sources from a supplementary role to a predominant force in electricity generation. Such a shift fundamentally alters the dynamics of the market, potentially introducing new entities and redefining the hierarchy of established players. Furthermore, traditional FERC regulations, which are the focus of subsequent sections, rely on metrics designed around fossil fuels, such as nameplate capacity and capacity factors. These measures may not accurately reflect the market influence of renewable energy entities, suggesting that surpassing the 50% renewable energy threshold necessitates a thorough reevaluation of FERC's regulatory approach and its mechanisms for analyzing market power.

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23. See STATISTA, SHARE OF RENEWABLE SOURCES IN ELECTRICITY GENERATION IN THE U.S. 2000-2022 (Nov. 17, 2023), https://www.statista.com/statistics/183396/proportion-of-renewables-in-us-electricity-generation-since-2000/.

24. Jiahao Zhang et al., Does the connectedness among fossil energy returns matter for renewable energy stock returns? Fresh insights from the Cross-Quantilogram analysis, 88 INT'L REV. FIN. ANALYSIS 102659, 102659-60 (2023).

25. WIKIPEDIA, HYBRID POWER, https://en.wikipedia.org/wiki/Hybrid_power (last visited Mar. 4, 2024).

26. Nathan B. Galer et al., *BUY CLEAN: BIDEN'S EXECUTIVE ORDER ON CATALYZING CLEAN ENERGY THROUGH FEDERAL PROCUREMENT*, MAYER BROWN (Mar. 24, 2022), https://www.mayerbrown.com/en/insights/publications/2022/03/buy-clean-bidens-executive-order-on-catalyzing-clean-energy-through-federal-procurement ("In the Clean Energy EO, President Biden aims to align the federal government's energy procurement strategy with his administration's climate policy . . . . Purchase 50% carbon-free electricity on a 24/7 basis by 2030, with "24/7" meaning carbon-free electricity production that matches use "on an hourly basis and [is] produced within the same regional grid where energy is consumed.""").

27. U.S. ENERGY INFO. ADMIN., EIA PROJECTS RENEWABLES SHARE OF U.S. ELECTRICITY GENERATION MIX WILL DOUBLE BY 2050 (Feb. 8, 2021), https://www.eia.gov/todayinenergy/detail.php?id=46676 ("By 2030, renewables will collectively surpass natural gas to be the predominant source of generation in the United States.").

Since the above reasons, answering 50% threshold questions holds profound implications for FERC's regulations, raising concerns about whether its existing regulations and market power analysis, grounded on metrics developed in an era when traditional fossil fuels were dominant, are suitable for an industry undergoing a transition toward renewable energy.

C. The DPT, a Core Analytical Tool for Market Power in FERC's regulations

As previously mentioned, the DPT is as a potent analytical tool within FERC's regulatory framework, crucial for identifying market power. FERC introduced the DPT in 1996 for section 203 filings in response to the "dramatic and continuing changes in the electric power industry."[28] This move aimed to ensure that future mergers align with the competitive objectives of the Energy Policy Act of 1992 (EPAct).[29] Subsequent developments in case law and policy statements have provided additional guidance but have not substantially altered the core DPT. On April 14, 2004, FERC took a significant step by incorporating indicative screens and the DPT into section 205 filings (MBR program).[30] Sellers who fail the indicative screens have the option to conduct the DPT.

In an attempt to consider the adoption of the Department of Justice's 2010 Horizontal Merger Guidelines (DOJ 2010 Guidelines),[31] FERC issued a Notice of Inquiry on March 17, 2011. On February 16, 2012, FERC decided against adopting the DOJ 2010 Guidelines, reaffirming its existing policies for horizontal market power analyses in both the merger and MBR contexts.[32] FERC noted that while its existing methodology might not perfectly capture market conditions in every scenario, the DPT remained a suitable method for identifying suppliers in a market. FERC further noted that it's a well-established test in the electric industry, flexible enough to consider fact-specific evidence of competitive harm.[33]

The DPT operates as a "hypothetical monopolist" model, striving to answer the question: "If a seller were to raise prices by a small but significant amount, typically around five percent, are there enough suppliers capable of supplying the study area to counter this hypothetical price increase?"[34] According to FERC, its primary function is to define the extent or size of the relevant geographic market

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28. Order No. 592, *Inquiry Concerning the Commission's Merger Policy Under the Federal Power Act: Policy Statement*, 61 Fed. Reg. 68,595 (1996); Merger Policy Statement, FERC STATS. & REGS. ¶ 31,044 at 30,110-111 (1996).

29. Merger Policy Statement, *supra* note 28, at ¶ 31,044.

30. *AEP Power Marketing, Inc.*, 107 FERC ¶ 61,018 at PP 1, 70 (2004), *order on reh'g,* 108 FERC ¶ 61,026 (2004).

31. Notice of Inquiry, *Analysis of Horizontal Market Power under the Federal Power Act*, FERC STATS. & REGS. ¶ 35,571, 76 Fed. Reg. 16,394, 16,394 (2011).

32. *Order Reaffirming Commission Policy and Terminating Proceeding*, 138 FERC ¶ 61,109 at P 34 (2012).

33. *Id.* at P 59.

34. Gregory J. Werden, *The 1982 Merger Guidelines and The Ascent of The Hypothetical Monopolist Paradigm*, U.S. DEP'T OF JUSTICE (June 4, 2002), https://www.justice.gov/archives/atr/1982-merger-guidelines-and-ascent-hypothetical-monopolist-paradigm#:~:text=The%201982%20Merger%20Guidelines%20did,instrumental%20in%20its%20widespread%20adoption.

by identifying potential suppliers, accounting for transmission availability and pricing, and evaluating the impact of a transaction on market concentration.[35]

The DPT is an economic model that combines generation costs and availability with a transmission model, usually referred to as the Simultaneous Transmission Import Limit study. This model estimates the available transmission capacity during seasonal peaks into a study area, often a balancing authority area. Various industry consultants use different application models, with the General Algebraic Modeling System being one of the most frequently employed software platforms. The General Algebraic Modeling System assists applicants in running the Competitive Analysis Screen model, aiding in the calculations required by Appendix A of FERC's Merger Policy Statement and Appendix F of the April 14 Order (Appendix F).

Within the General Algebraic Modeling System, the DPT algorithm analyzes each seller's available economic capacity (AEC) by minimizing the cost of each supplier at the destination market. This involves considering the supplier's generation portfolio, market price, transmission constraints, and native load obligations. The goal is to solve a linear programming model.[36]

FERC's guidance in Appendix F outlines the mechanics of the DPT, which involve the following five fundamental steps.

Step 1. Choosing a destination market and evaluating any market where the applicant does not pass the Pivotal Supplier or Market Share screen.

Step 2. Selecting the season and load level for analysis, typically including Super-Peak, Peak, and Off-Peak, for winter, shoulder and summer periods, and an extreme Summer Peak, for a total of ten season/load periods.

35. *See, e.g.,* Notice of Inquiry, *Analysis of Horizontal Market Power under the Federal Power Act*, FERC STATS. & REGS. ¶ 35,571 at P 2, 76 Fed. Reg. 16,394 (2011).

36. This linear programming model and equations are elaborated in Appendix I.

Table 1

SUMMER (June through August)	Super Peak 1 (S_SP1): Top 1 percent of peak load hours
	Super Peak 2 (S_SP2): Top 1-10 percent of peak load hours
	Peak (S_P): Remaining peak hours
	Off-peak (S_OP): All off-peak hours
WINTER (December through February)	Super Peak (W_SP): Top 10 percent of peak load hours
	Peak (W_P): Remaining peak hours
	Off-peak (W_OP): All off-peak hours
SHOULDER (September through November; March through May	Super Peak (SH_SP): Top 10 percent of peak load hours
	Peak (SH_P): Remaining peak hours
	Off-peak (SH_OP): All off-peak hours

Step 3. Determining the market price corresponding to each period, often using system lambda data as proxies.

Step 4. Identifying suppliers capable of selling into the destination market at a price within 5% of the market price, considering various factors, such as transmission availability and costs.

Step 5. Allocating transmission capacity, which is usually scarce, based on either an "economic" or "pro-rata" allocation method.

The DPT initiates its calculation based on nameplate capacity, calculates each supplier's economic capacity (EC) and available economic capacity (AEC), the remaining capacity after accounting for native load and contractual obligations in each season/load condition. This method has effectively served FERC in an environment where fossil fuels dominate. However, with the rise of renewable energy and advances in technology, the landscape is shifting. Renewable energy, coupled with enhanced battery storage capabilities, allows sellers to improve their market presence during peak periods. FERC, however, has not yet established updated standards specific to renewable energy resources.

Market power analysts within the MBR and merger programs now confront new challenges in assessing the presence and impact of renewable energy during critical periods. The key question currently facing regulators is whether this existing DPT methodology, designed for a fossil-fuel-dominant energy market, remains effective in an era where renewable energy supplies are poised to take the lead.

D. Forecasting Methods: Traditional Models and AI Models

Effective regulation revisions demand meticulous planning. Central to this process is the selection of a workable scientific method coupled with reliable forecasting upon which future regulations will be anchored. Renewable energy growth is expected to continue, spurred in part by the government's ambition to attain a net-zero emissions economy by 2050.[37] In pursuit of this objective, the administration has established a milestone to produce 50% of the nation's electricity from renewable sources by 2030.[38] Critical questions arise: is this goal feasible under current energy regulation and policy? Is there a need for supplementary policy or regulatory support? Addressing these inquiries requires a comprehensive quantitative analysis and accurate forecasting.

Forecasting, the process of predicting future events or trends based on historical data, is an invaluable tool for all organizations including federal regulatory agencies. Forecasting equips the regulatory bodies with the capability to make informed decisions. In the realm of forecasting, two primary methodologies hold sway: traditional models and AI models.[39] Traditional forecasting models, such as moving averages, exponential smoothing, and autoregressive integrated moving average models, leverage time series analysis to uncover patterns and trends within historical data. These patterns are then projected into the future to facilitate predictions.[40]

In the wake of recent advances in AI, LSTM models have emerged as some of the most robust and widely used in advanced AI modeling for time series forecasting. LSTM models belong to the category of recurrent neural networks, engineered to address long-term dependencies in sequential data. Stemming from their unique architecture, LSTM models are superior to conventional forecasting models such as autoregressive integrated moving average.

LSTM models are equipped with a distinct structure that includes three specialized gates: the input gate, forget gate, and output gate. These gates play a crucial role in managing the information flow within the network, making LSTMs particularly effective for tasks that require the understanding and retention of long-term dependencies in data. The functionality of these gates is enhanced by the hyperbolic tangent (tanh) activation function, which helps in normalizing the values passing through the network, thereby preventing issues related to gradient vanishing or exploding.

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37. WHITE HOUSE, FACT SHEET: PRESIDENT BIDEN SIGNS EXECUTIVE ORDER CATALYZING AMERICA'S CLEAN ENERGY ECONOMY THROUGH FEDERAL SUSTAINABILITY (Dec. 08, 2021), https://www.whitehouse.gov/briefing-room/statements-releases/2021/12/08/fact-sheet-president-biden-signs-executive-order-catalyzing-americas-clean-energy-economy-through-federal-sustainability/.

38. WHITE HOUSE, FACT SHEET: BIDEN-HARRIS ADMINISTRATION RACES TO DEPLOY CLEAN ENERGY THAT CREATES JOBS AND LOWERS COSTS (Jan. 12, 2022), https://www.whitehouse.gov/briefing-room/statements-releases/2022/01/12/fact-sheet-biden-harris-administration-races-to-deploy-clean-energy-that-creates-jobs-and-lowers-costs/.

39. Azzedine Boukerche et al., *Artificial Intelligence-based Vehicular Traffic Flow Prediction Methods for Supporting Intelligent Transportation Systems*, COMPUT. NETWORKS (Dec. 9, 2020), https://www.sciencedirect.com/science/article/pii/S1389128620311567?via%3Dihub.

40. FASTERCAPITAL, BRIEF OVERVIEW OF TRADITIONAL FORECASTING METHODS, https://fastercapital.com/topics/brief-overview-of-traditional-forecasting-methods.html (last visited Mar. 4, 2024).

LSTM models are like smart workers in an office who manage information. They have three "gates" or checkpoints: one for deciding what new information is important enough to keep, another for determining what old information to forget, and a third for deciding what information to use at the moment. These gates help the model remember and use important information from the past, which is great for tasks needing memory of previous events. The term "vanishing" refers to when details from the past start to fade away or get lost, which these gates help prevent by keeping the important stuff in focus.

The following illustrates how this works in electricity consumption. Imagine you are trying to predict how much electricity will be used in a city each day. You could look at the electricity usage over the past few days and guess based on that trend. This would be similar to what occurs under traditional forecasting models (such as under the autoregressive integrated moving average (ARIMA)). But suppose you have a method that can remember specific patterns from the past, like higher electricity usage on hot summer days due to air conditioning or lower usage during holidays when businesses are closed. That is essentially how LSTM models operate. LSTM models are advanced tools that excel in remembering important details over long periods and ignoring data points that are not relevant for purposes of the analysis. In effect, LSTM models provide a means of tracking significant electricity usage patterns and ignoring those deemed to be unhelpful for the desired analysis.

Since LSTM models feature three gates (input, forget, and output) for regulating the flow of information, all reinforced by the hyperbolic tangent (tanh) activation function, we can explain the three gates in the context of electricity usage prediction:

Input Gate: This is like a decision-maker who chooses which new information (like a sudden spike in electricity usage) is important enough to remember.

Forget Gate: This acts like a filter, removing outdated or irrelevant data (like old patterns of electricity usage that no longer apply).

Output Gate: This gate decides what information from the past and present should be used to predict the electricity usage for the next day.

The "hyperbolic tangent (tanh) activation function" works to keep these gates operating effectively. Think of it as a rule that operates so that the information utilized in the model remains balanced and useful.

In simpler terms, LSTM models are like having a highly efficient analysis system that remembers the right patterns and uses those insights to make better predictions about daily electricity usage, rather than just relying on recent trends (See APPENDIX II for a description of the process). Additionally, these models include two states, the cell state (long-term memory) and the hidden state (short-term memory), to efficiently grasp and exploit temporal dependencies in the data.[41]

41. Sima Siami-Namini et al., *A Comparison of ARIMA and LSTM in Forecasting Time Series*, 17 IEEE INT'L CONF. ON MACH. LEARNING & APPLICATIONS 1394, 1396-97 (Dec. 2018), https://ieeexplore.ieee.org/document/8614252 (explaining that in an LSTM model, the terms "cell state" and "hidden state" are used to describe two different ways the model remembers information, which helps it understand and use patterns in data over time).

LSTM models have demonstrated their superiority over traditional forecasting models in several key aspects:

- Ability to learn long-term dependencies: LSTM models are adept at identifying and capitalizing on long-term dependencies in the data, a significant advantage in forecasting future trends. Traditional forecasting models are often constrained to short-term predictions. "Dependencies" in this context means the relationships or connections between pieces of information across time.
- Resilience to noise and outliers: LSTM models exhibit greater robustness in the face of noisy data and outliers as compared to traditional forecasting models. This robustness is especially valuable when dealing with real-world data, which frequently contains noise and unexpected data points. In this context, "noise" refers to random or irrelevant information in the data that doesn't contribute to understanding the underlying patterns we are trying to analyze.

Versatility: LSTM models can be applied to forecast a wide spectrum of time-series data, including data marked by seasonal patterns and other non-stationary characteristics. Time-series data refers to information collected over time, where the sequence and timing of data points are crucial. Traditional forecasting models typically possess a narrower scope of applicability. In layman terms, LSTM models are like versatile tools for making predictions based on data collected over time, including data with repeating patterns like holiday sales spikes or changes that don't follow a set pattern. They are much more adaptable to different kinds of data changes than older prediction methods, making them useful for a broader range of forecasting tasks.

LSTM models are exceptionally well-suited for forecasting renewable energy shares. These models excel in uncovering long-term dependencies within data, a critical feature for forecasting renewable energy proportions in electricity generation, which are influenced by an array of factors subject to change over time, including technological advancements, government policies, and environmental regulations. LSTM models are also adept at handling noisy data and outliers, a key consideration for forecasting renewable energy shares, given the data's susceptibility to noise stemming from factors such as weather conditions and unexpected events.

Moreover, given that LSTM models require a significant volume of historical data for effective training, and access to such extensive data sets enhances the accuracy of forecasts, the abundance of national data spanning over twenty years, coupled with over ten years of regional data as well as thirty-four-year monthly sectional data, is a substantial asset. Our literature review further reinforces the potential benefits in using LSTM models. Studies conducted by several universi-

ties have demonstrated the superiority of LSTM models over traditional forecasting models for forecasting renewable energy shares and solar and wind power generation.[42]

E. Agent-Based Modeling (ABM) Simulation

With the recent advancements in emerging technology, computer models have gained prominence. Model simulations serve as invaluable tools for policy makers, regulators, and other stakeholders to understand complex systems and relationships and make informed decisions. A notable strength of simulation studies lies in their capacity to unveil the behavior of statistical methods, leveraging known "truths" from data generation processes, shedding light on methodological properties, such as bias.[43] Furthermore, conducting virtual experiments through simulation models is cost-effective and less time-consuming than real-world trials.

In recent years, ABM, a computer simulation model, has surged in popularity due to its ability to simulate complex systems. ABM involves individual agents with distinct rules and behaviors, fostering interactions within their environment, thereby generating emergent patterns at the system level. An "agent" is like a character in a video game. Each agent has its own set of rules and ways of behaving, which lets them interact with other agents and their surroundings. When all these agents act together, they create complex patterns or outcomes, similar to how individuals in a community contribute to the overall behavior of the group. Simultaneously, significant advancements in software testing have revolutionized complex system analysis by automating the discovery of security vulnerabilities.[44] We have summarized the most popular theoretical framework used in ABM in APPENDIX III.

One of the advantages of ABM is its ability to model the behavior of individual agents and their interactions in a dynamic way, capturing the complexity of real-world systems. This makes ABM a powerful tool for analyzing systems in which individual behavior is critical to the system's overall behavior. By modeling individual behavior and interactions, ABM can be used to study emergent properties of systems, such as pattern formation and cooperation. Additionally, ABM's flexibility helps model designers and users manage the challenges that complexity poses for researchers and policymakers.[45]

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42. Md. Iftekharul Alam Efat et al., *Deep-learning model using hybrid adaptive trend estimated series for modelling and forecasting sales*, ANNALS OF OPERATION RSCH. (July 1, 2022), https://link.springer.com/article/10.1007/s10479-022-04838-6#citeas; Janice Klaiber & Clemens Van Dinther, *Deep Learning for Variable Renewable Energy: A Systematic Review*, 56 ACM COMPUTING SURVS. 7-13 (Aug. 2023), https://doi.org/10.1145/3586006; Juan M. Lujano-Rojas et al., *Searching for Promisingly Trained Artificial Neural Networks*, 5 FORECASTING (Sept. 4, 2023), https://doi.org/10.3390/forecast5030031.

43. Tim P. Morris et al., *Using simulation studies to evaluate statistical methods*, STATS. IN MED. 2074 (Nov. 2, 2018), https://onlinelibrary.wiley.com/doi/full/10.1002/sim.8086.

44. Steven Manson et al., *Methodological Issues of Spatial Agent-Based Models*, J. OF ARTIFICIAL SOC'Y & SOC. SIMULATION (Jan. 31, 2020), https://www.jasss.org/23/1/3.html.

45. Ross A. Hammond, *Considerations and best practices in agent-based modeling to inform policy*, NAT'L LIB. OF MED. (July 17, 2015), https://www.ncbi.nlm.nih.gov/books/NBK305917/.

A typical ABM has three elements: a set of agents with attributes and behaviors; the agents' environment, including who they interact with, how the consequences of those interactions are determined, and their resources, objects, and obstacles; and rules governing the agents' incentives, whether they can change their initial features based on the consequences of their neighbors' and their own previous actions, and other factors.[46]

To simulate agent behavior, modelers run the simulation in a sequence of discrete time steps, where each step represents the smallest unit of progress in the simulation. In each time step, the states of the agents and their neighborhoods are updated according to the specified rules. ABMs can model complex behaviors by simulating each agent separately. A problem that is difficult to describe at the group level can often be described individually at the level of the participating entities. With the help of a simulation, we can then model the group's behavior.[47]

Researchers have applied ABM to a wide range of topics in sociology, physics, and other fields to study complex social systems. For example, ABM has been used to study epidemiology, infectious diseases, climate change, social network formation, financial markets, firms, and consumer behavior.[48] In the energy sector, ABM has been applied to assess the economic impact of feed-in tariff policies promoting renewable energy investments.[49]

Despite its widespread use in other fields, ABM is nearly absent from legal literature. Only a few ABM models in the field have general relevance to theories about the need for and effects of regulation.[50] In fact, quantitative legal scholarship is currently dominated by the Law and Economics (L&E) approach, which relies on a more limited modeling framework, not simulation.

Our analysis of ABM suggests its possible application to regulation. ABM can be used to model the interactions between regulated agents. This is important because the behavior of one regulated agent can affect the behavior of other regulated agents. For example, if one regulated agent cheats and gets away with it, other regulated agents may be more likely to cheat as well.

In the context of an electricity wholesale market, "regulated agents" would refer to power sellers or electricity generating companies who must adhere to spe-

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46. Manson, *supra* note 44, at 2.

47. Christian Graf, *Overcoming Complexity with Agent-Based Models*, MEDIUM (Jan. 11, 2021), https://towardsdatascience.com/overcoming-complexity-with-agent-based-models5c4cca37cc61.

48. Stephen Eubank et al., *Modelling disease outbreaks in realistic urban social networks*, GALE ACAD. ONEFILE (May 13, 2004), https://go.gale.com/ps/i.do?id=GALE%7CA186370768&sid=googleScholar&v=2.1&it=r&linkaccess=abs&issn=00280836&p=AONE&sw=w&userGroupName=anon%7E8e734fe6&aty=open-web-entry; s*ee also* J. Doyne Farmer, *A simple model for the nonequilibrium dynamics and evolution of a financial market. International Journal of Theoretical and Applied Finance*, WORLD SCIENTIFIC (2000), https://www.worldscientific.com/doi/abs/10.1142/S0219024900000346.

49. Linda Ponta et al., *An agent-based Stock-Flow Consistent Model of the Sustainable Transition in the Energy Sector*, ECOLOGICAL ECON. (Mar. 2018), https://www.sciencedirect.com/science/article/abs/pii/S0921800916310138.

50. Sebastian Benthall & Katherine Strandburg, *Agent-Based Modeling as a Legal Theory Tool*, FRONTIERS (June 21, 2021), https://www.frontiersin.org/articles/10.3389/fphy.2021.666386/full.

cific rules and guidelines set by a regulatory authority, such as FERC. For instance, consider various power sellers in an electricity wholesale market. These sellers are required to follow FERC regulations on how they conduct trades, adhere to behavior rules, and report their trade data to FERC. These regulations might include guidelines on fair pricing, ensuring reliability of supply, and transparency in their transactions.

If one power seller discovers a way to violate these rules without getting caught – for example, by manipulating market prices or not reporting certain transactions accurately – and if FERC does not penalize this seller, other power sellers in the market might notice this and consider engaging in similar behavior. This could lead to a broader issue of non-compliance within the market, affecting the overall integrity and efficiency of the electricity supply.

In this scenario, using ABM can be extremely valuable. ABM can simulate the interactions and decision-making processes of these regulated agents (the power sellers) within the confines of the regulatory framework set by FERC. By doing so, ABM can help in understanding how the actions of one power seller might influence the behavior of others, which is essential for maintaining a fair and efficient electricity market. To simulate the agents that aren't getting "caught" by the regulator, such as power sellers in the electricity market, without direct observational data on their illicit activities, one would rely on a combination of theoretical models, historical data, and observed patterns of market behavior. This approach involves constructing detailed simulations based on how agents are expected to behave within the regulatory framework and market conditions. By integrating these components, ABM allows for the construction of complex simulations that can mimic the decision-making processes and interactions of agents within the market. This methodology enables the exploration of potential outcomes and dynamics that may not be directly observable, providing regulators and policymakers with insights into how to effectively oversee and manage the market to ensure fairness and efficiency.

ABM is a relatively new tool in the field of regulation, but it has the potential to be used for a variety of tasks, including designing new regulatory policies, assessing the effectiveness of existing regulatory policies, studying the effects of different regulatory policies on different groups of people, and identifying potential unintended consequences of regulatory policies. ABM can help policymakers and regulators better understand the complex interactions between regulated agents and the potential consequences of different regulatory policies.

II. ANALYSIS

A. Renewables Energy Forecasting: LSTM Model, Data, and Results

The background section has revealed that LSTM models offer advantages over traditional statistical models when it comes to forecasting. LSTM models exhibit the potential to enhance forecast accuracy, particularly in large datasets or for use in longer forecasting horizons.

Our LSTM discussed in this Article is designed to process sequential data, effectively capturing long-term dependencies.[51] Each LSTM cell receives inputs from both the current timestep and the previous timestep, including the input vector and the cell's hidden and cell states. This design allows our LSTM to retain and learn from the sequence of data, making it particularly adept at handling our tasks where the order and context of data points are crucial.

In this study, we explore the use of LSTM models for renewable energy forecasting. The core functionality of our LSTM lies in its unique structure of gates: the forget gate, input gate, and output gate. These gates regulate the flow of information, with the forget gate determining what to discard from the cell state, the input gate updating the cell state with new information, and the output gate deciding the next hidden state. This gated mechanism enables the LSTM to maintain relevant information over long sequences while discarding the irrelevant, enhancing its ability to learn from complex data sequences (more technical information is included in APPENDIX IV).

As previously discussed, LSTM models belong to the recurrent neural networks category. They were introduced as a solution to overcome the "vanishing gradient" problem commonly found in traditional recurrent neural networks. The 'vanishing gradient' problem is a tricky hurdle we come across when teaching certain kinds of neural networks. These networks are like complex systems used in machine learning where data moves through many layers of processing. In each layer, the network learns to recognize more and more complex features by fine-tuning its internal settings, a process we call "training." This is illustrated by the following.

Think of these settings as being adjusted based on a kind of feedback that tells the network how accurate its guesses are. This feedback acts like a guiding light, traveling back through the network and tweaking the settings at each layer. However, in the vanishing gradient problem, as this feedback moves back through numerous layers of the network, the feedback will diminish, similar to the way a whisper will become quieter and fade as it travels down a long corridor. Guiding feedback can likewise become too faint by the time it reaches early network layers, affecting these layers' ability to adjust properly. When this occurs, the network does not learn as effectively, particularly for patterns in the data that are related to earlier parts of the sequence.

To solve this problem, LSTM models were created. LSTM models are effectively a "smarter" system that keeps the feedback strong, even for long sequences of data. These models do this through a unique memory system that operates like a special notebook that is used to keep track of important things over time. As with such a notebook, the LSTM has various tools (gates) that help decide what to remember and what to forget. With LSTMs, the network can remember important things for a long time, which helps it learn better, especially for

51. "Effectively capturing long-term dependencies" refers to the LSTM's ability to remember and use information from both the recent and more distant past. In our plant example, this would be like remembering how much sunlight the plant got weeks ago, not just yesterday, and understanding how those factors a few weeks back are affecting its growth today.

patterns in the data that rely on understanding things from early in the sequence that would otherwise be lost.

We have built our LSTM model and developed codes for forecasting based on the above principles. The key components of an LSTM cell in our model, and steps for creating and executing the model, as well as results of AI metric measurements for a solar capacity forecasting and renewables share forecasting are summarized in Parts 1-3, Appendix IV.

Monthly data for U.S. solar capacities were sourced from the Information Administration (EIA)'s Table 10.6, titled "Solar electricity net generation," available in Total Energy Monthly Data - U.S. Energy Information Administration). This data spans from January 1989 to December 2022, incorporating a total of 396 observations. Our findings suggest a sustained growth in solar capacity throughout the forecast period. Figure 4 displays forecasted values, representing solar capacity predictions for future time periods based on our trained model. The upward trend in these values indicates an anticipated expansion of solar capacity in the future. However, as the forecast progresses, the growth rate appears to stabilize. This is evident from the relatively smaller differences between consecutive forecasted values in later periods compared to earlier ones. This stabilization implies that the rate of growth is likely to become more consistent and gradual, with reduced fluctuations in the future.

According to our LSTM forecasting models, solar power is projected to maintain a high growth rate, with an estimated increase from 0.258 billion kWh in January 2011 to 24.796 billion Kilowatt-hours (kWh) in July 2024, signifying a ninety-six-fold increase. Our final forecasted values derived from our forecasting model are presented in Figure 1.

Figure 1. Actual and Predicted Values for Solar Capacity Growth

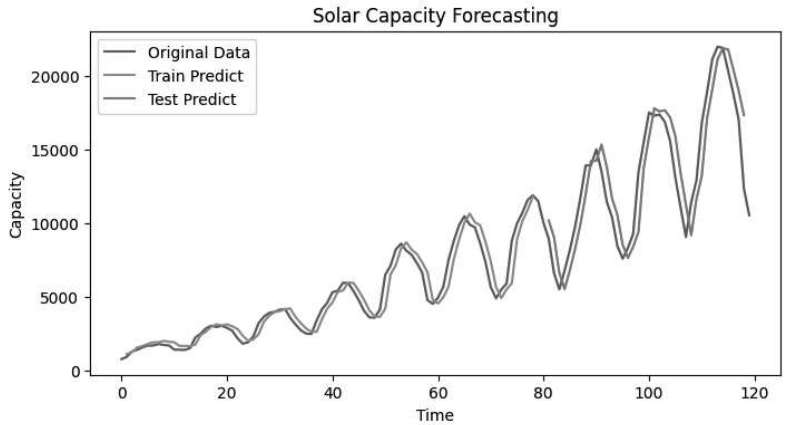

Figure 1: The model's predictions closely align with actual values for solar capacity growth.

Our LSTM forecasting model effectively uses past data and AI analysis to forecast solar capacity growth, closely matching actual figures. This suggests it

not only projects trends forward but does so with a high degree of precision, supported by advanced data processing capabilities of AI.

Subsequently, we conducted renewables share forecasting. We sourced SPP and California regional, as well as U.S. national annual data from the EIA's Table 7d, titled "U.S. Regional Electricity Generation, Electric Power Sector," spanning from 2000 to 2022. For each item, we incorporated twenty-three observations in the model.

Our final forecasted values for renewable shares in electricity generation in California, SPP and USA derived from our forecasting model are presented in Figure 2.

Figure 2. The Future of Renewables: Forecasts for the Two Fastest Growing Regions and the Nation

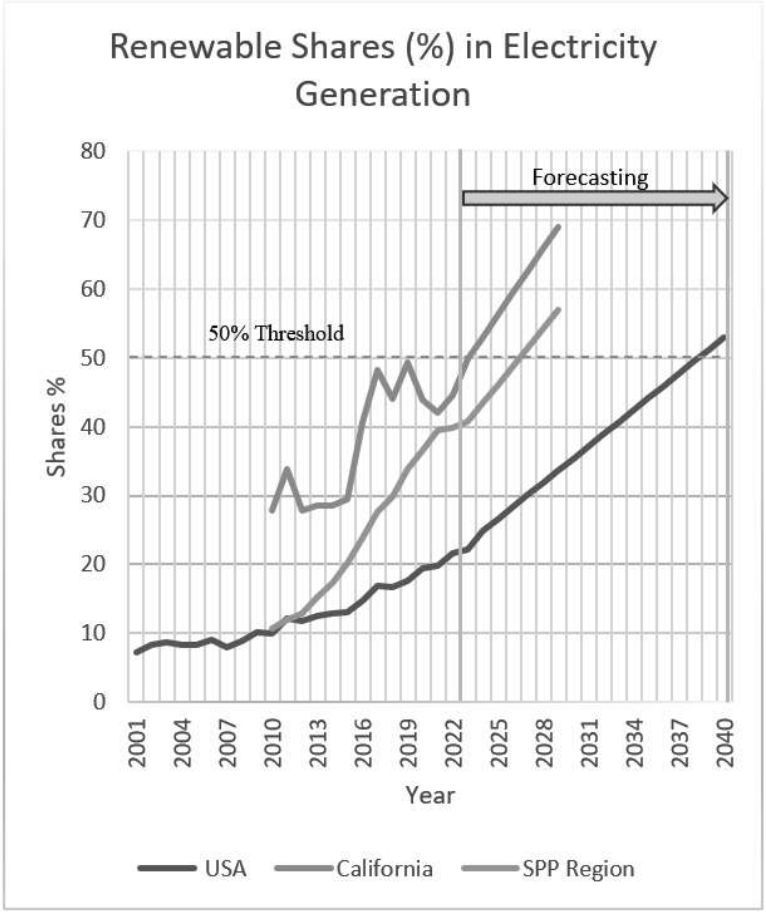

Figure 2: The model projects a robust continued increase in renewable shares, with the U.S. expected to surpass 50% by 2038, and even sooner in California and SPP regions.

The LSTM results, depicted in Figure 2, illustrate that renewable shares are projected to continue growing throughout the forecast period. The forecasted values exhibit an upward trend, signifying an ongoing increase in solar capacity. Nevertheless, the growth rate appears to stabilize as the forecasting progresses, with smaller variations between consecutive forecasted values in later periods compared to earlier ones. This stabilization implies that the rate of growth is likely to become more consistent and gradual in the future, with reduced fluctuations.

Our findings from the LSTM forecasting models indicate that renewable shares will continue to experience robust growth. We forecast the U.S. to surpass a 50% share in 2038 with California and the SPP region reaching this milestone as early as 2025 and 2026, respectively.

It is important to clarify that our LSTM model does not operate as a "crystal ball" forecasting tool. Instead, it's a scientifically sound AI model grounded in rigorous data analysis and advanced algorithmic design. By utilizing vast datasets and leveraging the latest advancements in machine learning, the model systematically analyzes patterns and trends in renewable energy generation and market movements. It's based on the principle that, while all models operate under certain assumptions and none can predict the future with absolute certainty, they can provide invaluable insights and guidance. Our LSTM model embodies this philosophy by offering a sophisticated yet practical tool for forecasting, grounded in the best available information and data. It represents the pinnacle of current scientific understanding and computational capabilities in the field of AI and renewable energy forecasting. As famously stated by statistician George Box, "All models are wrong, but some are useful." Our model falls into the category of being exceptionally useful, providing a solid foundation for making informed decisions and strategies in the renewable energy sector. It's a testament to the power of combining scientific knowledge with advanced technology to navigate the complexities of future energy trends.

B. DPT Case Study

As highlighted in the background section, the DPT is frequently employed in the MBR program and electricity energy merger cases. FERC allows the use of seasonal capacity factors to derate sellers' nameplate capacity in the DPT for market power analysis. For renewable resources like hydro and wind capacity, FERC's de-rate standard allows the use of capacity factors, permitting these resources to conduct an analysis based on historical capacity factors, including a five-year average capacity factor, along with a sensitivity test using the lowest capacity factor from the previous five years.[52] For new units lacking a history of actual output, sellers can submit estimated capacity factors.[53] FERC reasons that using seasonal capacity ratings provides a more accurate reflection of seasonal real power capability, aligning with industry standards.[54]

In this section, we aim to address three important questions:

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52. *Market-Based Rates for Wholesale Sales of Electric Energy, Capacity and Ancillary Services by Public Utilities*, 119 FERC 61,295 at P 344 (2007).

53. 107 FERC ¶ 61,018, at P 126; 108 FERC ¶ 61,026, at P 126.

54. 107 FERC ¶ 61,018, at P 126; 108 FERC ¶ 61,026, at P 129.

1. How will emerging technology impact capacity factors in electricity generation?

2. Could the flexibility provided by battery storage create opportunities for renewable companies to strategically adjust capacity factors and enhance market shares during peak demand times?

3. Will the growth of renewable energy challenge existing electricity regulations?

Recent developments, specifically the integration of renewables with battery storage technology, have transformed the energy landscape, offering new possibilities for electricity energy sellers to strategically modify capacity factors and increase their market influence. These changes have brought about several positive effects on the industry, such as enhanced flexibility, improved grid stability, and increased integration of renewable energy. These advancements enable energy sellers to adapt to the evolving energy landscape and capitalize on emerging market opportunities.[55] As the share of renewables in the energy mix increases, battery storage technology plays a crucial role in maintaining grid stability. Batteries act as a buffer for the grid, storing excess energy generated during peak production times from renewable sources like solar and wind, which can then be released during periods of high demand or low production. This not only ensures a consistent and reliable energy supply but also mitigates the variability and unpredictability associated with renewable energy sources. By smoothing out the fluctuations in energy production, batteries contribute significantly to the stability of the power grid, enabling a higher penetration of renewable energy sources and supporting the transition towards a more sustainable and resilient energy system.[56]

However, these developments have also raised concerns about market power in electric generation and the need for regulatory updates. Notably, new battery storage technologies allow power sellers to store excess electricity generated during periods of high production and discharge it during low generation or peak demand, when market power issues often arise. This technology provides opportunities for electricity sellers to strategically adjust capacity factors and enhance their market power during peak periods.[57]

To demonstrate the transformative effects of recent advancements in renewable energy and battery storage, consider a renewable energy facility with a nameplate capacity of 100 megawatts (MW). Using traditional seasonal capacity factors under the DPT analysis, this facility's estimated capacity at peak times is around thirty-six MW.[58] This is a standard calculation based on current derating methods.

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55. John E. Bistline, *Economic and Technical Challenges of Flexible Operations under Large-Scale Variable Renewable Deployment*, 64 ENERGY ECON. (2017), http://dx.doi.org/10.1016/j.eneco.2017.04.012.

56. ENERGY5, THE ROLE OF OFF-GRID BATTERY STORAGE IN ENSURING GRID STABILITY (Mar. 1, 2024), https://energy5.com/the-role-of-off-grid-battery-storage-in-ensuring-grid-stability.

57. H. Achour & A.G. Olabi, *Driving cycle developments and their impacts on energy consumption of transportation*, 112 J. OF CLEANER PROD. (2016), http://dx.doi.org/10.1016/j.jclepro.2015.08.007.

58. Since FERC has not set updated standards in the DPT specifically for renewable energy resources, all sellers use availability/capacity factors based on the NERC Generating Availability Data System (GADS) to calculate the "average equivalent availability factor." which was routinely accepted by FERC in current fossil dominant environment under FERC regulations.

However, this scenario changes dramatically with the introduction of a fully charged battery system. With this addition, the facility's output capacity can surge to 115 MW during peak times, a figure that significantly exceeds the traditional thirty-six MW estimate. This 115 MW "boosted" output, made possible by the integration of battery storage, is what we call the Max Available Economic Capacity (MAEC).

To put this into perspective, the MAEC of 115 MW is 115% of the facility's nameplate capacity, a metric we term the Max Available Rate (MAR). This substantial increase in output capacity -- from the standard thirty-six MW to 115 MW -- illustrates the profound impact that modern battery storage technology can have on discrete renewable energy facilities, enhancing their capability to meet peak demand and altering their role and influence in the energy market.

Public information available through FERC filings indicates that the market power analysis, especially in the DPT, is becoming more complex with the growth of renewable energy and the flexibility of capacity factors. FERC is grappling with new challenges in analyzing the presence of renewable energy during key periods. The following hypothetical case based on actual FERC filings demonstrates how MAEC affects FERC's DPT analysis results.

X Electric Utility Power Company (Seller) filed indicative screens and DPT in its initial MBR authority application showing its new renewables facility with a 200 MW nameplate capacity in its small balancing authority area in the Northwest region. Its horizontal market power analysis, using calculated seasonal capacity factor consistent with FERC's existing method, suggests that while Seller doesn't pass the indicative screens, it passes the DPT with a market share just below the acceptable level of 20%.[59] Consequently, the seller concludes that it lacks horizontal market power in its balancing authority area and qualifies for MBR authority.

Given the inherent limitations in using seasonal capacity factors in a DPT analysis, particularly concerning hybrid facilities, we conduct a deeper evaluation to determine whether Seller is understating its capacity factors and the subsequent impact on market shares. Here is our analysis:

Seller X operates a renewable facility with a nameplate capacity of 200 MW. During Summer Super-Peak 1, Seller's delivery cost is $23 per MWh, and market prices are $200 per MWh. The seller's native load obligation is 43 MWs. Following FERC's current method, Seller X can derate 55% of its capacity during Summer Super-Peak 1, resulting in an economic capacity of 110 MW. After deducting the native load obligation, the AEC is 67 MWs, leading to a market share of 19%. However, if Seller X adopts the Max Availability Rates we propose, the results differ as shown in the following table.

59. Here, we assume 20 percent is the only threshold for the analysis. Although FERC uses an on-balance approach to weigh all relevant factors, the market share threshold has the most important weight. *See* FERC, HORIZONTAL MARKET POWER (Feb. 18, 2022), https://www.ferc.gov/horizontal-market-power.

Table 2. Seller X with Renewables Facility

		Market Share Comparison between Available Economic Capacity and Available Max Economic Capacity (MW)									
Supplier		**S_SP1**	**S_SP2**	**S_P**	**S_OP**	**W_SP**	**W_P**	**W_OP**	**SH_SP**	**SH_P**	**SH_OP**
EIA Total Capacity (MW)	(1)	200	200	200	200	200	200	200	200	200	200
FERC Current Availability Rates for Renewables (%)	(2)	55%	45%	36%	23%	30%	23%	5%	40%	30%	15%
Max Availability Rates for this Facility (%)	(3)	115%	100%	90%	33%	105%	35%	10%	20%	15%	5%
Delivery Cost ($/MWh)	(4)	23	23	23	23	21	21	23	20	20	25
Market Price ($/MWh)	(5)	200	130	38	31	29	24	22	38	28	26
Seller's Economic Capacity (EC)	(6) = (1)*(2)	110	90	72	46	60	46	10	80	60	30
Seller's Max Economic Capacity (MEC)	(7)	230	200	180	66	210	70	0	40	30	10
Load Obligation (MW	(8)	43	42	36	32	38	35	33	33	29	10
Seller's Available Economic Capacity (AEC)	(9) = (6)-(8)	67	48	36	14	22	11	-23	47	31	20
Seller's Max Available Economic Capacity (AMEC)	(10) = (1)*(3)	230	200	180	66	210	70	20	40	30	10
AEC Market Size	(11)	350	350	350	350	350	350	350	350	350	350
AMEC Market Size	(12)	500	500	500	500	500	500	500	500	500	500
AEC Market [60]Share (%)	(13) = (9)/(11)	19%	14%	10%	4%	6%	3%	0%	13%	9%	6%
AMEC Market Share (%)	(14) = (10/(12)	46%	40%	36%	13%	42%	14%	4%	8%	6%	2%

Table 2 above vividly illustrates how emerging technologies empower energy sellers to increase their market share without breaching threshold of 20%. Under the AEC measure, Company X maintains market shares consistently below 20%.

60. 119 FERC ¶ 61,295, at P 112. Here, we use AEC not EC for our demonstration because the Commission explained in Order No. 697: "[I]n markets where utilities retain significant native load obligations, an analysis of available economic capacity may more accurately assess an individual seller's competitiveness, as well as the overall competitiveness of a market, because available economic capacity recognizes the native load obligations of the sellers."

However, when employing the Max Available Economic Capacity (MAEC) measure, market shares exceed 20% in four specific season/load periods: Summer Super-Peak 1 (46%), Summer Super-Peak 2 (40%), Summer Super-Peak (36%), and Winter Super-Peak (42%).

This case demonstrates that the existing methods may not accurately represent the available energy in the market, allowing sellers to strategically adjust capacity factors and gain market power. The capacity to store and discharge electricity during peak periods provides energy sellers with enhanced market power, potentially enabling them to influence electricity prices and manipulate market conditions. Further, by withholding electricity supply during peak periods or releasing stored energy when prices peak, sellers with substantial battery storage capacity could exert market power and manipulate prices to their advantage.[61]

We recommend that as renewables increase towards becoming 50% of the energy mix, regulations should undergo systematic revision.[62] Regulations that determine market share based on nameplate capacity may no longer be suitable for renewable energy companies with significant intermittent generation capacity. As renewable energy's share in the grid expands, energy regulations must evolve to mirror the distinct characteristics of these sources. We emphasize the importance of adapting regulatory frameworks to evolving energy landscapes. Consequently, we advocate for a reevaluation of regulations to ensure alignment with the ongoing energy transition and the promotion of a level playing field for all energy sources.

We recognize that the specific 50% threshold for renewable energy penetration discussed above may vary depending on the region or market context.[63] The determination of the precise trigger point for regulatory revision should be based on a comprehensive evaluation, considering factors such as grid stability, technological advancements, and market dynamics. We believe it is reasonable at this juncture for FERC to require sellers with substantial renewable hybrid facilities to conduct a sensitivity study using MAEC during this transition period or in regions where renewables have surpassed the national average. Simultaneously, FERC should proactively prepare for revisions in market power analysis as the threshold of 50% renewable energy penetration in the nation approaches, as indicated by our forecasting.

At the conclusion of this section, our case underscores the challenges encountered by FERC's market power analysts, affirmatively addressing the three questions posed at the beginning of this section**.**

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61. Tomaso Duso et al., *Abuse of Dominance and Antitrust Enforcement in the German Electricity Market*, 92 ENERGY ECON. 2-6 (2020), https://doi.org/10.1016/j.eneco.2020.104936.

62. *See* 18 CFR § 35.37 (2024). Regulations in this context encompass all FERC regulations related to measuring and mitigating market power within market-based rate programs and merger programs. This includes, but is not limited to, market power screen requirements, mitigation enforcement following a Delivered Price Test (DPT) failure, and regulations for Regional Transmission Organization (RTO) / Independent System Operator (ISO) market tariffs. Additionally, it covers aspects of market monitoring, supervision, and mitigation rules.

63. *See supra* Figure 2. As we forecasted on the last section, some regions such as Northwest, California and SPP reached and will reach threshold of 50 percent before the nation as a whole.

C. ABM Simulation: Implications for Evolving Regulations and Customer Protection

In this section, we strive to measure or simulate the challenges to FERC's regulations using ABM simulation, which can be considered a deployment of artificial intelligence (AI), especially in the way AI mimics and predicts complex systems and behaviors. As mentioned before, we can think of an agent-based model as a virtual world, where each "agent" is like a character in a video game. These agents can represent anything -- people, animals, cars, power sellers, or regulators, etc. Each agent follows a set of rules or behaviors, which can be simple or complex. These agents present "intelligence" because they interact and make decisions. They can learn from their environment, react to changes, and even adapt their behavior over time. This is where the new AI techniques can be utilized.

AI techniques, like learning algorithms, can be used to make these agents smarter, allowing them to behave in ways that are more realistic or to discover patterns and solutions that might not have been programmed directly. In our ABM simulation, AI serves as the "brain" behind these agents, helping them to navigate and interact in their virtual world in a way that mimics real-life complexity and unpredictability. Our goal is to create an environment where renewables, enhanced by new technologies, steadily approach a dominant position and examine the impact this has on the regulatory landscape.

ABM, especially in its modern form integrated with artificial intelligence (AI), is a relatively new and powerful tool for understanding complex systems, such as energy markets. The novelty of ABM lies in its ability to simulate the interactions of multiple agents, each with their own set of behaviors and decision-making processes, in a dynamic environment. When combined with AI, this tool becomes even more potent, enabling the detection and analysis of intricate patterns and outcomes that might not be apparent through traditional methods.

In the context of the energy market, AI-enhanced ABM can be particularly insightful in understanding the implications of new technologies like battery storage. For instance, AI can analyze how the introduction of battery storage technology allows power sellers to store excess electricity during periods of high production. More importantly, AI can predict the impacts of releasing this stored power during periods of low generation or high demand. This is crucial for identifying when and how market power issues might arise, as these are the times when the ability to control supply can have the most significant impact on the market.

Furthermore, AI can uncover how battery technology provides opportunities for electricity sellers to strategically adjust their capacity factors. This means they can increase or decrease their electricity production based on market need and their own storage capabilities, potentially enhancing their market power during peak periods. By simulating these scenarios, AI-driven ABM provides valuable insights into how these technologies can be used, potentially manipulated, and regulated to ensure fair and efficient market operations. This capability marks a significant advancement in our ability to understand and manage complex market dynamics in the era of rapidly evolving energy technologies. In the section below, we present our ABM model's architecture.

1. Model Setting

The simulation takes place in a virtual electric wholesale market system for the simulation (see APPENDIX V). In this dynamic environment, we introduce resources, objects, and obstacles for three distinct agents: electricity regulators, New-Techs (NT) power sellers with increasing market power, and traditional power sellers who have the potential to transition to NT power sellers. These agents interact, move, and adapt based on a set of predefined rules, including incentives for movement, the capacity for agents to modify their initial characteristics (e.g., shifting from traditional power sellers to NT power sellers), and the influence of neighbors and past actions.

a. Agent Goals

Each agent operates with its own objectives: power sellers, whether traditional or NS, aim to maximize profits or minimize costs, while electricity regulators seek to safeguard the interests of customers and maintain the integrity of the market. Consequently, the behavior of power sellers is driven by economic incentives, considering costs and benefits, while electricity regulators prioritize public interests, ensuring just and reasonable prices.

b. Initial Conditions and Economic Effects

At the outset, most power sellers were traditional power sellers, and NT power sellers represent a relatively small portion of the market. Anticipating further cost reductions in battery storage due to technological advancements and increased government incentives and penalties for environmental pollution, we assume that economic incentives, --minimize costs, maximize profits, and avoid penalties -- will gradually influence the behavior of power sellers, prompting some traditional power sellers to transition to NT power sellers.

c. Agent Interaction and Neighborhood Effects

Within the model setting, the behavior of power seller agents is first guided by their own economic interests but then influenced by other power seller agents in the same market. Agents establish connections with all immediate neighbors and generate a surplus if they are NT power sellers. This surplus enhances the resources of both theirs and their neighbors.

2. ABM Simulation

From the simulation, we observe a growing number of NT power sellers and a diminishing number of traditional power sellers with each iteration. Over time, traditional power sellers are mostly replaced by NT power sellers.

a. Control Variables

Several control variables are incorporated into the simulation, including the acceleration of new technology adoption, increased subsidies for renewables, adjustments in the cost of environmental pollution penalties, modifications to FERC regulations, the likelihood of adopting the behaviors of neighbors who performed

well in the previous turn, and the surplus generated by transitioning to NT power sellers.

To simulate the impact of emerging technology on electricity market regulations, we used a bottom-up modeling approach to incorporate the behavioral changes of three agents (electricity regulators, traditional power sellers, and NT power sellers) into the simulation. Drawing on the behavioral rules outlined for each agent (as derived from our theoretical analysis in the ABM theoretical framework in the background section and empirical study results from the LSTM model), we translated these insights into NetLogo code. Subsequently, we ran the model in NetLogo, making necessary adjustments to ensure the credibility of the simulation experiment. Our primary focus was to evaluate dynamic changes in the numbers of power sellers and regulators as renewable energy shares approach and then surpass 50% of the US generation market during the first ten periods. General system dynamics for simulation is elaborated in Appendix VI.

3. Analysis of Simulation Outcome

Once the model has been run for several rounds and the control variables have been adjusted to produce stable results, we can analyze how renewable growth supported by emerging technologies changes power sellers' behavior and how regulation can affect the outcomes. By plotting and monitoring the outcome data series, the simulation model allows us to observe how renewable development in an unchanged regulatory environment can yield different results from given initial conditions.

In the following two figures (Figure 3 and Figure 4), we can observe the compelling outcomes that emerge after running the model for numerous rounds and fine-tuning the control variables to achieve stable results. The simulation elucidates how new technologies contribute to the growth of NT power sellers and how regulations wield the power to influence these outcomes. By plotting and closely monitoring the data series generated by the simulation, we gain insights into the dynamics, system mechanisms, interrelationships, and alterations in agent numbers from their initial conditions.

Figure 3. Results of ABM Simulation: New Technologies' Impact on Numbers of Power Sellers and Regulators.

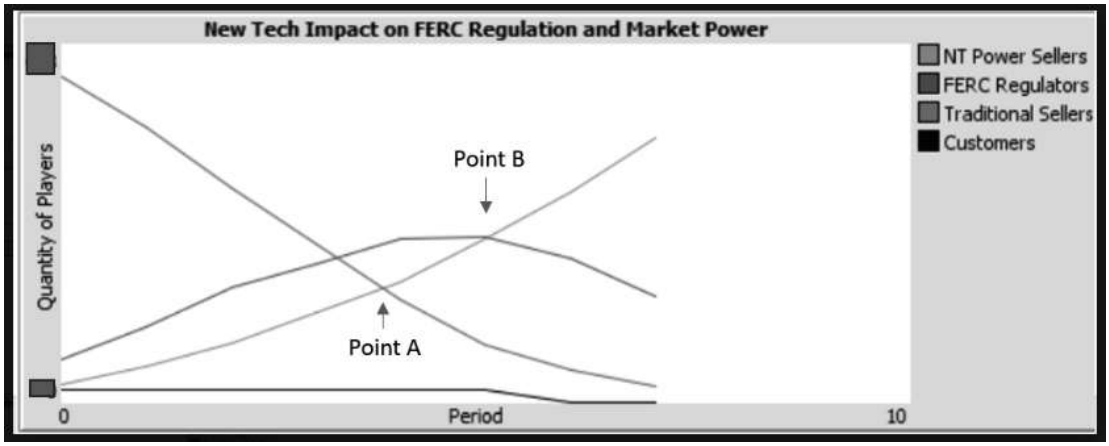

Figure 3 illustrates that the introduction of new technologies into the energy sector leads to an increase in the number of NT power sellers, while the number of traditional power sellers decreases.

Figure 3 shows our model's simulation of the evolution of the number of power sellers in the United States over ten periods,[64] starting in 2010 (green line). With the introduction of new technologies into the energy sector, their share began to swell. Concurrently, the number of regulators (blue line),[65] encompassing various government resources, such as subsidies for renewables, increased along with renewables.[66]

As the model runs, we observe dynamic transformations: the number of NT power sellers (green line), with more flexibility and thus more market power in critical high-load times, accelerates, while the number of traditional power sellers dwindles (red line). Simultaneously, the number of regulators adjusts. Under the influence of economic factors and neighborhood effects, a growing number of traditional power sellers transition to NT power sellers, exerting mounting pressure on the regulatory framework.

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64. The model period is a relative concept that can be defined as a specific timeframe, such as one or two calendar years.

65. In this context, "regulators" refers to the extent and effectiveness of FERC's regulatory oversight over New-Techs (NT) power sellers. The term doesn't imply the actual count of commissioners. Instead, it's a measure of regulatory intensity. For instance, if the number of regulators increases in proportion to the number of NS power sellers, it suggests that regulation is keeping pace with the growing market, especially as we shift towards renewable energy sources. On the other hand, if there are fewer regulators compared to NS power sellers, it might signify that regulation and enforcement are falling behind, potentially leading to issues in market power abuse.

66. The customer line is an added line to the plot that mirrors regulation strength and is closely related to customer and public interests.

Eventually, NT power sellers surpass traditional sellers at Point A, which is the critical threshold of our forecasting model where renewable share in electricity generation reaches 50%. After Point A, the strength of FERC's regulations starts to decline, although its existing regulations are still effective at protecting customers (blue line). However, as the strength of FERC's regulations further diminishes until a certain tipping point (Point B) where market power breaks regulatory boundaries, customers lose protection, and public interests are harmed.

Figure 4. Results of ABM Simulation: Regulation Gap

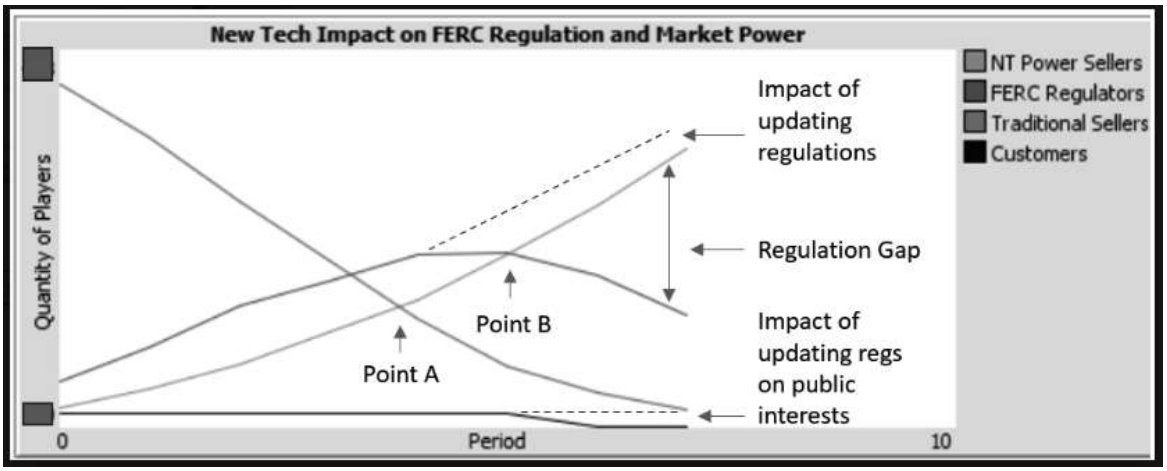


Figure 4 illustrates that the introduction of new technologies into the energy sector could lead to a regulation gap due to outdated regulations.

Figure 4 further elaborates our simulation results and policy options. Outdated regulations will open a regulation gap after Point B. However, if FERC updates its current market power analysis, such as by implementing the MAEC measure we suggested in the subsection under "Analysis," the regulations will be in a good position (see the dotted line about the green line) to mitigate possible market power originating from the side effect of emerging technologies development. The regulation gap will not occur. The dotted line about the dark blue line represents the impact of updating regulation on public interests, where customers are protected from market power. That is, regulatory agencies have measures in place to ensure fair competition and prevent power sellers from exploiting their dominant positions in a market.

The simulation offers forecasts regarding the dynamic relationship between power sellers and regulators. It underscores the pressing necessity for updated standards capable of accurately representing the available energy in the market and averting scenarios where sellers amass excessive market power. Moreover, it provides viable policy and regulatory options for FERC to revamp its regulations, thus ensuring customer protection during rapid technological advancement. The simulation demonstrates that without continuously updating its market power

monitoring and analysis techniques, the regulatory strength of electricity regulation may diminish, allowing sellers to expand their market power influence in lockstep with technological growth. Once this dynamic reaches a critical juncture, market power may break free from regulatory constraints, potentially leading to adverse consequences for customers.

In summary, the simulation forecasts the dynamic interplay between electricity companies and regulators, showing the need for updated standards that reflect the evolving energy landscape and safeguard against excessive market power. The simulation also underscores the need for FERC to adapt its regulations to ensure customer protection in the face of rapid technological advancements.

III. CONCLUSION

This study establishes a framework for understanding and empirically analyzing the impact of new technologies on energy regulations and market power dynamics, forging a path for understanding and shaping the complex interplay between these forces. Additionally, this study explores the potential of AI models to forecast critical points for regulators and identifies policy tools and methodologies that can effectively analyze market power in a renewable-dominant landscape, mitigating regulatory gaps.

The research findings have significant implications for stakeholders in the energy market and for regulatory policies. First, the determination of the turning point at which renewables could surpass traditional fossil fuel power generation underscores the need for regulators and researchers to accelerate their efforts. Although a complete transition to renewables across the U.S. may take approximately 14 years, regional shifts may happen much sooner, with California and the SPP region expected to exceed the 50% renewable threshold as early as 2025 and 2026, respectively.

Second, the demonstration that an updated market power analysis can more accurately capture market dynamics emphasizes the profound influence of regulatory policies on protecting the public interest. We recommend a partial revision of current energy regulations soon, especially those pertaining to market share calculations for antitrust purposes. These suggested revisions should pivot from fossil fuel-based (specifically, nameplate capacity) calculations to include renewable energy, incorporating sales-based or capacity-plus-battery-based metrics. This revision should be implemented gradually as renewables continue their ascent towards dominance across the United States. These efforts aim to advance the field of government regulation theories and provide practical tools for regulators, particularly as regulatory scrutiny intensifies in evaluating merger cases and MBR authority.

While this study represents an initial foray into the application of AI models and the ABM in the realm of regulation, the ever-expanding influence of new technology and AI development will likely stimulate more extensive investigations in the future. Overall, the findings of this study carries far-reaching implications for the fields of market power analysis and energy regulatory policy, ultimately fostering the development of more AI applications in the energy sector and regulatory practices.

APPENDIX

APPENDIX I – THE DELIVERED PRICE TEST (DPT) EQUATIONS

Within GAMS, the DPT algorithm analyzes each seller's available economic capacity (AEC) by minimizing the cost of each supplier in the destination market. As we mentioned in Section 1, this involves considering the supplier's generation portfolio, market price, transmission constraints, and native load obligations. The goal is to solve a linear programming (LP) model with the following form:

Objective Function:

$$Mininimize\ Cost_s = \sum_{g=1}^{n} (Dispatch\ Cost + Transmission\ Cost)_g \times MW_g \quad (1)$$

Where p is power seller, g is generating unit.

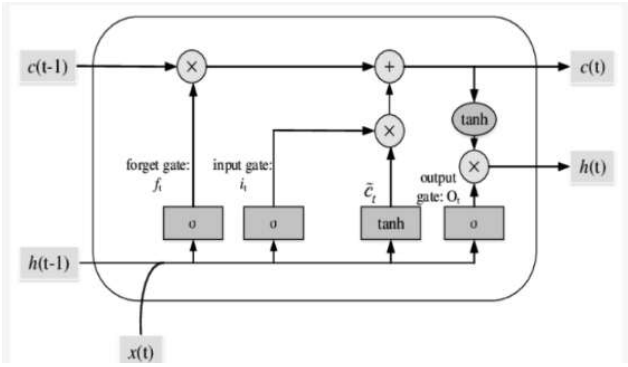
Subject to:

$$Delivery\ cost\ at\ destination \leq market\ price + 5\ \%, \quad for\ all\ suppliers \quad (2)$$
$$Supply < quantity\ (less\ native\ load), \quad for\ each\ node \quad (3)$$
$$Line\ flows < available\ linit, \quad for\ all\ interconnections\ (constrained\ network\ only) \quad (4)$$

APPENDIX II - ARCHITECTURE OF LONG SHORT-TERM MEMORY (LSTM)

LSTM model's distinctive architecture can be summarized as "three gates, two states, and one function." See the following figure and explanation:

Appendix Figure 1. Architecture of a neuron in LSTM network[67]



Three gates: The input gate governs the amount of new information to be stored in the cell state, enabling the selective retention of relevant data. The forget gate decides which information to eliminate from the cell state, effectively filtering

67. Daniela Durand et al., *An Analysis of the Energy Consumption Forecasting Problems in Smart Buildings using LTSM*, 14 SUSTAINABILITY 6 (Oct. 17, 2022), https://www.mdpi.com/2071-1050/14/20/13358.

out obsolete or irrelevant data. The output gate determines the quantity of information to be extracted from the current cell state, facilitating the summarization of pertinent information for forecasting.

Two States: The cell state, known as the long-term memory, enables LSTM models to preserve information across different time steps, a vital component for capturing enduring dependencies in data, such as seasonal patterns. In contrast, the hidden state, often referred to as the short-term memory or the output of the LSTM model, encapsulates the current input and the preceding hidden state.

One Function: By harnessing the architecture of LSTM models, complete with their gates, states, and the tanh activation function, these models effectively apprehend and leverage temporal dependencies inherent in the data. LSTM models adeptly decode the intricate data patterns and dynamics, leading to heightened forecasting precision.[68]

APPENDIX III – AGENT-BASED MODEL (ABM)'S THEORETICAL FRAMEWORK

The most popular theoretical framework used in ABM is Gary Becker's rational choice theory.[69] Becker's theory posits that individuals make decisions based on a cost-benefit analysis, weighing the expected costs and benefits of different options in order to choose the one that maximizes their utility. Becker used the formula below to determine a potential offender's utility (*EYj*), which will affect his or her behavior:

$$EY_j = p_j\left(Y_j - f_j\right) + (1 - p_j)(Y_j) \qquad (5)$$

Where p_j stands for the probability of being caught for the potential offender, f_j is the severity of the punishment, and Y_j is the benefit from successfully committing violations without being caught. An individual's utility is a function of the costs and benefits of violation; violation should rise in Y_j and fall for both p_j and f_j.

ABM predominantly relies on Gary Becker's rational choice theory, positing that individuals make decisions through cost-benefit analyses, aiming to maximize their utility by weighing the expected costs and benefits. This framework can be applied to regulation simulations, where regulated agents evaluate the benefits of non-compliance against the costs of detection and penalties, subsequently impacting their behavior.

For example, when regulations affect p_j, f_j, and Y_j, regulated agents' utility will be affected, and thus their behavior on regulation compliance will change.

68. Xianlin Ma Mengyao Hou et al., Enhancing Production Prediction in Shale Gas Reservoirs Using a Hybrid Gated Recurrent Unit and Multilayer Perceptron (GRU-MLP) Model, APPLIED SCI., (Aug. 2023).

69. Gary S. Becker, *Crime and Punishment: An Economic Approach*, 76 J. OF POL. ECON. 169 (1968), www.jstor.org/stable/1830482.

APPENDIX IV – OUR LSTM'S COMPONENTS, CONSTRUCTION STEPS AND METRIC

This appendix is divided into three parts: first, an overview of the essential components of an LSTM cell; second, a detailed guide on the steps required to develop and run the model; and third, a description of the metrics used for evaluating the forecasting results.

Part 1. The Key Components of an LSTM cell in Our Model

1. Forget Gate: This gate determines the extent to which information from the previous cell state should be forgotten.

$$f_{(t)} = \sigma(Wf \times [h_{(t-1)},\ X_{(t)}] + bf) \qquad (6)$$

Here, W represents the weight matrices, b denotes the bias terms, σ represents the sigmoid activation function, and tanh is the hyperbolic tangent activation function. The LSTM cell involves several multiplications, additions, and activation function evaluations to update the cell state and hidden state at each timestep. Wf represents the weight matrix for the forget gate, $[h_{(t-1)}, X_{(t)}]$ denotes the concatenation of the previous hidden state $h_{(t-1)}$ and the current input $X_{(t)}$, and bf is the bias term.

2. Input Gate: Determines how much new information should be added to the cell state.

$$i_{(t)} = \sigma(Wi \times [h_{(t-1)},\ X_{(t)}] + bi) \qquad (7)$$

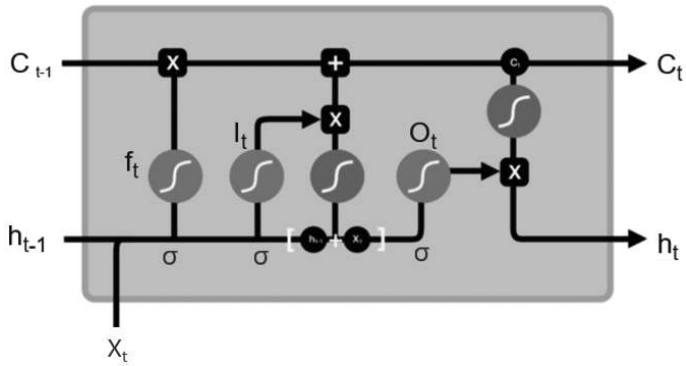
3.Update Cell State: Combines the information from the forget gate and the input gate to update the current cell state.

4.Output Gate: Determines the hidden state that will be passed to the next timestep.

$$o_{(t)} = \sigma(Wo \times [h_{(t-1)},\ X_{(t)}] + bo) \qquad (8)$$

Following Figure elaborates our model's structure:

Appendix Figure 2. LSTM's One Function, Two States, and Three Gates.



Appendix Figure 2 depicts the activation function (σ), previous cell state and new cell state (Ct-1 and Ct), and input gate, forget gate, and output gate (It, ft, and Ot).

$$C_t = f_t \times C_{t-1} + I_t \times c_t \qquad (9)$$

Where C_{t+1} previous cell state
f_t Forget gate output
I_t Input gate output
c_t candidate
C_t new cell state

In essence, each LSTM cell receives inputs, including the cell and hidden state from the previous timestep and the input vector from the current timestep. Subsequently, each LSTM cell generates a new cell state and a hidden state, which is utilized for processing in the next timestep. If the cell's output is required, such as for subsequent layers, it is represented by its hidden state.

Our model harnesses these gates and the memory cell to effectively capture long-term dependencies in sequential data while mitigating the vanishing gradient issue.

Part 2. Steps for Creating and Executing the Model

Here are the steps we've taken to create and execute an LSTM model that uses its own megawatts (MWs) and shares data to predict future MWs and shares:

- Data Preparation: We commence by gathering a dataset that encompasses historical MWs and shares values alongside their corresponding future MWs and shares values. Each sample within this dataset comprises a sequence of past MWs and shares values, coupled with the target future MWs and shares value.

- Data Preprocessing: In order to expedite the convergence of the LSTM model during training, we normalize the MWs and shares values to a consistent range, typically within zero and one.
- Sequence Generation: Input sequences for the LSTM model are generated. Each input sequence includes a window of past values, while the corresponding output sequence contains the future MWs and shares values.
- Dataset Splitting: The dataset is partitioned into training and testing sets. The training set is used to train the LSTM model, while the testing set is reserved for evaluating its performance.
- Model Architecture: We construct the LSTM model using a deep learning framework like TensorFlow or Keras. The model comprises LSTM layers, followed by one or more fully connected layers. The choice of the number of LSTM layers and the unit within each layer depends on the complexity of the problem, which we experiment with.
- Model Training: The LSTM model is trained with the training dataset. Throughout the training process, the model learns to recognize patterns and dependencies between past and future MWs and share values.
- Model Evaluation: After training, we evaluate the LSTM model's performance using the testing dataset. We calculate relevant performance metrics, such as mean squared error (MSE) or mean absolute error (MAE), to gauge the model's accuracy.
- Prediction: Subsequently, we deployed the trained LSTM model to make predictions for new MWs and share sequences. We supply the model with a window of past MWs and shares values, and it produces predictions for future MWs and shares values.
- Postprocessing: When we normalized the MWs and shares values during preprocessing, we undertake the necessary steps to convert the predicted values back to their original scale for meaningful interpretation.
- Model Refinement: In the event that the model's performance falls short of expectations, we experiment with various hyperparameters, model architectures, or explore advanced techniques such as attention mechanisms or hybrid models to improve its predictive capabilities.

Part 3. Metric for Forecasting Results

We initially conducted a solar capacity forecasting analysis. Solar energy was one of the fastest-growing renewable energy sources with a substantial drop

in the cost of solar panels and the introduction of generous state and federal tax incentives.[70]

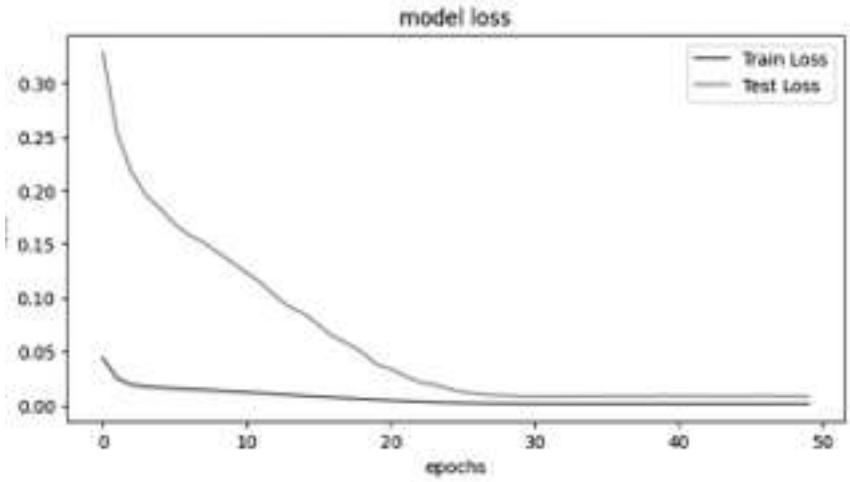
Monthly data for U.S. solar capacities were sourced from the EIA's Table 10.6, titled "Solar electricity net generation," available in Total Energy Monthly Data - U.S. Energy Information Administration (EIA). This data spans from January 1989 to December 2022, incorporating a total of 396 observations. Metric for Solar kWh forecasting in USA are shown in Appendix Table 1, and Appendix Figure 3.

Appendix Table 1. Metric for Solar kWh Forecasting in USA

	Train Score	Test Score
RMSE	0.75	1.95
MAE	0.54	1.67
R^2	0.93	0.81

70. *See* SOLAR ENERGY INDUS. ASS'N, SOLAR INDUSTRY RESEARCH DATA: SOLAR INDUSTRY GROWING AT A RECORD PACE ("48% of all new electric capacity added to the grid in 2023 has come from solar"); Elesia Fasching, *Wind, Solar, and Batteries Increasingly Account for More New U.S. Power Capacity Additions*, U.S. ENERGY INFO. ADMIN. (Mar. 6, 2023), https://www.eia.gov/todayinenergy/detail.php?id=55719 ("As of January 2023, 73.5 gigawatts (GW) of utility-scale solar capacity was operating in the United States, about 6% of the U.S. total . . . . Just over half of the new U.S. generating capacity expected in 2023 is solar power. If all of the planned capacity comes online this year as expected, it will be the most U.S. solar capacity added in a single year and the first year that more than half of U.S. capacity additions are solar.").

Appendix Figure 3. LSTM Training: Loss Function vs Iteration



Appendix Figure 3: The x-axis shows the number of iterations, and the y-axis shows the values of the loss function. At iteration 50, the loss function is equal to 0.0102386. Figure 3 shows that the loss function decreases over time, indicating that the model is improving.

Appendix Table 1 exhibits the root mean squared error (RMSE) values, the Mean Absolute Error (MAE), and the R-squared value.

Root Mean Square Error (RMSE) is a popular way to gauge how accurate a forecasting model is. Imagine a target on a dartboard, where the bullseye represents the actual values you're trying to predict. A train score of 0.75 RMSE means that, on average, the model's predictions within the training dataset are like darts landing 0.75 units away from the bullseye. The closer the darts (predictions) are to the bullseye (actual values), the better the model performs. So, in this scenario, a train score of 0.75 suggests the model is quite adept at hitting close to the mark, accurately capturing the patterns and trends in the training data.

Now, when it comes to the test score of 1.95 RMSE, think of it as the model trying to hit a new bullseye with different darts. This score measures the average difference between the actual and predicted values in the testing dataset, which comprises data the model hasn't seen before. A test score of 1.95 indicates that the model's predictions are, on average, about 1.95 units off target in this new set. This gives us a sense of how well the model can generalize its learning to unfamiliar data.

Mean Absolute Error (MAE) is another useful metric, akin to measuring the average distance of each dart from the bullseye, without considering the direction. With a test score of 1.67 MAE, we see that the model's predictions are generally quite close to the actual values, akin to most of the darts landing near the bullseye, showing the model's accuracy in predicting new data.

Finally, the R-squared value (R2), or the coefficient of determination, is a bit like understanding how much of the dart's path towards the bullseye can be explained by the way it was thrown. In this case, the model's R-squared value for the test data is 0.81. This means 81% of the variation in the target (or the dependent variable) is explained by the factors we're considering in our model (the independent variables). In other words, our model explains a significant portion of the changes in the data, indicating a strong fit to both the training and testing datasets.

The notation "Iteration 50, Loss = 0.0102386" reveals that the LSTM model underwent 50 iterations to optimize its parameters. The loss value of 0.0102386 denotes the final result of the loss function, which gauges the dissimilarity between the model's predictions and the actual values. A lower loss value signifies a more accurate fit of the model to the data.

Regarding renewables share forecasting, we sourced SPP and California regional, as well as U.S. national annual data from the EIA's Table 7d, titled "U.S. Regional Electricity Generation, Electric Power Sector," spanning from 2000 to 2022. For each item, we incorporated twenty-three observations in the model. LSTM model metric for renewable share in electricity generation in California, SPP and USA is presented in Appendix Table 2.

Appendix Table 2. LSTM Model Metric for Renewable Share in California, SPP and USA

	California		SPP		USA	
	Train Score	Test Score	Train Score	Test Score	Train Score	Test Score
RMSE	2.23	2.56	1.88	2.15	1.87	2.14
MAE	1.72	1.98	1.44	1.66	1.43	1.65
R^2	0.95	0.92	0.98	0.96	0.97	0.95

Note: Iteration 100 for each, Loss Values = Loss value: 1.86, 1.85, 1.87

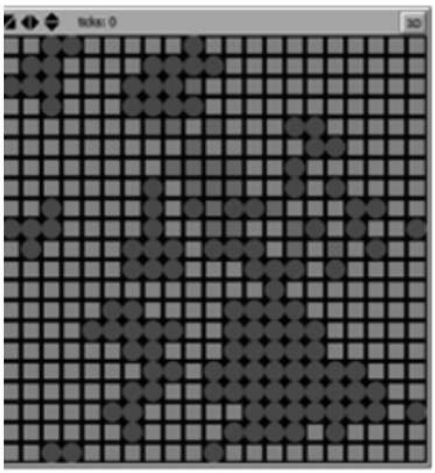
From Table Appendix 3, which provides the forecasting metrics for renewable share in California, SPP, and the U.S., we observe the following RMSE values: 2.23, 1.88, and 1.87 for the train scores, and 2.56, 2.15, and 2.14 for the test scores, respectively. Additionally, the MAE values for the train scores are 1.72, 1.44, and 1.41, and the MAE values for the test data are 1.98, 1.66, and 1.65. These values collectively indicate that, on average, the predicted values closely align with the actual values.

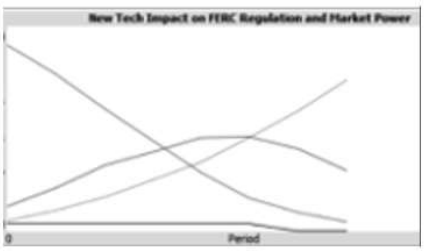
The R-squared (R^2) values for the train score are 0.95, 0.98, and 0.97, and for the test data are 0.92, 0.96, and 0.95, indicating that the change in past values in the model can explain 92%, 96%, and 95% of the variations in the forecasting values. R^2 of over 90% is generally considered quite good for a forecasting model.

APPENDIX V - ABM MODEL SETTING

The simulation is designed to unfold within a virtual 21x21 grid, which represents the electric wholesale market system. This means that the simulation is conducted on a grid consisting of twenty-one rows and twenty-one columns, which provide 441 individual cells for agents to operate within, and the specific dynamics of the simulation (see Appendix Figure 4). This grid serves as a dynamic playground where various elements come into play, mirroring the complexities of the real-world energy market. Within this environment, we introduce a variety of resources, objects, and obstacles that shape the interactions and strategies of three key types of agents: electricity regulators, innovative New-Techs (NS) power sellers who are gaining increasing influence in the market, and traditional power sellers who are at a crossroads, with the potential to evolve into NS power sellers.

Appendix Figure 4. Dynamic Environment of ABM Simulation





Period	Blockchain Taxpayers	Traditional Taxpayers	IRS Auditors
1	20	371	50
2	42	313	86
3	67	243	131
4	102	181	158
5	138	116	187
6	187	66	188
7	240	37	164
8	301	19	121

Appendix Figure 4 depicts a dynamic environment in the energy sector in a 21x21 virtual space where three distinct agents are represented by blue, red, and green colors. Data generated by the model can be visualized using plots and tables.

Each agent type operates under a unique set of behaviors and objectives. Electricity regulators work to maintain a balance and fair play in the market, overseeing activities and intervening when necessary. NS power sellers, equipped with advanced technologies and strategies, seek to expand their market share and influence, leveraging their innovative approaches. Traditional power sellers, meanwhile, face the decision of whether to continue with their established methods or transition to the more modern, potentially more profitable NS model.

The agents interact within the grid in complex ways. They move around, make decisions, and adapt their strategies based on a comprehensive set of predefined rules. These rules include incentives that drive their movement across the grid, such as market demands, regulatory changes, or technological advancements. Agents also have the capability to modify their initial characteristics. For example,

a traditional power seller might adopt new technologies and strategies, transforming into an NS power seller. This reflects the real-world scenario where companies evolve to stay competitive and relevant.

Additionally, the agents' decisions and movements are influenced by their neighbors and past actions. This aspect of the simulation mimics the interconnected nature of the energy market, where the actions of one player can significantly impact others, and where historical data and trends play a crucial role in shaping future strategies.

Through this simulation, we aim to provide a detailed, interactive model of the electric wholesale market, offering insights into how different entities interact, compete, and evolve in response to changing technologies, regulations, and market dynamics. This model serves as a valuable tool for understanding the complexities and potential future scenarios of the energy market.

APPENDIX VI – NETLOGO'S GENERAL SYSTEM DYNAMIC

A general system dynamic for simulation can be summarized as below:

The NetLogo programming logic and general system dynamics follow the sequence below:[71]

1. System Setup:
   - Create a set of agents that will interact with each other and the environment.
   - Assign starting values to each agent - not at random
   - Define agent behavior - specify the rules that govern the agents' decision-making processes and interactions with other agents and the environment.
   - Model the environment, creating the setting in which agents operate and setting the rules that guide changes for each simulation run.
2. Define Variables:
   - Identify and select the variables relevant to the system being modeled, such as costs, benefits, resource availability, and subsidy conditions.
3. Develop Relationships:
   - Create mathematical or logical equations describing how changes in one variable impact others.
4. Run the Model:

* For each round:

- Apply the cost effect (or not).
- Apply the subsidize effect (or not).
- Apply the neighborhood effect (or not).

71. Eugene Y. Lee et. al., *Impact of Blockchain on Improving Taxpayers Compliance: Empirical Evidence from Panel Data Model and Agent-Based Simulation*, J. OF EMERGING TECHS. IN ACCT. 13-14 (2023), https://doi.org/10.2308/JETA-2022-046.

For each regulator agent:

- Distribute subsidies.
- Conduct inspections and impose penalties.

For each power seller agent:

- Process benefit payments.
- Adjust agent consumption.

* Next Round . . .

5. Test the Model:
    - Execute the model, run it for a specified number of iterations, and analyze results to compare them with real-world observations or data.
6. Refine the Model:
    - Modify agent behavior, environment, variables, or relationships to enhance the model's accuracy and validity.
7. Validate the Model:
    - Compare the model's output with real-world data to ensure it accurately represents system behavior.
8. Use the Model:
    - Utilize the model for predictions or test hypothetical scenarios by adjusting variables or introducing new rules to the system.

Leveraging reinforcement learning, the AI-driven NetLogo model optimizes agent behavior within the ABM by enabling learning through trial and error and reward maximization. This iterative process leads to increasingly affect agent behavior over time, demonstrating how new technology can influence the conduct of power sellers.

ENERGY INSECURITY - WHAT IS IT, AND WHY DOES IT MATTER?

Robert Fleishman, Emma Hand, Mosby Perrow, and Dr. Diana Hernández[*]

Editor's Note: The ideas presented in their essay were first shared by the co-authors during a panel presentation titled "Understanding Energy Insecurity" moderated by Virginia State Corporation Commission Chairman Jehmal T. Hudson at the National Association of Regulatory Utility Commissioners (NARUC) 2023 Annual Meeting and Education Conference in La Quinta, California on November 14, 2023.

We and the authors have described their piece as an essay and not an article because it is not intended as a comprehensive approach to addressing energy insecurity but as an introduction to the subject intended to highlight select issues. Their perspectives, their hope – and ours – is that their essay will prompt in depth contributions from authors addressing energy insecurity issues in future editions of the Journal.

Synopsis: Energy insecurity is a pervasive issue affecting millions of households in the United States. As elaborated in Part I of this essay, energy insecurity is a framework for understanding the challenge of unmet household energy needs and its adverse consequences. Defined as the inability to adequately meet energy needs, energy insecurity encompasses economic, physical, and coping dimensions.[1] Rooted in poverty, the economic dimension reflects financial hardships in paying for utility bills. Its association with inadequate housing in the physical component refers to housing and energy infrastructure that may encumber the achievement of affordable comfort in the home environment. Meanwhile, people take coping actions in the form of restricting energy use to save on the bill, using alternatives such as space heaters or a stove or oven for heat or seeking help from government sources or social networks to make ends. Part I highlights the different use cases of this framework for regulators and other NARUC attendees. Based on comments made by the panelist, each author herein provides insights into specific

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1. Diana Hernández, *Understanding 'Energy Insecurity' and Why it Matters to Health*, 167 SOC. SCI. & MED. 1-10, (Oct. 2016); Diana Hernández, H*ealth Policy Brief: Energy Insecurity and Health,* HEALTH AFFS. (Jun. 29, 2023), https://www.healthaffairs.org/content/forefront/energy-insecurity-and-health-america-s-hidden-hardship#:~:text=As%20Hernandez%20explains%2C%20the%20three,by%20not%20running%20an%20air.

manifestations of energy insecurity and mechanisms to address this pressing issue. In Part II, Dr. Hernández summarized a report on the Low-Income Home Energy Assistance Program (LIHEAP) and described the signals of unmet needs and shortcomings that must be overcome for LIHEAP to achieve higher impact towards alleviating the burdens of energy insecurity.[2] In Part III, Emma Hand builds on pioneering work on the social distribution of disconnections due to non-payment[3] to examine the role of disconnection policies in affecting the frequency of this occurrence and the populations most at risk of facing a disconnection crisis. In Part IV, Mosby Perrow shares the origin story of the Energy Insecurity Initiative, a unique collaboration between the Energy Bar Association and academic partners at Columbia University that is meant to raise awareness among legal professionals so that they play a more central role in addressing energy insecurity issues in the United States and Canada. In Part V, Robert Fleishman beckons our moral conscience based on truths bestowed upon him over a long career as a legal professional in the energy field. Anchored in the wisdom of the philosophical and spiritual greats, Mr. Fleishman's comments remind us that fundamental change is happening and that during a vast and necessary energy transition, we must focus on technologies and just practices that protect the planet as well as approaches that solve an existential threat to people—energy insecurity.

I. INTRODUCTION

What is energy insecurity? It is defined as "an inability to adequately meet basic household energy needs."[4] It is a multi-dimensional construct that describes

2. Andrea Nishi et al., *Energy Insecurity Mitigation: The Low Income Home Energy Assistance Program and Other Low-Income Relief Programs in the U.S.,* CTR. ON GLOB. ENERGY POL'Y (Nov. 15, 2023), https://www.energypolicy.columbia.edu/wp-content/uploads/2023/11/LIHEAP-CGEP_Infoguide_111523-1.pdf. With the CGEP's permission, the CGEP LIHEAP report is included as an appendix to this essay.

3. Diana Hernández & Jennifer Laird, *Surviving a Shut-off: US Households at Greatest Risk of Utility Disconnections and How They Cope*, AM. BEHAV. SCI. (2022).

4. Diana Hernández, *Understanding 'Energy Insecurity' and Why it Matters to Health*, NAT'L LIBR. MED. (2016), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5114037/.

the interplay between physical conditions of housing, household energy expenditures and energy-related coping strategies.[5] Energy insecurity is a broad framework that includes energy burden as one of many factors in a household's ability to meet energy needs.[6]

Energy insecurity is an issue at the intersection of social inequity and public health[7] and is of great concern in the United States and Canada. For example, many communities in the United States struggle to pay their energy bills and avoid being disconnected from their energy services.[8] The U.S. Energy Information Administration uses the following measures to assess energy insecurity in the United States: reducing or forgoing necessities, such as food or medical care "to pay an energy bill, keeping the home at unhealthy or unsafe temperatures in order to reduce energy bills, or receiving a disconnection notice for bill nonpayment."[9]

Energy insecurity can arise and adversely impact communities due to outside causes that are beyond their control.[10] For example, the Coronavirus Disease 2019 (COVID-19) pandemic intensified energy insecurity in households already struggling or likely to struggle paying energy bills.[11] The COVID-19 pandemic raised interest in electric utility disconnections when customers lost their power when they did not pay their bills.[12]

State public service/utility commissions in the U.S. are mandated to ensure reliable services at fair, just, and reasonable rates.[13] Inherent in that mandate is the responsibility to serve the public interest.[14] One core principle of serving the public interest is promoting and protecting the public's health, welfare, and

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5. *Id.*

6. There are a myriad of different dimensions relating to energy issues that tend to overlap with one another. Concepts like "energy poverty," "energy access," "energy equity," and "energy burden" are separate constructs from energy insecurity and operate in different contexts. *See* Ann M. Eisenberg & Elizabeth Kronk Warner, *The Precipice of Justice: Equity, Energy, and the Environment in Indian Country and Rural Communities*, 42 ENERGY L.J. 282, 290 (2021); *see also* Diana Hernández et al., *Basing "Energy Justice" on Clear Terms: Assessing Key Terminology in Pursuit of Energy Justice*, 15 ENV'T JUST., 127 (2022).

7. Maricopa County, AZ, *Addressing Energy Insecurity Through Cross-Sector Collaboration*, MARICOPA.GOV, https://www.maricopa.gov/5723/Energy-Insecurity#:~:text=Energy%20insecurity%20is%20an%20issue,a%20prerequisite%20for%20good%20health (last accessed Mar. 24, 2024).

8. Sanya Carley, *Energy Insecurity During the Rime of COVID*, KLEINMAN CTR. FOR ENERGY POL'Y (Apr. 5, 2023), https://kleinmanenergy.upenn.edu/research/publications/energy-insecurity-during-the-time-of-covid/.

9. Ashley J. Lawson & Claire Mills, *Electric Utility Disconnections*, CONG. RSCH. SERV. 2 (Jan. 31, 2023), https://crsreports.congress.gov/product/pdf/R/R47417#:~:text=If%20customers%20are%20unable%20to,utility%20may%20disconnect%20the%20customer.

10. Diana Hernández, *Energy Insecurity and Health: America's Hidden Hardship*, HEALTH AFFS. (Jun. 29, 2023), https://www.healthaffairs.org/do/10.1377/hpb20230518.472953/.

11. Emily Schmidt, *Feeling the Heat: Energy Insecurity in the Nation's Hottest States*, APM RSCH. LAB (May 5, 2022), https://www.apmresearchlab.org/10x-energy-insecurity#:~:text=According%20to%20the%20ACEEE%2C%20residents,have%20a%20high%20energy%20burden.

12. Lawson & Mills, *supra* note 9.

13. NAT'L ASSOC. OF REGUL. UTIL. COMM'RS, THE MISSION OF YOUR STATE COMMISSION: TO SERVE THE PUBLIC INTEREST (2024), https://www.naruc.org/serving-the-public-interest/about/mission/.

14. *Id.*

safety.[15] The pandemic highlighted how utility service and its effective regulation is closely related to public health and the overall public welfare.[16] Many states placed a moratorium on service disconnections during the pandemic.[17]

The National Association of Regulatory Utility Commissioners (NARUC) is the national association representing the U.S. state public service commissioners who regulate essential utility services.[18] NARUC understands energy insecurity and the challenges and financial hardships households face when meeting basic household energy needs.[19] During its annual summer policy summits, NARUC has regularly held a poverty simulation which allowed interested participants the opportunity understand the challenges facing low-income and vulnerable communities.[20] During the poverty simulation, participants: encountered obstacles they faced trying to pay bills and deal with routine responsibilities; explored factors impacting consumer decisions related to utility payments; increased understanding on the challenges and dueling priorities facing low-income and vulnerable communities; and identified specific ways state public service commissions, utilities, and consumer advocates could collaborate to address utility affordability challenges.[21]

The energy insecurity framework includes identifying causes and obstacles to address factors that lead to or worsen adverse health issues.[22] The term may be classified by the "strategies used to cope, improvise, and counteract the impacts" that reflect the financial hardship associated with making ends meet on limited budgets and the consequences of high utility bills.[23] Similarly, energy insecurity is identified as "deficiencies in the physical infrastructure of the home environment that impact thermal comfort, induce harmful exposures and increase energy costs."[24] This framework helps us to understand energy insecurity and its consequences.[25] Energy insecurity is a framework for understanding the relationship regarding unmet household energy needs can draw connections between the direct

15. *Id.*

16. NAT'L ASSOC. OF REGUL. UTIL. COMM'RS, NARUC STATEMENT ON COVID19 (2024), https://www.naruc.org/about-naruc/press-releases/naruc-statement-on-covid19/.

17. *Id.*

18. NAT'L ASSOC. OF REGUL. UTIL. COMM'RS, https://www.naruc.org (last visited Mar. 24, 2024).

19. William McCurry, *State Energy Justice Roundtable Series: Customer Affordability and Arrearages*, NAT'L ASSOC. OF REGUL. UTIL. COMM'RS 4 (2023), https://pubs.naruc.org/pub/2B1596E2-1866-DAAC-99FB-37A81B4AFEF7.

20. NAT'L ASSOC. OF REGUL. UTIL. COMM'RS, NARUC SUMMER POLICY SUMMIT AGENDA (July 2019), https://pubs.naruc.org/pub/C285DE8A-9063-2966-2B77-4A99CE207C1E?_gl=1*bvryy2*_ga*MjEzNzA5NDA1Ni4xNzEwMTg0MjMy*_ga_QLH1N3Q1NF*MTcxMDE5MzM2Mi4zLjEuMTcxMDE5NDAwMS4wLjAuMA.

21. *Id*; NAT'L ASSOC. OF REGUL. UTIL. COMM'RS, POVERTY SIMULATION DATA SNAPSHOT (July 2019) https://pubs.naruc.org/pub/3408714E-1866-DAAC-99FB-10EC67C75483.

22. Sonal Jessel et al., *Energy, Poverty, and Health in Climate Change: A Comprehensive Review of an Emerging Literature*, 7 FRONTIERS IN PUB. HEALTH 357, 2 (2019).

23. Hernández, *supra* note 4, at 5-6.

24. *Id.*at 4, 6.

25. Jessel et al., *supra* note 22, at 8.

effects of inadequate household energy and how vulnerabilities and hardships contribute to the problem.[26]

This Essay examines the causes of energy insecurity and preliminarily identifies a few policy frameworks that have addressed these obstacles. The Essay is not intended as a comprehensive approach to solving energy insecurity issues. Rather, it aims to improve the public's understanding of energy insecurity and highlight these issues to prompt in-depth contributions from authors in future editions of the Journal. It also provides "a broader perspective that encompasses a wide range of factors that influence energy affordability and access as well as the long-term impacts on utility customers."[27]

Part II of the Essay examines the federal Low Income Home Energy Assistance Program (LIHEAP) and other low-income relief programs in the U.S. to reduce energy burden and their impacts on energy insecurity. Part III examines the impact of disconnection policies on the incidence of energy insecurity. Part IV describes the genesis of the Energy Insecurity Initiative, and Part V explains why the authors view reducing energy insecurity as a moral imperative and how the Energy Insecurity Initiative plans to address a range of key issues.

II. ENERGY INSECURITY AND THE LOW-INCOME HOME ENERGY ASSISTANCE PROGRAM IN THE UNITED STATES

Dr. Hernández spoke first at the NARUC Panel. She stated that energy insecurity is a pervasive issue affecting millions of households in the United States. Defined as the "'inability to adequately meet energy needs,'" energy insecurity encompasses economic, physical, and coping dimensions.[28] The economic dimension reflects financial hardships in paying for utility bills, while the physical component refers to housing and energy infrastructure that may encumber the achievement of affordable comfort in the home environment. Meanwhile, people take coping actions in the form of restricting energy use to save on the bill, using alternatives such as space heaters or a stove or oven for heat or seeking help for outside sources.

LIHEAP is a federal program designed to alleviate the burden of energy insecurity by aiding vulnerable households primarily through bill assistance. While LIHEAP remains a crucial tool in mitigating energy insecurity, there are clear signals that suggest it may be falling short of meeting the growing and persistently unmet needs of energy insecure populations.

Initially introduced in response to the oil crisis of the 1970s, LIHEAP evolved from a weatherization service to become a comprehensive program with a mission of aiding low-income households in managing their home energy expenses and intervening in financial crisis situations that would jeopardize access to household

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26. *Id.*

27. Maggie Kelley Riggins, *What is energy insecurity versus energy burden?,* SE. ENERGY EFFICIENCY ALL. (Mar. 15, 2021), https://www.seealliance.org/what-is-energy-insecurity-versus-energy-burden/.

28. Diana Hernández, *Energy Insecurity And Health: America's Hidden Hardship*, HEALTH AFFS. (June 29, 2023), https://www.healthaffairs.org/do/10.1377/hpb20230518.472953/.

energy. Presently, LIHEAP functions primarily (though not exclusively) as a heating subsidy, guided by funding formulas created in 1981 or 1984, which at once symbolize its origins and demonstrates a need to revisit this crucial lifeline for energy affordability in the US.[29]

A recent report published through the Center on Global Energy Policy at Columbia University, the Energy Opportunity Lab, the Sabin Center for Climate Change Law (Sabin Center), and the Mailman School of Public Health (set forth in Appendix A to this Essay) offers a comprehensive overview of the LIHEAP program.[30]

To analyze LIHEAP, this rigorous report reviewed Detailed Model Plans submitted by the fifty states and Washington D.C., which outline how energy assistance programs are to be administered at the federal and state level annually. In doing so, the report revealed clear signals indicating challenges and gaps in the types of assistance offered by the LIHEAP program and other issues that are hindering its efficacy and impact. Below, we provide a summary of the most salient issues raised in the report that point to the signals of unmet needs and shortcomings that must be overcome for LIHEAP to achieve higher impact towards alleviating the burdens of energy insecurity.

A. Budgetary Limitations and Enrollment Gaps

The Department of Health and Human Services distributes over 99% of regular LIHEAP block grant funding to participating states. These funds predominantly contribute to direct program costs, with strict limits on administrative spending, capped at 10%. However, only a few states supplement LIHEAP funds beyond federal allocations, which restricts the program's reach. It is noteworthy that the program overwhelmingly supports colder weather states and those with greater proportions of the populations living at or near the federal poverty level as per the 1981 formula.[31] When the LIHEAP budget surpasses a specified threshold, activating the "new" 1984 formula, more funding is directed to warmer weather states because the higher threshold provides more support for cooling assistance by equalizing heating and cooling degree days. Unfortunately, this approach often leaves residents in the South and Southeast regions who lack sufficient assistance to combat rising temperatures, with higher energy rates and homes that may not be as efficient (i.e. mobile homes).

Admittedly, this is an oversimplification of a complex funding formula, but the takeaway is twofold: 1) that the program still operates under very dated formulas that have not been revised to reflect modern times; and 2) the overarching emphasis on providing heating assistance, which is a relic of the program's origin in the oil crisis, negates the reality of greater cooling needs.

A mere 16% of eligible households in the US receive LIHEAP assistance, highlighting a substantial under-enrollment gap in the program. By comparison,

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29. Nishi et al., *supra* note 2.

30. *Id.*

31. Mark J. Kaiser & Allan G. Pulsipher, *Science and politics: The 1981 and 1984 LIHEAP distribution formulas*, 40 SOCIO-ECONOMIC PLANNING SCIENCE 15 (2006); for an expanded 1984 explanation, *see* Nishi et al., *supra* note 2.

over 80% of eligible households receive Supplemental Nutritional Assistance Program (SNAP, formerly food stamps) benefits. Further, LIHEAP funding is significantly less than SNAP, Temporary Assistance for Needy Families (TANF, formerly welfare benefits) and housing subsidies. Even with augmented budgets during the housing crisis of the late 2000s and the COVID-19 period, LIHEAP receives fewer dollars and remains significantly lower-funded than comparable federal needs-based programs such as SNAP and TANF.

Increases in program budgets are short-lived and out of pace with the rising cost of energy and increased demand. In effect, this means that most low-income households are unable to access assistance to offset their energy costs. And those that do receive already insufficient benefits levels, often delay seeking that limited assistance until the point of crisis because of the administratively burdensome application process.[32] Finally, inadequate federal funding may prompt states to impose more restrictive eligibility requirements, further lowering program participation and increasing administrative burdens. The consequence of insufficient funding at the federal level reverberates at the state level, ultimately hindering the program's ability to effectively assist a broader range of vulnerable households experiencing energy insecurity.

The LIHEAP eligibility criteria, designed to aid the most vulnerable, may unintentionally overlook significant subgroups grappling with energy insecurity. This encompasses households with medical vulnerabilities, as well as those positioned just above the income thresholds. Even if slightly beyond the eligibility criteria, such households may contend with elevated medical, housing, and general living expenses, leaving minimal flexibility in their household budgets to allocate funds towards utilities and other essential needs. Consequently, this leads to limited support for households that stand to benefit substantially from LIHEAP relief.

B. Heating Prioritization, Crisis Emphasis and Cooling Gaps

There are four programmatic components of LIHEAP: 1) heating; 2) cooling; 3) crisis support; and 4) weatherization. Of these, heating is the most common form of assistance, followed by crisis support then cooling aid. Over the years, crisis aid, which is activated when households are at risk of or actively experiencing a utility service disconnection due to non-payment, has been increasing overall and especially in the summer months. This may be partly explained by the fact that assistance provided for heating, cooling, and crisis situations are falling short of covering household energy costs, resulting in large affordability gaps. The average LIHEAP benefit of $400 per year represents a fraction of overall household energy expenditures compared to the average bill of over just over $100 per month and often more during peak cold and warm-weather months.

LIHEAP benefits are insufficient to relieve energy burdens, especially for the lowest income groups, particularly those facing elevated bills due to rising rates and increased energy demands. Although both cold and heat can pose health risks,

32. Miranda Simes et al., *Vigilant conservation: How energy insecure households navigate cumulative and administrative burdens*, 101 ENERGY RSCH. & SOC. SCI. 103092, 6 (2023).

LIHEAP assistance treats the two risks differently. All states offer heating assistance, but fewer than half utilize LIHEAP funds for cooling assistance, creating a notable gap in addressing energy needs during warmer weather. There is limited allocation of LIHEAP funding towards residential cooling costs, even in regions with higher year-round temperatures where the demand for cooling assistance is substantial. Notably, the Southeast region, characterized by elevated energy insecurity, receives disproportionately low LIHEAP funding, accentuating disparities in the program's support across different regions. Additionally, the steady increase in year-round and summer crisis disbursements suggests that households are at a heightened risk of experiencing shut-offs, further underscoring the fact that LIHEAP is a critical source of support and that vulnerable households are in greater need of more substantial financial intervention.

Other factors impacting LIHEAP include the absence of recent and thorough evaluations assessing the program's effectiveness and impact. There is also a need for crisis prevention efforts and better coordination with energy efficiency and other safety net programs. To address energy insecurity, measures beyond LIHEAP include utility rate designs and discount programs such as the Percentage of Income Payment Plans,[33] fixed percentage discounts, and arrearage forgiveness. Unique challenges in rural and Native American communities, where factors such as electricity availability and home energy efficiency present additional obstacles, underscore the importance of tailored solutions for addressing energy insecurity in these specific contexts.[34]

Eliminating energy insecurity requires a nuanced approach that not only recognizes LIHEAP's strengths but critically evaluates its limitations. LIHEAP remains a vital tool, but these signals of growing and unmet needs underscore the urgency for recalibration and modernization in the program's design to ensure it effectively serves the diverse and evolving energy needs of vulnerable households across the United States.

III. UTILITY DISCONNECTIONS

Emma Hand spoke next at the NARUC Panel. She stated that utility disconnections are one indicia of energy insecurity. "The U.S. Energy Information Administration (EIA) uses the following measures to assess energy insecurity in the United States: reducing or forgoing basic necessities (e.g. medical care, food) to pay an energy bill, keeping the home at unhealthy or unsafe temperatures in order to reduce energy bills, or receiving a disconnection notice for bill nonpayment."[35] "According to the EIA, thirty-four million households (27% of US households) reported at least one of these forms of energy insecurity in 2020."[36] In January

33. Nishi et al., *supra* note 2.

34. Emily Wild, *Lighting Up Navajo Nation*, NATIVE NEWS ONLINE, https://nativenewsonline.net/lighting-up-navajo-nation (last visited Apr. 22, 2024).

35. Lawson & Mills, *supra* note 9, at 2.

36. *Id.* (citing U.S. ENERGY INFO. ADMIN., TODAY IN ENERGY (Apr. 11, 2022), https://www.eia.gov/todayinenergy/detail.php?id=51979 ("In 2020, 27% of US Households Had Difficulty Meeting Their Energy Needs…")).

2024, the National Energy Assistance Directors Association (NEADA), representing the state directors of the LIHEAP, issued a press release reporting that the program served 7.1 million households in FY 23 with heating and cooling assistance, the highest number on record.[37] NEADA also reported that utility arrearages also reached record levels in 2023 with 21.2 million households (16% -- "more than one out of six households") being behind on their energy bills.[38]

While no federal agency tracked arrearages in a comprehensive way at the national level, some states did and NEADA "estimated that nationwide arrearages for electricity and heating bills combined increased from $8.1 billion at the end of December 2019 to $16.1 billion as of August 2022,"[39] and further "to $20.3 billion in December 2023."[40] Under current laws, state and local utility regulators will have to address these arrearages, and cannot require the utilities to absorb the costs. The regulators' options include requiring the utilities to write off the debt and increase rates to all customers to cover the cost, collect the debt from the customers who owe it, or shift costs to the federal government through financial assistance programs.[41]

Energy burden, energy insecurity, and utility disconnections affect some racial and ethnic groups more than others.[42] The share of Black households experiencing energy insecurity is about twice as high as that for White households (52% compared to 27% in 2020).[43] Similarly, the share of Hispanic or Latino households experiencing energy insecurity is about twice as high as that for households that are not Hispanic or Latino (47% compared to 25% in 2020).[44]

The U.S. Congressional Research Service found that the available data on disconnections suggests that the scale of the issue is not precisely known, but millions of Americans are disconnected each year, potentially up to 1% or so of households and that low-income households are at a higher risk for disconnections. Even more worrisome: Black and Hispanic households are disconnected from their utilities at a higher rate than non-Hispanic White households, even after account-

37. Press Release, Mark Wolfe, States Call for Cong. to Restore Funding for LIHEAP About 1.4 Million Households Could be Cut from the Program, Nat'l Energy Assistance Dir. Ass'n (Jan. 23, 2024), https://neada.org/wp-content/uploads/2024/01/pr-recordhhbehind.pdf.

38. *Id.* at 3.

39. Lawson & Mills, *supra* note 9, at 6-7 (citing Mark Wolfe, *Families Drowning in Utility Debt – Families Owe More than $16 Billion*, NAT'L ENERGY ASSISTANCE DIR. ASS'N 1 (Nov. 7, 2022), https://neada.org/wp-content/uploads/2022/11/20millionbehindPR.pdf.).

40. Nat'l Energy Assistance Dir. Ass'n, *supra* note 37, at 3.

41. Lawson & Mills, *supra* note 9, at 6-7 (citing Herman K. Trabish, *Utility Customers Owe Up to $40B in COVID-19 Debt, But Who Will Pay It?*, UTIL. DIVE 7-8 (Dec. 3, 2020), https://www.utilitydive.com/news/customers-owe-billions-in-covid-debt-to-their-utilities-and-somebody-has-to/589525/.).

42. Lawson & Mills, *supra* note 9, at 10.

43. *Id.* In previous years, 11.3% of Black households at or below 150% of the federal poverty level were disconnected, compared to 5.5% of White households at or below the same level. Mark Franklin, *Lights Out in the Cold: Reforming Utility Shut-Off Policies as If Human Rights Matter*, NAT'L ASS'N FOR THE ADVANCEMENT OF COLORED PEOPLE, 14 (Mar. 2017).

44. Lawson & Mills, *supra* note 9, at 10.

ing for levels of energy insecurity, suggesting an element of racial discrimination.[45] A study conducted by the Indiana University O'Neill School of Public and Environmental Affairs and the Cleveland State University Maxine Goodman Levin School of Urban Affairs (IU/CSU Study) suggested that even when controlling for key economic indicators, vulnerable households – specifically Black households, Hispanic households, and households with children under 5 years old – were more likely to have their electricity disconnected by their utility for nonpayment.[46]

When customers fail to pay their utility bills in full and on time, they become at risk of a utility disconnection. There are many steps along the way to a disconnection and many programs in place to assist customers in avoiding disconnections. For most utilities, disconnecting the customer is the last resort – utilities benefit more from a customer being able to return to paying bills in full than they do from disconnecting a customer.

Federal law identifies preferred utility policies under the Public Utility Regulatory Policies Act of 1978 (PURPA), which encourages utilities: (1) not to disconnect customers without giving "reasonable prior notice" and allowing customers "a reasonable opportunity to dispute the reasons for such termination"; (2) not disconnect customers who are unable to pay for electricity service during any period of time when termination of service would be "especially dangerous to health"; and (3) to have disconnection procedures that take into account "reasonable provisions for elderly and handicapped consumers."[47] However, the details of the disconnection process are determined by state and local regulations. As a result, these processes vary from jurisdiction to jurisdiction, though there are many commonalities generally consistent with the principles laid out in PURPA. Typically, the utility contacts the customer, usually several times over a period of up to several months to attempt to receive payment. Unpaid amounts accrue during this time as an arrearage and the utilities may also assess late fees. Customers may be able to enter into a payment plan with the utility or they may qualify for financial assistance from a utility and/or state-administered program, which can help the customer avoid disconnection and pay their outstanding balances. However, if the customer continues to be unable to pay their bill, the utility may disconnect the customer. Generally, utilities will reconnect a customer after receiving payment of the outstanding balances and, in some cases, a reconnection fee.[48]

There are differences in disconnection policies, however, with states trying different means of protecting customers. Over forty states have statutory-based utility disconnection protections that aim to limit shut-offs during specific times of the year and/or for vulnerable populations. These may take the form of seasonal protections, temperature protections, and population-based protections. Some states require certification of the population-based protections (such as a medical

45. *Id.* at 11.

46. Memmott et al., *Utility disconnections protections and the incidence of energy insecurity in the United States*, iSCIENCE, 6 (Mar. 17, 2023), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10025124/pdf/main.pdf.

47. 16 U.S.C. § 2625(g) (2005).

48. Lawson & Mills, *supra* note 9, at 4.

condition),[49] while some states limit the application of seasonal moratoria to certain customers, such as low-income customers,[50] and so forth.

While the topic of utility disconnections has been around for as long as there have been utilities, and most jurisdictions have well-established practices in place, recent experiences and forces in play are increasing pressure on customers and creating a need for a re-examination of disconnection practices and customer assistance programs designed to prevent disconnection. During the COVID pandemic, for example, most jurisdictions recognized the severe economic distress that could occur for families disconnected from utility service during the pandemic. In many ways, this was a logical extension of provisions that exist in many jurisdictions prohibiting disconnections during extreme weather conditions. "In the early part of the pandemic, approximately 88% of residential electricity customers were protected temporarily from disconnection by state-issued disconnection moratoria or voluntary utility practices."[51] Specifically, thirty-four states and the District of Columbia implemented moratoria to protect residents from utility disconnections.[52] "Most states had lifted their pandemic-related moratoria by the end of 2021, [and] anecdotal evidence suggests that disconnections increased after the end of pandemic-related moratoria, at least in some parts of the country."[53]

Importantly, while some state moratoria prohibited the assessment of late fees and other charges related to nonpayment, other states did not, and in general, the moratoria were not bill forgiveness programs – although customers could not be disconnected, their outstanding balances continued to accrue over the months of nonpayment.[54] This meant both that customers who were unable to pay their electric bills saw their outstanding balances continue to increase and that utilities had to provide electric service for extended periods of time without receiving payment from those customers. NARUC noted:

There is a growing consensus among state PUCs [public utility commissions], the private utility sector, and key advocates that the blanket moratoria policies enacted early on in the pandemic response could have been more strategically implemented. Moratoria policies could be more exclusive to low- and moderate-income customers with caveats that customers in arrears need to work with their

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49. Memmott et al., *supra* note 46, at 8.

50. *Id.* at 1.

51. Lawson & Mills, *supra* note 9, at 1, 5.

52. Memmott et al., *supra* note 46, at 1.

53. Lawson & Mills, *supra* note 9, at 5 (citing Richard J. Campbell & Ashley J. Lawson, *COVID-19 Electric Disconnections*, CONG. RSCH. SERV., 5 (June 9, 2020); Will Wade & Mark Chediak, *'Tsunami of Shutoffs' Looms With 1 in 6 Late on US Energy Bills,* BLOOMBERG L. (Aug. 23, 2022), https://news.bloomberglaw.com/environment-and-energy/tsunami-of-shutoffs-looms-with-1-in-6-late-on-us-energy-bills-1; Jake Zuckerman, *AEP Cut 164,000 Ohioan's Power for Nonpayment Last Year, More Than Any Other Utility*, OHIO CAP. J. 1 (July 7, 2022), https://ohiocapitaljournal.com/2022/07/07/aep-cut-164000-ohioans-power-for-nonpayment-last-year-more-than-any-other-utility/; Hannah LaClaire, *As energy prices rise, thousands of Mainers at risk of losing power*, PORTLAND PRESS HERALD 1 (May 22, 2022), https://www.pressherald.com/2022/05/22/as-energy-prices-rise-thousands-of-mainers-at-risk-of-losing-power/; Alicia Inez Guzman & Liciana Perez Uribe Guinassi, *The Other Energy Crisis*, SEARCHLIGHT N.M. 6 (Mar. 30, 2022), https://searchlightnm.org/the-other-energy-crisis/.).

54. Lawson & Mills, *supra* note 9, at 6.

utility on repayment plans to qualify. Customers and utilities alike were unprepared for the massive arrearage burden stemming from blanket moratoria policies prohibiting disconnections.[55]

Nonpayment of bills and the resulting disconnection is not only a problem for the customer that is disconnected, it also creates problems for utilities, regulators and other utility customers. Nonpayment creates a cost for utilities unable to collect revenues for the services they provide, and regulators must develop policies to address nonpayment, arrearages, and disconnections regarding how those costs are distributed.[56]

The lack of data around disconnection protection policies makes it difficult to determine which policies "substantially reduce disconnections or provide households meaningful relief from" energy insecurity.[57] It is difficult to obtain a comprehensive view of disconnection policies and practices and their success or lack of success. However, the IU/CSU Study suggests "that the utility disconnection moratoria that states implemented during the COVID-19 pandemic" did have a "substantial impact on disconnections"[58] and also "decreased the likelihood that a household had to forego basic household expenses, such as food or medical care, to pay an energy bill and avoid the threat of disconnection."[59]

The plethora of different approaches taken by states to disconnections during the COVID-19 pandemic offer a somewhat unique opportunity to study the impact of utility disconnection policies. With energy prices continuing to rise with rising fuel costs and as America seeks to replace and improve upon aging infrastructure, accommodate new demand from electrification, and transition to cleaner energy sources,[60] it is increasingly important to determine what best practices in utility disconnection policies can most effectively alleviate energy insecurity.

IV. THE ENERGY INSECURITY INITIATIVE

Mosby Perrow spoke next at the NARUC Panel.

My three children had seen snow before, but never enough in Houston to build a snowman or have a real snowball fight. The first day of Winter Storm Uri was magical in that sense. It reminded me of winters in the Northeast with packs of kids roaming the neighborhood streets and piles of soggy clothes beside the front door signaling hot-chocolate breaks. But the Northeast has insulation and

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55. William McCurry, *Lessons Learned from the Ongoing Response to the COVID-19 Crisis*, NAT'L ASS'N REG. UTIL. COMM'RS 20 (Oct. 2021), https://pubs.naruc.org/pub/99B5206E-1866-DAAC-99FB-E08F3EAF718C.

56. Lawson & Mills, *supra* note 9, at 15.

57. Memmott, et. al., *supra* note 46, at 1.

58. *Id.* at 8.

59. *Id.* at 9.

60. U.S. ENERGY INFO. ASS'N, US RESIDENTIAL ELECTRICITY BILLS INCREASED 5% IN 2022, AFTER ADJUSTING FOR INFLATION (May 31, 2023), https://www.eia.gov/todayinenergy/detail.php?id=56660; Adam A. Millsap, *High Elec. Prices Will Go Even Higher Unless We Change Course*, FORBES (Mar. 9, 2023), https://www.forbes.com/sites/adammillsap/2023/03/09/high-electricity-prices-will-go-even-higher-unless-we-change-course/?sh=42bbb53916a8; Irina Ivanova, *Inflation Is Falling, But Not Your Elec. Bill. Here's Why*, CBS NEWS (May 30, 2023), https://www.cbsnews.com/news/inflation-electricity-bills-higher-summer-2023/.

winterized facilities. As temperatures plunged in Texas, my in-laws lost power, so I brought them over to spend the night with us. Then I lost power, too. We huddled under blankets around a natural gas fireplace talking by candlelight, and it felt like an adventure. But after thirty-six hours of no power, no heat, no running water, and temperatures in single digits, the adventure turned critical. Others had it worse.

By the time Texas thawed, over 240 people had died from the storm,[61] over 9.9 million people went without electricity,[62] and the country lost between $195 to $295 billion in damages.[63] There was ultimately little that was magical about Winter Storm Uri. Almost immediately, natural gas advocates pointed to wind turbines in West Texas, and wind energy advocates pointed to shut-in wells and the loss of dispatchable generation. The conversation devolved from there with about as much light as the storm's darkest and coldest night.

As noted above, Energy Insecurity is the inability to obtain, loss, or threatened loss of energy required for our modern lives and has physical, economic, and coping dimensions.[64] It can be acute, as what happened during Winter Storm Uri, and it can be chronic, as is the case for a quarter to one-third of US households, or more than thirty-three million households.[65] According to national data analyzed by Dr. Diana Hernández, almost "twenty-five million households reduced or went without food or medicine to pay for energy."[66] "That is twice the number of those having received a disconnection notice and four times as many as lacked working heating or cooling equipment," Dr. Hernández reported.[67]

The Energy Bar Association celebrated its 75th Anniversary in the midst of the COVID-19 pandemic, and the celebration that had been planned for the occasion was converted into a call to action. The members of the EBA Board wanted to do something important to mark the occasion. A "Tiger Team" was assembled, tapping the broad diversity of EBA's membership and its deep expertise in energy regulation and policy. Winter Storm Uri crystallized the challenge that the Tiger Team narrowed on. As an organization devoted to advancing the professional excellence, facilitating robust dialogue and debate, and growing an inclusive community that connects and engages a vast and diverse community,[68], the challenge of addressing Energy Insecurity in the wake of a pandemic, a devastating winter

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61. Patrick Svitek, *Texas Puts Final Estimate of Winter Storm Death Toll at 246*, TEX. TRIBUNE (Jan. 2, 2022), https://www.texastribune.org/2022/01/02/texas-winter-storm-final-death-toll-246/.

62. Joshua W. Busby et al., *Cascading Risks: Understanding the 2021 Winter Blackout in Texas*, ENERGY RSCH. & SOC. SCI. 1 (June 2, 2021), https://www.sciencedirect.com/science/article/pii/S2214629621001997.

63. Irina Ivanova, *Texas Winter Storm Costs Could Top $200 Billion – More Than Hurricanes Harvey and Ike*, CBS NEWS (Feb. 25, 2021), https://www.cbsnews.com/news/texas-winter-storm-uri-costs/.

64. Diana Hernández, *Energy Insecurity and Health: America's Hidden Hardship*, HEALTH AFFS. (June 29, 2023), https://www.healthaffairs.org/do/10.1377/hpb20230518.472953/.

65. *Id.*

66. Diana Hernández et al., *Energy Insecurity in the United States*, CTR. ON GLOBAL ENERGY POL'Y AT COLUMBIA (Oct. 2023), https://www.energypolicy.columbia.edu/publications/energy-insecurity-in-the-united-states/.

67. Hernández, *supra* note 64.

68. EBA, EBA MISSION AND CORE VALUES, https://www.eba-net.org/home/eba-about/ (last visited Apr. 22, 2024).

storm, and a call to action triggered by seventy-five CGEP years of work in energy policy and regulation seemed worthy, important, and achievable.

EBA quickly found fellow travelers familiar with these issues and looking to collaborate. Dr. Hernández introduced members of the Tiger Team to others at Columbia University initiating a conversation with representatives from the Sabin Center and the School of International and Public Affairs' Center on Global Energy Policy (CGEP). The Energy Insecurity Initiative included attorneys and energy professionals from large and small law firms, a myriad of energy trade associations, organizations involved in public power and investor-owned utilities, federal regulators, those who regulated energy for states, and many others. Ultimately, EBA, the Sabin Center, the Mailman School of Public Health, and CGEP entered into an Memorandum of Understanding with the stated objectives to improve uptake of existing programs that can reduce Energy Insecurity in the United States and Canada, to demonstrate the importance of energy and the crisis of Energy Insecurity, to diagnose the causes of Energy Insecurity and to identify policy frameworks that can address the obstacles identified, to build stronger awareness around a just and equitable energy transition, and to improve public understanding of the issues underlying Energy Insecurity.

The Energy Insecurity Initiative was designed to underscore and support EBA's mission to advance the professional excellence of those engaged in energy law, regulation and policy through professional education, exploration of diverse viewpoints, and building connections within the energy community. Since initiating the Energy Insecurity Initiative, the EBA has featured Energy Insecurity at several national meetings, hosting panels to highlight issues within the broader Energy Insecurity challenge and to discuss potential solutions. The Energy Exchange podcast produced a deep dive into the elements of Energy Insecurity during a long-form conversation with Dr. Hernández. The Texas Chapter of the Energy Bar Association started the Annual Texas Symposium with the inaugural meeting focused on Winter Storm Uri that provided an evidenced-based, constructive conversation about what went wrong and how to prevent such acute episodes of Energy Insecurity in the future.

Columbia University, for its part, has provided an initial seed investment through the use of various facilities and in-kind support from Sabin Center Fellows that has helped launch and sustain the initiative through leadership from its senior members and support from sister institutions. In 2023, the Energy Insecurity Initiative kicked off the first phase of research conducted by volunteers from across the U.S. and Canada. The Initiative sought to leverage the EBA's expertise in energy regulations, law, and policy, and Columbia's world class research and academic resources. This round of research is focused on four topic areas: (1) Utility Disconnections and Shutoffs; (2) Low-Income Home Energy Assistance Programs and Other Low-Income Relief; (3) Energy Efficiency and Weatherization; and (4) Access to Clean Energy and Electrification. The response from volunteers has been robust, vindicating the Board's decision to start down this road many years ago.

Despite the efforts to date from volunteers and leaders who are members of the Energy Bar Association, the Energy Insecurity Initiative is really just at its beginning stages and much of the exciting and impactful work is yet to be done.

V. REDUCING ENERGY INSECURITY IS A MORAL IMPERATIVE

Bob Fleishman spoke last at the NARUC Panel.

He began by declaring, "I believe reducing energy insecurity in the United States in Canada is a moral imperative." But what is a moral imperative?

In pondering this question, I was drawn to the teachings of great leaders: Abraham Lincoln, Martin Luther King, and Mahatma Gandhi. I came across the following inspiring Albert Einstein statement about Gandhi: "Generations to come, it may well be, will scarce believe that such a one as this ever in flesh and blood walked on this earth." [69]

That compelled me to focus intensely on Gandhi for help answering the question. Among the vital messages of Gandhi's leadership were: even one person can make a difference; strength comes not from physical capacity but from an indomitable will; given a just cause, nonviolence and capacity for self-suffering, and fearlessness, victory is certain; leadership by example is the one most effective. To Gandhi the spirit of service and sacrifice was the key to leadership. For the spirit of service to materialize we must lay stress on our responsibilities and duties and not on rights. "The commitment to service, however demands a strong sense of conscience (moral imperative), courage (fearlessness, bravery, initiative), and character (integrity)."[70]

What I draw from this is that a strong sense of conscience – doing the right thing - is the essence of a moral imperative.

I turn seventy next month and have spent more than forty years in the energy industry in government, with an energy company/utility, as a lobbyist in Congress and Maryland, and at three Big Law firms. I also have served EBA in multiple capacities and as president of two community-based non-profit organizations. I've been reflecting lately on lessons learned, what's really important (and is not), and what how I should spend my time in the autumn of my life.

Besides for his leadership on the Energy Insecurity Initiative, Mosby Perrow developed the terrific idea of doing podcasts for EBA in which he interviewed energy industry leaders as part of "Energy Exchange" series. I was the first person he interviewed – kind of a guinea pig. Mosby asked me, among other things, "what do you know to be true?" [71]

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69. ALICE CALAPRICE, THE ULTIMATE QUOTABLE EINSTEIN 124 (Princeton Univ. Press, 2011) (citing Statement on the occasion of Gandhi's seventy-fifth birthday, 1939, In *Einstein on Humanism*, 94 (2000). Here is Einstein's full statement: Gandhi is a "leader of his people, unsupported by any outward authority a politician whose success rests not upon craft or the mastery of technical devices, but simply on the convincing power of his personality; a victorious fighter who always scorned the use of force, a man of wisdom and humility, armed with resolve and inflexible consistency, who has devoted all his strength to the uplifting of his people and the betterment of their lot; a man who has confronted the brutality of Europe with the dignity of the simple human being, and thus at all times risen superior. Generations to come, it may well be, will scarce believe that such a one as this ever in flesh and blood walked on this earth." *Id.* at 123-24.

70. Y.P. Anand, *Mahatma Gandhi's Leadership - Moral & Spiritual Foundations*, https://www.mkgandhi.org/articles/sept081.htm (last visited Mar. 31, 2024). .

71. The Energy Exchange Podcast, *Season 1, Episode 1: Bob Fleishman, Partner Kirkland & Ellis, Former Gen. Couns. Balt. Gas and Elec., Former Editor-in-Chief of Energy L.J., Past President of EBA*, ENERGY BAR ASS'N (March 18, 2021), https://www.eba-net.org/home/energy-exchange/.

Let me tell you how I would answer that question if asked today.

- The energy transition is in full swing; it will be neither quick nor easy.[72] If you do not believe me, read The State of the Transition - just published by Bill Gates - which states that we are in the beginning stages of a major "Clean Industrial Revolution."[73]
- Energy, environmental, and climate issues now, and for the foreseeable future, are inextricably intertwined.
- Energy insecurity is real, it exists in the U.S., Canada and elsewhere, and it is a significant problem.
- Steps must be taken to ensure the energy transition progresses in a just and equitable fashion.
- Reducing energy insecurity in the U.S. and Canada is a moral imperative, and we all have a role to play in addressing this moral imperative.

Major and interrelated trends in the U.S. and Canada are the movement toward decarbonization, access to cleaner forms of energy, and electrification. We will research the impact of these trends and related transitional developments on low-income households and communities as they relate to buildings and transportation. We don't have the answers yet; we're just in the beginning stages.

One set of issues to research is that "low-income households have been slower to adopt clean energy because they often lack sufficient savings or have low credit scores, which can impede their ability to finance projects."[74] With respect to buildings, we will focus on solar panels, community solar, net metering, demand response, distributed energy resources, microgrids, virtual net metering, smart technologies and metering, electric natural gas, appliances, and credit scores. In the transportation sector, we will focus on electric vehicles and charging stations.

Multifaceted and multidimensional problems require attention by a range of stakeholders. Because energy insecurity is a multifaceted problem with multiple dimensions, reducing it will require coordinated and extensive action by many stakeholders, including governments, regulators, companies, community organizations, academia, law firms, market participants, and others.

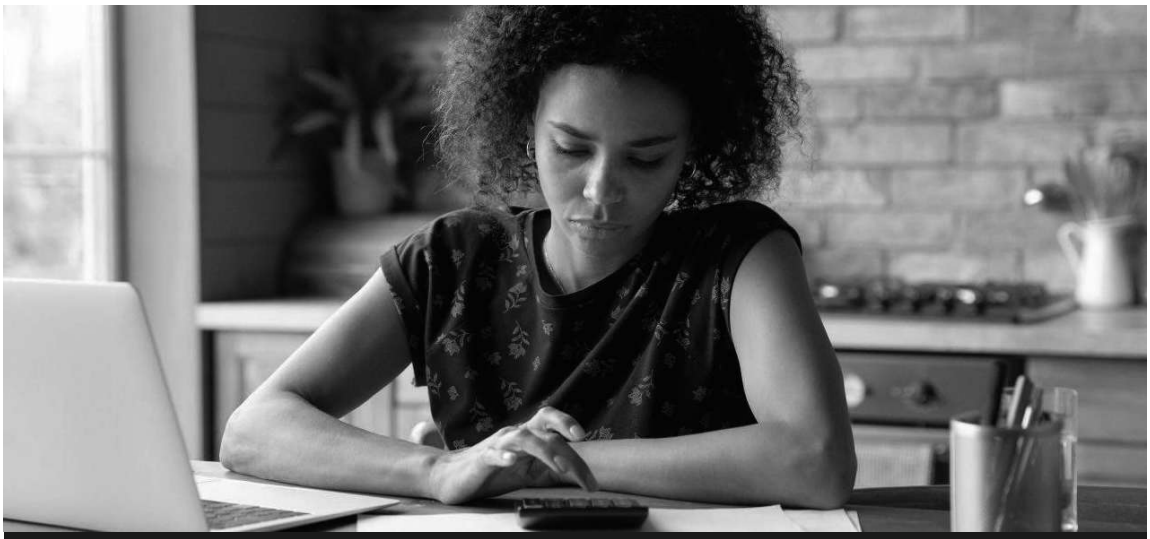
Reducing energy insecurity is a moral imperative. We need your help. Please join us in addressing this issue.

VI. APPENDIX

72. McKinsey puts it this way: "The energy transition is well underway, but how it will unfold in the decades ahead is difficult to predict. Decision makers in government and business face a challenging time planning for a future energy mix that remains unclear." MCKINSEY & CO., GLOBAL ENERGY PERSPECTIVE 2023 – EXECUTIVE SUMMARY (Nov. 21, 2023), https://www.mckinsey.com/industries/oil-and-gas/our-insights/global-energy-perspective-2023.

73. Bill Gates, *Breakthrough Energy Founder Bill Gates on the State of the Energy Transition*, BREAKTHROUGH ENERGY (Nov. 13, 2023), https://breakthroughenergy.org/news/bill-gates-annual-report/.

74. Madeleine Ngo & Ivan Penn*, As Util. Bills Rise, Low-Income Americans Struggle for Access to Clean Energy,* N.Y. TIMES (Jan. 11, 2024), https://www.nytimes.com/2024/01/11/us/politics/utility-bills-clean-energy.html.



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INFOGUIDE

Energy Insecurity Mitigation: The Low Income Home Energy Assistance Program and Other Low-Income Relief Programs in the US

By **Andrea Nishi**, **Dr. Diana Hernández**, and **Michael B. Gerrard**
November 2023

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About the Energy, Equity, Housing and Health Program

The Energy, Equity, Housing and Health (E2H2) Program established by Dr. Diana Hernández is housed in the Department of Sociomedical Sciences at Columbia University's Mailman School of Public Health. The E2H2 Program brings together students, staff, junior scientists, academic collaborators and community partners to advance research, practice and equity-focused policy related to housing and household energy as social and environmental determinants of health.

November 2023

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Acknowledgements

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Acronyms

DHHS – US Department of Health and Human Services

DMP – Detailed Model Plan

FPG – Federal poverty guideline

LIHEAP – Low Income Home Energy Assistance Program

SMI – State's median income

TANF – Temporary Assistance for Needy Families

WAP – Weatherization Assistance Program

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Andrea Nishi is the Climate Justice Fellow at the Sabin Center for Climate Change Law. She graduated from Columbia Law School in 2020.

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Michael B. Gerrard is Andrew Sabin Professor of Professional Practice at Columbia Law School, where he teaches courses on environmental and energy law and founded and directs the Sabin Center for Climate Change Law. He is also a former Chair of the Faculty of Columbia's Earth Institute and holds a joint appointment to the faculty of its successor, the Columbia Climate School. Before joining the Columbia faculty in January 2009, he was partner in charge of the New York office of the Arnold & Porter law firm; he is now Senior Counsel to the firm. He practiced environmental law in New York City full time from 1979 to 2008. His practice involved trying numerous cases and arguing many appeals in federal and state courts and administrative tribunals; handling the environmental aspects of numerous transactions and development projects; and providing regulatory compliance advice to a wide variety of clients in the private and public sectors.

Gerrard was the 2004-2005 chair of the American Bar Association's 10,000-member section of environment, energy, and resources. He also chaired the New York City Bar Association's executive committee and the New York State Bar Association's environmental law section. He has served on the executive committees of the boards of the Environmental Law Institute and the American College of Environmental Lawyers. Several independent rating services ranked Gerrard as the leading environmental lawyer in New York and one of the leading environmental lawyers in the world.

Since 1986, Gerrard has written an environmental law column for the New York Law Journal. He is author or editor of fourteen books, two of which were named Best Law Book of the Year by the Association of American Publishers: Environmental Law Practice Guide (twelve volumes, 1992) and Brownfields Law and Practice (four volumes, 1998). Among his other books are Global Climate Change and U.S. Law (with Jody Freeman and Michael Burger) (3rd ed. 2023); The Law of Environmental Justice (with Sheila Foster) (2nd ed. 2008) The Law of Clean Energy: Efficiency and Renewables (2011); Climate Engineering and the Law: Regulation and Liability for Solar Radiation Management and Carbon Dioxide Removal (with Tracy Hester 2018); and Legal Pathways to Deep Decarbonization in the United States (with John Dernbach, 2019).

He received his B.A. from Columbia University and his J.D. from NYU Law School, where he was a Root Tilden Scholar.

Energy Insecurity Mitigation: The Low Income Home Energy Assistance Program and Other Low-Income Relief Programs in the US

Introduction

Energy insecurity, defined as the "inability to meet basic household energy needs,"[1] can be both a chronic and an acute problem.[2] Chronic energy insecurity manifests as an inability to access or afford adequate supplies of energy, while acute energy insecurity arises when infrastructural, maintenance, environmental, or other external sources disrupt or impede access to energy.[3] A substantial number of individuals and families across the United States experience energy insecurity, which can lead to a variety of adverse consequences including residential instability and poor health outcomes.[4]

Reliable access to home energy is necessary for lighting, heating, and cooling the home, as well as other essential functions like refrigerating and preparing food, heating water, and using electronic or medical devices. In the past several decades, both home energy costs and usage have increased, placing greater financial burdens on low-income households.[5] Variation in energy usage and prices throughout the year can make utility bills unpredictable, making it more difficult for low-income households to stay current with payments. Overdue accounts are subject to disconnection from utility service until any arrears are paid, creating significant hardship for affected households. In order to lower utility costs or avoid a shut-off, a family may keep their home at an unsafe or unhealthy temperature, apply for assistance programs, or forgo other necessities like food or medicine.[6]

The Low Income Home Energy Assistance Program (LIHEAP) is a federal program administered by the Department of Health and Human Services (DHHS) that aims to assist low-income households in meeting their home energy needs. Funds appropriated by Congress are distributed to states, territories, and tribal governments to implement energy affordability programs for low-income households struggling with high energy burdens. In addition to or in combination with LIHEAP, many low-income households are also eligible to participate in utility-run affordability programs or rate discounts that are funded in part by other ratepayers. This paper explores both federal and state administration of LIHEAP, common ratepayer-funded affordability programs, and unique energy access and affordability concerns that arise in rural areas and Native American communities.

LIHEAP

Federal Administration of LIHEAP

LIHEAP is administered as a block grant, allowing states, the District of Columbia, federally recognized tribes, and territories (grantees) to apply for LIHEAP funds and then direct those funds toward eligible households in their jurisdictions. Each grantee has its own energy assistance program funded through LIHEAP, and each jurisdiction is given significant flexibility in how it designs and administers its program.

The amount of funding each grantee receives through LIHEAP every year is determined by the LIHEAP formula, a complex allocation system established by federal statute.[7] Under the current formula, the percentage of funding available to each state is adjusted annually by DHHS to account for changes in energy costs and consumption.[8] The share of LIHEAP funding allocated to each state is based in part on its portion of nationwide low-income household energy expenditures and in part on historical grant amounts.[9]

Each year, states, territories, and tribal governments must apply for LIHEAP funding and submit a Detailed Model Plan (DMP) outlining how the grantee's heating, cooling, crisis, and weatherization assistance programs are administered. Under the LIHEAP statute, the DMP must include 16 specific certifications that govern how the grantee's energy assistance program will operate.[10] These certifications, or "assurances," serve as guardrails for the design and administration of each grantee's energy assistance program, allowing the federal government to impose some uniform requirements for all LIHEAP-funded programs. According to 42 U.S.C. § 8624, grantees must certify, among other things, that they will:

- Use the funds they receive to "provide assistance to low income households in meeting their home energy costs" and "intervene in energy crisis situations";
- Make payments only to households meeting certain criteria laid out in the statute;
- Conduct outreach to eligible households, "especially households with elderly individuals or disabled individuals, or both, and households with high home energy burdens";
- Coordinate their LIHEAP activities with other federal and state assistance programs;
- Provide the highest levels of assistance to households with "the lowest incomes and the highest energy costs or needs in relation to income";
- Not exclude recipients of other government assistance programs from receiving benefits, and will treat owners and renters equitably;

- Use no more than 10 percent of their federal funding for planning and administration; and
- Provide an opportunity for an administrative hearing for applicants whose claims are denied.

Outside of these assurances, states have significant flexibility in designing their programs.[11] For example, grantees can set more restrictive eligibility criteria, determine the level of benefits to be provided, identify agencies to administer the program, and decide whether to disburse benefits through utilities or directly to program participants.[12] However, LIHEAP grantees must certify as part of their annual application that they will "provide a method for public participation in the state plan's development."[13]

Appropriations

LIHEAP is funded by annual appropriations to DHHS, which are then distributed to grantees for the provision of energy assistance through locally administered programs.[14] Because of this funding structure, the amount of money available for grantees can vary year to year, and no level of funding is guaranteed.[15] In fact, the Trump administration proposed a complete elimination of LIHEAP funding for fiscal year (FY) 2018 and 2019 on the grounds that states and utility companies provided sufficient low-income assistance and protection from disconnection.[16] Table 1 illustrates how funding levels have fluctuated in recent years.

Table 1: Annual LIHEAP funding

Fiscal year	Total funding	Block grant appropriation	Additional funding
2017	$3.4 billion	$3.4 billion	N/A
2018	$3.6 billion	$3.6 billion	N/A
2019	$3.7 billion	$3.7 billion	N/A
2020	$4.6 billion	$3.7 billion	$900 million (CARES Act)
2021	$8.2 billion	$3.7 billion	$4.5 billion (American Rescue Plan Act, available through fiscal year 2022)
2022	$3.9 billion	$3.8 billion	$100 million (Infrastructure Investment and Jobs Act)
2023	$6.1 billion	$4.0 billion	$1 billion (Continuing Appropriations Act); $1 billion (Consolidated Appropriations Act); $100 million (Infrastructure Investment and Jobs Act)

Source: LIHEAP and WAP funding, https://liheapch.acf.hhs.gov/Funding/funding.htm.

The most recent year of complete data on the LIHEAP funding breakdown is from FY 2017, when Congress appropriated $3.4 billion for the program and an additional $160 million was carried over from the previous year's unused funds, bringing the year's full funding to $3.5 billion.[17] Since 2017, LIHEAP funding has increased, in part due to federal pandemic assistance programs. Modest funding increases raised the total funding for both 2018 and 2019. LIHEAP received approximately $900 million in supplemental funding through the Coronavirus Aid, Relief, and Economic Security (CARES) Act in 2020, bringing the year's total to roughly $4.7 billion, and a further $4.5 billion in supplemental funding from the American Rescue Plan Act brought the 2021 total to $8.5 billion.[18] Funding returned to pre-pandemic levels in 2022,[19] but rose again in 2023 with $1 billion in supplemental funding that brought the year's total to more than $6 billion.[20]

In general, the vast majority of appropriated funds go directly to program costs. Each year, DHHS distributes more than 99 percent of the regular LIHEAP block grant funding among the states and other jurisdictions that have applied to participate in LIHEAP,[21] reserving the remainder until later in the year.[22] Once these funds have been allocated, grantees are permitted to spend no more than 10 percent of their allocation on administrative costs.[23] Similarly, the LIHEAP statute strongly encourages grantees to maximize the use of their allocations each year. Grantees may request to carry over no more than 10 percent of their allocation from one federal fiscal year to the next,[24] although few states have carryover funds approaching this threshold each year.[25] In the event that a grantee has more than 10 percent of their allocation remaining at the end of the fiscal year, the remaining funds are forfeited to DHHS to be reallocated among all grantees the following year.[26] In 2019, only two states—Ohio and Utah—had funding in excess of the 10 percent they were permitted to carry over to the following year.[27]

State Administration of LIHEAP

Each state runs a low-income energy assistance program that is funded in whole or in part through its LIHEAP allocation.[28] A few states use their LIHEAP allocations to fund multiple energy assistance programs. For example, Florida operates a general LIHEAP program, but also uses its LIHEAP funds for a second program that is exclusively open to elderly people in a small number of counties.[29]

Some states and localities contribute additional funding to these programs. Although comprehensive nationwide data on supplemental state funding is not available for recent years, 23 states provided a total of approximately $250 million in supplementary funding in 2010, with nearly half of this amount coming from New York.[30] Maryland and Michigan each provided more than $40 million in supplemental funding the same year, and Alaska contributed an additional $23 million.[31]

All but five states provide payment directly to utilities for heating assistance, rather than disbursing funds to participant households.[32] While these utility payments are the default in most states, many

jurisdictions have established processes to allow for payment to participant households under certain circumstances, such as when the household makes utility payments to its landlord under a rental agreement or when the household uses wood pellets as its main source of home energy.[33]

Data Source and Analytical Approach

As mentioned above, each LIHEAP grantee submits a *Detailed Model Plan* to DHHS each year to provide a detailed account of how the grantee's LIHEAP funds will be used and how its assistance program will be administered. The DMP must, among other things, describe the eligibility requirements for each type of assistance offered, explain the benefit levels available for each type of assistance, and provide data on the "number and income levels of households which apply and the number which are assisted with funds."[34] Each grantee's 2023 DMP is available through the LIHEAP Clearinghouse.[35]

The sections below explore the wide variations in state administrative approaches, including the different ways in which states determine eligibility and benefit levels for eligible households, as well as barriers to participation that applicants may face. These sections include descriptive statistics obtained via a compilation and summary of the 2023 DMP submitted to DHHS. The summary review examines the DMPs of all 50 states, plus the District of Columbia,[36] to understand the variety of LIHEAP administration models and the prevalence of different program features.

Grantees' responses in the following sections of the DMPs are explored in more detail throughout this paper. Specifically, the authors analyzed:

- **Categorical eligibility (Section 1.4):** This section requires grantees to report whether they consider households categorically eligible for LIHEAP benefits based on at least one member of the household receiving benefits through Temporary Assistance for Needy Families (TANF), Supplemental Security Income (SSI), Supplemental Nutrition Assistance Program (SNAP), or a means-tested veterans program. Grantees that recognize this type of categorical eligibility must also report which benefits programs qualify a household for heating, cooling, crisis, and weatherization assistance.
- **Gross vs. net income (Section 1.8):** This section asks whether the grantee uses gross or net household income for income-based eligibility requirements.
- **Income eligibility (Sections 2.1, 3.1, and 4.1):** These sections cover the grantee's income eligibility thresholds for households of different sizes.
- **Additional eligibility requirements (Sections 2.2, 2.3, 3.2, and 3.3):** These sections address any additional eligibility requirements that grantees may have for heating and cooling assistance,

including whether the grantee uses an asset test or gives priority to households with elderly, disabled, or young residents.

- **Benefit level determination (Sections 2.5 and 3.5):** These sections record the variables that grantees use to determine benefit levels for heating and cooling assistance, including income, household size, and home energy cost or need.
- **Benefit levels (Sections 2.6, 3.6, 4.12, 5.9, and 5.10):** These sections cover the grantee's minimum and maximum benefit levels for heating, cooling, crisis, and weatherization assistance.
- **Payment distribution (Section 9.1):** This section addresses whether the grantee makes payments directly to home energy suppliers for heating, cooling, and crisis assistance.
- **Documentation requirements (Sections 17.2, 17.4, 17.5, and 17.8):** These sections cover the documentation that is required to apply for LIHEAP benefits, including identification, citizenship documentation, income verification, proof of residency, and utility bills.

Many of the descriptive statistics cited throughout this paper are based on jurisdictions' answers to questions that required only binary responses, but some statistics also reflect the authors' interpretation of jurisdictions' responses to questions that required or permitted text-based responses.

Eligibility

In order to receive LIHEAP benefits, a household must meet the eligibility criteria established by the federal LIHEAP statute,[37] as well as any more restrictive criteria established by their grantee jurisdiction.[38] The LIHEAP statute sets out eligibility criteria that all recipient households must meet, which can be broken down into what are known as the "categorical" eligibility criteria and the "income" eligibility criteria.[39] The categorical eligibility criteria permit households in which at least one person receives income from specified state and federal assistance programs, including SNAP, SSI, and TANF, to also receive funding through LIHEAP. Separately, the income eligibility criteria provide that households with incomes at or below 150 percent of the state poverty level or 60 percent of the state median income (with exceptions) may receive LIHEAP benefits. Other criteria, such as asset tests or additional requirements for renters, may also apply.

These federal eligibility criteria establish a ceiling for eligibility, and states are permitted under the LIHEAP statute to set more restrictive criteria. Kansas, for example, limits participation in its heating and cooling assistance program to households at or below 130 percent of the federal poverty level, a lower income threshold than that set by the federal eligibility criteria.[40] However, state income-based criteria cannot exclude households with incomes falling below 110 percent of the federal poverty line solely on the basis of income.[41] Outside of these parameters, states have significant

freedom to establish their own eligibility criteria, including setting different criteria for each type of LIHEAP assistance that they provide. For example, in 2021, "Virginia set its eligibility for heating, cooling, and crisis assistance all at 130% FPL, while setting its eligibility for weatherization at 60% of state median income."[42] This case is somewhat anomalous, though, as most states use the same income criteria for all types of assistance.[43]

The sections below explore state-level eligibility criteria in more detail, breaking these criteria down along the federal lines of categorical and income-based criteria, as well as additional criteria.

Categorical Eligibility

In their DMPs for FY 2023, 45 percent of states identified at least one form of categorical eligibility for LIHEAP assistance.[44] The states that utilize at least one form of categorical eligibility incorporate TANF, SSI, SNAP, or veteran-related benefits at different rates (Table 2).

Table 2: Percentage of states using participation in various benefits programs as categorical eligibility criteria

		Benefit program			
		TANF	SSI	SNAP	Veteran-related
LIHEAP assistance type	Heating	43%	35%	48%	9%
	Cooling	61%	48%	61%	13%
	Crisis	61%	48%	61%	13%

Source: Summary review of 2023 DMPs of all states and Washington, DC.

While categorical eligibility can reduce administrative burdens for both LIHEAP applicants and the government agencies that process applications,[45] a small minority of states that use categorical eligibility criteria allows households to automatically enroll in LIHEAP based on their participation in another assistance program.[46] Only eight states (Kansas, Massachusetts, Michigan, Montana, New York, Oklahoma, South Dakota, and Vermont) provide any type of automatic enrollment based on categorical eligibility, and still most of these states require more than enrollment in another benefits program for automatic enrollment in LIHEAP.[47] While Vermont allows SNAP applicants to automatically enroll in LIHEAP and recertify their eligibility on the same schedule as their SNAP certification, the other seven states impose additional requirements for automatic enrollment. For example, a state may recognize the categorical eligibility of a household only if someone in the household meets an additional requirement, such as a separate age requirement.[48]

Income Eligibility

As mentioned above, in addition to setting categorical eligibility criteria for LIHEAP benefits, the LIHEAP statute also establishes income-based eligibility criteria that grantees may make more restrictive. For the purposes of these criteria, income may be measured in relation to the state's median income (SMI) or the federal poverty guideline (FPG) established by the Department of Health and Human Services. Table 3 breaks down the percentage of states that use each income measure, as well as the threshold that their program sets for income-based eligibility.

Table 3: Percentage of states using various income-based eligibility criteria

		Income threshold for a four-person household				
		< 60% SMI	60% SMI	< 150% FPG	150% FPG	> 150% FPG
LIHEAP assistance type	Heating	2%	59%	8%	24%	6%
	Cooling	0%	62%	6%	28%	3%
	Crisis	2%	59%	4%	27%	8%

Source: Summary review of 2023 DMPs of all states and Washington, DC.

Not only may grantees set thresholds for the level of household income that qualifies for LIHEAP assistance, they also have discretion in how they define and measure income. Overwhelmingly, states use a gross income measurement, although a small number of grantees base eligibility on net income.[49]

There is also significant variation in what grantees count as sources of income for the purposes of LIHEAP eligibility. While all grantees count wages, self-employment income, retirement benefits, and alimony as income, grantees are fairly evenly divided over whether some other sources, such as cash gifts, legal settlements, and insurance payments, count toward a household's income.[50] A minority of grantees consider income tax refunds, work study funding, and income earned by children as part of a household's income.[51] Table 4 breaks down the percentage of states that count different potential streams of income for the purposes of LIHEAP income-based eligibility.

Table 4: Percentage of states counting types of income sources for LIHEAP eligibility

Wages	100%	**Legal settlements**	51%
Self-employment income	100%	**Jury duty compensation**	49%
Retirement benefits	100%	**One-time lump-sum payments**	47%
Alimony	100%	**Insurance payments made directly**	45%
Contract income	98%	**Income from employment through the Workforce Investment Act**	41%
SSA benefits	98%	**Funds received for foster children**	37%
Rental Income	98%	**Work study**	29%
Unemployment Insurance	96%	**Stipends from companion programs**	14%
SSI	96%	**Ameri-Corp**	12%
Veterans Administration benefits	94%	**Income of child under 18**	10%
Child support	92%	**Certain other insurance payments**	8%
Strike pay	90%	**Income tax refunds**	8%
Interest, dividends, or royalties	90%	**Savings account**	6%
Commissions	88%	**Reimbursement**	4%
TANF	76%	**SNAP**	2%
General assistance benefits	65%	**Loans**	2%
Payments from mortgage contracts	59%	**Balance of retirement account**	2%
Cash gifts	59%	**Women, Infants, and Children Supplemental Nutrition Program benefits**	0%

Source: Summary review of 2023 DMPs of all states and Washington, DC.

Additional Criteria

While the LIHEAP statute only lays out eligibility criteria based on household income or participation in another benefits program, grantees have the ability to further restrict eligibility based on criteria that fall outside these two categories. A majority of states imposes at least one additional requirement for eligibility.[52]

For heating assistance, 59 percent of states use additional criteria to determine eligibility.[53] Of those jurisdictions:

- 10 percent use an asset test. For example, households in Arkansas can qualify for heating assistance only if they have $2,250 or less in assets, unless they have at least one member over the age of 60, in which case the threshold is $3,250.[54]
- 53 percent have additional requirements for renters in subsidized housing. For example, Maryland requires these renters to provide evidence that they are responsible for their own heating costs in order to receive heating assistance.[55]
- 53 percent have additional requirements for renters with utilities included in the rent. For example, in Illinois these renters are eligible for heating assistance only if their rent is greater than 30 percent of their income for at least 30 days prior to their application for benefits.[56]

Of the states that provide cooling assistance, 40 percent use additional eligibility criteria.[57] Of those jurisdictions:

- 25 percent use an asset test.
- 33 percent have additional requirements for renters in subsidized housing.
- 42 percent have additional requirements for renters with utilities included in the rent.

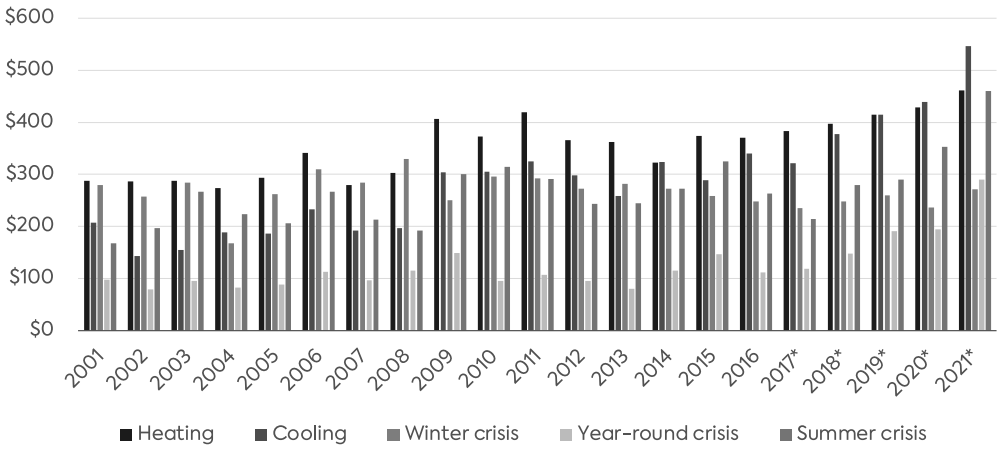
Additionally, many grantees expressly prioritize certain groups in their eligibility determinations.[58] Households with elderly or disabled members are prioritized by the most states: the elderly receive priority for heating assistance in 71 percent of states and for cooling assistance in 83 percent of states, and households with at least one disabled member are prioritized for heating assistance in 71 percent of states and for cooling assistance in 73 percent of states.[59] Households with young children are also commonly prioritized, with 59 percent of states prioritizing them for heating benefits and 73 percent of states prioritizing them for cooling benefits.[60] Finally, 37 percent of states prioritize households with high energy burdens for heating assistance, and 46 percent prioritize such households for cooling assistance.[61]

Benefit Levels

There are four categories of LIHEAP assistance: heating, cooling, weatherization, and crisis assistance, which can itself be distributed in the form of heating, cooling, or other assistance (see Figure 1 and "Types of Assistance" below). Each grantee sets its own eligibility criteria and minimum and maximum benefit levels for each category of assistance. For FY 2023, grantees' median minimum amount of heating assistance was approximately $200, while the median maximum for

heating assistance was about $1,200.[62] For cooling assistance, the median minimum was roughly $200 and the median maximum was approximately $800.[63] For crisis assistance, the median maximum benefit was $750.[64] Most states do not set a maximum weatherization benefit, but for the 17 states that do, the median maximum was $10,000.[65] These benefit levels are dependent on federal appropriations, which vary from year to year. Of the $3.5 billion appropriated for LIHEAP in FY 2017, approximately 50.6 percent ($1.8 billion) was used for heating assistance, 6.7 percent ($233 million) for cooling assistance, and 16.5 percent ($575 million) for crisis assistance.[66]

Figure 1: Average household benefits, 2001–21



Note: Data for years marked with an asterisk are preliminary pending final data validation.
Source: LIHEAP Performance Measurement website, https://liheappm.acf.hhs.gov.

Separate from establishing their own LIHEAP eligibility requirements, grantees can set unique criteria for determining the level of benefits that an eligible household receives. States determine how to distribute funds among households that qualify,[67] although the LIHEAP statute requires states to prioritize households with the lowest incomes and the highest energy burdens in their outreach and distribution of funds.[68] For heating benefits, all states take income and household size into account, while 96 percent also consider home energy cost or need.[69] Similarly, every state that offers cooling assistance considers income and household size when setting a recipient's benefit levels, and 93 percent consider home energy cost or need.[70] Table 5 breaks down how different states assess energy cost or need.

Table 5: Percentage of states considering various factors when assessing energy cost or need for heating and cooling assistance

Factor	Percentage of states considering factor for heating assistance	Percentage of states considering factor for cooling assistance
Fuel Type	80%	43%
Energy Burden	49%	43%
Dwelling Type	45%	20%
Individual Bill	40%	53%
Climate/Region	29%	7%
Energy Need[71]	22%	37%

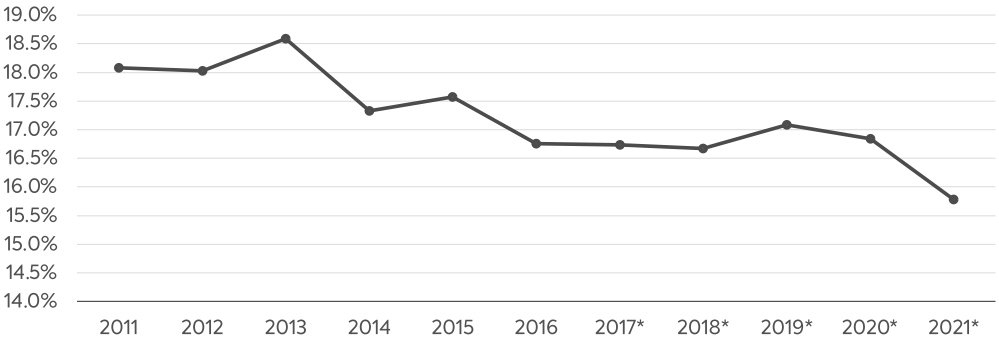
Note: "Energy need" is defined in the LIHEAP statute to "tak[e] into account both the energy burden of such household and the unique situation of such household that results from having members of vulnerable populations, including very young children, individuals with disabilities, and frail older individuals." 42 U.S.C. § 8622.

Source: Summary review of 2023 DMPs of all states and Washington, DC.

Barriers to Participation

Between 2011 and 2021, only about 15–20 percent of households meeting federal eligibility criteria received LIHEAP funding (Figure 2).[72] This rate is down significantly from when LIHEAP began in 1981 and the participation rate was about 36 percent.[73] However, even a participation rate of 36 percent is extremely low compared to other federal benefits programs like SNAP, which has an average participation rate above 80 percent.[74]

Figure 2: Percentage of income-eligible households served by LIHEAP, 2011–21



Note: Data for years marked with an asterisk are preliminary pending final data validation.
Source: LIHEAP Performance Measurement website, https://liheappm.acf.hhs.gov.

Given the block-grant nature of LIHEAP, there is substantial variation between grantees in their application processes, as well as the processes they use for determining eligibility and benefit levels, making it difficult to identify the precise cause of the program's low participation rate on a national level. The low levels of participation are likely based on a combination of factors operating at both the state and federal levels.

One partial explanation for low participation rates may be that some grantees have imposed application processes or requirements that discourage or prevent eligible households from receiving funding. Although the LIHEAP statute requires grantees to provide applicants with the opportunity to appeal the denial of their application, the statute provides limited safeguards against burdensome application processes that may prevent an otherwise eligible household from successfully submitting an application at all.[75] The application process in some jurisdictions includes in-person filing or meeting requirements, which can be challenging for people living in remote or sparsely populated areas. For example, Maine's LIHEAP program requires applicants to attend an in-person meeting before they can apply, meaning that applicants from Maine's island communities must make a ferry trip to the mainland in order to apply for benefits.[76] Similarly, grantees may require applicants to provide various forms of identification (Table 6), proof of immigration and residency status (Table 7), specific income-related documentation (Table 8), and other documents (Table 9) before their application can be reviewed. As providing these documents could be burdensome or impossible for some households, categorical eligibility criteria could help reduce some of the administrative burden for both applicants and administrators.[77]

Table 6: Percentage of states requiring various forms of identification

	Applicant only	All adults in household	All household members
Social Security Card photocopy & retention	14%	14%	20%
Social Security number (without actual card)	24%	25%	53%
Government-issued identification card	45%	14%	10%

Source: Summary review of 2023 DMPs of all states and Washington, DC.

Table 7: Percentage of states requiring documentation of citizenship or legal residency

Noncitizens must provide documentation of immigration status	78%
Applicants' submission of Social Security cards accepted as proof of legal residency	59%
Applicants' signed attestation of citizenship or legal residency	45%
Citizens provide birth certificate, naturalization papers, or passport	22%

Source: Summary review of 2023 DMPs of all states and Washington, DC.

Table 8: Percentage of states requiring specific documents for income verification

Documentation of income for all adult household members	100%
Pay stubs	100%
Social Security award letters	100%
Unemployment insurance letters	100%
Social Security award letters	90%
Zero-income statements	90%
Bank statements	69%

Source: Summary review of 2023 DMPs of all states and Washington, DC.

Table 9: Percentage of states requiring other eligibility documentation

Current utility bill	90%
Proof of physical residency	73%

Source: Summary review of 2023 DMPs of all states and Washington, DC.

LIHEAP funding levels may inhibit access to the program's benefits because those funding levels could limit the number of eligible cases grantees can support or encourage grantees to implement more restrictive eligibility requirements. Because grantees are not required to provide funding to all households that meet their eligibility criteria, "simply being eligible for LIHEAP does not entitle a household to LIHEAP benefits."[78]

First, there may simply not be enough funding available for states to provide benefits to all eligible households. As DHHS explains on its website, "Being qualified for LIHEAP does not guarantee that you will receive help. ... Quite often, states, tribes, and territories run out of LIHEAP money before they have served everyone that is eligible."[79] As energy costs rise and extreme weather increases household energy usage, some grantees are encountering earlier and more severe funding shortages.[80] When grantees run out of funding before the close of their annual application cycle, they are forced to stop accepting new applications and turn away otherwise eligible households.[81]

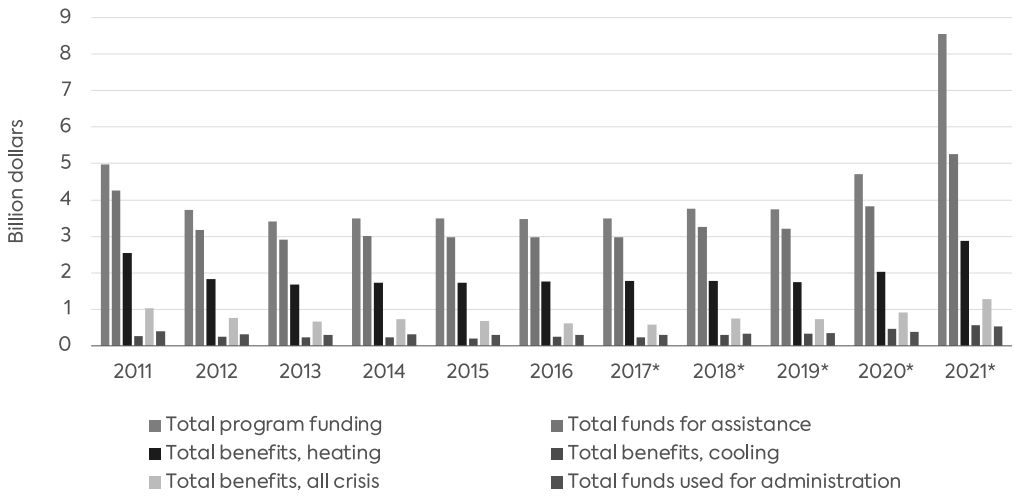
Second, insufficient funding at the federal level can also lower the overall program participation rate by placing pressure on grantees to impose more restrictive eligibility requirements. As grantees are permitted to restrict eligibility beyond the minimum eligibility standards set by the federal LIHEAP statute, the participation rate of households meeting the federal eligibility criteria will never be 100 percent.[82] Because the formula for allocating funds between grantees does not take account of participation rates, grantees are not incentivized to ensure that funding reaches all federally eligible households or even all households eligible under their own more restrictive criteria.[83] In light of the federal funding shortfall, grantees face a policy tradeoff between maximizing the number of households that receive funding and maximizing the level of benefits that each participating household receives, with many states opting to provide a higher level of benefits to a smaller number of households.[84] This dilemma is discussed in more detail below, in the section entitled LIHEAP Efficacy and Impact.

Types of Assistance

LIHEAP funds must be used to "provide assistance to low income households in meeting their home energy costs," "intervene in energy crisis situations," and "provide low-cost residential weatherization and other cost-effective energy-related home repair," in addition to conducting outreach and other administrative activities.[85] As a result, funding provided through LIHEAP can generally be broken into four categories: weatherization assistance, crisis assistance, and home energy assistance, which is defined as "a source of heating or cooling in residential dwellings"[86] and further broken down into heating and cooling assistance. The statute's broad definition of "home energy" means that a wide variety of residential heating and cooling fuels are eligible for LIHEAP funding, including electricity, natural gas, heating oil, kerosene, propane, and wood.[87]

While the majority of LIHEAP is used to provide heating assistance (Figure 3), unique issues related to crisis assistance and cooling assistance are explored below; weatherization assistance falls largely beyond the scope of this paper.

Figure 3: Allocation of LIHEAP funding, 2011–21

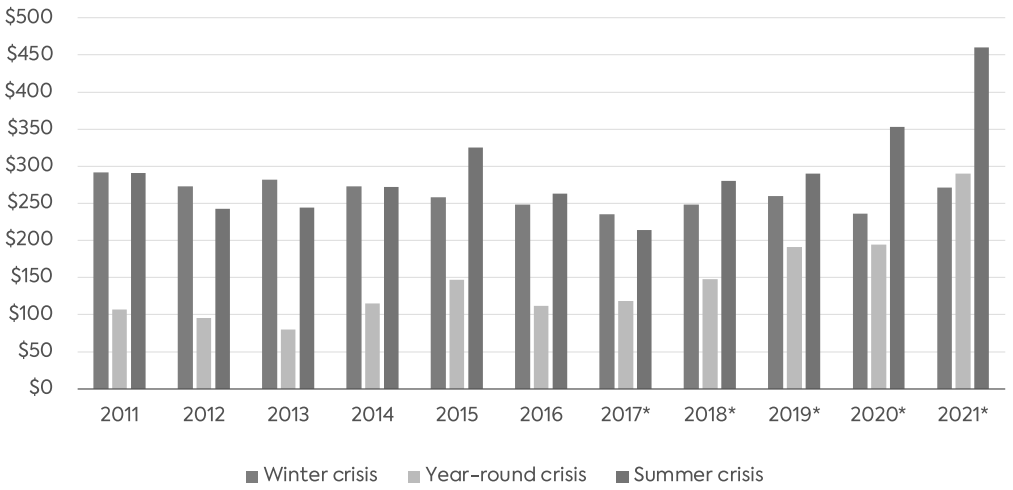


Note: Data for years marked with an asterisk are preliminary pending final data validation.
Source: LIHEAP Performance Measurement website, https://liheappm.acf.hhs.gov.

Crisis Assistance

In addition to the home energy assistance that grantees are required to provide, the LIHEAP statute requires grantees to reserve a "reasonable amount" of their funding through March 15 each year for an "energy crisis intervention" program.[88] This program must provide assistance to eligible households to resolve an energy crisis within 48 hours of the household's application, or within 18 hours in the case of a life-threatening situation, though these requirements are relaxed in the case of a natural disaster.[89] While the statute does not define what constitutes a "reasonable amount" of funding for a grantee to reserve for crisis assistance, approximately 21 percent of LIHEAP funding distributed each year falls under this category, and is distributed in the form of summer, winter, and year-round crisis assistance (Figure 4).[90]

Figure 4: Average household crisis benefits, 2011–21



Note: Data for years marked with an asterisk are preliminary pending final data validation.
Source: LIHEAP Performance Measurement website, https://liheappm.acf.hhs.gov.

The statute defines "energy crisis" as "weather-related and supply shortage emergencies and other household energy-related emergencies."[91] Because this definition is very broad, grantees have significant flexibility in determining what constitutes an energy crisis or life-threatening situation.

Each grantee must provide its definition of these terms as part of its DMP each year, giving DHHS some oversight of the way these terms are defined.

Many states' energy crisis definitions include situations in which households are imminently at risk of losing energy access as a result of non-payment, equipment failure, or limited fuel supply.[92] A selection of "energy crisis" (Table 10) and "life-threatening situation" (Table 11) definitions is available below.

Table 10: Selection of energy crisis definitions

Arizona	"A crisis exists when a household faces an energy burden that depletes or threatens to deplete financial resources, or which poses potential health and/or safety threat to the well-being of the household." This includes when any of the following occur: • "The household has received a shutoff or eviction notice (when included in the rent) and/or is pending loss of energy" • "The Standard LIHEAP benefit does not pay the full amount of the Applicant's bill" • "The Household utilizes portable fuel or pre-pay utility service and has 7 days or less of energy available"
Georgia	"A crisis is determined when a low-income household is facing imminent disconnection within 7 calendar days and/or needs restoration of their heating or cooling fuel source. A crisis may also result from a weather related emergency, which affects all, or a specific area of the state."
New Jersey	"Crisis Assistance is deemed necessary when a household is in danger of running out of fuel or where a client receives a shutoff notice from their utility company. This crisis must be resolved within 48 hours."
Virginia	"The Crisis Assistance component is designed to help households meet energy emergencies that cannot be met by other resources. The emergency may result from a weather related or supply shortage emergency such as: no source of heat; the only heating equipment in the home is inoperable or unsafe; or there is a potential no heat situation. Crisis Assistance will be provided when the conditions for providing assistance are met and the assistance will ensure heat for the household. Crisis Assistance intervention must resolve the energy crisis of eligible applicants within 48 hours, or 18 hours if in a life threatening situation. Assistance with the purchase of primary fuel and the payment of the primary utility bills is provided to households who did not receive Heating Assistance or who have exhausted their heating benefit."

Source: Authors' analysis of Arizona, Georgia, New Jersey, and Virginia 2023 DMPs.[93]

Table 11: Selection of life-threatening situation definitions

Arizona	"A client is considered to be in a life-threatening crisis when one of the following situations exists: The termination of power or exposure to heat or cold would be dangerous to the health of a household member, as evidenced by a statement from a licensed medical physician; Life supporting equipment used in the home is dependent on utility service for the operation of such apparatus."
Georgia	"A life-threatening situation is one where by there is a life threatening medical condition that exists that could be intensified if a crisis energy assistance applicant is without energy service. It must be validated by a medical professional such as a physician, public health official, licensed practitioner of the healing arts, or a county health director."
New Jersey	"A life threatening crisis exists when a household has no fuel and/or has been shut off by their utility company. This type of crisis must be addressed within 18 hours."
Virginia	"A crisis situation is considered life-threatening if 1) the temperature is projected to be 32 degrees or less and 2) the household includes at least one vulnerable person (an individual who is under age six, age 60 or over, or disabled). Temperatures of 32 degrees or less for the current and following day are established by verifying the projected temperature through a weather service (The Weather Channel etc)."

Source: Authors' analysis of Arizona, Georgia, New Jersey, and Virginia 2023 DMPs.[94]

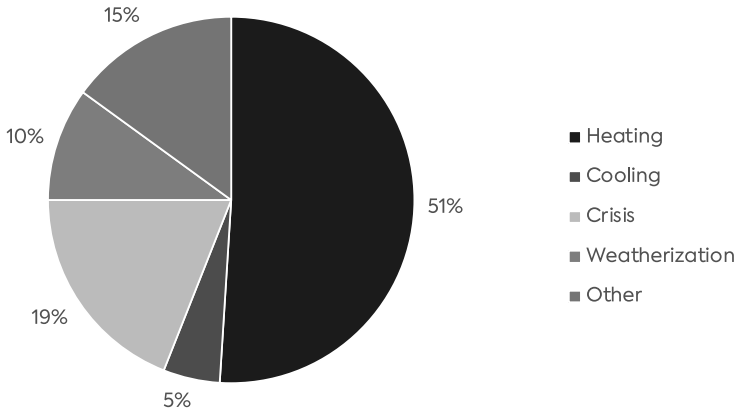
Cooling Assistance

Extreme heat kills hundreds of people in the United States each year,[95] and average temperatures nationwide are expected to rise by as much as 8 degrees Fahrenheit in some areas by 2100.[96] Before the end of this century, most Americans will experience more than 25 days of temperatures exceeding 90 degrees Fahrenheit each year.[97] The availability of cooling assistance under LIHEAP will likely increase in importance as global temperatures have been rising—the past eight years have been the warmest eight years in recorded history.[98]

During periods of high heat, access to air-conditioning can be a matter of life or death: a survey of heat-related deaths in Maricopa County, Arizona, found that approximately 20 percent of indoor heat-related deaths occurred in residences with no air-conditioning unit.[99] In cases where an air conditioner was present, the units were nonfunctioning more than 50 percent of the time.[100] While these statistics highlight the need for affordable access to air-conditioning units and maintenance, the study also found that approximately 13 percent of residences with air-conditioning units had been disconnected from their electricity service, and 34 percent of homes had not been running their air-conditioning when the death occurred, possibly out of a need to save money.[101]

Although the LIHEAP statute allows grantees to use their funds for home heating and cooling assistance, grantees are not required to cover both.[102] As noted above, all 50 states and the District of Columbia provide heating assistance with their LIHEAP funds, but fewer than half of these jurisdictions also use their funding to provide cooling assistance.[103] As of 2020, 23 states provided cooling assistance,[104] a figure that has risen from only 16 states in 2007.[105] Even with more states offering cooling assistance, only a small portion of LIHEAP funding actually goes toward residential cooling costs (Figure 5). Even in the Southeast, where temperatures are generally higher year round, 14 percent of funding has gone toward cooling while 38 percent went toward heating.[106]

Figure 5: Percentage of LIHEAP funds used by assistance type, 2001–19



Source: Scott Bechler, "How a Decades-Old Federal Energy Assistance Program Functions in Practice: A Deep Dive into LIHEAP" (2021), https://nicholasinstitute.duke.edu/sites/default/files/publications/How-a-Decades-Old-Federal-Energy-Assistance-Program-Functions-in-Practice-A-Deep-Dive-into-LIHEAP.pdf.

This disparity is partially explained by the history of the LIHEAP formula.[107] When LIHEAP first began in the early 1980s, the original formula heavily favored cold-weather states due to the heating oil crisis from which the program emerged.[108] This context contributed to a formula that limited the funding available for states where the affordability of cooling is a greater concern. In 1984, Congress introduced a new formula to address this issue by allocating funding based on "the ratio of energy expenditures of the state's low-income households to the energy expenditures of all low-income households in the country."[109] These changes are codified in the LIHEAP statute, and the formula can be altered only through further congressional action.

This formula, which is still referred to as the "new" LIHEAP formula nearly 40 years after its introduction, is intended to distribute funds more equitably between warm- and cold-weather states, and weighs state cooling and heating programs equally.[110] However, the "new" formula also includes provisions to ensure that states do not lose significant funding as a result of the formula change, so the "old" formula still applies to roughly the first $2 billion in LIHEAP funding allocated each year.[111] As a result, cold-weather states are still favored in the distribution of a significant portion of LIHEAP funding, leading to a continued underprovision of cooling assistance.

In addition to the general disparity in funding for cooling assistance compared to heating assistance, the current structure and administration of LIHEAP does not account for the more recent and growing need for air-conditioning in the context of rising temperatures. First, many northern states provide no cooling assistance under LIHEAP, and many of their residents lack air conditioners.[112] As of 2020, fewer than 70 percent of households in Washington, Vermont, and Montana had air-conditioning.[113] As northern states face increasing numbers of high heat days,[114] more households will need to obtain and regularly use air conditioners, both of which can be unaffordable for low-income households.

A number of states, including Mississippi and Nebraska, use LIHEAP funding to cover expenses related to both purchasing and running air conditioners.[115] However, some states, including New York, provide LIHEAP funding for the purchase of air-conditioning units but provide no assistance in covering the cost of running them.[116] Even for households that can afford to purchase an air conditioner, the operating costs can be prohibitively expensive, with the National Energy Assistance Directors Association estimating that households running air conditioners would spend an average of $540 on summer cooling in 2022.[117] In Nebraska, a state that provides assistance both for the purchase of an air conditioner and for the costs of running the air conditioner, receipt of a LIHEAP-funded air conditioner within the past four years is one of the additional criteria that can help a household qualify for cooling assistance.[118] States may also provide crisis assistance funding to households at risk of losing access to cooling "due to problems with equipment, receipt of a utility shutoff notice, or exhaustion of a fuel supply."[119]

LIHEAP Efficacy and Impact

Due to the block-grant nature of LIHEAP, assessing the efficacy of the program on a national scale is difficult,[120] and few detailed studies have been undertaken to evaluate its efficacy.[121] As the LIHEAP statute gives flexibility to each grantee in structuring its program, program design varies significantly from state to state.[122] Moreover, data collection and any necessary waivers for that collection are also handled by states, so performance measurement is not always uniform across all grantees.[123] This level of variation across programs means that nationwide statistics may obscure

nuance and noteworthy information related to the performance of programs in different states.

To combat this evaluation problem, the federal government has increased its efforts to collect standardized data on the program from grantees.[124] In 2014, DHHS began collecting and reporting on four performance metrics:[125]

- Benefit Targeting Index, which "demonstrates whether your state is giving higher benefits to higher burden households";[126]
- Burden Reduction Targeting Index, which "shows how burden reduction for your high burden households compares to the burden reduction for the average recipient";[127]
- Service Restoration, which reflects "how many clients had service restored by LIHEAP";[128] and
- Service Loss Prevention, which "shows the number of clients who would have lost service if not for your intervention with LIHEAP funds."[129]

Grantees report these performance metrics in their annual DMP submissions, along with information on their data collection practices and plans.[130]

Distributing Funds to Energy Insecure Households

One metric for assessing the efficacy of LIHEAP is the extent to which appropriated funds actually reach energy insecure households across the country. Several aspects of the LIHEAP statute encourage grantees to distribute funding efficiently, even if they are not able to reach all federally eligible households. The LIHEAP statute prohibits states from spending more than a small percentage of their grant on administrative costs,[131] so the vast majority of funds appropriated for LIHEAP go toward direct benefits for program participants. At the same time, the LIHEAP statute's limitations on carryover funding encourage grantees to use as much of their allocation as possible each year. For example, in FY 2017, only $160 million of the total $3.5 billion LIHEAP allocation was carried over from the previous year,[132] suggesting that grantees used nearly all of the funds they received.

Reducing Energy Burdens

Another metric for assessing LIHEAP's efficacy is the impact it has on reducing energy burdens for eligible households. The most recent report to Congress on LIHEAP, in 2017, stated that "[t]he percentage of household heating expenditures offset by LIHEAP benefits decreased from 79.6 percent in FY 2016 to 73.7 percent in FY 2017." However, this nationwide statistic obscures many variations in the ways that grantees distribute benefits. The LIHEAP statute does not require grantees to provide a specific level of benefits to any eligible household, or even to provide benefits to all eligible households. As a result, the portion of total utility expenses covered by LIHEAP varies

from state to state, as well as within states that provide tiered benefits to different households.

When determining the level of benefits to provide to eligible households, grantees are faced with a choice between giving greater funding to a smaller pool of recipients or distributing less funding to a larger number of households.[133] States that provide a higher amount to fewer eligible households include Florida, Mississippi, and South Carolina,[134] while Arkansas, Kentucky, North Carolina, and West Virginia[135] generally provide a lower level of funding to more recipients.

The different approaches taken by Florida and North Carolina capture the two sides of this policy choice. In 2019, both states received roughly $100 million in LIHEAP funding, although it is worth noting that the population of Florida is roughly twice that of North Carolina. The two states received similar allocations, but Florida provided its LIHEAP participants with an average benefit of $944, while North Carolina provided an average benefit of $254.[136] While Florida's average benefit was more than three times higher than North Carolina's, it served only 6.3 percent of its 1,684,340 eligible households, compared to North Carolina, which served 16.8 percent of its 754,753 eligible households.[137] This funding reduced the average Florida participant's energy burden from 15.50 percent to 11.27 percent, whereas the average North Carolina participant's energy burden decreased from 12.81 percent to 10.46 percent as a result of LIHEAP funding.[138]

Targeting Energy Burdened Households

A further metric for evaluating LIHEAP's efficacy is the extent to which program funding flows to the households with the lowest incomes and the highest energy burdens. While studies have found that participation in LIHEAP reduces household energy insecurity, researchers have noted that the program would be more successful with better targeting of and more focused outreach to low-income households.[139] One study also found that LIHEAP tends to benefit "marginally energy-insecure households more than the severely energy insecure."[140] This finding runs contrary to the LIHEAP statute's requirement that grantees "ensure that households with the lowest incomes, together with the highest home energy need in relation to income, receive the highest level of assistance."[141] Despite this directive, households with greater resources may inevitably be better able to navigate the administrative aspects of applying because of those resources.[142]

Federally determined funding that does not keep pace with energy costs is a limitation on the efficacy of LIHEAP: energy costs are generally rising around the globe, increasing energy burdens on many low-income households.[143] Many grantees receive insufficient funds to serve all eligible households, and as energy costs rise, grantees will need increased funding in order to maintain even the current reach of their programs.[144] Although President Biden's proposed FY 2024 LIHEAP budget includes a $111 million increase in LIHEAP funding over FY 2023, this increase is intended to help

provide water bill assistance to low-income households following the expiration of the Low Income Household Water Assistance Program.[145]

As the foregoing discussion illustrates, LIHEAP provides meaningful energy assistance to low-income households across the country, but its reach and efficacy are limited due in large part to funding. While the variation in program design among states makes it difficult to draw universal conclusions about LIHEAP's efficacy, the flexibility afforded to LIHEAP grantees allows each jurisdiction to tailor its program to meet its unique needs and policy objectives. Without increased funding at the federal level, though, LIHEAP will not be able to fully alleviate energy insecurity for all low-income households in the US. The following section discusses ratepayer-funded affordability programs administered by utilities, which often work with or alongside LIHEAP to provide additional energy assistance.

Utility Rate Designs and Discount Programs to Promote Energy Affordability

Overview of Programs

In addition to LIHEAP and other assistance programs administered at the state or federal level, ratepayer-funded affordability programs administered by utilities make up a significant portion of energy affordability programs in the United States. Currently, utilities in at least 30 states operate at least one ratepayer-funded bill assistance program.[146] These programs include an enormous variety of designs and structures, including different funding models, eligibility criteria, target populations, and benefits.[147] Especially when combined with LIHEAP participation, ratepayer-funded utility assistance programs can significantly lower household energy burdens. The most common ratepayer-funded structures are percentage of income payment plans (PIPPs), flat percentage discounts, and tiered discounts.[148] These and other common structures are explored in Table 12, with example programs noted in the footnotes; PIPPs and prepaid metering will be discussed in greater detail below.

Table 12: Common Ratepayer-Funded Energy Affordability Program Structures

Percentage of Income Payment Plan (PIPP)	Payments are capped at predetermined percentage of household income,[149] which may be a flat percentage for all participants or tiered based on income level or other factors.
Set percentage discounts	Bills are reduced by a set percentage, which may be universal across program participants[150] or tiered based on income level or other factors.[151]
Set bill credits	Bills are offset by a set credit amount, which may be universal across program participants[152] or tiered based on income level or other factors.[153]
Usage-based programs	Programs can include: • Monthly payments based on average usage;[154] • Tiered discounts based on usage;[155] • Discounted rates applied to consumption.[156]
Arrearage forgiveness	Existing customer debt is erased through participation.[157] Programs can operate as gradual forgiveness based on timely bill payments or one-time full forgiveness.[158] Forgiveness may occur gradually over the course of program participation. [159] In addition to arrearage forgiveness that is built into a utility's low-income assistance program, many states offered one-time utility debt forgiveness during the COVID-19 pandemic.[160]

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Waiver or reduction in fees	Can include reduction or waiver of service charges[161] or reduced minimum bills.[162]
Round-up programs	Utilities may allow customers to "round up" their monthly bill to the next whole dollar, with the additional money being added to a program fund to provide assistance to households that are struggling to pay their bills.[163]
Prepaid metering	Customers pay in advance for service, which typically is disconnected when prepaid balance reaches zero.[164]

Source: Authors' analysis.

Some programs combine multiple features from the common structures outlined above, and some utilities also offer multiple programs. For example, many utilities in California offer both the California Alternate Rates for Energy (CARE) program, which provides a 20 percent discount on gas and electricity for households that meet certain income requirements or are enrolled in specific benefits programs, and the Family Electric Rate Assistance program, which gives households of three or more residents an 18 percent discount on electricity if they meet certain income requirements.[165]

The enrollment criteria for ratepayer-funded affordability programs differ greatly across programs, but may be based on income, energy burden, participation in government benefits programs, age, disability, household size, medical necessity, or other factors. Programs that allow applicants to self-certify for enrollment, like California's CARE program, can reduce administrative burdens.[166] Similarly, some states, like New Jersey, automatically enroll households that participate in other benefits programs.[167] Programs that use "categorical" eligibility criteria such as participation in specific government assistance programs like TANF, SSI, or LIHEAP generally pose a lower administrative burden for both applicants and administrators, which can increase participation. Although the use of categorical eligibility in utility-run affordability programs can allow utilities to avoid undertaking burdensome income verification, participation in TANF, SSI, LIHEAP, or another assistance program is not always a reliable stand-in for income level, particularly in light of the low levels of participation in LIHEAP.

On top of any eligibility criteria, utility-run affordability programs often have additional limits on participation, which can include restricting program participation to a set number of customers, allowing households to participate only for a certain number of months,[168] or applying reduced rates to only a certain amount of usage.[169] Some utilities will also make program participation contingent on the customer making on-time monthly payments,[170] which can be a major barrier to participation for low-income households, even when the program reduces their monthly payment

requirements. Households may similarly struggle to enroll or maintain their participation due to limited enrollment periods,[171] existing arrearages,[172] limitations on re-enrollment for previous participants,[173] or limits on the duration of benefit periods.

State Laws and Affordability Programs

Many states have established laws, either by legislation or regulation through the public utility commission, mandating that regulated utilities establish affordability programs.
Some examples include:

- Pennsylvania's Public Utility Commission requires utility companies to run a variety of programs that help low-income customers maintain their service.[174] These programs include budget billing to stabilize monthly bill amounts, customer assistance programs to lower monthly bills based on household size and income, energy conservation assistance, and hardship funding for customers whose needs are not met by other assistance programs.
- Minnesota's Cold Weather Rule requires utilities to set up reasonable payment plans for low-income customers struggling to pay their bills during the winter.[175] This rule applies to both gas and electric utilities, which are required to work with customers to establish a payment plan that is reasonable in light of the household's unique financial circumstances.
- Connecticut law establishes a utility-run arrearage forgiveness program.[176] This program allows income-eligible gas and electric customers to have the amount of their monthly payment, including any assistance they receive from the state's energy assistance program, deducted from the arrearage of their account pursuant to an amortization agreement with the utility.
- Nevada state law establishes a statewide ratepayer-funded utility discount program to reduce energy burdens through the imposition of a universal energy charge.[177] Eligible households receive assistance calculated to reduce their energy expenditures to "the median percentage of household income spent on natural gas and electricity statewide."
- Maine state law set an early example by explicitly authorizing the development of affordability programs in 1990 after the Maine Public Utility Commission rejected Central Maine Power Co.'s program proposal due to a perceived lack of jurisdiction.[178] In response, the 1990 legislation required the commission to order utilities to develop plans for special rates or bill assistance programs for low-income customers. Legislative changes in 1997 required the commission to establish a statewide assistance program that would apply to a larger group of electric utilities.

Common and Noteworthy Program Types

Percent of Income Payment Plans

Percentage of income payment plans (PIPPs) are payment programs designed to reduce household energy costs by capping utility bills at a set percentage of household income. Energy costs that exceed the established percentage of the consumer's income are typically covered by LIHEAP funds to the extent possible, then by other ratepayers.[179] In addition to keeping utility costs down for low-income consumers, PIPPs protect consumers from increases in utility rates by tying the consumer's financial obligation to income rather than to usage.

Although PIPPs are typically administered by utilities as ratepayer-funded affordability programs, the development of these programs is often influenced by state law. In some instances, states have incorporated a PIPP-like structure directly into their own energy assistance programs rather than relying on utilities to implement these programs, although this strategy is uncommon. In Nevada, for example, the state-run energy assistance program includes a credit of up to $240 per household that is intended to reduce the household's energy burden to a uniform percentage.[180]

Many researchers see PIPPs as a promising model for reducing home energy burdens, particularly in the face of rising energy costs,[181] and efforts are underway in several states to pass legislation mandating that utilities develop and implement PIPPs for low-income households. For example, the George Wiley Center in Rhode Island is advocating for the adoption of a state law that would allow the state's largest utilities to develop PIPPs capping energy expenses at approximately 3–6 percent for low-income households;[182] although the state legislature failed to pass the bill in 2022, advocacy efforts are ongoing.[183] While PIPPs have widespread support, some experts have noted that they are administratively more complicated than other energy affordability programs.[184] They may also provide lower levels of benefits for some households when compared to affordability programs that would reduce a household's energy burden below the threshold that is used for the PIPP.[185]

Utilities in several states,[186] including Colorado, Illinois, Maine, Nevada, New Jersey, Ohio, and Pennsylvania, have established PIPPs,[187] while the development of new PIPPs is underway in others, including New York.[188] These programs are often created pursuant to state requirements, but utilities may also establish PIPPs independent of any requirement in state law. Table 13 explores PIPPs in several states and provides information on the percentage of household income that each program uses as a cap on the responsibility of plan participants, explains any basis the program has in state law, and highlights other noteworthy aspects of the PIPP.

Table 13: PIPP examples

State	Maximum percentage of income that customer must pay	Relation to state law and other notes
CA	4%[189]	California's PUC has mandated that investor-owned utilities establish four-year pilot PIPPs.[190] These pilot programs are limited to customers who have experienced two or more disconnections in one year prior to the state's disconnection moratorium, or who reside in one of the zip codes with the highest rates of recurring disconnections. Participants must also be enrolled in the California Alternate Rates for Energy program, which provides discounted rates for low-income utility customers.
IL	6%	Utilities required to participate under state law if they serve more than 100,000 retail customers.[191] Participating utilities are required to "bring participants' gas and electric bills into the range of affordability," while seeking to maximize program participation. On-time PIPP payment qualifies a participating household for credit on past bills to reduce arrearages by up to $1,000 per year.[192]
ND	Tiered between 1–3%	PIPP is integrated with North Dakota's LIHEAP program, so that LIHEAP benefits are distributed based on a formula that reduces household energy burdens to tiered percentages based on household income.[193] The program operates with three income tiers. Households with the lowest incomes receive LIHEAP benefits to reduce their energy burden to 1% of the household's income, while the middle tier's energy burden is adjusted to 2% of household income, and the final tier is responsible for paying 3% of household income.
NV	Based on statewide median energy burden	Nevada's statewide Energy Assistance Program, which is based in state statute,[194] provides annual credits to reduce household energy costs based on statewide energy burdens.[195] Households with income levels below 150% of the federal poverty guideline are eligible to receive credits that reduce their energy burden to the level of the state's median energy burden, which is calculated annually.
OH	Up to 10%	The nation's oldest PIPP, which has served as a model for other jurisdictions, was originally developed through the state's utility commission, but is now codified in statute.[196] Under the program, participants who heat their homes with gas are required to pay up to 5% of their household income toward their gas bill and up to an additional 5% toward their electric bill. Households that are heated with electricity are simply responsible for up to 10% of their household income for their electric bill. The program also includes arrearage reduction, which eliminates a participating household's outstanding utility debt after two years of on-time, in-full monthly payments.

Source: Authors' analysis.

Prepaid Metering

The majority of US electricity consumers purchase energy on a postpaid basis, but prepaid utility service has become more common in recent years.[197] Prepaid metering programs have been around since the early 20th century, and have been particularly common in Great Britain over the past 100 years.[198] More recently, these programs have evolved significantly with the availability of advanced metering infrastructure (AMI) technology, which can provide utility companies with remote access to customer usage, balance, and account data.[199] Whereas early prepay meters accepted coins and had to be periodically emptied, modern meters can be paid electronically and provide accurate, to-the-minute balance information. At their most basic, these programs are often compared to filling up a car with gas, in that customers access service by loading funds into their account but then are unable to use any energy beyond what they have paid for in advance.[200]

Following increased investment in smart grid research as part of the 2009 American Recovery and Reinvestment Act, prepaid metering programs have become more widespread in the United States.[201] Because these programs no longer require the installation or removal of special equipment, the costs for utility companies to administer prepaid metering and for customers to participate have made these programs more viable.[202] Some experts have also suggested that prepaid metering has become more popular due to pressures on utilities to reduce consumer debt.[203]

As of 2012, at least 53 utilities in 19 states offered prepayment programs for energy customers.[204] Prepaid service is more common in southern states and among unregulated utilities such as cooperatives.[205] An independent study of Arizona utility Salt River Project's M-Power program, one of the largest prepaid metering programs in the United States, found the following trends among program participants: "M-Power customers tend to be relatively young and have low-incomes, have families, use relatively low amounts of electricity, make an average of seven payments per month during peak spring and summer seasons, and experience disconnection from service an average of one time per month throughout the year."[206]

Compared to postpaid service, some prepaid metering programs provide significant benefits for low-income households, since they often do not require a deposit to sign up for service[207] and customers may not be required to pay off existing arrears before enrolling.[208] However, some programs require a portion of each payment to go toward paying past-due balances.[209] Service that is disconnected under a prepaid metering program can typically be reconnected more quickly than postpaid service, and usually does not require payment of a reconnection fee, though this is not the case for all prepaid metering programs.[210]

At the same time, customers participating in prepaid metering programs often report higher levels of satisfaction with their service than traditional postpaid customers.[211] Prepaid consumers have

more control over the amount and frequency of their payments,[212] along with greater certainty and predictability when it comes to their energy expenses.[213] Prepaid consumers are also at lower risk of accruing unpaid utility debt, and may reduce their energy consumption by monitoring their usage using the real-time information offered by prepaid metering technology.[214]

However, prepaid metering programs are heavily criticized by consumer advocates, who find that these programs have the potential to harm low-income customers unless implemented thoughtfully.[215] Prepaid metering programs often result in higher rates of disconnection for consumers and evade the legal protections that exist for low-income consumers facing disconnection from postpaid plans.[216] Under prepaid metering programs, utilities may consider disconnections for lack of funds to be voluntary disconnections that are not subject to traditional legal protections. In many states, prepaid metering is not expressly subject to the legal protections that exist for utility customers facing shut-offs, which can include notice requirements and special protections for consumers who rely on electricity for lifesaving medical devices.[217]

Some states have remedied this by clarifying that existing protections apply to these prepaid programs as well, or by passing new laws to create specific protections for prepaid metering customers. In an early example, when Otter Tail Power Company proposed a prepaid metering pilot project in 1990, the Minnesota Public Utilities Commission determined that the program violated state rules surrounding disconnection notices.[218] Pennsylvania's regulation of prepaid metering programs is particularly rigorous.[219] Low-income customers are not eligible to participate, and the utility must agree to give consumers an emergency backup card covering five days.[220] In addition to Pennsylvania, several states including Oregon,[221] Iowa,[222] Oklahoma,[223] and Texas[224] have laws regulating prepaid metering programs. The National Association of State Utility Consumer Advocates has also assembled a set of model protections for implementing prepaid metering programs.[225]

In the absence of state law clarifying or extending the reach of these protections to prepaid metering programs, utilities have relatively free rein in establishing disconnection protections and procedures for their prepaid customers. In states that provide legal protections against disconnection of prepaid service, utilities have identified other ways of restricting service when a prepaid customer's balance runs out, such as "load limiting or periodic load interruption when the customer balance falls below zero."[226]

In addition to the concern about the potential for prepaid metering programs to evade traditional disconnection protections, advocates raise a number of other concerns about treating prepaid metering as an energy affordability program for low-income households. First, prepaid metering can be difficult to pair with assistance programs, making it difficult for low-income households to access the benefits that they are entitled to receive.[227] Prepaid metering programs also provide

no option for budget billing, which allows the customer to spread the cost of their utility bill evenly across the year to increase the predictability of billing and reduce seasonally high bills.[228] Some research also suggests that even though prepaid customers typically use less energy than postpaid customers, they can end up paying more due to the potentially higher rates imposed for this service[229] or an increased number of payment processing fees or fees for rejected payments.[230] For example, a study of M-Power, the prepayment program run by the Salt River Project in Arizona, revealed that the utility charged higher rates to prepaid customers on the grounds that it cost more to serve these households due to special services required for the program to operate, like payment and monitoring infrastructure.[231] Some states, including Iowa[232] and Oklahoma,[233] prohibit the imposition of higher rates for prepaid service without approval of the state.

Ultimately, prepaid metering programs reduce public scrutiny of energy insecurity[234] and may do more to mask the problem of energy affordability than to solve it.[235] Some studies have shown that low-income households on prepaid meters use less electricity,[236] but advocates are divided on whether this is because prepaid metering encourages consumers to use energy more thoughtfully or because these programs "encourage householders experiencing severe hardship to take extreme measures when restricting their energy use" and deprive themselves of the energy that they need to live comfortably.[237] A study analyzing one prepaid metering program found that prepaid customers who were able to retain service when their balance fell below zero still reduced their consumption, although not to the same extent as prepaid customers who lacked this protection.[238] This finding suggests that improved legal protections around disconnections may help prepaid service households avoid significant deprivations, while still allowing them to benefit from the payment flexibility and predictability that prepaid metering can provide.

Unique Challenges in Rural and Native American Communities

While the preceding sections discuss several affordability programs in place to assist low-income households with their energy bills, this section highlights unique factors that contribute to energy insecurity in rural and Native American communities. Energy affordability remains an issue in these communities, but other factors, such as the availability of electricity and the energy efficiency of homes and appliances, create additional obstacles for low-income households on the path to energy security.

Rural Areas

Households in rural areas often face disproportionately high energy burdens. On average, rural households face energy burdens 33 percent higher than the national average, a disparity that is even more pronounced among low-income rural households.[239] The high energy burdens seen in rural areas are due in part to low income levels in these communities, with more than 40 percent of rural households earning less than 200 percent of the federal poverty level.[240]

Several factors besides income contribute to high energy burdens for rural households, including the quality of housing stock and the resources of local utilities. Low-income residents of rural areas are more likely to live in low-quality housing that falls short of contemporary weatherization and energy efficiency standards. At the same time, it can be difficult for rural households to access or afford energy efficiency and weatherization upgrades that can help lower their energy burdens.[241] Rural utilities may have limited resources, making them less likely to fund efficiency programs that are more common in urban areas.[242] Even when cost is less of a concern, there may be few local workers in rural areas with the training necessary to perform energy efficiency and weatherization upgrades.[243]

Proposed programs intended to combat energy insecurity in rural areas focus primarily on regional initiatives to improve energy efficiency.[244] One paper proposes local workforce development and reimbursement programs, which would train rural residents to perform energy efficiency upgrades and provide funding for them to travel to other remote areas to increase access to these services.[245] Other proposals include improving standards for manufactured housing, which makes up a disproportionate share of housing stock in rural areas and can be harder to retrofit than traditional site-built homes.[246] Acknowledging these challenges, the Department of Energy is in the process of rolling out new energy efficiency standards for manufactured housing.[247]

Rural households are also more likely to rely on propane or fuel oil to heat their homes, which leaves them exposed to higher heating costs and unpredictable cost fluctuations and ineligible for energy efficiency funding provided by utilities.[248] However, these households are eligible for LIHEAP funding that can help cover the cost of propane or fuel oil, and some states even provide higher levels of

LIHEAP benefits to propane users.[249] Many states also cover propane as part of their emergency assistance programs, allowing customers to apply for immediate funding when their propane tanks are low.

Tribal Reservations

Native Americans are the racial group most likely to live in rural areas, so Native American communities face many of the issues that contribute to energy insecurity in rural areas.[250] In addition to these challenges, however, the legal and social history of tribal reservations has given rise to unique energy insecurity obstacles in these communities.

Collecting detailed data on energy insecurity in Native American households can be difficult,[251] but an estimated 36 percent[252] to 50 percent[253] of Native American households experience a high energy burden. Tribal governments may opt into one of two LIHEAP funding allocations: receiving their own allocation directly from DHHS, or receiving a portion of the allocation for the state(s) in which their land is located.[254] When receiving a portion of the state allocation, the tribe's grant is based on the proportion of the state's low-income households that are located on the tribe's reservation or trust land.[255] Alternatively, the tribe may enter into a negotiated agreement with the state to receive a different level of funding.[256] No matter how the funding is allocated, tribal governments face the same constraints and challenges in disbursing LIHEAP funds to their residents as other grantees, namely the level of federal funding.[257]

On many tribal reservations, LIHEAP and other energy affordability measures fail to address a compounding and prevalent cause of energy insecurity: limited access to the electrical grid.[258] For example, on the Navajo Reservation, which is the largest reservation in the United States, 37 percent of households lack electricity.[259] Nationwide, 14.2 percent of Native American households lack electricity, compared to about 1.4 percent of the general population.[260,261] Because of the relative lack of grid access in these areas, LIHEAP and other federal programs focused on individual assistance overlook significant structural and infrastructural obstacles that many Native American households face in accessing adequate home energy supplies.[262] Even where electricity is available, high energy costs and low per capita income contribute to high rates of energy insecurity in Native American communities.[263]

The lack of grid connectivity presents unique concerns for many Native American communities. Households that cannot receive electricity must rely on alternative sources of fuel for light and heating, such as kerosene lamps or wood-burning heaters.[264] As a result, members of these households face increased asthma rates "linked to indoor air pollution, such as the combustion created from burning wood, coal, or kerosene to heat or light the home."[265] Lack of consistent lighting and internet access at home can also limit educational attainment. Even for households

that have access to a generator, which is necessary for off-grid households to cool their homes, operate a phone or computer, refrigerate food, or power life-saving medical devices, fuel is often more expensive than grid electricity, contributing to high poverty rates in these communities.[266]

The low levels of grid connectivity on Native American reservations can be traced back to a number of historical policies—importantly, restrictions on the Rural Electrification Administration—that limited infrastructure development on tribal land. Although much of the rural US lacked access to electricity until the 1930s, the Rural Electrification Administration was established in 1935 to "make loans to local governments, nonprofits, and farming cooperatives for purposes of developing electricity infrastructure" in rural areas to close this urban-rural electrification gap.[267] Local governments used these loans to significantly expand grid access, but tribal governments were not eligible to receive Rural Electrification Administration grants, meaning many Native American reservations missed out on this infrastructure boom.[268]

The legacy of this programmatic exclusion is that grid extension is now prohibitively expensive on many reservations. By one estimate, extending transmission lines can cost up to $40,000 per mile on some reservations.[269] On the Navajo Reservation, where more than a third of households lack electricity, it would cost an estimated $27,000 per mile to extend power lines to many homes due to the area's low population density.[270] While these infrastructure costs could typically be shared across several homes benefitting from a single line extension, the dispersed nature of the Navajo Reservation means that the "cost often cannot be split over a sufficient number of customers to make it economically viable."[271] Even when federal subsidies are available, some require matching funds that tribal governments are not able to provide,[272] and many homes require costly upgrades to reach service-ready status.[273]

Although public utilities are often subject to a state law duty to serve, including a duty to provide service to households that are not already connected to service,[274] this duty is cabined in ways that limit its applicability to homes on Native American reservations. Utilities are typically subject to this duty only within the geographic boundaries of their existing service territories,[275] which may not extend to reservation land or other remote or rural areas. Furthermore, even if a proposed extension falls within the utility's service area, the duty may be limited to reasonable extensions, which may not include developing several miles of transmission to provide service to a single home. Often, the reasonableness of extension hinges on an assessment of several factors, including need, cost, revenue potential, and the public interest.[276]

The legal status of tribal land also poses a significant obstacle to grid extension for many Native American communities. Under the General Allotment Act of 1887, reservation land was divided for assignment to members of the tribe or sale to other individuals, creating a checkerboard of

tribal land and land owned by non-members.[277] Parcels that were owned by the tribal government or tribal members became subject to complex inheritance laws that led to some pieces of land having dozens or even hundreds of fractional owners.[278] When allotted land was sold outside of the tribe, the parcel's reservation status was terminated and the tribe's ability to condemn the land for infrastructure development was extinguished.[279] This mosaic of ownership interests is even further complicated by the requirement that the Department of the Interior grant permission for any easements or rights-of-way on tribal land.[280] As a result, tribes may struggle to secure the necessary rights and approvals to extend grid access even when they have the funds to do so.[281]

In some instances, resistance from community members has prevented tribes from developing energy infrastructure.[282] A case study focusing on the Hopi Reservation found that "[a]s grid power was introduced to the Hopi Reservation, eight villages chose to allow the power lines, but not without conflict among residents. Often traditional elders objected for religious, economic, or aesthetic reasons. Many villagers believed the electrical grid's attendant poles and lines infringed on village rights-of-way. When all of the discussions were consummated, four villages refused grid power altogether."[283]

This resistance recalls efforts on the part of Native American groups to halt the development of oil and natural gas pipelines, including the Dakota Access Pipeline. In these instances, advocates resisting the development of new fossil fuel infrastructure have been criticized for stalling projects that would purportedly help lower energy costs.[284] Although Native American resistance to the development of fossil fuel infrastructure is more widely reported, the reluctance of some communities to pursue development of electric transmission underscores that the concerns of many tribal members and organizations are rooted in indigenous rights, culture, and values, rather than solely energy access and affordability.[285]

In light of these challenges, a number of tribal governments have established programs to develop off-grid solar systems that can provide electricity to households outside of the electrical grid.[286] On the Navajo Reservation, the Navajo Tribal Utility Authority (NTAU) has been working since 1999 to subsidize access to small-scale solar power.[287] During that time, "NTAU has rented over 260 [renewable energy generating units] (consisting of an 880-watt solar array, 400-watt turbine, and battery bank) to tribal members at a cost of $75 per month, which pays for NTUA maintenance and installation training."[288]

Federal funding has helped to bolster tribes' efforts to provide off-grid energy across their reservations. In 2020, NTAU received funding through the CARES Act to purchase and install 300 additional off-grid solar units for homes that were not already connected to the grid.[289]

Other tribes have secured federal funding to build microgrids through grant programs for energy

efficiency projects in energy burdened communities.[290] In Nevada, the Moapa Band of Paiute Indians received $2.38 million in federal funding to develop a solar project that could power the tribe's roadside businesses, which was less than the cost of connecting the shopping center to the grid.[291] At the time the microgrid project was completed, it was expected to save the tribe $700,000 each year, which would have otherwise been spent on diesel to power the businesses.[292]

Without federal or state subsidies, such microgrid projects can be prohibitively expensive. For example, "a family in Wyoming would have had to pay $80,000 to their local utility company to bring electricity to their home. While the cost of installing solar panels was cheaper, it still would have cost the family about $50,000 for the panels and batteries."[293] In similar instances, federal or state funding to improve access to solar or other small-scale renewables may go further in reducing energy insecurity than bill assistance programs.[294]

Not all reservations are well suited to small-scale renewable projects, though. The Yurok Reservation in Northern California, for example, is largely forested with poor wind resources.[295] Drought conditions and upstream dams limit the potential for developing hydropower on the reservation.[296] In such conditions, subsidized grid extension may be the only way to bring electricity to these households.

Fortunately, the Inflation Reduction Act (IRA) contains funding for transmission development and the electrification of tribal homes.[297] Section 80003 of the IRA appropriates more than $145 million to provide electricity to unelectrified tribal homes, help electrified tribal homes transition to zero-emissions energy systems, and conduct related home repairs and retrofitting.[298] Section 50152 of the IRA provides additional funding for the Department of Energy to make grants to state, local, and tribal governments for transmission development.[299]

Conclusion

While the federal LIHEAP program has been shown to reduce the energy burdens of the households it affects, its effectiveness at reducing energy insecurity is hampered by its limited reach. The program's block grant structure leads to major variations in administrative approaches among states, making it difficult to assess the efficacy of the program at a national level. However, LIHEAP reaches a significantly smaller percentage of federally eligible households than other federal benefits programs, and applicants are regularly turned away as each year's funding is allocated. Without significant funding increases at the federal level, LIHEAP will remain unable to serve as a comprehensive solution to energy insecurity nationwide.

Ratepayer-funded assistance programs operated by utilities provide another, often complementary, source of relief for low-income households struggling to afford their energy bills. Utilities are often required under state law to develop and administer relief programs for low-income households, although the applicable law may leave utilities with flexibility in how they design and structure their programs. The percentage of income payment plan appears to offer an option for effective relief for low-income households, as it caps their financial responsibility at a set percentage of household income. However, the efficacy of any utility-run program is still dependent on how the program is designed and implemented, including the program's eligibility criteria and application requirements.

When considering the structure of assistance programs intended to alleviate energy insecurity, it is important to tailor solutions to the unique causes of energy insecurity in the target community. In the case of rural communities, low-quality and aged housing stock, combined with lower average household incomes, mean that energy efficiency improvements could have a major impact on reducing energy consumption, and therefore energy burdens. Consequently, programs that provide funding for or support access to these improvements may be warranted alongside bill assistance programs. In Native American communities and other areas with limited grid access, improving access through subsidized microgrid development or transmission line extension may be a necessary first step in addressing communities' energy insecurity.

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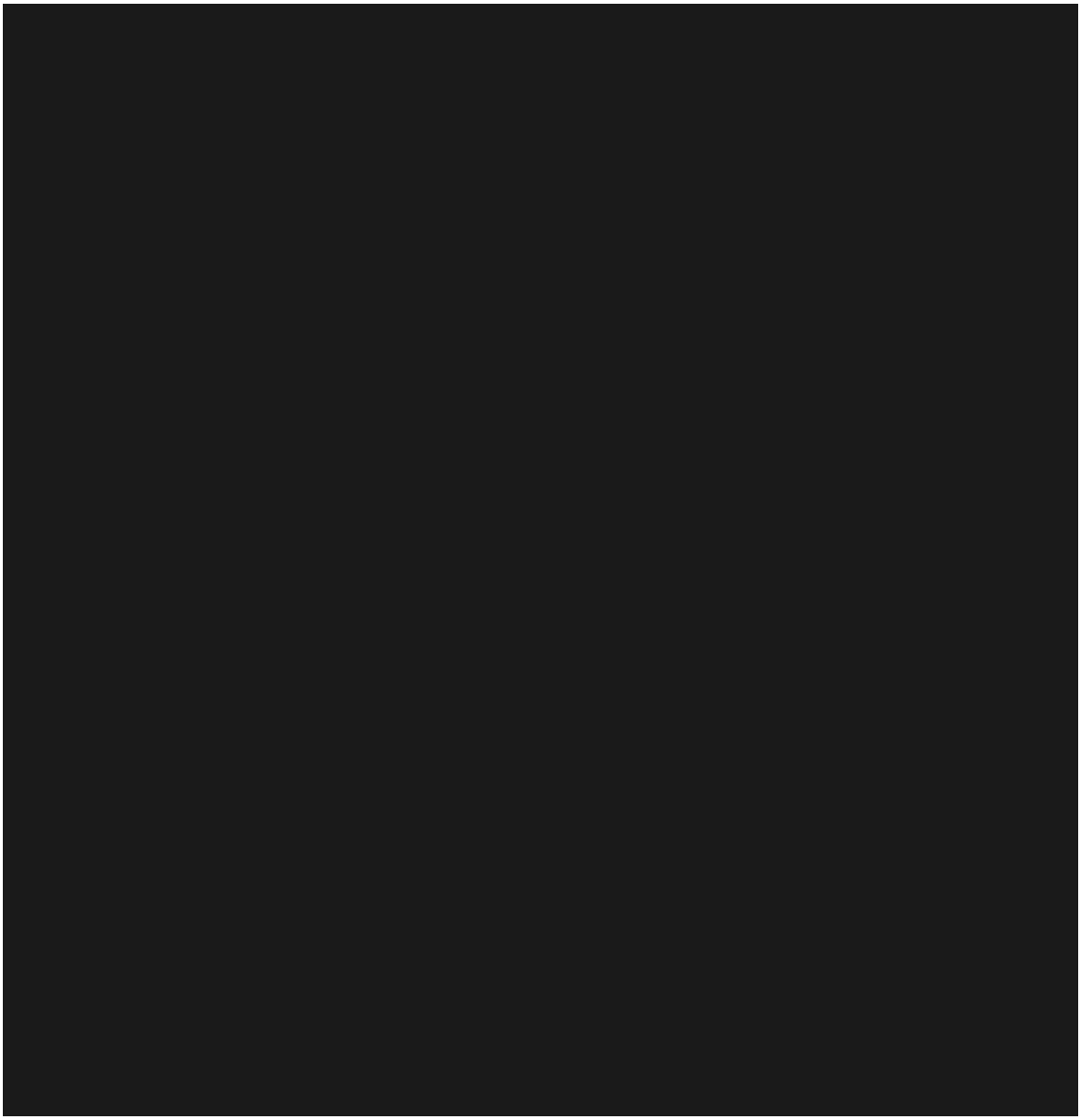

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REGULATORY IMPERATIVE TO ENSURE UTILITY CLIMATE RESILIENCE PLANNING

DON'T LOOK UP!
Adam McKay
(Title of Last Movie Made
Before Comet Destroyed Earth)

Janice A. Beecher, Harvey L. Reiter, Jeffrey D. Watkiss[*]

Synopsis: Climate change has pushed our planet beyond the tipping point. The consequences are already upon us in the form of rising sea levels and more frequent and extreme weather events, wildfires, flooding, and drought, despite ongoing efforts to reduce carbon emissions. Decarbonization efforts are not futile, as they can still prevent a climate catastrophe, but adaptive measures are needed to protect critical public utility infrastructure and maintain essential services. This article asserts that the necessary predictive tools are available for utilities to engage in climate resilience planning, that market forces (evidenced by insurance coverage and premiums and bond ratings) confirm the imperative for planning, and that state and local regulators that oversee and incentivize utility performance have the responsibility and authority to tackle this critical policy issue.

As commissions are charged with ensuring the provision of *safe, adequate,* and *reliable* utility services at a reasonable cost, regulators can deploy long-standing prudence principles to mandate utility action and penalize utility inaction regarding known weather-related risks affecting service continuity. The regulatory toolkit is not limited to reactive measures. Regulatory commissions have broad rulemaking powers that they can utilize to impose requirements for resilience planning and principled ratemaking tools for climate resilience cost recovery.

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I. THE ISSUE

The toll of climate change and extreme weather events on public utility infrastructure and operations totals billions of dollars annually.[1] Although we focus here mainly on electricity utilities and, to some extent, the water sector, climate change poses risks to all utility infrastructure, including natural gas, communications, and transportation networks. The federal government has issued a clear call to action for utility climate change resilience. In 2016, the Department of Energy published comprehensive utility guidelines for vulnerability assessment and resilience planning.[2] A January 2020 report by the Government Accountability Office (GAO) pointed to the threat that climate change poses to "utilities that produce drinking water and treat wastewater, emphasizing the availability of "federal technical and financial assistance to make such infrastructure more resilient to extreme weather," and recommending that the U.S. Environmental Protection Agency (EPA) organize a network of technical advisors to help prepare water utility infrastructure.[3] A March 2021 GAO report on electricity grid resilience found that climate change "could affect every aspect of the grid from generation, transmission, and distribution to demand for electricity . . . [and] could cost utilities and customers billions, including the costs of power outages and infrastructure damage."[4]

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The accelerating risks, impacts, and costs to utilities from climate change beg several questions that utility policymakers, regulators, and managers should be asking.[5] Are public utilities developing and implementing adaptive climate-change resilience plans? Are state regulatory commissions and other responsible oversight entities sufficiently focused on requirements and rules for resilience planning? How does the time-sensitive imperative of resilience planning square with the public interest and the long-standing and codified utility obligations under the regulatory compact to provide *safe, adequate, and reliable* service in exchange for their enfranchised monopolies?[6] In short, are utilities required to take steps to ensure secure and uninterrupted public utility service, and are they doing so?

A. Reasons or Rationales?

A 2020 study by Columbia University's Sabin Center (Sabin) and the Environmental Defense Fund (EDF) found that while studies have shown that "accurate, specific, and actionable climate resilience planning is possible . . . relatively few electric utilities have engaged in the process."[7] Some of the explanations offered were as follows (emphases added):[8] [9]

- "[C]limate change is often perceived as involving greater *unknowns.* Many electric utilities appear to view climate resilience planning as akin to an exercise in conjecture."
- "Other electric utilities have cited *limited data* availability as a hindrance to climate resilience planning."
- "[E]lectric utilities often have to engage consultants or other researchers to develop localized climate data that meets their needs which can be *costly*."
- "[W]ill they be permitted to *recover* the potentially significant costs incurred in the planning process?"

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5. *See* Roshi Nateghi, et al., *Past The Tipping Point: How Regulators and Utilities Are and Will Be Looking At Ways to Mitigate the Inevitable Impacts of Climate Change*, 43 ENERGY L.J. 190 (2022), https://www.eba-net.org/wp-content/uploads/2023/02/8-Climate-Symposium-191-222.pdf; *World Headed for Climate Catastrophe Without Urgent Action: UN Secretary General*, UN ENV'T PROGRAMME (Oct. 2022), https://www.unep.org/news-and-stories/story/world-headed-climate-catastrophe-without-urgent-action-un-secretary-general.

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9. A less benign view is that utilities and associated fossil-fuel industries have engaged in political strategies to thwart climate action individually or through their trade organizations. *See, e.g.,* LEAH STOKES, SHORT CIRCUITING POLICY: INTEREST GROUPS AND THE BATTLE OVER CLEAN ENERGY AND CLIMATE POLICY IN THE AMERICAN STATES (2020).

- "[W]ill they be permitted to recover the much *larger costs* associated with implementing resilience measures that planning demonstrates are advisable?"
- "Even if electric utilities are permitted to recover resilience investments, the regulatory lag—i.e., the gap between when the investments are made and when cost recovery occurs—could undermine their *financial viability*."

Considerable effort has been devoted to holding to account those responsible for climate change and its impacts. Leading works include the event attribution work pioneered by Myles Allen in *Liability for Climate Change*[10] and the empirical research of Friedrike Otto and others,[11] which has been cited in climate-related litigation.[12] This article focuses on the need for comprehensive resilience planning and the related role of regulators in promoting planning, as also highlighted in the Sabin-EDF study.

But utilities also continue to face financial risks if they do not take distinct but related actions to mitigate the effects of climate change. Utilities are subject to potential exposure to administrative, civil, or even criminal liabilities for service interruptions or damages attributable to climate change, notwithstanding the adoption and implementation of approved resilience plans. Increasingly, individual plaintiffs or members of a class are making claims against their public utilities for compensatory damages or injunctive relief for failing to adapt and become climate-change resilient.[13]

Some progress has been made since the Sabin-EDF study. An Edison Electric Institute survey reports that in 2022, "adaptation, hardening, and resilience" drove 12% of distribution and 7% of transmission investments, totaling about $30 billion annually in recent years.[14] But, many utilities still have not undertaken meaningful and proportionate resilience planning in the face of climate change and extreme

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13. *See* Otto et al., *supra* note 11; Webb et al., *supra* note 7, at 16-38.

14. EDISON ELECTRIC INST., 2022 FINANCIAL REVIEW: ANNUAL REPORT OF THE U.S. INVESTOR-OWNED ELECTRIC UTILITY INDUSTRY 44, https://eei.org/-/media/Project/EEI/Documents/Issues-and-Policy/Finance-And-Tax/Financial_Review/FinancialReview_2022.pdf ("Specific examples of AHR investments in the electric grid include underground-ing power lines, installing cement poles, and elevating or relocating transformers… Electric companies also [investing in technologies to] better predict and prepare for extreme weather events and wildfires.").

weather events, suggestive of "utility lag,"[15] that is, a lack of responsiveness or action in the face of discernible changes in circumstances.

Indeed, ICF's Judsen Bruzgul and Neil Weisenfeld concluded in 2021 that "[t]he threats of climate change are rising, but utility responses lag behind."[16] They regarded the pace as too slow to help close what they estimate to be a $500 billion capital investment "gap" needed "to provide the level of resilience required for U.S. investor-owned energy utilities to effectively address risks from climate change and prepare energy systems for a changing environment."[17]

B. Mitigation, Adaptation, and Resilience

The Fifth National Climate Assessment offers the following key distinctions in the realm of climate change and responses to it:

> **Mitigation**: Measures to reduce the amount and rate of future climate change by reducing emissions of heat-trapping gases (primarily carbon dioxide) or removing greenhouse gases from the atmosphere.
> **Adaptation**: The process of adjusting to an actual or expected environmental change and its effects in a way that seeks to moderate harm or exploit beneficial opportunities.
> **Resilience**: The ability to prepare for threats and hazards, adapt to changing conditions, and withstand and recover rapidly from adverse conditions and disruptions.[18]

Actions toward mitigation, adaptation, and resilience are not mutually exclusive but interdependent and synergistic. All are needed to maintain safe, adequate, and reliable public utility services, and all should be addressed through mandated comprehensive planning synchronized with integrated resource, capital improvement, and operational planning. Mitigative actions at the system level aim to slow or halt global climate change[19] and make adaptation and resilience easier. Adaptive actions aim to make systems reliable and sustainable over time. Across public utility infrastructure subsectors, resilience extends conventional concepts of system reliability and endogenous capacities and vulnerabilities to account for the

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15. *See* JANICE A. BEECHER & STEVEN G. KIHM, RISK PRINCIPLES FOR PUBLIC UTILITY REGULATORS 81 (1st ed. 2016); Steve Kihm et al., *Regulatory Incentives and Disincentives for Utility In-vestments in Grid Modernization*, BERKELEY LAB 43 (2017), https://eta-publications.lbl.gov/sites/default/files/feur_8_utility_incentives_for_grid_mod_rev_062617.pdf.

16. Judsen Bruzgul & Neil Weisenfeld, *Bridging the Utility Resilience Investment Gap*, ICF (Mar. 24, 2021), https://www.icf.com/insights/energy/utility-resilience-investment-gap; *see also* Kenneth Costello, *Electric Power Resilience: The Challenges for Utilities and Regulators*, YALE J. ON REG. BULLETIN (Nov. 8, 2019), https://www.yalejreg.com/bulletin/electric-power-resilience-the-challenges-for-utilities-and-regulators/.

17. *Id.*

18. Allison R. Crimmins et al., *The Fifth National Climate Assessment,* FIFTH NAT'L CLIMATE ASSESSMENT, https://nca2023.globalchange.gov. The report identifies four stages of resilience: 1) preparing for events before they happen, 2) alleviating problems during the event, 3) recovering quickly after the event, and 4) learning from the experience to improve for next time.

19. *See* RICHARD J.T. KLEIN ET AL., *Inter-relationships Between Adaptation and Mitigation*, *in* CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY 747 (M.L. Parry et al., eds. 2007); *see also* M.L. Parry et al., *Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change,* CAMBRIDGE UNIV. PRESS at 745-77, https://www.ipcc.ch.

probability and impact of disruptions from exogenous forces. The National Renewable Energy Laboratory elaborates for electric utilities:

> A resilient power grid withstands, responds to, and recovers rapidly from major power disruptions as its designers, planners, and operators anticipate, prepare for, and adapt to changing grid conditions . . . Resilience also typically includes more extreme, rare events that go beyond 'reasonable' outages considered in resource adequacy and operational reliability.[20]

Given the limits of mitigation, the need for adaptation to climate change is apparent and urgent. Experts have recognized the need to factor climate risks into infrastructure management and planning and have distinguished between *reactive* and *proactive* adaptation: "[A]daptive measures are taken in response to climate change impacts (reactive adaptation) and in advance of impacts (proactive adaptation)."[21]

We pivot here from mitigation to focus on the urgency of climate *resilience planning* as essential to proactive public utility adaptation to the realities of climate change and its accelerating economic and social injury to people and property. Our primary audience is state regulators of investor-owned utilities, but our planning recommendations extend to all public utilities, including federal power authorities, municipal enterprises, rural cooperatives, and their respective regulators (or oversight entities) at the federal, local, and membership levels. A 2021 film satirizes denial of climate change (in the form of mass planetary extinction from an incoming comet) with the advice: "Don't Look Up!"[22] Here, we implore public utilities and their regulators to look up and take the necessary steps to protect vital public utility services against the incoming existential threat of climate change.

Part II of this article discusses some of the risks to public utilities posed by climate change as manifested in extreme weather-related events that can disrupt service, how these risks are recognized in market forces (insurance rates and coverage, bond ratings, and climate litigation), and how analytical tools can be used to assess the nature, location, and magnitude of these risks. Part III highlights some of the adaptive and preventative measures utilities could consider in a resilience plan. Part IV explains how regulators review utility failures to take affirmative adaptive measures to maintain safe, adequate, and reliable service consistent with their responsibility to investigate and penalize imprudent action or inaction. Part V addresses the broad rulemaking powers of regulatory commissions and how those existing powers can be deployed to require utilities to adopt and implement

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20. NAT'L RENEWABLE ENERGY LAB'Y, POWER SYSTEM RESILIENCE, https://www.nrel.gov/research/power-system-resilience.html#:~:text=NREL%20is%20leading%20research%20efforts,adapt%20to%20changing%20grid%20conditions.

21. James E. Neumann et al., *Climate Effects on US Infrastructure: The Economics of Adaptation for Rail, Roads, and Coastal Development*, SPRINGER LINK 43 (Aug. 19, 2021) https://doi.org/10.1007/s10584-021-03179-w.

22. Elizabeth Howell, *Climate Scientist and Netflix 'Don't Look Up' Director Talk Comet Metaphors and Global Warming,* SPACE.COM, (May 11, 2022), https://www.space.com/dont-look-up-climate-change-comet-metaphore-scientist-praise.

climate resilience plans. Part VI recommends developing resilience planning rules and considers some experience in this area. Finally, Part VII discusses how capital and operating costs to implement resilience planning can be recovered, consistent with generally accepted ratemaking principles and practices.

II. CLIMATE CHANGE AS A KNOWN AND MEASURABLE RISK

The near-unanimous scientific consensus confirms the imminent and accelerating threat of climate change.[23] Most Americans view climate change as a major threat to the country (54%) and impacting their local communities (61%).[24] The effects of climate change fall disproportionately on disadvantaged countries, communities, and households that also lack scale, resources, and capacities for mitigation, adaptation, and resilience, worsening and perpetuating environmental injustice,[25]

The impacts on critical infrastructure and operations that produce and deliver essential energy and water utility services are also coming into focus. The 2018 Fourth National Climate Assessment focuses on the potential for accelerating climate change to disrupt and damage infrastructure, reduce power generation efficiency, increase energy demand, and raise electricity costs.[26] Changing and extreme weather are also expected to impact the water cycle and, thus, the reliability and cost of drinking water, wastewater, and stormwater utility services.[27]

Even those who ignore climate science will find it hard to disregard the *market* forces that drive insurers, credit rating agencies, and financial institutions. Market actors are beginning to expect utilities to disclose and manage their climate and weather vulnerabilities and risks.[28] Insurance companies are dropping some property coverage or dramatically raising premiums in areas where climate change poses unacceptable risks.[29] A recent report from Washington State's insurance

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23. *See generally* NAT'L AERONAUTICS & SPACE ADMIN., SCIENTIFIC CONSENSUS: EARTH'S CLIMATE IS WARMING (2020) (summarizing the conclusion of 18 preeminent scientific associations (2009-2019) that anthropogenic climate change is indisputable and accelerating); *see also* Nateghi et al., *supra* note 5.

24. Alec Tyson et al., *What the Data Says About Americans' Views of Climate Change*, PEW RSCH. CTR., (Aug. 9, 2023), https://www.pewresearch.org/short-reads/2023/08/09/what-the-data-says-about-americans-views-of-climate-change.

25. Crimmins et al., *supra* note 18, at sections 4.2, 9.2, 12.2, 14.3, 15.2, 16.1, 16.2, 18.2, 19.1, 20.1, 20.3, 21.3, 22.1, 23.1, 26.4, 27.1, 31.2.

26. *See* U.S. GLOBAL CHANGE RSCH. PROGRAM, FOURTH NATIONAL CLIMATE ASSESSMENT, VOL. II 65-66, 182, 192 (2018); *see* also JEFF GOODELL, THE HEAT WILL KILL YOU FIRST – LIFE AND DEATH ON A SCORCHED PLANET 132 (2023).

27. ENV'T PROT. AGENCY, CLIMATE IMPACTS ON WATER QUALITY, https://www.epa.gov/arc-x/climate-impacts-water-quality (Mar. 10, 2024).

28. *See generally* Rack, *supra* note 1; *see also* Yang et al., *Decomposing Climate Risks in Stock Markets* at 7 (Int'l Monetary Fund, Working Paper No. 23, 2023); MSCI, *Climate Solutions: Climate Change – A Key Risk for Institutional Investors*, https://www.msci.com/climate-solutions/, (last visited Mar. 10, 2024); *see also* Paul Munday et al., *Risky Business: Companies' Progress On Adapting To Climate Change*, S&P GLOBAL (Apr. 3, 2024), https://www.spglobal.com/_assets/documents/ratings/research/101595538.pdf.

29. Jacob Bogage, *Home Insurers Cut Natural Disasters from Policies as Climate Risks Grow*, WASH. POST (Sept. 3, 2023), https://www.washingtonpost.com/business/2023/09/03/natural-disaster-climate-insurance/; *see also* Justine McDaniel, *Citing Climate Change Risks, Farmers is Latest Insurer to Exit Florida*, WASH.

commissioner noted that during the last five years, the state's electric utilities had also seen dramatic increases in liability insurance costs, with fewer insurers willing to provide coverage and more requiring "wildfire exclusions" in policies."[30] Water utilities face parallel market challenges.[31] Reduced insurance coverage for losses or damages could increase utility financing and operating costs and rates to consumers. Notably, insurance and re-insurance providers are increasingly incentivizing investment in climate risk management.[32]

Public utilities ignore these market realities and the detrimental consequences for investors and ratepayers at their peril. Utility infrastructure can be both vulnerable and culpable in the context of climate change. Hawaii Electric Company faces several lawsuits, a downgrade in its bond ratings (increasing borrowing costs), and the prospect of bankruptcy because of the calamitous Maui wildfires.[33] Edison International's December 31, 2022, 10-K filing with the Securities and Exchange Commission discloses that despite its efforts to reduce wildfire risks, its insurance coverage may not be adequate.[34] Berkshire Hathaway told financial regulators that its performance depends partly on reducing the potential for wildfires *caused by its infrastructure* (emphasis added).[35]

POST (Jul. 12, 2023), https://www.washingtonpost.com/climate-environment/2023/07/12/farmers-insurance-leaves-florida/.

30. *New report on utilities' liability market reveals increased costs, coverage exclusions*, OFFICE OF THE INS. COMM'R: WASH. STATE (Jan. 19, 2023), https://www.insurance.wa.gov/news/new-report-utilities-liability-market-reveals-increased-costs-coverage-exclusions; *see also* Gabriel Petek, *Allocating Utility Wildfire Costs: Options and Issues for Consideration,* LEGIS. ANALYST'S OFFICE, STATE OF CALIF. (June 2019), https://lao.ca.gov/reports/2019/4079/allocating-wildfire-costs-062119.pdf.

31. *See* Erica Brown, *Water Utilities, Climate Change, Bond Ratings and Insurance: Connections and Implications*, WATER FIN. & MGMT. (Feb. 7, 2020), https://waterfm.com/water-utilities-climate-change-bond-ratings-and-insurance-connections-and-implications; *see also* ASS'N OF METRO. WATER AGENCIES, INS., BOND RATINGS AND CLIMATE RISK: A PRIMER FOR WATER UTILITIES (2019), https://www.amwa.net/assets/Insurance-BondRatings-ClimateRisk-Paper.pdf.

32. *See* Thomas Frank & E&E News, *Climate Change is Destabilizing Insurance Industry*, SCI. AM. (Mar. 23, 2023), https://www.scientificamerican.com/article/climate-change-is-destabilizing-insurance-industry/ (emphasizing climate change is "driving up prices and pushing insurers out of high risk markets"); Antonio Grimaldi et al., *Climate Change and P&C Insurance: The Threat and Opportunity*, MCKINSEY & CO. (Nov. 19, 2020), https://www.mckinsey.com/industries/financial-services/our-insights/climate-change-and-p-and-c-insurance-the-threat-and-opportunity.

33. Evan Halper, *Hawaii Utility Faces Collapse as Others Delay on Extreme Weather Risks*, WASH. POST (Aug. 25, 2023), https://www.washingtonpost.com/business/2023/08/25/hawaiian-electric-maui-fires-power-companies/.

34. Edison Int'l., Annual Report (Form 10-K) at p. 47-48 (Dec. 31, 2022) ("SEC's insurance coverage for wildfires may not be sufficient…. Climate change exacerbated weather-related incidents and other natural disasters could materially affect SCE's financial condition and results of operations.").

35. Justin Worland, *Utilities Are Becoming a Risky Business Thanks to Climate Change,* TIME (Aug. 24, 2023), https://time.com/6308144/utilities-risky-business-thanks-to-climate-change/?utm_source=Sailthru&utm_medium=email&utm_campaign=Issue:%202023-08-25%20Utility%20Dive%20Newsletter%20%5Bissue:53950%5D&utm_term=Utility%20Dive; *see also* MOODY'S INV. SERV., INC., CLIMATE CHANGE & SOVEREIGN CREDIT RISK, https://www.moodys.com/sites/products/productattachments/climate_trends_infographic_moodys.pdf (Governments also face credit risks tied to their susceptibility to climate change impacts and their own resilience measures).

A. Planning for the Foreseeable and the Unforeseeable

Climate-related vulnerabilities are ongoing, but extreme weather events can strike suddenly and dramatically with little forewarning. The damage caused by severe weather events, wildfires, flooding, and drought to energy and water infrastructure and operations is increasingly apparent and highlights the water-energy nexus.[36] Indeed, freshwater withdrawals for thermoelectric cooling far outweigh those for public supply.[37] Flash flooding from hurricanes is no longer confined to coastal areas, even extending to desert environments.[38] Secondary risks of weather events are also coming into view, some of which could undermine mitigation measures. For example, the particulate matter falling on solar panels during fires substantially reduces their output, a factor that at least one utility is now incorporating into its planning.[39]

Today's climate experience may be prologue, but the past is not always predictive. Not long ago, the prospect of "a killer heat wave in the Pacific Northwest," causing uncontrollable wildfires in Washington, Oregon, and British Columbia in 2021 "seemed as likely as snow in the Sahara."[40]

While historical records may be of limited value, data-intensive and spatial climate and weather modeling has matured. Climate change data for modeling and planning is also increasingly granular.[41] Modern meteorology makes it possible to forecast weather events that could threaten utility operations or damage infrastructure. Among other resources, the National Association of Insurance Commissioners (NAIC) Climate Risk and Resource Center provides early warning systems, predictive modeling tools, and pre-disaster mitigation strategies.[42] Several organizations, including Resources for the Future, offer additional resources and tools.[43]

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36. U.S. DEP'T OF ENERGY, THE WATER-ENERGY NEXUS: CHALLENGES AND OPPORTUNITIES OVERVIEW AND SUMMARY (2014), https://www.energy.gov/sites/default/files/2014/07/f17/Water%20Energy%20Nexus%20Executive%20Summary%20July%202014.pdf.

37. U.S. GEOLOGICAL SURV., ESTIMATED USE OF WATER IN THE UNITED STATES (2015). https://doi.org/10.3133/cir1441.

38. *See, e.g.*, NAT'L PARK SERV., HURRICANE HILARY IN DEATH VALLEY NATIONAL PARK, (Aug. 23, 2023), https://www.nps.gov/deva/learn/nature/hilary.htm#:~:text=This%20included%20heavy%20rain%2C%20which,of%201.7in%20(43mm) (Hilary dumped 2.2 inches on Furnace Creek in Death Valley "making it the all time wettest day recorded at that location," causing extensive wreckage in that desert environment hundreds of miles from the Pacific Ocean); Sarah Kaplan, *Tennessee floods show a pressing climate danger across America: 'Walls of Water,'* WASH. POST (Aug. 23, 2021), https://www.washingtonpost.com/climate- environment/2021/08/23/tennessee-floods-show-pressing-climate-danger-across-america-wall-water ("Tennessee's flash floods underscore the peril climate change poses even in inland areas.").

39. Telephone Interview with Steven Lins and Andrew Meditz, Sacramento Municipal Utility District (Aug. 31, 2023).

40. Goodell, *supra* note 26, at 18-19.

41. Juliet S. Homer et al., *Emerging Best Practices for Electric Utility Planning With Climate Variability: A Resource for Utilities and Regulators*, PAC. NW. NAT'L LAB'Y 34 (2023).

42. *See Climate Risk and Resiliency Resource Center*, NAIC, https://content.naic.org/climate-resiliency-resource.htm (last visited Mar. 21, 2024).

43. *See Data Tools,* RES. FOR THE FUTURE, https://www.rff.org/publications/data-tools/.

An initiative by the Electric Power Research Institute (EPRI) provides "decision-relevant" resources on climate change and weather variability to the energy sector to guide cost-effective investments in energy grid reliability and resilience.[44] Similarly, the American Water Works Association and the Water Research Foundation provide their respective professional and utility members with management resources for climate and weather adaptation resources, including flood mitigation planning.[45] Several other organizations have banded together to develop a resilience assessment framework for the sector.[46] The U.S. EPA also offers various tools to build water utility resilience.[47] As climate science evolves, policymakers, regulators, and utility managers will have better data and more robust tools to enhance planning and decision-making,

III. RESILIENCE MEASURES IN THE FACE OF ACCELERATING CLIMATE CHANGE AND EXTREME WEATHER THREATS

In 2021, the electricity sector contributed 25% of total U.S. greenhouse gas emissions by burning fossil fuels, second to the transportation sector (28.5%).[48] Public utilities are continually building and replacing infrastructure. Underscoring the intertwined nature of mitigation and resilience planning, if these capital investments *add* to the emissions that trap heat and cause climate change, adaptation and resilience become ever more challenging, expensive, and potentially ineffective. Without simultaneous mitigation of greenhouse gas emissions, resilience becomes a treadmill going nowhere, which makes comprehensive governmental and regulatory policy particularly essential. Even utilities taking measures to reach zero carbon emissions will still need to devote effort toward adaptation and resilience to manage their risks and the direct and indirect costs of climate change.

As previously noted, resilience in the utility sector extends long-prevailing reliability standards. As Andrew Ott of the PJM Interconnection observed, the concepts have commonalities but with relevant distinctions:

> Reliability is about designing, running, and maintaining electricity supply to provide an adequate, safe, and stable flow of electricity . . . Equipment failure and extreme weather are common threats to reliability . . . Resilience is

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44. The authors thank Alex Pozdnyakov of the Long Island Power Authority, who pointed us to industry research in this area. *See* ELEC. POWER RSCH. INST., CLIMATE READI: RESILIENCE AND ADAPTATION INITIATIVE: PREPARING FOR THE FUTURE AHEAD (Apr. 2022), https://publicdownload.epri.com/PublicAttachmentDownload.svc/AttachmentId=77841.

45. ERIC HERSH ET AL., HOLISTIC APPROACHES TO FLOOD MITIGATION PLANNING AND MODELING UNDER EXTREME EVENTS AND CLIMATE IMPACTS, THE WATER RSCH. FOUND. (2023).

46. Paul Fleming et al., *Water Resilience Assessment Framework: Guidance for Water Utilities* (2024), https://ceowatermandate.org/files/Water-Resilience-Assessment-Framework-Guidance-for-Water-Utilities.pdf?utm_medium=email&utm_source=govdelivery.

47. The utility concerns about the limited availability of data and the costs of analyzing the data cited in the 2020 Sabin Center/EDF study ignore the fact that the cost of assembling and analyzing the data does not have to be borne by individual utilities. NOAA, EPRI, EPA and DOE laboratories do much of this type of research. *Creating Resilient Water Utilities*, EPA (Dec. 22, 2016), https://19january2017snapshot.epa.gov/crwu_.html.

48. ENV'T PROT. AGENCY, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990-2021, ES-22 (2023), https://www.epa.gov/system/files/documents/2023-04/US-GHG-Inventory-2023-Main-Text.pdf.

> directly linked to the concept of reliability; you cannot be resilient if you are not first reliable. Resilience encompasses additional concepts – preparing for, operating through, and recovering from significant disruptions, no matter what the cause. It is about our ability to withstand extreme or prolonged events.[49]

Resilience is relative; it is the ability to maintain or "bounce back" to a previous state that itself is likely affected by *non-stationary* long-term trends in weather conditions.[50] Climate resilience calls for building knowledge and capacities to plan for, adapt to, and recover from extreme weather-related and other events.[51]

Examples of weather-related risks from climate change and related adaptive measures and operating practices are summarized in Table 1. Risks and their scope and magnitudes vary geographically, but no system can claim immunity from the potential impacts.

Table 1. Examples of Weather-Related Risks to Utilities from Climate Change and Adaptive Measures[52]

Weather-related Risks	Adaptive Measures and Operating Practices
Rising sea levels	Shoreline vegetation management, facility relocation, sea wall construction
Coastal storm surges	Vegetation management, public safety power shut-off (PSPS), elevation of critical assets, facility relocation
Flooding	Diversion, elevation of critical assets, nature-based stormwater management
Drought	Technical efficiency, recirculating cooling systems, raw water storage
Extreme heat	PSPS, derate some transformers and conductors
Extreme cold	Weatherization of fuel-delivery systems and production facilities
Extreme wind	Vegetation management, PSPS, wire undergrounding

49. Andy Ott, *Reliability and Resilience: Different Concepts, Common Goals*, PJM INSIDE LINES (Dec. 17, 2018), https://insidelines.pjm.com/reliability-and-resilience-different-concepts-common-goals/; *see also* T.J. Galloway Sr., *Advancing Reliability and Resilience of the Grid*, N. AM. TRANSMISSION F. (July 31, 2018) https://www.ferc.gov/sites/default/files/2020-08/Galloway-North-American-Transmission-Forum.pdf.

50. CTR. FOR CLIMATE AND ENERGY SOL., WHAT IS CLIMATE RESILIENCE AND WHY DOES IT MATTER? (Apr. 2019), https://www.c2es.org/document/what-is-climate-resilience-and-why-does-it-matter/.

51. *Id.*

52. *See* SEATTLE CITY LIGHT, SEATTLE CITY LIGHT CLIMATE CHANGE VULNERABILITY ASSESSMENT AND ADAPTATION PLAN, 2, https://www.seattle.gov/documents/Departments/CityLight/ClimateChangeAdaptationPlan.pdf [hereinafter Seattle Action Plan].

Wildfires	Vegetation management, PPSPS, protective wire coating, wire undergrounding

In addition to adaptive operating practices (such as vegetation management), emerging technologies can enhance reliability and resilience.[53] These include optimized distributed resources aggregated into virtual power plants and their strategic interconnection;[54] energy and water storage from utility to consumer scales; microgrids[55] and combined heat and power (typically, cogeneration) systems;[56] real-time satellite and video (drone) surveillance; remote sensing and monitoring and dynamic line ratings; alternative materials (such as metal utility poles);[57] power-flow control (energy) and pressure management (water); advanced metering infrastructure; coordinated resource management (including colocation and multi-utility tunnels); and nature-based solutions for urban flood management (such as wetlands and stormwater parks).[58]

The combination of microgrids with distributed resources and battery storage to maintain electricity reliability at medical, research, and other critical facilities is frequently identified.[59, 60] Microgrids can localize ("island") the impacts of

53. Allyson Chiu, *How sensors could help catch wildfires before they spread*, WASH. POST (June 16, 2023), https://www.washingtonpost.com/climate-solutions/2023/06/15/wildfire-early-detection-sensors-technology/.

54. *See* Patrick Cooley, *US virtual power plants expected to proliferate as reliability needs rise with increasing renewables*, UTIL. DIVE (Aug. 14, 2023), https://www.utilitydive.com/news/virtual-power-plants-proliferate-reliability-needs-renewable-energy/690322/ (explaining how utilities are embracing virtual power plants to provide resilience against weather-related outages).

55. U.S. DEP'T OF ENERGY, MICROGRIDS OVERVIEW (Feb. 2021), https://www.energy.gov/eere/amo/articles/combined-heat-and-power-technology-fact-sheet-series-microgrids#:~:text=A%20microgrid%20is%20a%20group,grid%2Dconnected%20or%20island%20mode ("A microgrid is a group of interconnected loads and distributed energy resources that act as a single controllable entity" that "can connect and disconnect from the {electrical] grid and operate in grid-connected or island mode," and thereby "improve customer reliability and resilience to grid disturbances."); *see also* Akhtar Hussain et al., *Microgrids as a resilience resource and strategies used by microgrids for enhancing resilience*, 240 APPLIED ENERGY 56, 72 (2019).

56. *See, e.g.,* BETTER BUILDINGS – U.S. DEP'T OF ENERGY, COMBINED HEAT AND POWER FOR RESILIENCY – COMPLETED, https://betterbuildingssolutioncenter.energy.gov/accelerators/combined-heat-and-power-resiliency (last visited Mar. 21, 2024) (discussing the "Combined Heat and Power for Resiliency Accelerator"); *see also* BETTER BUILDINGS – U.S. DEP'T OF ENERGY, THE DG FOR RESILIENCE PLANNING GUIDE, https://dg.resilienceguide.ornl.gov/ (last visited Mar. 21, 2024); BETTER BUILDINGS – U.S. DEP'T OF ENERGY, APPLYING CHP IN CI 101, https://dg.resilienceguide.ornl.gov/applying-chp (last visited Mar. 21, 2024) (describing how CHP can aid climate resiliency for universities, data centers, fire stations, supermarkets, government facilities, hospitals, military bases, police stations, schools, prisons, and water treatment plants).

57. *See* NAT'L INTEGRATED DRAUGHT INFO. SYS., DROUGHT STATUS UPDATE FOR THE PACIFIC NORTHWEST (July 29, 2021), htpps://www.drought.gov/drought-status-update-pacific-northwest (Pacific Northwest "has not seen this dry of a spring since 1924); Andrea Thompson, *What Caused Maui's Devastating Wildfires?*, SCI. AM. (Aug. 9, 2023), htpps://scientificamerican.com/what-caused-mauis-apocalytic-wildfires/.

58. *Stormwater Parks,* FED. ENERGY MGMT. AGENCY (Oct. 27, 2021), https://www.fema.gov/node/stormwater-parks. ("Stormwater parks are recreational spaces that are designed to flood during extreme events and to withstand flooding.")

59. *See* Hussain, *supra* note 55 (microgrids used to adapt to climate change).

60. Hyleah O'Quinn, *Energy Resilience Reference Guide Chapter Three: Climate Resilience Strategies for regulators*, NARUC 26 (Sept. 2023), https://pubs.naruc.org/pub/45930E31-AD27-1228-C5A0-

weather events that interrupt service, separating infrastructure and facilitating faster service restoration. The advantages of microgrids include modular design, flexibility, scalability, islanding, deployment in remote areas, and rapid emergency response and disaster recovery.[61] Given their pronounced vulnerabilities, some island states are leading the way on microgrids.[62] In 2018, Hawaii's legislature directed its state commission "to establish a microgrids services tariff to encourage and facilitate the development and use of energy resilient microgrids."[63]

In various forms and scales, batteries support resilience by storing electrical energy. Pumped storage facilities use water reservoirs and gravity to feed hydropower systems for later use; compressed air and chillers can also be used. Batteries can also convert chemical energy into electrical energy using an electrochemical oxidation-reduction ("redox") reaction. Batteries can store energy produced from intermittent renewable resources that displace fossil fuels, or energy generated off-peak that might otherwise be lost. In combination, microgrids and storage enhance resilience in facilities requiring an uninterrupted power supply, such as hospitals, critical care facilities, and biomedical and other scientific research laboratories.

Demand-side solutions can also serve resilience, including technologies such as direct-load controls and pricing methods for shifting or reducing usage, generally and under certain conditions. DOE has highlighted the role of demand response and load management combined with distributed resources in limiting and overcoming power outages.[64]

In addition to technological infrastructure solutions, utilities can explore managerial options to improve resilience and save costs. Collaboration among utilities might include insurance pools, joint purchasing and contracting, shared equipment and supplies, and mutual aid agreements. Alternative strategies should be subject to an evaluation of relative feasibility, efficiency, and effectiveness. Undergrounding of power lines, for example, can shield utility infrastructure from high winds and wildfires but not necessarily from flooding, and alternative technological solutions, such as remote heat sensors for early fire detection and shutoff systems, may be more cost-effective.[65] As mentioned below, comparing a full array of options enables prudence review for cost recovery.

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61. *Id.* at 25.

62. Laurie Stone, *How the Storm-Ravaged Bahamas Can Be a Model for Resilient Energy*, ROCKY MOUNTAIN INST. (July 26, 2022), https://rmi.org/how-the-storm-ravaged-bahamas-can-be-a-model-for-resilient-energy/.

63. Kelsey Jones et al., *State Microgrid Policy, Programmatic and Regulatory Framework,* NAT'L ASS'N OF REGUL. UTIL. COMM'RS 31 (2023), https://pubs.naruc.org/pub/2649E6EB-D7CE-77DC-2BE3-89D48A713213.

64. U.S. DEP'T OF ENERGY, ENERGY EFFICIENCY AND DISTRIBUTED GENERATION FOR RESILIENCE: WITHSTANDING GRID OUTAGES FOR LESS 2 (July 2019), https://www.energy.gov/scep/slsc/articles/energy-efficiency-and-distributed-generation-resilience-withstanding-grid.

65. Chiu, *supra* note 53 (noting that one Rockville, MD company manufacturing fire sensors "is working with four utilities around the country, as well as stakeholders in eight states and has two engagements in Canada."). There may also be less expensive alternatives to sea walls*; see* Geoff Dembicki, *The Progressive Way to*

IV. CLIMATE RESILIENCE PLANNING AS A MATTER OF PRUDENCE

The reluctance of some public utility regulators to address environmental challenges, including the impact of climate change on service continuity, might be due to their perception (or misperception) of the boundaries of their responsibilities to serve the public interest. Regulatory agencies sometimes struggle with aligning the objectives of reliability, affordability, and environmentally sound practices. Some might be concerned about the impact on rates of capital and operating costs needed to address climate resilience.

Others might hold that environmental protection and climate response are not within their charge or expertise and are better left to other policymakers, environmental regulators, or legislators. Under this view, utility regulators are mainly relegated to assessing costs and prudence in implementing technological standards, mandates, and restrictions set by environmental and other regulators and setting rates for compliance and recovery of any legislatively determined costs, including carbon prices or taxes. Still, other public utility commissions might also feel ill-equipped or disinclined to modify standards, practices, and processes to meet the climate change challenge.[66]

A. Resilience Planning and Service Obligations

These concerns do not excuse negligence in the face of known climate risks to the provision of utility services. The objectives and obligations of safe, adequate, reliable, and economical service are at the heart of public utility management and regulation.[67] Regulators are responsible for ensuring that utility infrastructure is maintained and operated appropriately and for investigating failures that adversely affect the quality and cost of service. No new authorizing legislation is needed before regulators can act to ensure resilience; it is part and parcel of the universal charge of the commissions to ensure service reliability at a reasonable cost to consumers.

Whether utilities meet their obligation to provide safe, adequate, and reliable service in the most cost-efficient and effective manner falls squarely within the prudence standard by which utility investments and operating expenditures are deemed appropriate for cost recovery. Prudence requires ongoing attention to dynamic circumstances. Today's public utilities and their regulators have an expanding set of analytical and planning tools they can and should apply to ensure prudent management of contemporary systems, including resilience planning (e.g., modeling and forecasting, multi-objective frameworks, and increasingly, machine learning and artificial intelligence).[68]

Save Cities From Superstorms, THE NEW REPUBLIC (Aug. 2, 2023), https://newrepublic.com/article/174664/progressive-way-save-cities-superstorms (discussing natural solutions to sea level rise that can be implemented "quickly and often at lower costs than traditional gray infrastructure" such as sea walls).

66. Inara Scott, *Teaching an Old Dog New Tricks: Adapting Public Utility Commissioners to Meet Twenty-First Century Climate Challenges*, 32 HARV. ENV'T L. REV. 371, 375-76 (2014).

67. *See, e.g.*, Webb et al., *supra* note 7, at 8.

68. Beecher, *supra* note 15.

The prudence standard is core to the obligation to ensure that licensed utility franchises serve the "public convenience and necessity" and that the terms and conditions of service, including whether investor returns and customer rates are "just and reasonable."[69] Prudence is generally understood as "what is considered 'reasonable' under the circumstances."[70] Prudent performance is expected and does not warrant special incentives; extraordinary financial incentives and rewards for prudence constitute a windfall to the utility.[71]

Traditional prudence assessment often focuses on unnecessary or extravagant spending. But regulators can also determine whether the utility has adequately addressed "reliability, innovation, safety, and environmental effects."[72] In their capacity to substitute for market forces, regulators can penalize imprudence through disallowances or adjustments to returns to promote desirable utility performance.[73]

A common conception is that a utility satisfies the prudence standard where it acts in conformance with "fair and prevailing utility practice."[74] The purpose of this approach is to reprimand a utility for deviating from industry norms to the detriment of consumers. Conformance to prevailing industry practice, however, is not conclusive evidence of a utility's prudence. An industrywide failure to address known and knowable risks should not insulate a public utility from regulatory prudence reviews. A Massachusetts case is illustrative. Invoking new enforcement powers conferred by the legislature in 2009, regulators imposed million-dollar fines on several utilities for sluggish service restoration in the aftermath of tropical storm Irene in 2011 and a subsequent snowstorm.[75] The state's Supreme Court upheld the fines, rejecting the utilities' argument that their conduct should have been measured not against the 2009 statute's "reasonableness" standard but against the more forgiving standard based on prevailing utility practices.[76]

Critically, imprudence by utility managers can be reflected in action but also in the *failure to act.* An act of omission can be "just as imprudent as an act of commission,"[77] although not necessarily so. As the Pennsylvania Public Utility

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69. SCOTT HEMPLING, REGULATING PUBLIC UTILITY PERFORMANCE: THE LAW OF MARKET STRUCTURE, PRICING AND JURISDICTION 252 (2021).

70. Rev. of N. Ind. Pub. Serv. Co. LLC's R.M. Schahfer Generating Station Fire & Related Impact on Fuel Procurement and Fuel Costs, No. 38706 FAC 130 S1 45 (2022).

71. *See* California Pub. Util. Comm'n v. FERC, 879 F.3d 966, 977 (9th Cir. 2018)*; see also* Supplemental Notice of Proposed Rule Making, *Electric Transmission Incentives Policy Under Section 219 of the Federal Power Act*, 175 FERC ¶ 61,035 (2021) (concurring opinion of Commissioner Christie).

72. Hempling, *supra* note 69, at 257.

73. *Id.* at 235*; see also* Entergy Gulf States, Inc. v. Louisiana Pub. Serv. Comm'n, 726 So. 2d 870, 874 (La. 1999).

74. Boston Gas Co. v. Dept. of Pub. Utils., 359 Mass. 292, 301 (1971).

75. Massachusetts Elect. Co. v. Dept. of Pub. Utils., 469 Mass. 553 (2014).

76. *Id.* at 554-55.

77. Penn. Pub. Util. Comm'n v. Philadelphia Elec. Co. (Part 1 of 6), R-891364; R-891364, C001-C007, 1990 Pa. PUC LEXIS 155, *64-65 [hereinafter *PPUC*]; *see also* Georgia Power Co. v. Georgia Pub. Serv. Comm'n, 396 S.E.2d 562, 569 (1990).

Commission has found, reasonable alternatives must have been available.[78] History abounds with examples of utility failures to act when better options were available, including the following findings of imprudence:

- Gulf Power failed to terminate a high-price coal contract when lower-priced coal was readily available (1984).[79]
- Kansas Gas and Electric failed to discover an operational problem that extended a scheduled maintenance outage of its nuclear plant, forcing it to buy more expensive replacement power (1990).[80]
- Gulf States Utilities failed to fulfill its commitment to the Nuclear Regulatory Commission to install a bypass switch, causing it to purchase expensive replacement power to prevent a forced plant shutdown (1993).[81]
- Entergy Gulf States failed to avoid an outage of its power plant and the need to purchase expensive replacement power if it had installed a bypass switch the company had committed to the NRC to install years earlier (1999).[82]
- San Diego Gas & Electric failed to anticipate wind impacts on its facilities based on earlier wildfire experience and was denied recovery of restoration costs of $400 million (2017).[83]
- Xcel Energy failed to dispatch "peak-shaving" resources to reduce the amount of costly gas it had to buy during a severe cold snap (2022).[84]
- Public Service Co. of Colorado failed to urge customers to conserve energy during Storm Uri, forcing it to buy relatively more expensive replacement power (2022).[85]

Any past rationale for inaction by some utilities that climate resilience planning is "an exercise in conjecture"[86] (as recounted in the 2020 Sabin-EDF study) is no longer credible. Resilience planning for climate change is a matter of prudence because climate change risks are *known and actionable*. Resilience requires

78. PPUC, *supra* note 77, at *65.

79. In re: Investigation of Fuel Cost Recovery Clauses of Electric Utilities (Gulf Power Co. – Maxine Mine), 84 FPSC 6:295 (June 22, 1984).

80. Kansas Gas and Elec. Co. v. State Corp. Comm'n of State of Kan., 794 P.2d 1165, 1174 (Kan. Ct. App. 1990).

81. Re Gulf States Utilities Co., 19 Tex. P.U.C. Bull. 1401 (Aug. 19, 1993).

82. Entergy Gulf States, Inc. v. Louisiana Pub. Serv. Comm'n, 726 So. 2d 870, 886 (La. 1999).

83. Application of the San Diego Gas & Electric Company (U902E) for Authorization to Recover Costs Related to the 2007 Southern California Wildfires Recorded in the Wildfire Expense Memorandum Account (WEMA) 7 (Cal. P.U.C. 2015).

84. In the Matter of the Petition of Xcel N. States Power Co. d/b/a Xcel Energy to Recover Feb. 2021 Nat. Gas Costs in the Matter of a Comm'n Investigation into the Impact of Severe Weather in Feb. 2021 on Impacted Minnesota Nat. Gas Utilities & Customers, No. G-002/CI-21-610, 2022 WL 13983153 (Oct. 19, 2022).

85. In Re the Application of Public Service Co. of Colorado, for Recovery of Costs Associated with the Feb. 2021 Extreme Weather Event for its Electric and Gas Utilities, 2022 Co. PUC Decision C22-0413 (Co. P.U.C. June 22, 2022), available at www.dora.state.co.us.

86. Webb et al., *supra* note 7, at 10.

knowledge, foresight, planning, and decision-making by utilities, subject to regulatory standards of review. State and local rate regulators can and should monitor the prudence of climate resilience spending during and between rate cases. They also have the responsibility and authority to ensure prudence through comprehensive planning and operational changes responsive to evolving hazards and threats (from natural and human origins), allowing for appropriate cost recovery while remaining vigilant in policing and penalizing imprudence as necessary.

B. Resilience Planning Compliance and Litigation over Damages

The Sabin-EDF study found that public utility resistance to resilience planning grew out of concerns that they would be compelled to make substantial investments yet still be exposed to civil or even criminal liability for the damages of service interruptions. That concern seems misplaced. An approved and implemented resilience plan should help protect the utility from civil or criminal exposure. Civil or criminal liability apportions culpability for "prior impacts" and past failures to prepare for climate change.[87] Central to all successful litigation or prosecutions is recognizing that the defendant, here the public utility, has violated a duty or standard of care (civil) or a criminal statute. Preparing, implementing, and complying with an approved resilience plan potentially provides an affirmative defense to any civil or criminal complaint growing out of a service interruption tied to climate-related weather events.[88]

Plaintiff-favorable decisions on climate resilience claims, although redressing prior harms, can inform resilience planning. Adverse decisions can identify planning gaps, incentivize utilities to improve their resilience plans, and prompt regulators to revise their climate resilience planning requirements.

V. RULEMAKING AUTHORITY TO MANDATE AND ENFORCE UTILITY RESILIENCE PLANNING

A. Responsibility and Authority to Ensure Safe, Adequate, and Reliable Service

The review of utility prudence is essentially reactive and primarily used to penalize past conduct or inaction found to be imprudent. This practice is not to say that regulatory oversight is only reactive and that prudence reviews come into play only after disaster strikes. With a finding of imprudence, regulators can order corrective action by utilities to avoid or mitigate adverse consequences for infra-

87. *Id.* at 27.

88. *Cf.* Richard C. Ausness, *The Case for a "Strong" Regulatory Compliance Defense*, 55 MD. L. REV. 1210, 1239 (2008), favoring a compliance defense under multiple regulatory regimes. At least one court has concluded that private common law nuisance claims over damage to the climate are preempted by the Clean Air Act and EPA regulations implementing that Act. City of New York v. Chevron Corp, 993 F.3d 81, 95-96 (2d Cir. 2021). While that case dealt with climate mitigation measures, an enforceable, ongoing state-approved resilience planning mandate might similarly foreclose a private cause of action; *see, e.g.*, San Diego Gas & Electric Co. v. Superior Court, 13 Cal. 4th 893, 916-19 (1996) (upholding decision denying lawsuit for service interruption damages where tariff under regulator's "continuing supervisory or regulatory program" precluded such private claims).

structure, services, or ratepayers. The typical regulatory enabling statute also authorizes agencies to clarify performance expectations proactively through rulemaking, which can frame subsequent prudence evaluation, including in the context of performance-based regulation.

State regulators, like their federal counterparts, are given broad mandates to ensure the safety, adequacy, and reliability of utility services, even as circumstances change (predictably or unpredictably). State commission authority and rulemaking powers readily extend to requiring, specifying, and enforcing climate resilience planning.[89] States typically also provide for broad participation and public comment in the rulemaking process.[90] A closely related precedent for resilience rulemaking can be found in the integrated resource plans (IRPs) that many states require (for energy),[91] as well as asset management or capital improvement plans (for water).[92] Examples might also be found in rulemaking for reliability, outage management and restoration, grid modernization, and physical and cyber security.

Rules for IRPs demonstrate how state commissions have used their existing authority to address changing industry circumstances. IRPs were initiated in response to fuel price volatility, concerns about supply-side capacity, and growing interest in demand-side solutions."[93] In many jurisdictions, regulators adopted IRP rules in response to specific legislation,[94] but integrated planning requirements have also been prescribed pursuant to the general authority and obligations

89 . We reviewed the rulemaking powers in six diverse states: California, Kansas, Minnesota, Pennsylvania, Texas, and Washington state. The public utility regulator in each of these states is empowered with the ability to take all actions necessary, proper, or convenient to ensure the adequate, safe, and reliable provision of public utility service. *See, e.g.*, Cal. Pub. Util. Code § 701; Kan. Stat. Ann. §§ 66-101, 1108(b), 1188, 1201, 1216; Minn. Stat. § 216B.08; 2 Pa. C.S. § 102(a); Tex. Util. Code Ann. §§ 14.001, 14.002; Wash. Rev. Code § 80.01.040 (3)-(4).

90. *See* CAL. PUB. UTILS. COMM'N, PROVIDING PUBLIC COMMENT AT THE CPUC: FOUR WAYS TO PROVIDE COMMENTS TO THE CPUC, https://www.cpuc.ca.gov/about-cpuc/divisions/news-and-public-information-office/public-advisors-office/providing-public-comments-at-the-cpuc#:~:text=Parties%20to%20a%20proceeding%20must,public%20on%20the%20CPUC%E2%80%99s%20website (last visited Mar. 8, 2024); KAN. CORP. COMM'N, PUBLIC COMMENTS FREQUENTLY ASKED QUESTIONS, https://www.kcc.ks.gov/public-comments-frequently-asked-questions (last visited Mar. 8, 2024); MINN. PUB. UTILS. COMM'N, GUIDE FOR PUBLIC PARTICIPATION AND PUBLIC COMMENT 1 (2012) https://mn.gov/puc-stat/documents//pdf_files/013992.pdf; PA. INDEP. REG. REV. COMM'N, FILING A COMMENT, https://www.irrc.state.pa.us/contact/comments.cfm (last visited Mar. 8, 2024); TEX. PUB. UTIL. COMM'N, MAKING RULES AT THE PUC, https://ftp.puc.texas.gov/public/puct-info/industry/projects/administrative/PUCTX-RulemakingProcess-fin.pdf (last visited Mar. 8, 2024); WASH. STATE OFF. OF THE ATT'Y GEN., PUBLIC INPUT, https://www.atg.wa.gov/public-input (last visited Mar. 8, 2024).

91. Rachel Wilson & Bruce Biewald, *Best Practices in Electric Utility Integrated Resource Planning*, REGUL. ASSISTANCE PROJECT 6 (June 2013), https://www.raponline.org/wp-content/uploads/2023/09/rapsynapse-wilsonbiewald-bestpracticesinirp-2013-jun-21.pdf.

92. *Id.* at 2, 6.

93. MIDWEST ENERGY EFFICIENCY ALL., INTEGRATED RESOURCE PLANS CRITERIA FOR AN EFFECTIVE PLANNING TOOL 1, https://www.energy.gov/scep/slsc/articles/integrated-resource-plans-criteria-effective-planning-tool (last visited Mar. 8, 2024)*; see also* Wilson & Biewald, *supra* note 91, at 2.

94. Wilson & Biewald, *supra* note 91, at 34-36; *see also* N.C. UTIL. COMM'N, R8-60 INTEGRATED RESOURCE PLANNING AND FILINGS, http://ncrules.state.nc.us/ncac/title%2004%20-%20commerce/chap-

of commissions to ensure the provision of safe, adequate, reliable, and economical service.[95]

Resource and resilience planning both aim to ensure that utilities will be able to meet their customers' current and future needs. IRPs focus on environmental impacts and bringing diversity and balance to the consideration of supply and demand-side resource capacities; IRP tools have evolved to encompass renewable portfolio standards and demand response programs. The complementary role of resilience plans is to ensure that utility infrastructure and operating procedures can withstand or recover from foreseeable events associated with climate change. A comprehensive planning framework can ensure that resilience plans are incorporated into the long-term resource adequacy and capital improvement plans that many regulated utilities must file with regulators and keep current.[96]

While the risks to service continuity posed by climate change and other contemporary threats, such as cyber-attacks, were unknown when the state public utility statutes were initially enacted, executives and legislatures have long been concerned about *adapting regulation* in an evolving context. That is why regulatory statutes are written in broad terms. As the Supreme Court has explained with regard to federal regulatory mandates:

> Regulatory agencies do not establish rules of conduct to last forever; they are supposed, within the limits of the law and of fair and prudent administration, to adapt their rules and practices to the Nation's needs in a volatile, changing economy. They are neither required nor supposed to regulate the present and the future within the inflexible limits of yesterday.[97]

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ter%2011%20-%20utilities%20commission/04%20ncac%2011%20r08-60.pdf, (last visited Mar. 8, 2024) (implement North Carolina G.S. 62-2(a) 3 and (3a), which grant the state's utility commission authority to "promote adequate, reliable and economical utility service to all of the citizens and residents of the State" and to ensure that utilities plan using a mix of demand-side, energy efficiency and generation sources); *see also* N.C. UTIL. COMM'N, § 62-2. DECLARATION OF POLICY., 1, https://www.ncleg.gov/EnactedLegislation/Statutes/PDF/BySection/Chapter_62/GS_62-2.pdf. (last visited Mar. 8, 2024).

95. *See, e.g.*, 4 C.S.R. § 240-22.010 (Mo. 2011) (authorized by RSMo §§386.040, empowering the state commission with "all powers necessary or proper to enable it carry out fully and effectively all the purposes of this Chapter" and 386.610) (protecting the public welfare and "efficient facilities and substantial justice between patrons and public utilities").; Order No. 07-002, *Investigation Into Integrated Resource Planning*, PUB. UTIL. COMM'N OF OR., 1 (2007), https://apps.puc.state.or.us/orders/2007ords/07-002.pdf (first adopted in 1989, Order No. 89-507, Order No. 89-507 - Oregon Public Utility Commission, relied on ORS 756.515) (empowering state commission to investigate on its own motion whether any current utility service is "unsafe or inadequate" and to effectuate the same orders it could issue on a third-party complaint).

96. For comprehensive recommendations on how public utilities can most effectively structure and manage their climate-change resilience plans, *see* Craig D. Zamuda et al., *Resilience management practices for electric utilities and extreme weather*, 32 ELEC. J. 1 (2019), https://toolkit.climate.gov/sites/default/files/Resilience%20management%20practices%20for%20electric%20utilities%20and%20extrreme%20weat....pdf.

97. American Trucking Ass'ns v. Atchison, Topeka, & Santa Fe Ry. Co., 387 U.S. 397, 416 (1967).

B. Developing a Resilience Planning Rule

Despite progress toward climate resilience planning by utilities, there remains a need for a definitive and proactive process to frame regulatory requirements and clarify expectations.[98] As a start, a rulemaking process for resilience planning should:

- Detail the purpose of resilience planning to identify known, foreseeable, and emerging climate change vulnerabilities and risks.
- Be transparent, fair, and inclusive, readily accessible to stakeholders and the public affected by climate change and its costs, including the cost of resilience.
- Be efficient in ensuring timely preparation of resilience plans and implementation of adaptative strategies.
- Clarify procedures and expectations about implementation timelines and cost recovery of expenditures to implement an approved plan.

Resilience planning should commit utilities to making investments, managing assets, and implementing operating protocols that effect prudent and meaningful climate resilience consistent with approved plans. Regulators can advance the utility planning process by establishing rules and directives that, among other things:

- Specify the objectives and scope of resilience plans and the processes for their development, approval, implementation, enforcement, and evolution.[99]
- Address how utilities will identify and manage vulnerabilities specific to the services they provide, the locations in which they operate, and the populations they serve, including disadvantaged communities and households.[100]
- Ensure transparency and disclosure in plans about risks and risk management to all stakeholders.
- Include requirements for considering alternative strategies and designs and their costs and relative cost-effectiveness.

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98. Judsen Bruzgul & Neil Weisenfeld, *Resilient Power: How Utilities Can Identify and Effectively Prepare for Increasing Climate Risks,* ICF CLIMATE CTR. (2021), https://www.icf.com/insights/energy/resilient-power-utilities-prepare-climate-risks.

99. For guidance across key planning steps, *see* U.S. DEP'T OF ENERGY, CLIMATE CHANGE AND THE ELEC. SECTOR: GUIDE FOR CLIMATE CHANGE RESILIENCE PLANNING (Sept. 2016), https://toolkit.climate.gov/sites/default/files/Climate%20Change%20and%20the%20Electricity%20Sector%20Guide%20for%20Climate%20Change%20Resilience%20Planning%20September%202016_0.pdf.

100. At the federal level, for example, the Federal Energy Regulatory Commission (FERC) has adopted a rule requiring public utility electric transmission providers to file one-time informational reports on extreme weather vulnerability assessments. *See* FERC, PRESENTATION | E-1: TRANSMISSION SYS. PLANNING PERFORMANCE REQUIREMENTS FOR EXTREME WEATHER; E-2: ONE-TIME REP. ON EXTREME WEATHER VULNERABILITY ASSESSMENTS (June 15, 2023), https://www.ferc.gov/news-events/news/presentation-e-1-transmission-system-planning-performance-requirements-extreme.

- Address how resilience plans will be comprehensive (all-hazard planning) and synchronized with the utility's resource adequacy, capital improvement, security, and other long-term plans.
- Detail the scoping, scheduling, and budgeting required of all planned projects in advance of the regulatory review and approval process.
- Specify regulatory requirements and review processes for periodic progress reports, plan updates, and public outreach and communications.

Procedurally, regulatory approval of utility plans could be in the form of issuing a certificate of need (or public convenience and necessity) to justify projects and their technological and monetary scale and scope before implementation proceeds and expenditures are incurred. Certification would not confer a guarantee but is suggestive of *probable* recovery of capital and operating costs to ensure compliance, subject to subsequent regulatory audits and prudence reviews within and between rate cases.

The regulatory compact confers to jurisdictional utilities *a reasonable opportunity to earn a fair return* assuming efficient management.[101] Certification of need is consistent with this concept, while preapproved spending is not.[102] Regulators do not (micro) manage utility projects or operations of any kind and should not assume the associated risks, which, in effect, transfers them to ratepayers. Given their advantages of technical and operational knowledge, utilities should bear considerable responsibility for implementing resilience measures. Economic regulation imposes incentives for prudence and efficiency, and cost recovery is more likely for beneficial projects that are well planned, designed, and implemented. Section VII discusses cost recovery issues in more detail.

C. The Role of Torts in Resilience Planning

Tort litigation against public utilities for damages attributable to climate change, if not preempted by state utility regulation, is still reactive. It can be remedial if successful, but unlike resilience planning, it is neither forward-looking nor a substitute for public policy and regulatory oversight. Indeed, tort litigation can inform and validate the need for and content of rulemaking requiring proactive climate resilience planning by utilities.

Tort liability awards against utilities can and should motivate resilience planning and prudent action so that further liability can be averted and additional costs

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101. *See* BEECHER & KIHM, *supra* note 15, at 67. Regarding regulatory standards, *see* Missouri ex rel. Sw. Bell Tel. Co. v. Public Serv. Comm'n, 262 U.S. 276, 289-313 (1923); Fed. Power Comm'n v. Hope Nat. Gas Co., 320 U.S. 591 (1944).

102. For information on preapproval, see Russell J. Profozich et al., *Comm'n Preapproval of Util. Investments,* NAT'L REGUL. RSCH. INST. (Dec. 1981), https://ipu.msu.edu/wp-content/uploads/2016/12/Profozich-Burns-Hess-Commission-Preapproval-81-6-Dec-81.pdf; *see also* Scott Hempling & Scott H. Strauss, *Pre-Approval Commitments: When and Under What Conditions Should Regulations Commit Ratepayer Dollars to Util.-Proposed Capital Projects?*, NAT'L REGUL. RSCH. INST. (Nov. 2008), https://pubs.naruc.org/pub/5F3D50FA-1866-DAAC-99FB-55C8EF422EC8.

can be avoided.[103] Successful tort claims turn on a finding of a duty or standard of care that defendants owe to plaintiffs. According to conventional legal tort formulations, climate damages will be awarded against a public utility defendant if the known damages of accelerating climate change outweigh the forecastable costs of timely resilience measures.[104] Tort damage awards so determined are also relevant to subsequent utility choices about resilience measures and regulatory evaluation of prudence.

VI. EXPERIENCE IN CLIMATE RESILIENCE PLANNING

According to the Center for Climate and Energy Solutions, as of Spring 2023, thirty-three states had adopted "climate action plans" (Table 2) relevant to utilities and regulators.[105] To varying degrees, the plans "include greenhouse gas (GHG) emissions reduction targets and detail actions the state can take to help meet those goals" as well as "resilience strategies, clean energy targets, and economic and social goals."[106]

Table 2. State Action Plans and Reports[107]

	Previous	Latest
Arizona		2006
Arkansas		2008
California	2017	2022
Colorado	2019	2021
Connecticut	2018/2022	2021
Delaware	2014	2021
District of Columbia		2010
Florida		2008
Illinois	2007	2021
Iowa		2008
Kentucky		2011
Louisiana		2022

103. Some of the climate-related tort suits pending in the courts concern utilities' failure to mitigate climate change, but some of these claims, such as wildfire lawsuits, might also point to the lack of adaptation and resilience planning. On prudence and cost allocation associated with wildfires, *see* Petek, *supra* note 30.

104. *See* Thomas C. Galligan, *The Structure of Torts,* 46 FLA. ST. U. L. REV. 239, 496-97 (2022) ("At its most basic" a duty or standard of care in torts posits "a defendant has an obligation to the plaintiff to exercise reasonable care under the circumstances."). Instructive for purposes of efficient resilience planning is a calculus for determining when an existing duty of due care has been breached and damages are owing in the tort context. Articulated by Judge Learned Hand in United States v. Carroll Towing Co., 159 F.2d 169, 173 (2d Cir. 1947), that calculus posits that a duty of due care arises when PL>B, where P is the *probability* of injury or loss (L), L is the *gravity or severity* of injury or loss, and B is *burden or cost* to prevent L.

105. CTR. FOR CLIMATE & ENERGY SOL'S., U.S. STATE CLIMATE ACTION PLANS, (Nov. 2023), https://www.c2es.org/document/climate-action-plans/.

106. *Id.*

107. CTR. FOR CLIMATE & ENERGY SOL'S., *supra* note 105. No data were available for the District of Columbia.

Maine	2004	2020
Maryland	2015	2021
Massachusetts	2015	2022
Michigan	2009	2022
Minnesota	2015	2022
Montana		2020
New Hampshire		2009
New Jersey	2009	2020
New Mexico		Scheduled
New York		2022
Nevada		2020
North Carolina	2008	2019
Oregon	2010	2020
Pennsylvania	2019	2021
Rhode Island	2002	2022
South Carolina		2008
Vermont	2018	2021
Virginia		2008
Washington	2012	2014
Wisconsin	2008	2020

California[108] and New York[109] have adopted comprehensive approaches to climate resilience planning for regulated public utilities.[110] In New York, resilience planning with regulatory oversight was mandated for investor-owned utilities by state law in 2022 following the 2020 Sabin/EDF study.[111]

The New York statute requires investor-owned utilities to prepare and submit to state regulators climate-change vulnerability studies that "[e]valuate the electric corporation's infrastructure, design specifications, and procedures to improve un-

108. The California Public Utilities Commission devotes a web page to the issue, where it cites several orders intended "to integrate climate change adaptation matters in relevant CPUC proceedings." CAL. PUB. UTILS. COMM'N, CLIMATE ADAPTATION, https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/climate-change.

109. *See supra* note 102.

110. *See* CAL. FOURTH CLIMATE CHANGE ASSESSMENT, TECHNICAL REPORTS (Mar. 2023), https://climateassessment.ca.gov/techreports/; *see also* CONEDISON, CLIMATE CHANGE VULNERABILITY STUDY (Dec. 2019), https://coned.com/-/media/files/coned/documents/our-energy-future/our-energy-projects/climate-change-resiliency-plan/climate-change-vulnerability-study.pdf (Plan developed in response to New York PSC directive to respond to significant damage caused by Superstorm Sandy).

111. *See* Webb et al., *supra* note 7, at 13 (citing Con Edison settlement arising out of the New York Public Service Commission's Resiliency Collaborative). The Con Edison 2019 study resulting from the settlement "analyzed projected change in temperature, humidity, precipitation, sea level, and extreme weather in Con Ed's service territory over seven time periods spanning from 2020 through 2080," and identified safety and reliability risks to transmission lines and substations posed by these expected climate changes. *Id.* at 15. Many of the planning features described by the Sabin Center were incorporated into the New York statute enacted in 2022.

derstanding of the corporation's vulnerability to climate-driven risks, and shall include, but not be limited to, adaptation measures to address vulnerabilities and any other information deemed necessary by the commission."[112]

Some mandated resilience plans, such as those required under New York law, are comprehensive, requiring utilities to assess all climate vulnerabilities by location and implement actions to ensure infrastructure and operational resilience; others are focused on specific risks, such as wildfires or storm events, as well as prompt service restoration following interruptions. Some state, municipal, and member-owned (cooperative) utilities typically exempt from state utility commission oversight have also prepared comprehensive resilience plans. Examples include Seattle City Light[113] and the Long Island Power Authority.[114] Utilities not subject to commission jurisdiction can emulate resilience planning and practices from their regulated counterparts.

Economic regulation is mostly self-enforcing based on institutional legitimacy and acceptance of commission rulings. But here, too, regulators have a cudgel if utilities fail to comply with or adequately implement approved resilience plans. With variations, public utility commissions also have the authority to enforce their regulations and orders. Some regulators have statutory authority to issue fines for violations. The California Public Utilities Commission describes its enforcement program as "a variety of formal and informal means, including" formal investigations (preceded by staff investigations) that may include fines and other remedies, staff citations for violations, audits, and inspections, Administrative Consent Orders (ACO), Administrative Enforcement Orders (AEO), and a whistleblower program.[115] In some states, commissions must invoke the authority of the courts for enforcement.[116]

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112. N.Y. Pub. Serv. Law § 66 (29) (a-k) (Consol. 2022); *see* Proc. on Motion of the Comm'n Concerning Elec. Util. Climate Vulnerability Stud. and Plans, Case 22-E-0222 (N.Y. P.U.C. 2022), https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={CA027C18-8246-47E7-A1A1-B2C096AC42C0.

113. *See* Seattle Action Plan, *supra* note 52.

114. *See* LONG ISLAND POWER AUTH., 2023 INTEGRATED RESOURCE PLAN, https://www.lipower.org/irp/; *see also* LONG ISLAND POWER AUTH., LIPA-PSEG LONG ISLAND 5-YEAR STRATEGIC ROADMAP 4, 29 (Mar. 29, 2023), https://www.lipower.org/wp-content/uploads/2023/03/2.6-Consideration-of-Approval-of-the-5-Year-Strategic-Roadmap.pdf (referencing intent to "[p]articipate in EPRI's Climate READi initiative to model and evaluate climate risks and resiliency plans using industry best practices").

115. CAL. PUB. UTIL. COMM'N, ENFORCEMENT AND CITATIONS (June 2023), https://www.cpuc.ca.gov/regulatory-services/enforcement-and-citations.

116. The Ohio Revised Code, for example, makes willful failure to comply with lawful orders of the state's PUC a statutory violation. *See, e.g.*, Ohio Rev. Code § 4905.56. The Ohio revised code authorizes the state commission to "supervise and regulate" both public utilities and railroads, but only expressly gives the commission direct authority to "enforce all orders relating to" railroad safety. *Id.* at § 4905.04. Instead, the state's Attorney General, "upon the request of the commission, shall commence and prosecute such action, or proceeding in mandamus, by injunction, or by other appropriate civil remedies in the name of the state." *Id.* at § 4905.60. The court then has the authority to order "proper" relief. *Id.*

VII. RISK AND REWARD: COST RECOVERY FOR RESILIENCE SPENDING

Achieving climate resilience will be very expensive regardless of who pays and how. But, failure to invest in climate resilience may soon be costlier to society and utilities in the long term. Urban areas face massive costs to construct sea walls and levees to protect people and infrastructure from rising sea levels and flooding.[117] Utilities may need to plan for relocating facilities along coastal areas and inland shorelines.[118] Undergrounding electrical power lines (new or conversions) might be justified under some conditions, but it is far more costly than stringing better-insulated power lines between above-ground utility poles.[119] The water sector's needs associated with water resource, stormwater, and energy management add to the substantial infrastructure investment needed to replace and upgrade aging water and wastewater infrastructure.[120] Building infrastructure to divert and store stormwater in urban areas will also be costly,[121] raising issues of affordability and equity, particularly in legacy cities.

Under the prevailing regulatory model and ratemaking construct, investor-owned utilities have inherent and considerable incentives favoring capital investments that expand the rate base on which returns are earned. The same strong motives influence decisions about spending for system reliability and climate resilience. Regulators and consumer advocates are rightly concerned about rising costs and the spending propensity of utilities, including favoring capital expenditures over operating expenditures and "gold-plating" over more economical alternatives.[122]

Indeed, overspending on resilience is as much a risk as underspending. Utilities should be expected to evaluate and compare technological, operational, and managerial alternatives in terms of feasibility and cost-effectiveness.[123] Competitive bidding or collaborative partnerships could be used for procurement and project management. Sharing experience in climate resilience planning can offer lessons learned and promote the diffusion of legal processes, technical knowledge, and sound policies and practices across regulatory jurisdictions.

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117. Geoff Dembicki, *The Progressive Way to Save Cities from Superstorms*, THE NEW REPUBLIC (Aug. 2, 2023), https://newrepublic.com/article/174664/progressive-way-save-cities-superstorms.

118. *See, e.g.*, Climate Change Impacts on Coasts, EPA, https://www.epa.gov/climateimpacts/climate-change-impacts-coasts (last visited Apr. 17, 2024).

119. *See* EIA, POWER OUTAGES OFTEN SPUR QUESTIONS AROUND BURYING POWER LINES (July 25, 2012), https://www.eia.gov/todayinenergy/detail.php?id=7250; *see generally* Peter H. Larsen, *A Method to Estimate the Costs and Benefits of Undergrounding Elec. Transmission and Distrib. Lines*, 60 ENERGY ECON. 47, 47-61 (2016).

120. CONGRESSIONAL RESEARCH SERVICE, DRINKING WATER INFRASTRUCTURE NEEDS: BACKGROUND AND ISSUES FOR CONG. 8, 10 (Dec. 18, 2023), https://crsreports.congress.gov/product/pdf/R/R47878.

121. *See* EPA, CLIMATE ADAPTATION AND WATER UTILITY OPERATIONS (June 14, 2023), https://www.epa.gov/arc-x/climate-adaptation-and-water-utility-operations (adaptation strategies include aquifer storage and recovery, increased municipal storage capacity, and flood barriers).

122. *See* Costello, *supra* note 16 (discussing concern about "gold plating" resilience measures); *see also* Beecher, *supra* note 15, at 41, 47-50 (discussing utility spending propensities).

123. *See* Costello, *supra* note 16.

Bruzgul and Weisenfeld recommend "flexible adaptation pathways" to reduce regulatory uncertainty and allow for changing course as conditions change.[124] Regulatory review and approval processes can be specified without prejudging regulatory treatment or outcomes. Resilience mandates and standards promulgated by statutes or rules can establish a presumptive need for resilience planning; resilience plans can establish a presumptive need to incur capital and operating costs and provide the basis for evaluating prudence in spending. Following plan approval, processes are needed by which utilities can give notice of major investments and operational actions so that regulators can monitor implementation progress and outcomes. Regulators should also hold utilities to account for compliance in plan-specific and rate-case prudence reviews, including penalization for non-compliance.

Whether utility spending comports with an approved climate resilience plan should become a relevant and possibly determinative consideration in rate cases. Compliance with a regulator-approved plan would create a rebuttable presumption that, for ratemaking purposes, prudently incurred expenditures for approved projects shown to be beneficial will be recoverable in regulated rates charged to customers[125] or by other available means (including tax-supported funding).[126]

Utility regulators will need to be vigilant about prudent and efficient compliance with resilience plans and related mandates and seek to minimize the risk of technological obsolescence. Stranded investments compound resilience costs and do not produce value for utilities, ratepayers, or society. Restrictions on retroactive ratemaking also limit the ability to revisit costs once approved for inclusion in rates.[127] Utilities are in the best position to formulate resilience strategies and should face strong incentives to manage risks, including the possibility of foregone cost recovery or lower returns. Flexible infrastructure design that limits large (lumpy) and nonfungible investments is an adaptive strategy with technological and economic advantages in the context of uncertainty.[128]

VIII. CONCLUSION

We find ourselves beyond the tipping point and facing the mounting toll of climate change. Today's investments will lessen tomorrow's costs. The risks are

124. Bruzgul & Weisenfeld, *supra* note 98, at 10-11.

125. Many states apply a "used and useful" standard for recovery of capital investments, but it is not a constitutional requirement. *See, e.g.,* Jersey Cent. Power & Light Co. v. FERC, 810 F.2d 1168, 1175 (D.C. Cir. 1987). Regulators have allowed utilities to recover prudent investments in failed projects that, for reasons ruled to be beyond their control, never became used and useful. *Id*. at 1184-85. There may well be climate resilience projects that, while prudently undertaken, later become unnecessary or outmoded in the face of new conditions or technologies.

126. Janice Beecher, *Funding and Fin. to Sustain Pub. Infrastructure: Why Choices Matter*, MICH. ST. UNIV. 4 (Jan. 15, 2021).

127. *See, e.g.,* Pub. Util. Comm'n v. FERC, 988 F.2d 154, 161 (9th Cir. 1993) ("[T]he rule against retroactive ratemaking prevents utilities from collecting revenues to compensate for [prior over or] underrecoveries….").

128. *See* RICHARD DE NEUFVILLE & STEFAN SCHOLTES, FLEXIBILITY IN ENG'G DESIGN, THE MIT PRESS (2011); *see also* ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, CLIMATE-RESILIENT INFRASTRUCTURE 2 (2018), https://www.oecd.org/environment/cc/policy-perspectives-climate-resilient-infrastructure.pdf (noting that "[f]lexible, adaptive approaches to infrastructure can be used to reduce the costs of building climate resilience given uncertainty about the future.").

known and actionable, and rationales for inaction are no longer tenable. Climate science confirms that despite mitigation efforts, heat-trapping gases will continue to cause rising sea levels and increasingly extreme weather events, with widespread economic and social consequences. Prudence calls for adaptive and *resilient* utility infrastructure. It is manifestly urgent for regulators to exercise their rulemaking authority and mandate enforceable climate resilience planning by public utilities to ensure the continuity of services vital to the public interest.

CLIMATE UNCERTAINTY AND RISK: RETHINKING OUR RESPONSE

By Judith Curry
Reviewed by Kenneth A. Barry[*]

I. INTRODUCTION

Judith Curry is unquestionably a well-credentialed climate scientist. Professor Emerita of Earth and Atmospheric Science at the Georgia Institute of Technology, and now leading her own climate forecasting organization, she has toiled in the trenches of classrooms and international conferences alike. She is also, manifestly, an independent thinker. Since the 1990s, she has been taking a hard squint at the evolving climate consensus espoused by the majority of her colleagues and posing tough-minded questions. To her, maintaining a degree of skepticism is not a disservice to her profession, but rather essential in scientific research as well as the task of crafting recommendations for policy framers.

In her 2023 book, *Climate Uncertainty and Risk: Rethinking our Response* (*Climate Uncertainty*), Curry mixes insights from her personal journey with a wealth of data and analysis drawn from a wide array of climate researchers. Her primary themes, as the book's title foreshadows, are (1) the underappreciated degree of uncertainty in the current state of the science; and (2) how the risks posed by climate change in the 21st century might best be comprehended and planned for. An undercurrent is her disappointment that more than a few scientists have swallowed their skepticism and donned an activist mantle, the better to forge a global, doubt-resistant climate consensus.

In that drama – the inherent tension between scientific skepticism and the yearning for a consensus that drives bold action to curtail greenhouse gas emissions – Curry's leading protagonist is the U.N.'s Intergovernmental Panel on Climate Change (IPCC). Founded in 1988 and reinforced by the U.N. Framework Convention on Climate Change, the IPCC has assumed a major role in assessing the state of research findings in climate change, issuing periodic reports thereon, and alerting policymakers and the wider public of what might transpire absent preventative action (famously enunciating the goal of constraining emissions so that global average temperatures won't exceed 1.5 °C – or at worst, 2.0 degrees – above the preindustrial average).

Curry does not seek to eviscerate the work of the IPCC, which has included many respected scientists, but neither does she take its projections, prescriptions, and sprawling range of possible scenarios as gospel. Rather, she homes in on the periodic reports' uncertainties and diversity of potential outcomes, while taking to task those who seize upon the most alarming and extreme possibilities. "How concerned should we be about climate change?" she asks early on, and responds:

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> The IPCC Assessment Reports do not support the concept of imminent global catastrophe associated with global warming. However, a minority of scientists, some very vocal, believe that catastrophic scenarios are more realistic than the IPCC's *likely* scenarios. There is also a very vocal contingent among journalists and politicians that support the catastrophic narrative.[1]

Readers may be surprised by Curry's take on the periodic IPCC assessments – documents which, as publicized in general circulation media, appear to sound an unequivocal alarm that the world is on the brink of dangerous, even irreversible, global warming. However, critics of the U.N.-sponsored process have often observed that the IPCC's detailed underlying assessments are not as cataclysmic as the accompanying executive summaries, much less the media, activist, and political glosses. *Climate Uncertainty* falls somewhere within that school of criticism in suggesting that politicization of the IPCC's work has resulted in a skewed understanding of its implications.[2]

Curry demonstrates a mastery of both the fortes and foibles of climate change modeling – a topic she returns to repeatedly, given its centrality in the projections emanating from the IPCC. While she accepts their usefulness in exploring the impacts of various inputs, placing *too much* stock in them, according to the author, understates the profound complexity and variety of oftentimes weakly understood factors that shape the climate. For readers who are not themselves experts in climate studies or allied fields (such as weather forecasting, computer modeling, or statistics), it's a challenge to consistently follow Curry's explanations and reasoning. As a lawyer in the energy industry and occasional consumer of books on the impacts of energy production (among other drivers) on global warming, I was reasonably familiar with the subject and yet not infrequently tripped on some of the technical jargon and concepts related in *Climate Uncertainty*. In certain chapters, this is an in-depth science book, not a treatise dumbed down for lay readers to digest in easy spoonfuls. Nonetheless, most readers will understand the broad themes and get the gist of what Curry is presenting, if not all the particulars.[3]

It is helpful that Curry's prose is clear and straightforward, even if some terminology is less so. Another plus is the organization of *Climate Uncertainty.* Chapters are relatively short, and themselves broken down into subsections of just a page or two, each preceded by a title and brief quotation. The latter are sometimes amusing (e.g., drawn from pop culture or well-known literature), sometimes from scientists opining on some idiosyncrasy of climate change or science more generally, but always intended to introduce the discrete matter being explored with a touch of wit and wisdom. If the reader is beginning to feel at sea, these miniature prologues serve as islands of humor and common sense.

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1. JUDITH A. CURRY, CLIMATE UNCERTAINTY AND RISK: RETHINKING OUR RESPONSE 3 (2023).

2. Steven E. Koonin's book on climate change uncertainty, *Unsettled* (2021), charts a similar path in underscoring a distinction between the IPCC's executive summaries and underlying detailed analyses, as well as the difficulty in sorting out natural climate variability versus that caused by human activities. *See* the review, also by this reviewer: Kenneth Barry, *Unsettled: What Climate Science Tells Us What it Doesn't and Why it Matters*, 43 ENERGY L.J. 237 (2022).

3. It can be debated whether Curry should have spliced in explanations for general readers to overcome deterrents to full understanding. The drawback is that doing so would substantially lengthen the book, and perhaps bore specialists who don't need handholds.

II. THE BIRTH OF A SKEPTIC

Curry recounts in an early chapter her journey from being a conventional climate scientist to a more skeptical practitioner. Her skepticism, it should be emphasized, isn't about whether the planet has shown some warming since preindustrial times, or whether carbon dioxide emissions from fossil fuels are a contributing factor. Those are givens. Instead, it's about *how much* warming can be attributed to greenhouse gas emissions, *how well* projections of future warming and climate impacts are supported, and *how to cope* with the manifest uncertainties that surround these questions. Her analysis insists on foregrounding the natural changes in climate that have occurred, from time immemorial, across multiple periodic cycles. As Curry puts it in the book's introduction:

> A changing climate has been the norm throughout the Earth's 4.6-billion-year history. The Earth's temperature and weather patterns change naturally over timescales ranging from decades to millions of years. Natural variations in the surface climate originate in two ways. Internal climate fluctuations associated with circulations in the atmosphere and ocean produce exchanges of energy, water, and carbon between the atmosphere, oceans, and ice. External influences on the climate system include variations in the energy received from the sun and the effects of volcanic eruptions.[4]

At the same time, Curry does not shortchange the contributions of mankind. Human activities, she notes, "influence climate through changing land use and land cover [as well as by] changing atmospheric composition by increasing the emissions of CO_2 and other greenhouse gases and by altering the concentrations of aerosol particles in the atmosphere."[5]

However, one of the objectives of Curry's book is to restore more balance in the public perception of the two great forces – natural variations and human actions – behind climate change. She laments:

> Any change that is observed over the past century is now implicitly assumed to be caused by human emissions in the atmosphere. This assumption leads to connecting every unusual weather or climate event to human-caused climate change from fossil fuel emissions.[6]

In the same passage, Curry takes matters a step further, suggesting that climate change is blamed for a whole spectrum of social ills: "Everything that goes wrong reinforces the conviction that there is only one thing we can do to prevent societal problems – stop burning fossil fuels."[7] Thus, an implicit aim of *Climate Uncertainty* is to counter the practice of scapegoating greenhouse gas emissions as the root cause of problems that require a much wider perspective to solve.

Curry wants us to know something else essential to understanding climate change: its mysteries are a lot more complicated to unravel than "laboratory physics and chemistry."[8] In her words:

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4. CURRY, *supra* note 1, at 4.
5. *Id.*
6. *Id.* at 5.
7. *Id.*
8. CURRY, *supra* note 1, at 6.

> Complexity of the climate system arises from the chaotic behavior and nonlinearity of the equations for motions in the atmosphere and oceans, and the feedbacks between subsystems for the atmosphere, oceans, land surface, and glacier ice.[9]

All this, insists the book, is more than a handful for contemporary computer modeling of climate systems to tackle. As one of many examples, Curry points out that "[t]he wide differences among climate model simulations of clouds and ocean circulations continue to be primary sources of uncertainties in the current generation of climate models."[10] Her treatise is thus, among other things, a sustained call for humility in construing the readouts of computer modeling runs.

Curry also faults the U.N. and its IPCC for implying that the preindustrial climate was "just right," in the Goldilocks sense. Few would want to return to the 18th century climate, part of the so-called Little Ice Age, she notes, with "viciously cold winters" in the US, Europe, and China.[11] In reality, she continues, the migration of populations in North America in more recent times has evinced a preference for warmer winters.[12] However, this relativism does not mean that the book is cavalier about concerns over extreme weather events and "dangerous" global warming. Over many pages of *Climate Uncertainty,* Curry examines the IPCC's identification of such risks to human civilization and the ecosystem, while evaluating whether they are overstated or justified. She also interrogates whether "tipping points" are close at hand, debunking most of these "catastrophic scenario[s]" as "unlikely" in the IPCC's own estimation.[13]

In Chapter 2, the author takes a special interest in documenting how the requirement for a "consensus" among scientists has evolved, under the auspices of the IPCC and urged on by major political figures. This is a section in which the author takes a clear personal interest, but her analysis is nuanced. She records the observation of a social scientist that the IPCC "adopted a 'speaking consensus to power' approach that sees uncertainty and dissent as problematic and attempts to mediate these into a consensus."[14] The hitch is that, where "available knowledge is inconclusive," consensus becomes "a proxy for truth," reflecting "a specific vision of how politics deals with scientific uncertainty."[15] The approach may be a pragmatic strategy to transcend gaps in our understanding, but is a constant source of worry underlying *Climate Uncertainty* insofar as it fosters an attitude of "overconfidence" that isn't warranted by the actual state of the science. Indeed, an "extended group of scientists" has absorbed this "confidence in the consensus," Curry

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9. *Id.*

10. *Id.* at 7. Curry provides a longer bullet-point list of climate science "gaps' she noted as early as 2014 when attending a workshop. These include solar impacts; multi-decadal and century scale "internal variability" associated with ocean circulations; vertical heat transfer mechanism in oceans; thermodynamic feedbacks (from water vapor, clouds, and atmospheric "lapse rates" that determine the climate sensitivity to greenhouse gases; and (added in later years) the planet's "carbon budget and . . . cycle"; ice sheet dynamics; and geothermal heat transfers under oceans and ice sheets. The book details these phenomena and understanding gaps in ensuing chapters. *Id.* at 8.

11. CURRY, *supra* note 1, at 9.

12. *Id.*

13. *Id.* at 11.

14. *Id.* at 21.

15. CURRY, *supra* note 1, at 21.

alleges, via a "second-hand manner from the institutional authority of the IPCC and the emphatic way in which the consensus is portrayed."[16]

Curry goes on in Chapter 2 to argue the essentiality of skepticism in sorting through hypotheses and advancing science.[17] In a rather poignant passage, Carry asks:

> [H]ow did skepticism about climate change come to be an accusation, with some scientific researchers in academia being branded as deniers, heretics, misinformers, and anti-science?[18]

In this environment, "independent thinkers, who are not supportive of the IPCC consensus, are suspect," Curry frets.[19] She adduces a roster of scientists with impressive credentials whom activists have denounced in such terms. The "denier" label has even been pinned on scientists well known for raising concerns about climate change but who have dared to suggest that renewable energy sources aren't sufficient to power the grid (and have therefore voiced support for nuclear energy).[20]

Curry emerges as an advocate for *not* camouflaging scientific uncertainties and dissent in a veneer of consensus. While she acknowledges that the IPCC's bent towards consensus-building was "useful" in forging an "early synthesis" of the basic science behind climate change, she maintains that "[g]reater openness about scientific uncertainties and ignorance, plus more transparency about dissent and disagreement, would provide policymakers with a more complete picture of climate science and its limitations."[21]

III. A PLEA FOR POLICY FRANKNESS

Another dimension to the book is a call to recognize "inconvenient truths" in the realm of what is *politically and economically* feasible. In this regard, Curry has serious doubts about whether carbon neutrality by 2050 – a route the U.N. bodies have prescribed as vital to holding the global temperature average to just 1.5 degrees °C above the preindustrial level – is achievable. There's a 'wide gap," she notes, between "ambition and obligation" in the 2016 Paris Agreement on climate change. Moreover, she adds:

> The proposed stabilization of CO_2 emissions has revealed and created new problems in terms of energy policy. Energy policy is driven by a complicated mix of economics and economic development, energy security and reliability, environmental quality and health issues, and resource availability. It is becoming increasingly apparent that we don't know how to address the challenge of rapidly stabilizing atmospheric concentrations of CO_2 at a low level. The green energy revolution has barely begun. Large-scale sequestration of CO_2 emissions is an idea that is far from reality.[22]

16. *Id.* at 26.
17. *Id.* at 27.
18. *Id.* at 29.
19. CURRY, *supra* note 1, at 29.
20. *Id.* at 30.
21. *Id.* at 32.
22. *Id.* at 41.

The carbon neutrality goal is further hindered by the need to get all countries on board with the proposed strategies. Curry suggests readjusting emissions policy goals that "almost certainly will not be met since they aim beyond the scope of the knowable and doable and what is politically feasible."[23]

While she's at it, Curry takes another controversial shot, this time at what she calls the "sustainability trap" (which she locates "at the heart of the [U.N.] agenda").[24] Sustainability, she adds, treats carbon emissions as a "control knob" in the service of maintaining a stable climate; but this notion is "being increasingly challenged," maintains Curry, because the "world and its climate are thought to be continually out of balance."[25] Instead, she suggests more policy focus and resource investment should be directed at "resilience" which "looks for ways to manage in a continually imbalanced world . . . the ability to bounce back in the face of shocks . . . reorganize and retain essentially the same functional structure."[26]

In Chapter 3 ("Mixing Science and Politics"), Curry returns to her theme that climate science has been undermined by political activism – this time with even more vigor. Her main beef is that many climate scientists have allowed their craft to bleed over into policy advocacy, whereas, in her view, they should be kept separate: "The phrase 'follow the science' has a virtuous ring to it. But it does not lead anywhere. It can illuminate various courses of action and quantify the risks and tradeoffs. But science cannot make choices for us."[27]

In addition to disapproving of scientists who have leveraged public trust in science to promote their political agendas, Curry chastises editors of scientific journals who've acted as gatekeepers in filtering out research papers that don't align with the IPCC consensus. She cites as just one example the editor of *Science,* who proclaimed in an op-ed in 2015 that "[t]he time for debate has ended. Action is urgently needed."[28] The result has been suppression of dissenting voices:

> How many studies providing quality data and analyses relevant to climate controversies have gone unpublished because the researcher feared repercussions, did not see the value of reporting it, or did not want the results to be widely known? How many skeptical papers were not published by activist editorial boards? How many published papers have buried results in order to avoid highlighting findings that conflict with preferred narratives?[29]

The questions are rhetorical, in that the actual numbers are "unknowable," Curry reflects, but she states that she's aware of anecdotal examples of each such form of suppression.[30]

The upshot is that science has been distorted and misused by the relevant U.N. bodies, Curry concludes, as the latter have asked for more precision from

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23. CURRY, *supra* note 1, at 41.
24. *Id.*
25. *Id.*
26. *Id.* at 42.
27. CURRY, *supra* note 1, at 55.
28. *Id.* at 58.
29. *Id.* at 59.
30. *Id.*

their expert panels "in support of a preordained policy solution" than permitted by the "complexity, chaos, and our current understanding," resulting in "an impossible situation for scientists and misleading outcomes for policy makers."[31]

IV. PLAUSIBILITY OF WORST-CASE SCENARIOS

After decrying the atmosphere in which climate scientists who question the IPCC's advertised "consensus" work, *Climate Uncertainty* in Chapter 9 ("What's the worst case?") takes a closer look at the predicate for worst-case scenarios – possibilities that seem to get the most oxygen in widespread publicity surrounding the panel's periodic reports. Inevitably, this steers the book into a dissection of the science. Curry takes a hard look at the spectrum of possible global warming outcomes – both potential average temperatures and adverse consequences (storms, floods, draughts, heat waves, etc.). Her skepticism that the more extreme possibilities will occur is rooted in historical precedents, offsetting natural variability phenomena, the feedbacks and inherent boundaries of the climate system, and above all the limitations of complex computer modeling to meaningfully capture and predict the myriad of factors that affect weather and climate trends. A recurrent point is that *global* climate models are particularly weak at predicting *regional* weather and climate changes, which require "high resolution" and localizing parameters.

Many readers may find these sections edifying but slow-going, simply because the discussion gets increasingly granular and technical. Those who lack expertise in climate research and modeling may be challenged, but persistence should yield a deeper appreciation of why a fair number of independent-minded scientists like Curry are hesitant to join the chorus forecasting climate and ecological devastation as the 21st century unfolds. Her hard-headed, anti-alarmist attitude is well summed up in this passage:

> There is not a straightforward continuum between the plausible and implausible. Rather, there is a spectrum from the extremely plausible . . . to the implausible, which is nearly inconceivable or incredible. . . . Articulation of plausible scenarios provides a pathway away from prediction and probabilistic thinking that creates a more fruitful basis for making decisions for complex problems with large uncertainties.[32]

Her argument to focus on the "plausible" leads her to denigrate high estimates of the "economic cost of carbon" that derive from a "statistically manufactured fat tail whose outcome values have no scientific justification."[33] Her own analytic framework is then applied in short sections on the risks of West Antarctic Ice Sheet collapse, sea level rises, and other "worst-case scenarios."

V. LIVING WITH, AND MANAGING RISK, IN DEEP UNCERTAINTY

Much of the latter half of *Climate Uncertainty* is consumed by a wide-ranging meditation on how society deals with risks and unknowns. Overcorrecting for risks that resist easy identification or quantification can be as bad, or worse, than

31. CURRY, *supra* note 1, at 61.

32. *Id.* at 141.

33. *Id.* at 142.

taking them too lightly, in the author's view. The uniqueness of climate change risk forecasting is something Curry continually stresses. While it is tempting to treat climate change as a "well-understood problem with a strong consensus" that traditional risk management can address, she counters that "the diversity of climate-related drivers and their complex linkages, various inherent and irreducible uncertainties . . . and the unequal distribution of exposure and effects across geographies and time . . . confound any simple or uncontested application of traditional risk management approaches."[34]

In Chapter 11, squarely titled "Risk Management," Curry prescribes for the unique challenges of climate or extreme weather a form of "dynamic risk assessment and management" with responses that can be "monitored and adjusted."[35] It is clear from the pages that follow that Curry has given extensive thought to the anatomy of risk associated with climate change and to pragmatic, adaptive management strategies. Her enlargement of the subject shuttles between the abstract and the concrete. As an instance of the latter, Curry reviews how Germany's "single-minded focus" on eliminating the risk of a nuclear power plant accidents in the wake of Japan's Fukushima disaster – specifically, by phasing out its nuclear capacity – resulted in a Pandora's box of ill effects: high prices and energy "impoverishment," an increase in reliance on fossil fuels (including coal when Russia's invasion of Ukraine imperiled natural gas supplies), and a "spike in greenhouse gas emissions and air pollution."[36] The lesson is to broaden risk analysis to take more potential downsides into account.

The book then turns from flexible risk assessment to adjacent fields: robustness and resilience of systems that can be impacted by extreme weather. As typical in *Climate Uncertainty,* Curry provides a clear, well-organized, bullet-pointed overview of the myriad considerations that go into these capabilities. Notably, she opines that setting a specific target level to stabilize greenhouse gas emissions is a "non-robust strategy" given the complex web of uncertainties, feedbacks, and non-linear drivers entailed. She prefers to deploy a "broad technological portfolio of mitigation and adaptation measures. . . ."[37]

The discussion, as it proceeds, takes on the flavor of a management seminar on the science of decision-making in a context of flux and high-stakes risks (Chapter 12, in fact, is titled "Decision-Making under Deep Uncertainty"). With its core of common sense, the dissertation is useful in delineating concepts and processes that are more likely to succeed (i.e., lead to decisions society won't regret later on) where the goal is to optimize for a future that is rife with uncertainties. Curry favors collaborative processes that are, in some ways, the inverse of traditional decision-making and lead to stakeholder buy-in, a set of feasible alternatives, and flexibility later on to hone the decision to fit future developments.

In a succeeding chapter (Chapter 13, "Adaptation, Resilience, and Development"), Curry tackles a subject that has been a sore subject over the long haul of climate debate. "For the last 30 years," she observes, the U.N. bodies addressing

34. *Id.* at 163.

35. CURRY, *supra* note 1, at 164.

36. *Id.* at 194-96.

37. *Id.* at 206-07.

climate change have chosen "eliminating emissions from burning fossil fuels" to be their "dominant goal."[38] Activists, she adds, have looked down on adaptation approaches as "capitulation and a distraction from the need to curb emissions . . . in essence, a copout that lets the fossil fuel companies off the hook."[39] However, the author discerns a countertrend over the last decade that has admitted adaptation strategies into the conversation. She then traces some of these signs and concrete actions.[40]

Here, Curry circles back to a previous peeve: using climate change as an all-purpose excuse. Politicians around the globe, she notes, are prone to invoking climate change to deflect blame for chronic problems with other root causes, such as natural climate variability, inter-class discrimination, resource exploitation, or their own government's inadequacies.[41] This can lead to neglect or misdirected efforts in tackling economic or environmental dysfunctions with more relevant solutions.[42]

Another swipe at IPCC orthodoxy comes with Curry's observation that a key building block of resilience and adaptation is economic development (because underdeveloped societies are most exposed to harsher weather events). Yet, the most recent IPCC assessment (AR6), while specifically addressing "climate resilient development," has an inherent tension, in that its insistence on "sustainability" (i.e., ruling out fossil fuel-based energy) "conflicts with the objective of poverty eradication."[43] The upshot is that:

> Development and resilience are potentially being slowed down by a growing emphasis on linking international development funds to reducing emissions . . . [which] comes at the expense of development funds that have historically been targeted for poverty reduction.[44]

VI. MORE ENLIGHTENED ENERGY POLICIES

Of even greater interest to those in the energy field is one of the concluding chapters, simply titled "Mitigation" (Chapter 14). *Mitigation* is shorthand for strategies to cut carbon emissions and atmospheric concentrations of greenhouse gases as the linchpin for preventing excessive global warming. "Reducing CO_2 emissions," argues Curry, "has become an end in itself, with the implicit assumption that [it] will rapidly decrease atmospheric CO_2 and improve the climate."[45] But even if the brakes are slammed on greenhouse gas emissions in the near term, she maintains:

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38. *Id.* at 231.

39. CURRY, *supra* note 1, at 231.

40. *Id.* at 231-32.

41. *Id.* at 232-33.

42. *Id.* at 233-34. Curry provides some concrete examples of such misidentification.

43. CURRY, *supra* note 1, at 246.

44. *Id.* at 248. Curry returns to this theme ("Conflicts with Mitigation"), where she deplores the U.N. Secretary General, the governments of the U.K., the U.S., and such major lenders as the IMF and World Bank for "aggressively limiting fossil fuel investments" at the expense of economic development for poor countries. This forbearance includes "natural gas [which is] regarded as the best near-term solution for most countries." *Id.* at 234.

45. *Id.* at 263.

> The bottom line is that there is substantial inertia in the global carbon cycle and the climate system. Even if the emissions are successfully reduced/eliminated, it takes time for the CO_2 concentration in the atmosphere to respond . . . [and] for the climate to respond to the change in atmospheric CO_2.[46]

Several pages later in the chapter, Curry surveys the state of carbon sequestration. "Natural" sequestration (though planting vegetation that stores carbon dioxide) is an obvious "no regrets" strategy, but technological methods of carbon capture, she continues, are "in relatively early stages of development."[47] Curry finds it "prudent" to continue development of such carbon sequestration technologies – noting that the IPCC's latest report deems them "an essential element of scenarios that limit warming to 1.5º C or likely below 2º . . . regardless of whether net-zero emissions goals are reached."[48]

There are also compact but enlightening subsections on (1) short-lived but potent emissions (e.g., methane and "black carbon" or soot) – whose control in the nearer term Curry finds potentially impactful and more feasible than a precipitous clampdown on CO_2 emissions; and (2) the history of past energy transitions and the state of the current transition (i.e., from fossil fuels to "cleaner" technologies).[49] She describes a bumpy road so far in Europe's and China's clean energy transitions, due to spells of uncooperative weather coupled with insufficient planning for wind and solar intermittency.[50] In the U.S., Curry delineates several obstacles to rapid deployment of wind and solar, including growth of the transmission network "at a pace that is a fraction of that required for net-zero emissions."[51] As for biofuels, Curry's comments point to largely ill-considered, politically-driven policies – both in the U.S. and E.U. – pushing the dedication of farm and woodlands to this variety of renewables.[52]

Uncertainties notwithstanding, Curry also takes a crack at imagining the electric grid as the 21st century ends – bearing in mind that fossil fuels are finite and increasing electrification of energy usage incorporating lower-carbon resources is likely a long-term trend. The subsection is well worth reading in detail, but the biggest takeaway is that nuclear power will have to serve as a "backbone" and that some combination of super-regional "macro" and smart "micro" grids will best serve to distribute the diverse energy sources and demand response opportunities of tomorrow.[53] In a closer look at the state of nuclear power globally and in the U.S., Curry describes how advanced "modular" unit designs currently being developed can alleviate the safety and cost concerns that have dogged nuclear plant development in the last few decades.[54]

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46. CURRY, *supra* note 1, at 266.
47. *Id.* at 267-68.
48. *Id.*at 268.
49. *Id.* at 268-75.
50. CURRY, *supra* note 1, at 273.
51. *Id.* at 274.
52. *Id.* at 273-74.
53. *Id.* at 278-79.
54. CURRY, *supra* note 1, at 281-283. Curry suggests in this subsection that, notwithstanding some well-publicized accidents, the overall safety record of nuclear is good and concerns have been overblown.

VII. CONCLUSION

As *Climate Uncertainties* winds to a close, the author reprises some themes and arguments in previous chapters, shaping them into broader recommendations. Notably, Curry weighs the countervailing risks of energy shortages and high costs associated with a steep reduction in fossil fuel use versus the risks of a dangerously warmer climate. Her verdict is that the socioeconomic risk of a less reliable energy system is more definite and quantifiable than the far less certain risk of severe, worst-case climate scenarios coming to pass by mid-century. Hence, she prefers a less aggressive agenda for phasing out conventional fuels and bringing on new, greener technologies.[55]

The final chapter of the book – "Climate Risk and the Policy Discourse" (Chapter 15) – is a compelling sermon on the intensified, partisan state of the public debate. As a scientist who has studied the technical issues in great detail but declines to pull the ripcord of a "climate emergency," Curry laments the devolution of the debate into volleys from entrenched encampments:

> Catastrophizing is motivated by a desire to amp up the urgency for action in eliminating fossil fuels. Continued catastrophizing has produced a public battle between two extremes: those who insist on urgent elimination of fossil fuels, and a range of others that are castigated as deniers of climate science because they do not support the rapid elimination of fossil fuels until reliable replacement fuels are in place.[56]

In the last several pages, effectively an epilogue, Curry calls for bringing the temperature down, figuratively speaking, while listening to multiple perspectives: "The road ahead . . . requires moving away from the consensus-enforcing and cancel culture approach of attempting to restrict the dialogue surrounding climate change and the policy options. We need to open up space for dissent, disagreement, and discussion about scientific uncertainty and policy options . . . ."[57]

I found *Climate Uncertainty* an impressive undertaking that is well-executed throughout. In just 300 pages, it covers a remarkably broad array of interrelated topics, from the science to energy technology to policies that are sensitive to the needs underdeveloped nations, with an attitude that's more pragmatic than ideological. When Curry enters the thicket of IPCC warming scenarios, the discussion may get a bit esoteric for non-scientists, and some thought might be given to an expanded future edition that ameliorates the challenge.

Certainly, Judith Curry has some axes to grind – and at times the sparks fly – but for the most part she proves a patient, deeply researched, and objective guide through the labyrinth of issues and debates clustering around the future of our climate. The lengthy endnotes following each chapter attest to her recruitment of many authorities to buttress her explanations and arguments. Yet, she provides a distinct voice, whether you classify her as a "skeptic" or simply an apolitical, professionally detached observer.

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55. *Id.* at 280.
56. *Id.* at 297.
57. *Id.* at 304.

Curry finished writing the book in mid-2022.[58] That means a plethora of new studies and data have flowed into the arena since she sent off her proofs to the publisher. With front-page stories in the *Washington Post* every week proclaiming fresh evidence of grave climate damage on the horizon, I wondered whether Curry has retreated from the stands she takes in *Climate Uncertainty.* A visit to the author's website *Climate, Etc.,* featuring Curry blog posts quickly convinced me otherwise: all her core premises appear to remain intact.[59] Indeed, one can find a Curry lecture, posted on May 4, 2024, encapsulating the book in a convenient 30-minute video.[60]

58. CURRY, *supra* note 1, at 292.

59. *See* CLIMATE ETC., https://judithcurry.com/ (last visited May 8, 2024).

60. Judith Curry, *Annual GWPF lecture: Climate Uncertainty and Risk*, CLIMATE ETC. (May 4, 2024), https://judithcurry.com/2024/05/04/annual-gwpf-lecture-climate-uncertainty-and-risk/.

FERC V. STATES: SUBSTANTIAL EVIDENCE & FUNCTIONAL AGREEMENTS UNDER SECTION 401 OF THE CLEAN WATER ACT

Da'Lisha Kirk

I. INTRODUCTION

According to the Office of Energy Efficiency & Renewable Energy, hydroelectric power makes up 31.5% of the United States' total renewable energy and 6.3% of the United States' electricity.[1] Since hydroelectric power is considered an affordable source of electricity, has a longer lifespan, and is potentially more flexible and reliable than other sources, such as solar, many companies have harnessed hydroelectric projects to garner these benefits.[2] Over the years, the courts have interpreted the scope of FERC's authority and obligations regarding hydroelectric projects in a number of cases.[3] While FERC has general authority to approve, reject or condition hydroelectric project license applications, applicants must still satisfy the requirements of the Clean Water Act. Although that Act is administered by the Environmental Protection Agency (EPA), section 401 of that Act delegates certain EPA certification authority to states, provided they act on CWA applications within a year.[4]

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1. OFF. ENERGY EFFICIENCY & RENEWABLE ENERGY, HYDROPOWER BASICS (2021) https://www.energy.gov/eere/water/hydropower-basics.

2. *Id.*; Lisa M. Bogardus, *STATE CERTIFICATION OF HYDROELECTRIC FACILITIES UNDER SECTION 401 OF THE CLEAN WATER ACT*, 12 VA. ENV'T L.J. 43, 43 (1992) ("The number of hydroelectric facilities in operation increased in the late 1970s and early 1980s when Congress established incentives to encourage hydropower development.")

3. HYDROPOWER BASICS, *supra* note 1.

4. Section 401 provides:

If the State . . . fails or refuses to act on a request for certification, within a reasonable period of time (which shall not exceed one year) after receipt of such request, the certification requirements of this subsection shall be waived with respect to such Federal application. No license or permit shall be granted until the certification required by this section has been obtained or has been waived as provided in the preceding sentence. No license or permit shall be granted if certification has been denied by the State.

33 U.S.C. § 1341(a)(1).

For decades, hydroelectric project applicants that had not yet received CWA permits from the state within a year of applying would withdraw their permit applications and resubmit them, restarting the CWA's one-year clock. FERC had never questioned this process. But for the first time, a 2019 case, *Hoopa Valley Tribe v. Federal Regulatory Commission* (*Hoopa Valley),* called the legitimacy of this withdraw and resubmit process into question. There, the D.C. Circuit held that "a state waives its Section 401 authority when, pursuant to an agreement between the state and applicant, an applicant repeatedly withdraws-and- resubmits its request for water quality certification over a period of time greater than one year."[56] In the aftermath of the *Hoopa Valley* decision, FERC expanded upon *Hoopa Valley*, finding waiver in a series of cases, not only where there was a written agreement to withdraw and resubmit a permit application but an implicit "functional" agreement to do so. This expansion of *Hoopa Valley* led to successful challenges to FERC's new standard brought in the Fourth and Ninth Circuit Courts of Appeal. As discussed in more detail *infra*, neither court addressed whether an implicit agreement could result in a state's loss of CWA section 401 rights, but both found that, assuming implicit agreements could result in waiver, FERC lacked substantial evidence to support its finding of such agreements. The implications of those cases, a 2021 Fourth Circuit decision in *North Carolina Department of Environmental Quality v. Federal Energy Regulatory Commission* and a 2022 Ninth Circuit opinion in *California State Water Resources Control Board v. Federal Energy Regulatory Commission* are the subject of this note.

This note makes the following contribution to the literature: in Part II *Hoopa Valley Tribe v. Federal Energy Regulatory Commission* and its holding will be discussed as it creates a picture of a coordinated scheme with the substantial evidence standard applied.[7] This note will, additionally in Part III, explain the holdings of both *North Carolina Department of Environmental Quality v. Federal Energy Regulatory Commission* and *California State Water Resources Control Board v. Federal Energy Regulatory Commission.* Last, in Part IV, along with its impact on the application of the substantial evidence standard as it pertains to the FERC's findings of implicit agreements resulting in state waivers of their CWA authority, future implications of the holdings of both *NCDEQ* and *California State Water* will be contemplated.

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5. Hoopa Valley Tribe v. FERC, 913 F.3d 1099, 1103 (D.C. Cir. 2019).

6. *See* Charles R. Sensiba & Elizabeth J. McCormick, *Emerging Developments in Water Quality Certification for Federally Licensed or permitted Facilities,* NR&E 2 (2020) https://www.troutman.com/a/web/246105/NRE-v035n01-Summer20-feat06-SensibaMcCormick.pdf ("In some states, however, it was common practice prior to Hoopa Valley Tribe for WQC applicants, at the request of the certifying agency, to withdraw their request prior to the one-year mark and resubmit the same application (often through the filing of a one-page withdraw and-resubmit letter) to purportedly restart the one-year time period"); *see also* 33 U.S.C. §§ 1251, § 401(a)(1) ("If the State, interstate agency, or Administrator, as the case may be, fails or refuses to act on a request for certification, within a reasonable period of time (which shall not exceed one year) after receipt of such request, the certification requirements of this subsection shall be waived with respect to such Federal application.").

7. *Hoopa Valley Tribe*, 913 F.3d at 1105.

II. THE HOOPA VALLEY EFFECT

Under *Hoopa Valley Tribe v. FERC,* the United States Court of Appeals for the DC Circuit held that a coordinated withdrawal-and-resubmission scheme that involves a state's engagement in idleness or deliberate delay is a failure to act under section 401 of the Clean Water Act.[8] The statute does not directly define failure to act, but since the statute requires state action a year, states that fail or refuse to act within one-year fall into this category.[9]

The Clean Water Act (CWA), formally known as the Federal Water Pollution Act, was first established in 1948 and aimed to address the various issues that came with pollution and wastewater.[10] To maintain and restore the integrity of the Nation's waters,[11] the Act, through its many subsequent amendments, has continued its 1948 focus on water pollution elimination.[12] The Act, codified at 33 USC §§ 1251-1387, has been implemented by the EPA through its National Pollution Discharge Elimination System (NPDES) under which the agency grants individual or general permits.[13]

Part of the Clean Water Act, § 401, grants states and tribes the authority to "grant, deny, or waive certification of proposed federal licensing or permits that may discharge into the waters of the United States."[14] If an agency, State, or individual wishes to conduct an activity that may lead to discharge in any navigable waters, it must both submit federal application and obtain either a certification from the State where the activity would occur or a waiver of the certification requirement.[15] Once notified, the State may deny the request. However, if approved, the federal permit would follow suit.[16]

In *Hoopa Valley,* the Klamath Hydroelectric Project, licensed to PacifiCorp's predecessor in 1954, consisted of multiple dams on the Klamath River.[17] Along with Native American tribes, conservation groups, California, Oregon, and others,

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8. *Id.*

9. *Id.* at 1104.

10. US ENV'T PROT. AGENCY, SUMMARY OF THE CLEAN WATER ACT (July 6, 2022), https://www.epa.gov/laws-regulations/summary-clean-water-act#:~:text=(1972),quality%20standards%20for%20surface%20waters.

11. US DEP'T OF INTERIOR, CLEAN WATER ACT, https://www.boem.gov/environment/environmental-assessment/clean-water-act-cwa#:~:text=95%2D217)%2C%20this%20law,1251).

12. Claudia Copeland, *Clean Water Act: A Summary of the Law*, 1, CONGRESSIONAL RSCH. SERV. (Oct. 18, 2016), https://sgp.fas.org/crs/misc/RL30030.pdf.

13. US ENV'T PROT. AGENCY, NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES): About NPDES* (July 6, 2022), https://www.epa.gov/npdes/about-npdes.

14. US ENV'T PROT. AGENCY, SECTION 401 OF THE CLEAN WATER ACT (Aug. 10, 2022), https://www.epa.gov/cwa-401#:~:text=Section%20401%20Certification,Learn%20more%20about%20401%20certification; Lisa M. Bogardus, *STATE CERTIFICATION OF HYDROELECTRIC FACILITIES UNDER SECTION 401 OF THE CLEAN WATER ACT*, 12 VA. ENV'T L.J. 43, 43(1992) ("Because hydroelectric projects can cause water quality problems within the impounded water and downstream of the dam states have required hydroelectric applicants seeking a license from the Federal Energy Regulatory Commission (FERC) to obtain certification, pursuant to section 401 of the Clean Water Act (CWA), that the project will not violate water quality standards.").

15. SECTION 401 OF THE CLEAN WATER ACT, *supra* note 14; Bogardus, *supra* note 2, at 43.

16. SECTION 401 OF THE CLEAN WATER ACT, *supra* note 14.

17. *Hoopa Valley Tribe,* 913 F.3d at 1101.

PacifiCorp discussed settlement regarding the risks of decommissioning, leading them to enter into an agreement that imposed on PacifiCorp funding obligations and interim environmental measures.[18] The Klamath Hydroelectric Settlement Agreement obligated PacifiCorp to seek deferral of the approval deadline of one year by withdrawing and resubmitting its certification requests.[19] The Agreement explicitly contemplated that licensing activities under the CWA and review under CEQA would be held in abeyance during what the agreement called the 'Interim Period" – the period between the Effective Date and Decommissioning.[20] The certification requests under this method were prerequisites to FERC's review.[21]

The Hoopa Valley Tribe was not a party to either of the settlement agreements but was located downstream.[22] To transfer the dams, PacifiCorp filed for an amended transfer, causing FERC to review the applications separately for transfer and amendment.[23] On May 25th 2012, there was a petition by Hoopa which sought a declaratory order stating that California and Oregon waived their Section 401 authority.[24] Further, the Hoopa Valley Tribe argued that PacifiCorp had failed to prosecute its project licensing application.[25] FERC ultimately denied that position two years later in June 2014, and again in October of 2014 when the Hoopa Valley Tribe requested a rehearing.[26] On June 19, 2014, after arguing that PacifiCorp was not taking action to obtain water quality certification, the Tribe asked FERC to dismiss the relicensing application and for the Commission to require the company to file a plan for decommission.[27] FERC agreed with the Hoopa Valley Tribe that PacifiCorp had been complicit in the Settlement Agreement to delay water quality certification, but denied that the remedy of decommissioning was the correct remedy.[28] The Tribe then petitioned the DC Circuit Court of Appeals to review FERC's orders, arguing that the agreement between the state and the applicant to a withdraw and resubmit process unlawfully circumvented the one year deadline for state to act under section 401.[29]

On review, the court agreed with the Tribe. "[A] state," it ruled, "waives its Section 401 authority when, pursuant to an agreement between the state and applicant, an applicant repeatedly withdraws-and-resubmits its request for water quality certification over a period of time greater than one year."[30]

Section 401, the Court reasoned, was put in place to limit a State's ability to unreasonably delay the issuance of a permit. California and Oregon, it found, were

18. *Id.*

19. *Id.*

20. *Id.* at 1101-02; *KLAMATH HYDROELECTRIC SETTLEMENT AGREEMENT,* (Feb. 18, 2016) https://klamathrenewal.org/wp-content/uploads/2020/03/2016.12.31-Executed-and-Amended-Final-KHSA.pdf.

21. *Hoopa Valley Tribe*, 913 F.3d at 1101-02.

22. *Id.*

23. *Id.* at 1102.

24. *Id.*

25. *Hoopa Valley Tribe*, 913 F.3d at 1102.

26. *Id.*

27. *PacifiCorp*, 147 FERC ¶ 61,216 at PP 9-10 (2014).

28. *Id.*

29. *Hoopa Valley Tribe*, 913 F.3d at 1102.

30. *Id.* at 1103.

indefinitely delaying the federal licensing process through their agreements with the permit applicants and thus, the scheme was illegal.[31] This meant that by agreeing to delay action on the permit for more than a year, the states had waived their rights under Section 401.[32] Once the certification is waived under the CWA Section 401, the agency, here FERC, has the power to issue the license to the project applicants.[33] As the Court made plain in *Hoopa Valley*, however, its holding was narrow: "This case presents the set of facts in which a licensee entered a *written* agreement with the reviewing states to delay water quality certification."[34]

The DC Circuit's decision in *Hoopa* led FERC to change its position, expanding on *Hoopa* to find waiver even absent formal agreement between the applicant and the state. FERC continued to adhere to its longstanding position that where the applicant had *voluntarily* withdrawn and resubmitted an application there would be no state waiver.[35] But it went beyond *Hoopa Valley* to find waiver where there was an implicit or "functional" agreement between the state and the applicant to withdraw and resubmit. "In a series of orders," including those that are a subject of this note, "FERC concluded that states had waived their Section 401 certification authority by coordinating with project applicants on the withdrawal-an-resubmission of Section 401 certification requests, even in the absence of an explicit contractual agreement to do so."[36]

In the aftermath of the DC Circuit's decision, FERC began to find waivers involving both express agreements for certification delay and informal, coordinated schemes.[37] This led to the states of North Carolina and California challenging FERC's waiver findings in *North Carolina Department of Environmental Quality v. FERC*[38] and *California State Water Resources Control Board v. FERC*,[39] the two cases that are the subjects of this note.

III. FERC VS. STATE

In both *California State Water Resources Control Board* and *North Carolina Department of Environmental Quality,* the state agencies administering the CWA asked the court system to strike down FERC's determination that they had waived their rights under CWA Section 401 to issue water quality certifications. Although both cases were decided in different circuits, one thing is clear—the courts both ruled that FERC's findings of waiver did not pass the substantial evidence test.

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31. *Id.* at 1104-05.

32. *Id.* at 1105.

33. *Hoopa Valley Tribe*, 913 F.3d at 1101 ("The statute further provides that state certification requirements "shall be waived with respect to such Federal application" if the state "fails or refuses to act on a request for certification, within a reasonable period of time (which shall not exceed one year) after receipt of such request."").

34. *Id.* at 1104. (emphasis added)

35. Cal. State Water Res. Control Bd. v. FERC, 43 F.4th 920, 925 (9th Cir. 2022) ("an applicant's unilateral withdrawal and resubmittal is not imputed to the State").

36. *Id.* at 926.

37. *Id.* at 931.

38. N.C. Dep't of Env't Quality v. FERC, 3 F.4th 655 (4th Cir. 2021).

39. Cal. State Water Res. Control Bd. v. FERC, 43 F.4th at 920 (9th Cir. 2022).

North Carolina Department of Environmental Quality v. FERC involved a Section 401-certification application filed by a hydroelectric license applicant with the North Carolina Department of Environmental Quality (NCDEQ). NCDEQ then sent a letter to the applicant containing information about refiling his application.[40] This letter included a date for submission, fee information, and the suggestion to withdraw and resubmit.[41] Afterward, the applicant withdrew and reapplied for certification. NCDEQ subsequently issued the certification, but on the same day it did so, FERC, purporting to apply *Hoopa Valley*, concluded that more than a year had passed from the time the applicant had filed with NCDEQ, that NCDEQ had effectively coordinated a withdraw and resubmit agreement with the applicant and that NEDEQ had therefore waived its authority to issue the certification.[42]

NCDEQ sought judicial review of FERC's decision in the Fourth Circuit. There, it advanced two arguments: (1) that the state *had* taken timely action on the permit application, albeit not final action, within the one year statutory window[43] and (2) that, in any event the questions it posed to the applicant did not demonstrate the existence of a coordinated agreement to a withdraw and resubmit scheme, but responses to the applicant, who, "in every instance . . . sought to withdraw his application."[44]

As to the second of these arguments, the Court agreed with the state that there was no agreement, informal or otherwise, between the state and the applicant and that in ignoring an unrebutted affidavit from an NCEEQ staff member that "NCDEQ never ordered or otherwise required McMahan Hydro to withdraw and resubmit [its] application," FERC had failed to support its finding of such an agreement with substantial evidence.[45] Indeed, the record indicated that it was the *applicant* that, "for its own purposes, raised the prospect of withdrawing and resubmitting its application."[46]

Having found that FERC's orders lacked substantial evidence of a functional agreement to coordinate, the Court found it unnecessary to rule whether by taking actions short of final action the state would avoid waiver of its rights under section 401.[47] But after noting that it owed FERC's interpretation of section 401 no deference under *Chevron*,[48] in unusually strong dicta, the Court made plain its inclination to accept NCDEQ's interpretation of section 401:

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40. *N. C. Dept. of Env't Quality*, 3 F.4th at 662.

41. *Id.*

42. *McMahan Hydroelectric, LLC*, 168 FERC ¶ 61,185 at P 37 (2019).

43. *N.C. Dept. of Env't Quality*, 3 F.4th at 666-7.

44. *Id.* at 663.

45. *Id.* at 672.

46. *Id.*

47. *N.C. Dep't of Env't Quality*, 3 F.4th at 671 ("we agree with NCDEQ that FERC's key factual findings underpinning its waiver determination are not supported by substantial evidence. Accordingly, we leave the statutory-interpretation question for resolution in a case where the outcome depends on the precise meaning of the statute.").

48. *Id*. at 667 ("Because FERC does not administer the Clean Water Act, we owe no deference to its interpretation of § 401.").

> If Congress had intended for the states to take final action on § 401 applications within a year of filing, the statute could have made that clear by providing that waiver occurs if the agency "fails to certify or deny compliance with water quality standards within one year." Since Congress instead hinged waiver on the agency's failure "to act" on a certification request, traditional rules of statutory construction would generally require us to interpret "acting" on a certification request as meaning something other than certifying or denying compliance with water-quality standards.[49]

The court "remand[ed] the matter to FERC with instructions that the McMahan license be re-issued to include the conditions imposed by NCDEQ in its § 401 certification,"[50] which FERC then did.[51]

The Ninth Circuit's decision in *California State Water,* issued a year after the Fourth Circuit's opinion, covered similar ground. As in *N.C. Dep't of Envtl. Quality*, the case centered on challenges to FERC's findings that the state agency had waived its Section 401 rights by entering into functional withdraw and resubmit agreements with several applicants as a means to circumvent the one-year time limit for agency action. And as in the Fourth Circuit's case, the Ninth Circuit found it unnecessary to determine whether an unwritten agreement between the applicant and the state could result in a state's waiver of its Section 401 rights because it found no substantial evidence that such agreements existed.[52] Citing *N.C. Dep't of Envtl.*, it agreed that "it must take more than routine informational emails to show coordination" because the states' "rights and responsibilities to ensure compliance with their water-quality standards are too important to be so easily stripped away."[53]

The *California State Water* case involved four hydroelectric projects proposed by the Nevada Irrigation District ("NID"), the Yuba County Water Agency ("YCWA"), the Merced Irrigation District ("MID"), and Pacific Gas and Electric Company ("PG&E"). As in *N.C. Dep't of Envtl.*, FERC rested its Section 401 waiver findings in each instance on emails or other communications between the project applicants and the State Board as evidence of a coordinated scheme to reset the clock.[54] In NID's case, FERC relied on the state board's comments on FERC's draft environmental impact statement, where the state described its "expectation that NID would withdraw and resubmit its request."[55] As to YCWA FERC cited an email California sent to the applicant suggesting that it should withdraw and resubmit the request as soon as possible because the CEQA documents were incomplete.[56] When the YCWA responded with a date that it would resubmit, the State Board gave a reply in which it recommended that, due to the time it takes to get to the Executive Director, it is best to resubmit before a particular day.[57] The

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49. *N.C. Dep't of Env't* Quality, 3 F.4th at 670.
50. *Id.* at 676.
51. *McMahan Hydroelectric, LLC*, 177 FERC ¶ 61,014 at P 13 (2021).
52. California State Water Res. Control Bd. v. FERC, 43 F.4th 920 (2022).
53. *Id.* at 936.
54. *Id.*
55. *Id.* at 928
56. *Cal. State Water Res. Control Bd.*, 43 F.4th at 928.
57. *Id.*

YCWA followed the guidance of the State Board and resubmitted their application, which the State Board accepted.[58] Looking at this, as well as an email exchange between YCWA and the state as evidence of their coordination, FERC reasoned that YCWA's "withdrawal and refiling of its application was in response to the [State] Board's request that it do so."[59]

Like the previous two applicants, the MID and its predecessor PG&E were also found by FERC to be in a coordinated scheme with the State Board.[60] Before the due date had come up, MID was advised by the State Board that it should withdraw and resubmit the application.[61] MID and PG&E took this advice and continued resubmitting over four years.[62]

Ultimately agreeing with the Fourth Circuit, the Court stated that even if FERC was correct that a "functional" agreement could result in a state's waiver of its Section 401 rights, FERC lacked substantial evidence to demonstrate the existence of such agreements:

> In short, the records in all three orders under review demonstrate that the Project Applicants chose to withdraw and resubmit their certification requests because they had not complied with California's CEQA regulations. Without a complete CEQA evaluation, the State Board was legally obligated to deny the requests without prejudice, and the record suggests that the State Board was prepared to do so. To avoid such a denial, the Project Applicants employed the common and long-accepted withdrawal-and-resubmission maneuver, with the State Board's acquiescence. We note that, if the Project Applicants had preferred not to undertake withdrawal-and-resubmission, they could have declined to do so, forced the State Board to deny their certification requests, and, if they believed the denials were unwarranted, challenged them in state court. The Project Applicants chose not to take that path—and nothing in the record shows that the State Board encouraged that choice. Under FERC's own coordination standard, a state's mere acceptance of a withdrawal-and-resubmission is not enough to show that the state engaged in a coordinated scheme to avoid its statutory deadline for action. Accordingly, FERC's orders cannot stand.[63]

IV. FUTURE IMPLICATIONS

There are several considerations that come out of the *NCDEQ* and *California State Water* cases. First, while the two decisions tell us what does not qualify as substantial evidence of a coordinated functional agreement between the state and an applicant to a withdraw and resubmit scheme, they give little guidance as to what evidence of such a scheme would qualify as substantial. Second, and related, is the question left undecided by both courts, whether a "functional" agreement, as opposed to a written one, could result in a state waiving its rights under Section 401. Last, and most important, given (1) the strong dicta in *NCDEQ* suggesting that taking any action on a permit within a year, even if not final action, the state would not waive its Section 401 rights (2) given the subsequent adoption of that

58. *Id.*
59. *Cal. State Water Res. Control Bd.,* 43 F.4th at 929.
60. *Id.* at 930.
61. *Id.*
62. *Id.* at 930.
63. *Cal. State Water Res. Control Bd.*, at 935-36.

interpretation of Section 401 by FERC itself[64] and (3) given the Fourth and Ninth Circuits' observation that because EPA, not FERC, administers Section 401, FERC's interpretation of that provision will get no *Chevron* deference, how much real risk does a state face that it would waive its Section 401 rights?

A. Substantial Evidence & Coordinated Schemes

Because neither the Ninth nor Fourth Circuits needed to reach the question of whether a functional agreement to withdraw and resubmit permit applications could result in waiver of a state's Section 401 rights their decisions provide little guidance on the issue. Nor, therefore, do they provide much guidance as to what would constitute substantial evidence of such an agreement. But the discussions in both cases strongly hint that it may never be possible to prove the existence of a functional agreement to circumvent Section 401.

In *Hoopa Valley*, it was clear that there was a coordinated scheme reaching over a decade and memorialized in a formal agreement between all of the parties that was placed in writing. In both *California State Water* and *NCDEQ,* this was not the case. Both decisions made clear that where the applicant had made a unilateral decision to withdraw and resubmit its permit application the clock would restart even under FERC's interpretation of *Hoopa Valley*. And, both courts were reluctant to read into a state's advice to the applicant that its permit would be denied without more information as an agreement or the exercise of coercion.

Why this reluctance to finding a waiver through circumstantial evidence? As the Ninth Circuit pointed out in *California State Water*, "if a state waives its authority to impose conditions on a hydroelectric project's federal license through Section 401's certification procedure, that project may be noncompliant with prevailing state water quality standards for decades."[65] This concern appears to be at the heart of the Court's rejection of FERC's waiver findings involving four California hydroelectric license applications.[66] The purpose of giving states the authority to consider the environmental impact of a project is to ensure that water quality is protected. A standard that would make it too easy to find waiver would deprive states of the important right to protect local water quality.

Additionally, while there is no consensus as to what would amount to substantial evidence to signify a waiver, there is a decided trend to limit the circumstances in which a waiver could be found. In *Hoopa Valley*, the only case to find waiver as a result of continued withdrawals of submissions of permit applications, the D. C. Circuit found critical the existence of a formal written agreement covering years of withdrawals and resubmittals.[67] As noted earlier, the Fourth Circuit's dicta would further narrow the impact of *Hoopa Valley* by finding that *any* meaningful state action on a permit application taken within a year of filing – even though short of a final decision – would satisfy Section 401.

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64. *See* discussion of Turlock Irrigation District v. FERC, 36 F.4th 1179 (D. C. Cir. 2022).

65. *Cal. State Water Res. Control Bd.*, 43 F.4th at 925.

66. *Id.* at 920.

67. *Hoopa Valley Tribe*, 913 F.3d at 1104.

While the Fourth Circuit's discussion of the issue was dicta, of particular significance is FERC's own subsequent decision to adopt the Fourth Circuit's dicta, an interpretation the D.C. Circuit itself has now upheld. A license applicant, Turlock Irrigation District, had sought a declaratory order from FERC that California's denials of its permit applications were not timely final actions under Section 401 because they were made without prejudice and "not 'on the technical merits of the certification requests."[68] FERC rejected Turlock's argument, holding that "Section 401 requires only action within a year to avoid waiver."[69] The D.C. Circuit agreed. "The Fourth Circuit," the D.C. Circuit said, "accurately described *Hoopa Valley* as a case in which "the state agencies and the license applicant entered into a written agreement that obligated the state agencies, year after year, to take *no action at all* on the applicant's § 401 certification request."[70] By contrast, *Hoopa Valley* "stressed that the applicant's "water quality certification request has been complete and ready for review for more than a decade."[71]

So, what, if anything, is left of FERC's "functional agreement" waiver theory? Given FERC's determination that "Section 401 requires only action [and not final action] within a year to avoid waiver,"[72] a functional agreement to a withdraw and resubmit scheme would require proof that the agency planned to take *no* action when an application was resubmitted. It is possible that such a case might be made – that was the situation in *Hoopa*. But while possible, it seems unlikely that a state agency, aware of FERC's interpretation of "action" under Section 401, would not try to take *some* action on an application once submitted. Indeed, in the less than two years since the D.C. Circuit's 2022 *Turlock* opinion, FERC has entertained, but rejected "functional agreement" waiver arguments several times, finding that the state had taken action that precluded Section 401 waiver.[73]

B. Chevron Deference

Finally, whatever viability might be left of the *Hoopa Valley* waiver decision is further diminished by the fact, noted earlier, that FERC would get no *Chevron* deference for any new interpretation of Section 401 it might adopt. This is not to say that a court would not find, on its own, that a functional agreement to a withdraw and resubmit scheme could violate Section 401. But, for the reasons discussed above, it would take a rare set of circumstances in which a state would waive its Section 401 rights because it took no action at all on an application.

V. CONCLUSION

In the aftermath of the DC Circuit's *Hoopa Valley* decision, it remains undecided whether, absent an express agreement between the applicant for certification and the certifying state agency the state could waive its rights under CWA Section

68. Turlock Irrigation District v. FERC, 36 F.4th 1179, 1182-83 (D. C. Cir. 2022).

69. *Id.*

70. *Id.* at 1183 (emphasis added).

71. *Id.*

72. *Turlock Irrigation District*, *supra* note 68, at 1182.

73. *See, e.g.*, *Pacific Gas and Electric Company*, 186 FERC ¶ 61,121 at P 28 (2024); *Pacific Gas and Electric Company*, 184 FERC ¶ 61,138 at P 22 (2023).

401 by implication. What we do know however, is that subsequent decisions have greatly diminished importance of resolving this uncertainty. In the aftermath of the Fourth and Ninth Circuit decisions and FERC's own subsequent conclusion, upheld by the same court that decided *Hoopa Valley*, that "action" needed to avoid waiver need not be final action by the state, there is little likelihood that states will be found to have waived their Section 401 rights.

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THE "SOLAR COASTER" – THE IMPACT COUNTERVAILING DUTY ORDER IMPLEMENTATION HAS ON THE SOLAR ENERGY INDUSTRY IN THE UNITED STATES

Madison Plumhoff

I. INTRODUCTION

Riding a roller coaster elicits excitement and jitters as you feel yourself getting higher and higher into the sky. But at a moment's notice, and before you know it, down you go. The renewable energy industry, and in this case specifically solar energy, has seen its fair share of roller coaster rides in its short life span.[1] For periods of time, the industry is on a rise, taking substantial strides in production and deployment. But just at a moment's notice. . . .

Several years ago, the United States Department of Commerce (USDOC) launched an investigation into whether Canadian Solar, an importer of Chinese solar panels selling into the United States, had received unlawful subsidies from China. Finding that it had, USDOC imposed "countervailing duties" on the company; its countervailing duty order (CVD) subsequently upheld by the Court of

1. The use of photovoltaic cells began in 1955 with Bell Laboratories, when researchers created a 6%-efficiency PV cell that can be used for everyday equipment. OFFICE OF ENERGY EFFICENCY & REWNEWABLE ENERGY, SOLAR ACHIEVEMENTS TIMEINE, https://www.energy.gov/eere/solar/solar-achievements-timeline (last visited Apr. 25, 2024).

International Trade (CIT). Following an appeal by Canadian Solar, the United States Court of Appeals for the Federal Circuit (the court) rendered its opinion on January 28, 2022, affirming the CIT's decision.[2] The court in *Canadian Solar* held that the USDOC could draw adverse inferences from China's failure to respond to USDOC's inquires for information, and that USDOC's adverse inferences constituted substantial evidence that Canadian Solar had received regionally specific countervailable subsidies that warranted CVDs.[3] Of pertinence, in determining the size of the subsidy, USDOC measured the subsidy as "the difference between what Canadian Solar is paying and the highest tariff set for any province."[4] While the court found that this measure was reasonable given China's refusal to provide requested information, it nonetheless drastically increased the duties applied to its U.S. sales.[5]

The court's judgment, upholding USDOC's decision to impose substantial duties on Canadian Solar in reliance on negative inferences, followed well-trodden ground.[6] This note, however, examines the application of negative inferences, and whether USDOC has become over reliant on its use, and how such use affects the solar energy industry.

Over the past decade, the push to expand solar energy sources gained significant traction with the purpose to fight global emissions and diversify energy sources to combat the worldwide energy crisis.[7] Therefore, unless and until the U.S. strengthens its domestic manufacturing of crystalline photovoltaic cells, imported solar materials will still be needed to assist the solar energy industry's growth in deployment and manufacturing.[8] And if the recent history of subsidy investigations is any guide,[9] there will be more instances in which negative inferences will form the basis for steep countervailing duties that will curtail imports. Indeed, commentators have already noted the sharp increase of the use of adverse inferences in the past fifteen or so years.[10] The frequent use of negative inferences may well be supported by existing case law. But is it doing more harm than good

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2. Canadian Solar, Inc. v. United States, 23 F. 4th 1372 (Ct. App. Fed. Cir. 2022) (hereinafter *Canadian Solar*).

3. *Id.* at 1378, 1380-81.

4. *Id.* at 1381.

5. *Id.* at 1380-81.

6. *Canadian Solar*, 23 F. 4th at 1378-81.

7. *Renewable power's growth is being turbocharged as countries seek to strengthen energy security*, INT'L ENERGY AGENCY (Dec. 6, 2022) https://www.iea.org/news/renewable-power-s-growth-is-being-turbocharged-as-countries-seek-to-strengthen-energy-security.

8. *See generally,* Garrett Hering & Anna Duquiatan, *'Extreme dependence': US solar panel imports boom to record 54 GW in 2023*, S&P GLOBAL (Feb. 23, 2024), https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/extreme-dependence-us-solar-panel-imports-boom-to-record-54-gw-in-2023-80448513#:~:text=23%20Feb%2C%202024-,'Extreme%20dependence'%3A%20US%20solar%20panel%20imports%20boom,record%2054%20GW%20in%202023&text=An%20unprecedented%20wave%20of%20imported,on%20America's%20solar%20manufacturing%20renaissance; *see also* REGLOBAL, US SOLAR MARKET REMAINS HEAVILY RELIANT ON IMPORTED GOODS (Apr. 8, 2024), https://reglobal.org/us-solar-market-is-strong-yet-overreliant-on-imported-goods/.

9. REGLOBAL, *supra* note 8.

10. Final Rule, *Regulations to Improve Administration and Enforcement of Anitdimping and Countervailing Duty Laws*, 86 Fed. Reg. 52300, 52305 (2021).

– potentially making imports unaffordable when domestic production isn't sufficient to make up for the shortfall? Though courts don't intend for the application of adverse inferences to be punitive on its face, in certain circumstances the effects could be argued as having punitive effect. While the concept of negative inference is long settled in the law,[11] whether to draw a negative inference in an individual case is nonetheless generally within the discretion of the fact finder.[12] The importance of administrative review and its processes and effects will take a front row seat on the solar coaster.

II. BACKGROUND

A. The Rise of the Solar Industry

> We exist in part because of the sun's energy, it warms our planet and sends rays of energy to earth constantly.[13]

1. The Importance of Photovoltaic Cells

Although the sun has been used to provide energy since the seventh century B.C. (in the use of magnifying glasses to start fires),[14] solar energy has seen its greatest advancements in the development of solar panels and photovoltaic (PV) cells[15] to produce electricity.[16] The importance of PV cells rests in the technology's ability to enable manufacturing in large plants, and thus it "creates economics of scale" for use in not only utility power generation installations, but also deployment in more minute quantities for small-scale residential rooftop systems.[17] In 2022, PV-generated power increased by 191 GW, and was therefore responsible for "almost all the increase in solar power" that year.[18] New electric generating capacity increased in 2023 to add a record 33 GW of solar capacity.[19] Additionally, "utility-scale solar PV is the least costly option for new electricity generation in a significant majority of countries worldwide."[20]

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11. The principle underlying the use of adverse inferences is that if the evidence withheld would have done the party withholding it any good, that party would readily have produced it. Int'l Union (UAW) v. NLRB, 459 F. 2d 1329, 1339 (D.C. Cir. 1972).

12. Bray v. United States, 306 F.2d 743, 747 (1962).

13. Jamie Smith & Catherine Lane, *The history of solar energy*, SOLARREVIEWS (Apr. 21, 2024), https://www.solarreviews.com/blog/the-history-of-solar-energy-timeline.

14. *Id.*

15. "A photovoltaic cell, is a nonmechanical device that converts sunlight directly into electricity." EIA, SOLAR EXPLAINED – PHOTOVOLTAICS AND ELECTRICITY (May 26, 2023), https://www.eia.gov/energyexplained/solar/photovoltaics-and-electricity.php.

16. Smith & Lane, *supra* note 13.

17. Piotr Bojek, *Solar PV*, IEA50 (July 11, 2023), https://www.iea.org/energy-system/renewables/solar-pv.

18. Press Release, IRENA, Record Growth in Renewables Achieved Despite Energy Crisis, (Mar 21, 2023), https://www.irena.org/News/pressreleases/2023/Mar/Record-9-point-6-Percentage-Growth-in-Renewables-Achieved-Despite-Energy-Crisis.

19. Press Release, SEIA, Solar Poised for Record-Setting 2023 while Economic Challenges Mount (Dec. 7, 2023), https://www.seia.org/news/solar-poised-record-setting-2023-while-economic-challenges-mount.

20. Bojek, *supra* note 17.

Though PV cells have revolutionized the solar energy industry, manufacturing these cells is dominated by Asian countries.[21] While the U.S. has taken steps to encourage and support domestic manufacturing through legislation like the Inflation Reduction Act, achieving domestic manufacturing independence will not occur overnight.[22] Therefore, because imports of PV cells will continue to grow in the interim (maybe years), so will administrative review of countervailing duty orders.[23]

B. An Icebreaker to Solar Energy Subsidies

In the early 2000s, energy subsidies significantly influenced the economic and political agendas in many countries.[24] "In principle, any measure that keeps prices for consumers below market level or for energy producers above market levels, or that reduces costs for consumers or producers, may be considered a subsidy."[25] Implementation of energy subsidies can enhance a multitude of policy goals, such as providing "affordable energy for low-income society, correct[ing] markets for unpriced externalities, induc[ing] technology learning and driv[ing] down costs of new technologies, reduc[ing] import dependence and enhance[ing] energy security, and creat[ing] new economic activity and jobs."[26] The type of subsidy results in different effects on costs of production, increased prices that disfavor producers, and decreased prices for consumers, which thus emphasizes the importance of how energy subsidies are categorized and calculated.[27]

But the same energy subsidies that can increase solar deployment may also run afoul of laws intended to protect domestic industries from subsidized imports. *Canadian Solar* deals specifically with U.S. trade laws authorizing countervailing subsidies, i.e., subsidies in the form of duties intended to offset, or countervail subsidies by the producing country.[28] For a subsidy to be countervailable, i.e., eligible to be offset, "a subsidy must involve a government financial contribution that confers a benefit that is specific to a certain enterprise, industry or region in

21. *See* INT'L ENERGY AGENCY, SPECIAL REPORT ON SOLAR PV GLOBAL SUPPLY CHAINS (Aug. 2022), https://iea.blob.core.windows.net/assets/d2ee601d-6b1a-4cd2-a0e8-db02dc64332c/SpecialReportonSolarPVGlobalSupplyChains.pdf.

22. Anne Fischer, *US solar industry calls for domestic content rules to support manufacturing*, PV MAG. (Mar. 29, 2024), https://www.pv-magazine.com/2024/03/29/us-solar-industry-calls-for-domestic-content-rules-to-support-manufacturing/.

23. OFFICE OF ENERGY EFFICENCY & RENEWABLE ENERGY, QUARTERLY SOLAR INDUSTRY UPDATE (Jan. 25, 2024), https://www.energy.gov/eere/solar/quarterly-solar-industry-update.

24. Trevor Morgan, *An Introduction to Energy Subsidies*, GLOB. SUBSIDIES INITIATIVE (Nov. 29, 2006), https://www.iisd.org/gsi/commentary/introduction-energy-subsidies.

25. *Id.*

26. Michael Taylor, *Energy Subsidies: Evolution of the Global Energy Transformation to 2050*, IRENA 14 (2020), https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Apr/IRENA_Energy_subsidies_2020.pdf.

27. *Id.* at 21-24.

28. *Canadian Solar*, 23 F. 4th at 1375

that country or that is contingent upon export or the use of domestic goods over imported goods in production."[29]

C. Law and Overreliance? – The Law on Countervailing Duty Orders

Antidumping and countervailing duty laws have been in effect since the Fordney-McCumber Act of 1922, which "gave the president the power to impose antidumping duties on imports being sold at or below the price of American-made goods."[30] Countervailing duties are imposed by the government to "protect domestic producers by countering the negative impact of import subsidies," and thus, are an "import tax on the imported product by the importing country."[31] In turn, countervailing duties raise the imported products closer to market price and provide a more "level playing field for domestic products."[32] A subsidy is countervailable when it is "specific," making it "limited to an enterprise or industry located within a designated geographical region within the jurisdiction of the authority providing the subsidy."[33] This is referred to as a regionally specific subsidy.[34]

1. Administrative Review of Countervailing Duty Orders

USDOC has the power of administrative review of CVD orders under section 751(a)(1) of the Tariff Act of 1930 (The Act) (as amended by 19 U.S.C. section 1675).[35] The Act states that United States "industries may petition the government for relief from imports that are sold in the United States at less than fair value or which benefit from subsidies provided through foreign government programs."[36] There are four different avenues to request administrative review "each year during the anniversary month of the publication of an antidumping or countervailing duty order."[37] For CVD order proceedings, administrative review "normally will

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29. U.S. CUSTOMS & BORDER CONTROL, ANTIDUMPING AND COUNTERVAILING DUTIES (AD/CVD) FREQUENTLY ASKED QUESTIONS (Jan. 30, 2024), https://www.cbp.gov/trade/priority-issues/adcvd/antidumping-and-countervailing-duties-adcvd-frequently-asked-questions.

30. *Id.* Anti-dumping laws are implemented to prevent dumping, which occurs when "foreign producers sell a product in the United States at a price that is below that producer's sales price in the country of origin, or at a price that is lower than the cost of production." *Antidumping and Countervailing Duty FAQs*, INT'L TRADE ADMIN., https://www.trade.gov/antidumping-and-countervailing-duty-frequently-asked-questions (last visited Apr. 25, 2024).

31. *What is Countervailing Duty*, BUS. STANDARD, https://www.business-standard.com/about/what-is-countervailing-duty (last accessed Apr. 25, 2024); "Commerce is required to impose a countervailing duty on imported merchandise when it 'determines that the government of a country or any public entity within the territory of a country is providing, directly or indirectly, a countervailable subsidy.'" *Canadian Solar,* 23 F.4th at 1372 (citing 19 U.S.C.A. § 1671(a)(1)).

32. *Id.*

33. 19 U.S.C.A. §§ 1677(5)(A), 1677(5(A)(D)(iv).

34. *Id.*

35. Tariff Act of 1930 (Hawley-Smoot Tariff Act) 19 U.S.C.A. § 1654.

36. *Understanding Antidumping & Countervailing Duty Investigations*, U.S. INT'L TRADE COMM'N https://www.usitc.gov/press_room/usad.htm; 19 U.S.C.A § 1654; 19 U.S.C.A. § 1671; *see also* 19 C.F.R. § 351.213 for details of requests, deferrals, recissions, period of review, antidumping and countervailing duty proceedings, and time limits for administrative review of orders under § 751(a)(1) of the Act.

37. 19 C.F.R. § 351.213(b)(1-4).

cover entries or exports of the subject merchandise during the most recently completed calendar year," or if "requests are received during the first anniversary month after publication of an order or suspension of investigation, an administrative review will cover entries or exports . . . during the period from the date of suspension of liquidation . . . to the end of the most recently completed calendar or fiscal year. . . ."[38]

Once a petition has been made for administrative review of a CVD order, USDOC then concludes if a subsidy exists and if so, the amount of the existing subsidy.[39] Once the existence and amount of subsidy are determined, the United States International Trade Commission (USITC) will determine if there is a material injury/threat of material injury and if said material injury/threat of material injury is occurring to the domestic industry due to the subsidized imports.[40] USITC oversees both the preliminary phase and final phase of the injury investigation.[41]

The preliminary phase of a subsidized imports injury investigation generally must be completed within forty-five days of receiving a petition for investigation.[42] USITC then determines, with the information best available at the time of the investigation, "(1) whether there is a 'reasonable indication' that an industry is materially injured or is threatened with material injury, or (2) whether the establishment of an industry is materially [less advanced], by reason of imports under investigation by [USDOC] that are allegedly sold at less than fair value in the United States or subsidized."[43] USITC must answer both questions in the affirmative for USDOC to continue its investigation.[44]

After USDOC completes its preliminary affirmative determination, USITC moves onto its final investigation of injury, which usually must be completed within 120 days after USDOC concludes its preliminary affirmative determination.[45] USITC then determines "(1) whether an industry in the United States is materially injured or threatened with material injury, or (2) whether the establishment of an industry in the United States is materially [less advanced], by reasons of imports that [USDOC] has determined to be sold in the United States at less than fair value or subsidized."[46] If USITC finds in the affirmative, it issues a CVD

38. *Id.*
39. U.S. INT'L TRADE COMM'N, *supra* note 36.
40. *Id.*
41. *Id.*
42. *Id.*
43. U.S. INT'L TRADE COMM'N, *supra* note 36.
44. *Id.*; Let it be noted there are exceptions to this rule. *Id.*
45. *Id.*
46. U.S. INT'L TRADE COMM'N, *supra* note 36.

order which is subsequently enforced by the U.S. Customs Service.[47] If an interested party[48] wishes to appeal, the party may appeal to the United States Court of International Trade.[49]

During administrative review, if USDOC finds "'(a) necessary information is not available on the record, or (b) 'an interested party or any other person . . . withholds information that has been requested by [USDOC],'" or does not provide the information before set deadlines, "'in the manner requested,' [and/or] 'provides such information but the information cannot be verified,' [USDOC] must use 'facts otherwise available.'"[50] In addition, if an interested party does not comply with USDOC's requests for information "to the best of its ability," USDOC then "*may* use an inference that is adverse to the interests of that party in selecting from among the facts otherwise available," using information "from the petition, a final determination in the investigation, prior administrative reviews, or 'any other information placed on the record.'"[51]

This process, described in more detail below, led to USDOC's imposition of countervailing duties on the solar panels Canadian Solar sells in the U.S., and to Canadian Solar's appeal to the Federal Circuit of the CIT decision to uphold USDOC's CVD order.

III. ANALYSIS

Canadian Solar's appeal centered on one issue: did USDOC lack "substantial evidence" to uphold its finding that Canadian Solar had benefitted from a "regionally specific subsidy"?[52] As noted earlier, the Federal Circuit's decision in *Canadian Solar Inc*. rejected Canadian Solar's appeal, finding that the agency's decision was, in fact, supported by substantial evidence.

More specifically, the court rejected Canadian Solar's argument that USDOC had "failed to identify a single geographic region receiving the subsidy."[53] USDOC, the court found, could reasonably infer such a subsidy relying on the negative inference from China's refusal to provide the more detailed information it had sought.[54]

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47. *Id.*

48. "Interested party" is defined as follows: (1) a manufacturer, producer, or wholesaler in the United States of a domestic like product; (2) a certified or recognized union or group of workers that is representative of the industry; (3) a trade or business association a majority of whose members manufacture, produce, or wholesale a domestic like product; (4) a coalition of firms, unions, or trade associations as described above; and (5) in cases involving processed agricultural products, a coalition or trade association representative of processors, or processors and producers, or processors and growers. *Id.*

49. *Id.*

50. *Canadian Solar*, 23 4th at 1375-76; 19 U.S.C.A. § 1677e(a).

51. *Canadian Solar*, 23 4th at 1376 (citing 19 U.S.C.A. §§ 1677e(b) 1677e(b)(2)); *see also* 19 C.F.R. § 351.308(c)); Gallant Ocean Co. v. United States, 602 F.3d 1319, 1321 (Fed. Cir. 2010) (emphasis added).

52. *Canadian Solar, Inc.*, 23 4th at 1377-78.

53. *Id.* at 1377.

54. *Id.* at 1378 ("Commerce sufficiently and reasonably explained that it lacked key information because the government of China failed to cooperate by not acting to the best of its ability to comply with requests for information. As a result, Commerce was forced to fill informational gaps and properly relied on adverse inferences to find that Canadian Solar received a regionally specific electricity subsidy that must be countervailed.").

When the agency relies on the withholding of pertinent information to draw an adverse inference, its decision can move the needle toward domestic producers to the detriment of consumers who resultingly pay higher prices.[55] That, in itself, is not a bad thing – the whole point of countervailing duties is to level the playing field for domestic manufacturers facing unfair competition from subsidized foreign competitors. But the danger in overreliance on the negative inference is that it may result in erroneous determinations that subsidies exist.

In the typical case, it is the party in possession of the evidence being withheld that is penalized by the negative inference.[56] However, in Canadian Solar's case, it is the Chinese government, not Canadian Solar, that possesses the information.[57] The agency's "substantial evidence" burden is relatively low – to have its findings sustained, it must only show its reliance on evidence a reasonable mind would find as ample to support a conclusion.[58] Because a negative inference can itself constitute substantial evidence that a subsidy has been provided by a foreign government,[59] parties like Canadian Solar are put in the predicament of relying on the Chinese government to produce the relevant information or face the substantial consequence of a negative inference being used to impose hefty countervailing duties.

A. Challenger: Canadian Solar, Victor: CIT.

Canadian Solar, a solar photovoltaic products and energy solutions provider, exporter, and manufacturer, exported crystalline silicon photovoltaic cells from China.[60] In December 2012, following USITC's affirmative final determination that domestic manufacturers had been materially injured by imported solar panels subsidized by China, USDOC implemented a CVD order directed at those imports.[61] On February 13, 2017, USDOC began its fourth review of this CVD order (covering the period from January 1, 2015 to December 31, 2015)[62] and selected Canadian Solar as one of its mandatory respondents.[63] There, USDOC sought to determine whether Canadian Solar "benefited from receiving electricity for less than adequate remuneration ('LATR')."[64]

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55. Ragan Updegraff, Note, *Striking a Balance between Necessity and Fairness: The Use of Adverse Facts Available in Dumping and Subsidies Investigations*, 49 GEO. L. REV. 709, 718-30 (2018) https://www.law.georgetown.edu/international-law-journal/wp-content/uploads/sites/21/2018/08/GT-GJIL180024.pdf; Simon Lester & Scott Lincicome, *Some New Data on U.S. Anti-Dumping Abuse*, CATO INSTITUTE (Apr. 9, 2021) https://www.cato.org/blog/some-data-us-anti-dumping-abuse.

56. *See* Hon. Shira A. Scheindlin & Natalie M. Orr, *The Adverse Inference Instruction After Revised Rule 37(E): An Evidence-Based Proposal*, 83 FORDHAM L. REV. 1299 (2014); *see* Stephen A. Saltzburg, *A Special Aspect of Relevance: Countering Negative Inferences Associated with the Absence of Evidence*, 66 CAL. L. REV. 1011 (1978).

57. *See generally*, *Canadian Solar, Inc.*, 23 4th at 1372-81.

58. Richardson v. Perales, 402 U.S. 389, 401 (1971).

59. That, in fact, is the essence of the Federal Circuit's ruling in *Canadian Solar*.

60. Canadian Solar, Inc., v. United States, No. 18-00184 U.S. Ct. Int'l Trade (Feb. 25, 2020).

61. *Crystalline Silicon Photovoltaic Cells, Whether or Not Assembled Into Modules, From the People's Republic of China: Countervailing Duty Order*, 77 FR-73017-01 (Dec. 7, 2012).

62. *Canadian Solar,* slip op. at *1.

63. *Canadian Solar*, 23 4th at 1376.

64. *Id.*

At the beginning of its inquiry, USDOC sent China questionnaires requesting information on "provincial price proposals, descriptions of how the National Development and Reform Commission ('NDRC') is involved in electricity price-setting, and an explanation of how electricity pricing is responsive to market variables" and in establishing local provincial level electricity prices.[65] When China then failed to provide the requested information, USDOC drew the adverse inference that "Canadian Solar received a countervailable subsidy through below-market electricity prices."[66] Canadian Solar then filed suit in CIT, challenging multiple aspects of the ruling, including the finding that Canadian Solar received a countervailable electricity subsidy.[67]

USDOC revised its determination on remand, stating instead that "Canadian Solar received a regionally specific subsidy,"[68] a finding that nonetheless supported the imposition of countervailing duties on Canadian Solar. USDOC explained that because China failed to provide USDOC with the requested information in reference to the "electricity price variation across the provinces, [USDOC] was unable to 'confirm that market and commercial principles explain the variation in electricity prices on the record.'"[69]

USDOC gave three reasons for its finding: (1) China failed to produce "'provincial price proposals for each of the relevant provinces'" that would assist USDOC in determining why electricity prices vary by province and identify "'market or cost-based reasons underlying the variation;'"[70] (2) "China's response lacked 'a detailed description of the cost elements and price adjustments that were discussed between the provinces and the NDRC' and that would have helped USDOC ascertain why prices varied by province;"[71] and (3) lastly, "China's response was devoid of any 'province-specific explanations' for price variation, such as how costs inform provincial electricity prices."[72]

Subsequently, USDOC applied the adverse inference principle and determined "the provision of electricity is a countervailable subsidy program whereby the central Chinese government, through the NDRC in Beijing, sets different prices in different regions under its authority (i.e., the provinces) without any commercial or market considerations, but instead for development purposes."[73] As such, USDOC applied the "highest electricity prices from the province-by-province price list" for Canadian Solar's benchmark in calculating its duty rate.[74]

Canadian Solar then filed another suit before CIT challenging USDOC's finding that Canadian Solar received countervailable electricity subsidies, but CIT

65. *Id.*
66. *Id.*
67. *Canadian Solar*, 23 4th at 1377
68. *Id.*; *see* 19 U.S.C.A. § 1677(5A)(D)(iv).
69. *Canadian Solar*, 23 4th at 1377.
70. *Id.*
71. *Id.*
72. *Id.*; Note there was 7 arguments total in the redetermination.
73. *Canadian Solar*, 23 4th at 1377.
74. *Id.*

sustained USDOC's findings.[75] Canadian Solar then appealed CIT's determination, arguing, "USDOC's application of adverse facts available to determine that the electricity program was a regionally specific subsidy was not supported by substantial evidence because USDOC allegedly ignored the provincial price schedules and failed to identify a single geographical region receiving subsidies."[76]

B. The Implications of Reliance on Adverse Inferences

1. Canadian Solar, this is Customary.

Unfortunately for exporting corporations like Canadian Solar, the practice of reliance on adverse inferences is essentially universal in common law systems.[77] In fact, USDOC has even granted a 386.45% CVD rate for a foreign producer and stated it is not unlawful nor punitively high when based on substantial evidence in the record, including adverse inferences.[78] The courts have consistently stated that the use of adverse inferences is to promote cooperation and not elicit punitive sanctions.[79] And because the rates at which adverse inferences are applied in administrative review have skyrocketed in determinations made between 2009-2020s,[80] it is important to examine why this is happening, and its effect.

2. Adverse Inferences: The Good, and the Ugly

As the application of the adverse inferences principle increased throughout the past decade, views started to diverge on its application.[81] The argument "for" contends that using adverse inferences enhances efficiency to reach determinations, instead of expending potentially extensive time to procure information from the non-responsive party.[82] Supporters also argue for the value of incentives; that parties involved in countervailing duty order cases should willingly provide the information requested.[83] Additionally, proponents assert that without the possibility of USDOC having discretion to apply adverse inferences, information submitted, if any at all, would not be an accurate representation of the subsidies or dumping levels.[84]

On the other hand, opponents of the application of adverse inferences argue its use is discretionary and that overuse can lead to abuses of discretion and disproportionate favoring of petitioners claiming that imports are being subsidized.[85]

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75. *Id.*

76. *Id.*; The United States Court of Appeals for the Federal Circuit has jurisdiction to hear this claim pursuant to 28 U.S.C.A. § 1295(a)(5). *Canadian Solar*, 23 4th at 1377.

77. Trans Texas Tire, LLC v. United States, 519 F. Supp. 3d 1289 (U.S. Ct. Int'l Trade 2021).

78. *Id.* at 1306.

79. *Id.* (citing BMW of N. Am., LLC v. United States, 926 F.3d 1291, 1297 (Fed. Cir. 2019).

80. *Id.*

81. Updegraff, *supra* note 55 at 718-30.

82. *Id.* at 719-20.

83. *Id.* 720-21.

84. *Id.*

85. Updegraff, *supra* note 55 at 725.

For example, those subject to countervailing duties will perceive that they are disproportionately disfavored when they face percentage rate increases of over 300% resting solely on the exporting country's failure to provide information.[86] Opponents further argue unfair hindrances in instances where respondents to the government's information requests have fewer resources and only weeks to file responses compared to petitioners who have several weeks if not months to gather information to prepare their petitions.[87] For smaller, less sophisticated exporters and producers, these tight deadlines and costs to obtain the needed information to answer extensive and detailed questionnaires can become incredibly burdensome.[88] Because of the multiple sources from which information needs to be gathered, the sheer amount of information to be obtained, and the rigorous deadlines, mistakes are bound to be made, and as a result, USDOC will resort to relying on adverse inferences.[89] Even if small errors are made, or there is only a piece of information in evidence that is in question, USDOC will throw out all of the information already obtained by respondents and then apply an adverse inference to conclude that the seller has been subsidized.[90] Essentially, all the work and resources put into obtaining and producing such information would be for naught. Critics of overbroad use of the adverse inference principal reason that there should be greater procedural safeguards in order to avoid overuse of the adverse inference as a substitute for more rigorous fact-finding.[91]

C. An Overreliance on the Use of Adverse Inferences to Justify Countervailing Duties has Unnecessarily Hurt Consumers

1. Uncertainty? From the Industry POV

The intent behind CVDs is to protect US solar-related manufacturing against unfairly lower-priced imports "and/or subsidies by other countries' governments."[92] But an erroneous determination both as to the existence of a subsidy and the size of the subsidy, can also cause harm. An excessive countervailing duty unnecessarily increases costs of imports and thus affects sections of the solar industry, such as developers and installers, who "benefit from having access to imported [products] at the lowest possible cost."[93]

Over the course of a CVD investigation and until a decision is made, the solar industry resides in a state of limbo because of the uncertainty, and "developers will find it very difficult to move ahead with projects unless they have a source of [solar-related materials] that they can be sure will not be affected."[94] If solar-related materials have already been ordered, packed, and on the seas, a new order

86. *Id.*
87. *Id.* at 725-26.
88. *Id.* at 725-26.
89. Updegraff, *supra* note 55 at 726-27.
90. Lester & Lincicome, *supra* note 55.
91. *Id.*
92. *Id.*
93. *Id.*
94. Lester & Lincicome, *supra* note 55.

could retroactively impact the cost of said materials, rendering even more problems for importers and their contracting deals.[95] For instance, Wood Mackenzie's global head of solar research, Xiaojing Sun, stated that these investigations are an "example of how policy uncertainty can have devastating impact on an industry," and "neither buyers nor sellers are willing to bear the tariff risk."[96]

In the present case, USDOC infers the size of China's subsidy to be the difference between what Canadian Solar is paying and the highest electric tariff rate set for any province.[97] Because of this, Canadian Solar's sales are subject to much higher duties than it originally contemplated when it began exporting photovoltaic cells from China.[98] This can create uncertainties between products providers like Canadian Solar and its clients with projects already in the works.[99] For example, if the agency orders higher CVDs importers may not have sufficient funds to cover the increased prices, and thus, their projects slow down, or may even be canceled.[100] This then prevents shipping due to "negative sentiment" in the market, and could effectively lead to a reduction in investments in the industry.[101]

95. *Id.*

96. Ed Crooks, *Anti-dumping threat throws US solar industry into turmoil*, WOOD MACKENZIE (May 6, 2022), https://www.woodmac.com/news/opinion/anti-dumping-threat-throws-us-solar-industry-into-turmoil/#:~:text=In%20March%2C%20the%20US%20Department,duties%20on%20imports%20from%20China; Wood Mackenzie is a global energy research company and provides data, analytics, and insights to strengthen the power of the natural resources industry. *Id.*

97. *Id.*

98. *Id.*

99. Crooks, *supra* note 96.

100. Iulia Gheorghiu, *Senators press for quicker solar anti-dumping investigation amid reports of sector's 'rapid degeneration*,' UTIL. DIVE (May 3, 2022) https://www.utilitydive.com/news/senators-press-for-quicker-solar-anti-dumping-investigation-amid-reports-of/621654/.

101. *Id.*

IV. CONCLUSION

Although countervailing duty orders are intended to protect U.S. manufacturers, the dramatic increase in the agency's use of negative inferences to support the imposition of countervailing duties increases the risk that the agency will erroneously find the presence of foreign subsidies, errors that will needlessly increase costs to consumers. Consumers, importers, and the general public would benefit from the agency's more judicious use of its discretionary authority to draw negative inferences from a country's non-production of information, particularly where affected exporters to the U.S. have no independent ability to secure that information themselves. Erroneous subsidy findings can translate into unnecessary price increases for consumers and, particularly in the case of our nation's ambitious carbon reduction goals, result in barriers to meeting those goals through still necessary imports. Until then, "solar coaster" will keep on its ups and downs.

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