June 14, 2021

VIA ELECTRONIC SUBMISSION

Attn: Gary Gensler, Chair, Securities and Exchange Commission
Re: Public Input Welcomed on Climate Change Disclosures

Dear Chair Gensler:

Attached to this letter is the report *What Investors and the SEC Can Learn from the Texas Power Crises*, authored by the undersigned individuals, Stephanie H. Jones, Gabriel Malek, and Michael Panfil of Environmental Defense Fund ("EDF"), and David G. Victor, Nonresident Senior Fellow at The Brookings Institution.[1] We respectfully submit this report to the Securities and Exchange Commission ("SEC") in response to its request for public input on climate change disclosures.[2] EDF is a non-partisan, non-governmental environmental organization representing over two million members and supporters nationwide. Since 1967, EDF has linked law, policy, science, and economics to create innovative and cost-effective solutions to today's most pressing environmental problems. The Brookings Institution is a nonprofit public policy organization based in Washington, DC. Its mission is to conduct in-depth research that leads to new ideas for solving problems facing society at the local, national and global level.

The report examines the February 2021 extreme winter weather event and ensuing power outages in Texas (collectively, the "February 2021 Crisis") as a salient example of the electric sector's vulnerability to extreme weather events that will plausibly become more frequent and more severe with climate change. The blackouts were dangerous, costly, and in some cases deadly for the Texans who suffered the effects on the ground.

Such events, and the market and policy responses they trigger, are also highly material to investors in the affected companies. We use the February 2021 Crisis as a reference point to analyze what companies consider and disclose about present and future climate-related perils. We focus on the

[1] Stephanie H. Jones is Climate Risk and Financial Regulations Attorney at Environmental Defense Fund (EDF). Gabriel Malek is Investor Influence Coordinator at EDF. Michael Panfil is Lead Counsel and Director of Climate Risk Strategies at EDF. David G. Victor is Professor of Innovation and Public Policy at the UC San Diego School of Global Policy and Strategy, Adjunct Professor in Climate, Atmospheric Science and Physical Oceanography at the Scripps Institution of Oceanography, Professor of Mechanical and Aerospace Engineering (by courtesy), and Nonresident Senior Fellow at The Brookings Institution. David G. Victor joins this filing in his individual capacity, not as a representative of any of his affiliated institutions. This letter and the attached report do not necessarily reflect the views, if any, of those institutions.

[2] *See* Public Statement, Acting Chair Allison Herren Lee, SEC, Public Input Welcomed on Climate Change Disclosures (Mar. 15, 2021), https://perma.cc/79R6-MEBD.

"10-K" reports filed with the SEC by all seven major publicly-traded power generation and utility companies in the Texas Interconnection, the grid covering the majority of the state.

The review finds that these reports say little about the physical impacts of climate change and possible policy changes in response to physical climate change impacts. Where the 10-Ks engage with climate-related risks at all, it is mainly in the domain of risks related to transition away from high carbon fuels, despite increasing evidence that material physical risks are knowable to companies (with varying degrees of uncertainty, as is common with many material risks). Investors are not readily able to gain such information absent corporate disclosure.

The high degree of similarity in the insufficiencies of disclosure practices across all seven companies analyzed reflects a need for reform in disclosure standards, rather than just reform by individual companies. We outline potential disclosure reforms that address failures of "memory" (i.e., the need to learn from prior extreme weather events, such as a similar cold snap in Texas in 2011) and failures of "imagination" (i.e., the need to do better forecasting of how climate impacts might affect assets, markets, and policies). We also conclude that existing voluntary frameworks—we focus on the TCFD—are not driving sufficient change in 10-K disclosure practices, which suggests the need for the SEC to mandate climate risk disclosures rather than expect that voluntarism will be sufficient. Finally, we outline a process by which the SEC can engage its fellow agencies and market participants to advance disclosure rules and practices, in tandem with evolving science around physical climate change impacts and improving capabilities of companies to assess climate-related risks to their assets.

We thank the SEC for its consideration of this report.

Respectfully,

/s/ Michael Panfil
Michael Panfil
Stephanie H. Jones
Gabriel Malek
Environmental Defense Fund
[redacted]

/s/ David G. Victor
David G. Victor
UC San Diego and The Brookings Institution
[redacted]

Attachments

What Investors and the SEC Can Learn from the Texas Power Crises

Stephanie H. Jones, Gabriel Malek,
Michael Panfil, and David G. Victor

June 2021

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About the Authors

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Acknowledgements

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Abstract

The February 2021 extreme winter weather event and ensuing power outages in Texas (collectively, the "February 2021 Crisis") are a salient example of the electric sector's vulnerability to extreme weather events that will plausibly become more frequent and more severe with climate change. The blackouts were dangerous, costly, and in some cases deadly for the Texans who suffered the effects on the ground. Such events, and the market and policy responses they trigger, are also highly material to investors in the affected companies. We use the February 2021 Crisis as a reference point to analyze what companies consider and disclose about present and future climate-related perils. We focus on the "10-K" reports filed with the Securities and Exchange Commission ("SEC") by all seven major publicly-traded power generation and utility companies in the Texas Interconnection, the grid covering the majority of the state. The review finds that these reports say little about the physical impacts of climate change and possible policy changes in response to physical climate change impacts. Where the 10-Ks engage with climate-related risks at all, it is mainly in the domain of risks related to transition away from high carbon fuels, despite increasing evidence that material physical risks are knowable to companies (with varying degrees of uncertainty, as is common with many material risks). Investors are not readily able to gain such information absent corporate disclosure. The high degree of similarity in the insufficiencies of disclosure practices across all seven companies analyzed reflects a need for reform in disclosure standards, rather than just reform by individual companies. We outline potential disclosure reforms that address failures of "memory" (i.e., the need to learn from prior extreme weather events, such as a similar cold snap in Texas in 2011) and failures of "imagination" (i.e., the need to do better forecasting of how climate impacts might affect assets, markets, and policies). We also conclude that existing voluntary frameworks—we focus on the TCFD—are not driving sufficient change in 10-K disclosure practices, which suggests the need for the SEC to mandate climate risk disclosures rather than expect that voluntarism will be sufficient. Finally, we outline a process by which the SEC can engage its fellow agencies and market participants to advance disclosure rules and practices, in tandem with evolving science around physical climate change impacts and improving capabilities of companies to assess climate-related risks to their assets.

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Part I

Introduction

In February 2021, millions of Texans were left without power, water, and heat as major winter storms decimated the state's electric system (the "February 2021 Crisis"). The February 2021 Crisis, because it was extreme, helps to reveal how individual power companies and the power sector as a whole may be affected under adversity. Understanding such impacts is important in its own right, for the power system is constantly affected by extreme weather.[1] With climate change, some of those extremes will become more frequent and more severe.

We examine this event as a case study on how climate-related perils can affect publicly traded companies.[2] Texas electric power companies,[3] along with their suppliers and customers, are exposed to the two major categories of climate risks. One is transition risk, which encompasses the impacts on companies of society's responses to climate change in the form of shifts in policy, liability, technology, market dynamics, and reputational issues related to the control of emissions. The other is physical risk, which encompasses the impacts of climate change-driven shifts in weather extremes, patterns, and baseline conditions on companies' assets and operations. While some firms are ostensibly reporting on both types of climate-related risk, the quality of these disclosures is often inadequate, and disclosure of physical risks is particularly weak.[4] Physical risks have great significance for many sectors, including the electric sector.

Since the origin of the federal mandatory securities disclosure framework, there have been important arguments in favor of enhancing disclosure requirements (such as protecting investors and correcting market failures) and against (such as the benefits of more onerous reporting obligations not necessarily justifying the costs). As society, the economy, technology, and science evolve, securities disclosure rules must also evolve to sustain the right balance of requiring information that investors and other market participants need with what companies are able to reasonably provide. In recent years, investors, regulators, and other experts have focused on climate change as an area where disclosure is not keeping pace with a large and growing set of risks. Recognizing the increasing significance of climate-related information to market participants, the Securities and Exchange Commission ("SEC") requested public input on questions relating to climate disclosure in March 2021.[5]

The February 2021 Texas Crisis is a recent, significant example of an extreme weather event that inflicted substantial impacts on the region's power industry. Although unusual, the extreme weather experienced was a foreseeable possibility. In the context of this event, we investigate the gulf between what is known or knowable about physical climate risks and what is actually disclosed under the current disclosure regime.[6] Section II of this report describes the February 2021 storm and resulting impacts on the Texas electricity system, and examines the foreseeability of such a crisis in light of prior events and climate science. Section III analyzes the extent of climate risk information disclosed by publicly-traded Texas power generators and investor-owned utilities in their 10-Ks, and reveals consistent underreporting of climate risks, notably

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1 NAT'L ACAD. OF SCI., ENHANCING THE RESILIENCE OF THE NATION'S ELECTRICITY SYSTEM 54-66 (2017), https://www.nap.edu/catalog/24836/enhancing-the-resilience-of-the-nations-electricity-system.

2 "Climate" as used in this paper encompasses current weather patterns (including incidence of extreme weather events) and potential shifts in these patterns that may plausibly result from increased atmospheric carbon levels.

3 All of the companies analyzed have generation or utility operations in the Texas electric system. Some of the companies analyzed also have additional locations or types of operations, including gas service and gas distribution.

4 PARKER BOLSTAD ET AL., BROOKINGS INST., FLYING BLIND: WHAT DO INVESTORS REALLY KNOW ABOUT CLIMATE CHANGE RISKS IN THE U.S. EQUITY AND MUNICIPAL DEBT MARKETS? 3 (2020), https://www.brookings.edu/wp-content/uploads/2020/09/WP67_Victor-et-al.pdf.

5 *See* Public Statement, Acting Chair Allison Herren Lee, Sec. & Exch. Comm'n, Public Input Welcomed on Climate Change Disclosures (Mar. 15, 2021), https://www.sec.gov/news/public-statement/lee-climate-change-disclosures.

6 For the purposes of this study, a risk is "known" if companies already have information regarding the risk. A risk is "knowable" if companies are able to seek out information about that risk at a reasonable cost.

related to physical impacts of climate change. Section IV considers the implications of these findings for potential action by the SEC to strengthen climate risk disclosure. Section V offers conclusions.

Part II

Foreseeability of the February 2021 Crisis in Texas

a. February 2021 Storm and Impacts on the Texas Electricity System

In February 2021, Texas experienced a severe winter weather event, with days of extremely cold temperatures, snow, and ice affecting large portions of the state, unofficially known as Winter Storm Uri. The event created higher electricity demand, lower natural gas production, and generation equipment outages, which together resulted in a severe electricity shortage and blackouts that affected millions of people for days.[7] While Texas was not the only state exposed to extremely cold temperatures, snow, and ice during this event, other states "routinely expect harsh conditions in the winter," whereas in Texas "the conditions were more extreme than anticipated."[8] The crisis was particularly acute within the grid operated by the Electric Reliability Council of Texas ("ERCOT"), the Texas Interconnection, which covers the majority of the state.[9] The ERCOT footprint is especially vulnerable to severe storm impacts because it has "isolated itself from the national grid, limiting the state's ability to import power when its own generators are foundering," and its deregulatory approach lacks enforcement of reserve margins and incentives for equipment weatherization.[10] In the spirit of looking at extremes because they reveal more starkly factors that can be relevant in other settings as well, this analysis focuses on the ERCOT areas of Texas.

The extreme February 2021 weather conditions resulted in "record-breaking winter-time demand for electricity at the same time that various adverse conditions developed on the supply side."[11] On the demand side, over 60 percent of Texans rely on electric heat and many homes are poorly insulated, and thus extreme cold caused a surge in demand for electricity by an amount equivalent to a third of winter peak load.[12] Supply suffered at the same time, as freezing in the natural gas supply system, and priorities in gas supply for home heating, meant much less gas was available for power generation.[13] Emissions reports from multiple natural gas producers in Texas confirmed that their system failures

[7] Keith Everhart & Gergely Molnar, *Severe power cuts in Texas highlight energy security risks related to extreme weather events*, IEA (Feb. 18, 2021), https://www.iea.org/commentaries/severe-power-cuts-in-texas-highlight-energy-security-risks-related-to-extreme-weather-events; *see also* Letter from Woody Rickerson, Vice President, Grid Planning and Operations, Elec. Reliability Council of Tex., Inc. to Arthur C. D'Andrea, Chairman, Pub. Util. Comm'n of Tex. (Apr. 6, 2021), http://www.ercot.com/content/wcm/lists/226521/51878_ERCOT_Letter_re_Preliminary_Report_on_Outage_Causes.pdf (presenting preliminary analysis of causes of February 14-19, 2021 outages in Texas).

[8] Testimony of Dr. Susan F. Tierney, Ph.D., Before the U.S. House Committee on Science, Space and Technology, Hearing on "Lessons Learned from the Texas Blackouts: Research Needs for a Secure and Resilient Grid" (Mar. 18, 2021), at 7, https://science.house.gov/imo/media/doc/Dr.%20Tierney%20Testimony.pdf (citing News Release, Elec. Reliability Council of Tex., Extreme cold weather expected to result in record electric use in ERCOT region (Feb. 11, 2021), http://www.ercot.com/news/releases/show/224996) [hereinafter "Testimony of Susan F. Tierney"]; News Release, Pub. Util. Comm'n of Tex., PUC Anticipates Record Electricity Demand Across ERCOT Region (Feb. 11, 2021), https://www.puc.texas.gov/agency/resources/pubs/news/2021/PUCTX-REL-ERCOT-COLD21-FIN.pdf.

[9] Elvia Limón & Julián Aguilar, *You might have heard that Texas has its own power grid. Did you know not all parts of the state use it?*, TEX. TRIBUNE (Feb. 18, 2021), https://www.texastribune.org/2021/02/18/texas-power-grid-outage-ercot/ (reporting that the parts of Texas connected to other grids experienced shorter outages affecting fewer customers during the February 2021 storm than those within the ERCOT footprint).

[10] Clifford Krauss et al., *How Texas' Drive for Energy Independence Set It Up for Disaster*, N.Y. TIMES (Feb. 21, 2021), https://www.nytimes.com/2021/02/21/us/texas-electricity-ercot-blackouts.html.

[11] Testimony of Susan F. Tierney, *supra* note 8, at 7 (citing BILL MAGNESS, REVIEW OF FEBRUARY 2021 EXTREME COLD WEATHER EVENT (2021) http://www.ercot.com/content/wcm/key_documents_lists/225373/2.2_REVISED_ERCOT_Presentation.pdf (slides presented by ERCOT President & CEO at Feb. 24, 2021 urgent Board of Directors meeting) [hereinafter "ERCOT Presentation"]).

[12] Peter Cramton, *Lessons from the 2021 Texas electricity crisis*, UTIL. DIVE (Mar. 23, 2021), https://www.utilitydive.com/news/lessons-from-the-2021-texas-electricity-crisis/596998/.

[13] Testimony of Susan F. Tierney, *supra* note 8, at 7-8 (citing Department of Energy, Emergency Situation Report, February 17, 2021, at https://www.energy.gov/sites/prod/files/2021/02/f82/TLP-WHITE_DOE%20Situation%20Update_Cold%20%20Winter%20Weather_%20Report%20%232%20FIN.pdf). These problems with the natural gas supply are emblematic of a larger set of concerns that have been raised about reliability of the nation's bulk gas supply, and the understanding of and reporting on factors that affect reliability. *See* Gerad Freeman, Jay Apt, & Michael Dworkin, *The Natural Gas Grid Needs Better Monitoring*, 34 ISSUES IN SCIENCE & TECHNOLOGY 79-84 (2018), https://www.jstor.org/stable/26597993.

were due to the cold weather.[14] Many power generators, even those gas plants not starved for fuel and wind generators, also tripped offline for reasons related to the cold temperatures, such as freezing of control systems.[15] All told, "over 48% of the region's total capacity [was] unavailable at the highest point in the outages."[16]

As often happens in large power crises, the loss of electric service created synergistic effects that made the crisis deeper. For example, as production and generation activity declined, "power was cut to the wells, processing plants and compressor stations that move the gas into and along major pipelines serving power plants," which "created a death spiral for electricity generation."[17] To break this cycle and "avoid a catastrophic system-wide outage as potential demand exceeded available generation, ERCOT instituted rolling blackouts ('load shedding')," which "extended over nearly three full days and at one point affected 20,000 MW of customer loads"—over 25 percent of estimated total customer demand had the system been fully operational.[18]

As the supply of electricity and gas plummeted, prices skyrocketed. Power prices were set by market regulators at the cap, $9,000/MWh, and stayed there for most of the trading hours over a few days—a windfall for generators that were still online but a catastrophic rise in cost for customers that still bought power at variable wholesale prices,[19] as well as companies that had to procure power at these prices to meet supply obligations.[20] Natural gas prices also increased dramatically, exceeding $200/MMBtu at multiple Texas hubs—approximately 100 times higher than prices at the beginning of February.[21]

The storm and outages caused massive disruption to people's lives and to business operations of all kinds.[22] Hypothermia and other cold weather-related perils, exacerbated by the outages, took the lives of at least 151 Texans.[23] Marginalized communities experienced particularly devastating impacts, both in terms of the outages and resulting price spikes.[24]

Initial damage estimates vary depending on method, but

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[14] *See, e.g.*, Tex. Comm'n on Env't Quality, Air Emission Event Report Database Incident 350608 (Mar. 3, 2021), https://www2.tceq.texas.gov/oce/eer/index.cfm?fuseaction=main.getDetails&target=350608 (XTO Energy report of February emission event); Tex. Comm'n on Env't Quality, Air Emission Event Report Database Incident 351001 (Mar. 3, 2021), https://www2.tceq.texas.gov/oce/eer/index.cfm?fuseaction=main.getDetails&target=351001 (Apache Corporation report of February emission event); Tex. Comm'n on Env't Quality, Air Emission Event Report Database Incident 352572 (Mar. 12, 2021), https://www2.tceq.texas.gov/oce/eer/index.cfm?fuseaction=main.getDetails&target=352572 (Chevron report of February emission event); *see generally* Tex. Comm'n on Env't Quality, Air Emission Event Report Database, https://www2.tceq.texas.gov/oce/eer/index.cfm.

[15] *See, e.g.*, Erin Douglas, *Texas largely relies on natural gas for power. It wasn't ready for the extreme cold*, TEX. TRIBUNE (Feb. 16, 2021), https://www.texastribune.org/2021/02/16/natural-gas-power-storm/; ERCOT Presentation, *supra* note 11, at 14.

[16] Testimony of Susan F. Tierney, *supra* note 8, at 7 (citing ERCOT Presentation).

[17] Garrett Golding, Anil Kumar & Karel Mertens, *Cost of Texas' 2021 Deep Freeze Justifies Weatherization*, FED. RESERVE BANK OF DALLAS (Apr. 15, 2021), https://www.dallasfed.org/research/economics/2021/0415.

[18] Testimony of Susan F. Tierney, *supra* note 8, at 6 (citing ERCOT Presentation).

[19] Mark Watson, *Texas regulators keep prices near $9,000/MWh cap during rotating outages*, S&P GLOBAL (Feb. 16, 2021), https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/021621-texas-regulators-keep-prices-near-9000mwh-cap-during-rotating-outages; Erin Douglas & Mitchell Ferman, *ERCOT overcharged power companies $16 billion for electricity during winter freeze, firm says*, TEX. TRIBUNE (Mar. 4, 2021), https://www.texastribune.org/2021/03/04/ercot-texas-electricity-16-billion/.

[20] *See, e.g.*, Maryam Adeeb, *Vistra estimates up to $1.3B earnings hit from Texas winter storm*, S&P GLOBAL (Feb. 26, 2021), https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/vistra-estimates-up-to-1-3b-earnings-hit-from-texas-winter-storm-62895293 ("[Vistra] expects the extreme weather event 'will have a material adverse impact on its financial results driven by generation output being constrained due to challenges with receiving a steady supply of fuel for some plants as well as challenges with handling fuel already on site given the freezing conditions . . . ."); Will Wade & Naureen S. Malik, *NRG Energy Sees $750 Million Loss Following Texas Cold Snap*, BLOOMBERG (Mar. 17, 2021), https://www.bloomberg.com/news/articles/2021-03-17/nrg-energy-sees-750-million-loss-following-texas-cold-snap ("NRG Energy Inc. withdrew an earlier full-year profit forecast and said it expects a $750 million loss due to the brutal cold snap that froze Texas and led to sweeping blackouts.");Will Wade, *Exelon Sees Profit Cut By Up to $710 Million From Texas Cold*, BLOOMBERG (Feb. 24, 2021), https://www.bloomberg.com/news/articles/2021-02-24/exelon-sees-profit-cut-by-up-to-710-million-from-texas-cold ("Exelon Corp. expects its first-quarter net income will be reduced by $560 million to $710 million because of last week's cold blast in Texas, saying three of its power plants were forced to shut down.").

[21] Devika Krishna Kumar, Scott Disavino & Jessica Resnick-Ault, *Texas freeze delivers billions in profits to gas and power sellers*, REUTERS (May 6, 2021), https://www.reuters.com/business/energy/results-tally-up-billions-profit-texas-freeze-gas-power-sellers-2021-05-06/.

[22] Peter Eavis & Neal E. Boudette, *Winter Storm Disrupts Wide Swath of American Business*, N.Y. TIMES (Feb. 16, 2021), https://www.nytimes.com/2021/02/16/business/winter-storm-business-disruptions.html.

[23] Tom Steele, *Number of Texas deaths linked to winter storm grows to 151, including 23 in Dallas-Fort Worth area*, DALLAS MORNING NEWS (Apr. 30, 2021), https://www.dallasnews.com/news/weather/2021/04/30/number-of-texas-deaths-linked-to-winter-storm-grows-to-151-including-23-in-dallas-fort-worth-area/.

[24] James Dobbins & Hiroko Tabuchi, *Texas Blackouts Hit Minority Neighborhoods Especially Hard*, N.Y. TIMES (Feb. 16, 2021), https://www.nytimes.com/2021/02/16/climate/texas-blackout-storm-minorities.html.

A preliminary projection from Texas-based economic research firm The Perryman Group, which included estimates of property damage and lost income, reported a range of $197-295 billion in costs stemming from the February 2021 Crisis. Other estimates put the costs at $130 billion.

uniformly conclude that costs inflicted by the event were significant. A preliminary projection from Texas-based economic research firm The Perryman Group, which included estimates of property damage and lost income, reported a range of $197-295 billion in costs stemming from the February 2021 Crisis. Other estimates put the costs at $130 billion,[25] a figure "[t]hat rivals the economic toll of Hurricane Harvey in 2017, and is nearly 2.5-times larger than the cost of the entire Atlantic basin hurricane season."[26] The Federal Reserve Bank of Dallas reported an estimate of $80-$130 billion in direct and indirect economic loss from the February 2021 Crisis, and calculated the value of lost load ("VOLL") to be $4.3 billion.[27] VOLL is a metric representing customers' "willingness to pay for electricity service (or avoid curtailment)."[28] Even based on this VOLL figure, a much lower damages figure than the other types of estimates that reflect the wider societal costs of lost power, the authors concluded that "the most reasonable solutions to prevent winter storm blackouts are within the bounds of being economically justified."[29]

The catastrophe has created massive political pressure for policy changes—pressure that is still playing out, but could lead to market reforms that further affect some companies.[30] ERCOT is in the midst of conducting a cause analysis of the outages and anticipates completing this analysis by August 2021.[31]

b. Foreseeability of Crisis Due to Prior Extreme Weather Impacts on Energy Sector and Texas

Extreme weather events akin the February 2021 Crisis are not new. Winter weather events, including extreme cold temperatures, snow, and icy conditions, have previously affected power sector operations in severe ways on multiple occasions, including in Texas.[32] These precedents have shown empirically that it is possible for these weather conditions to occur in the affected areas, and furthermore demonstrate the effects of such conditions on the electric system. Extreme weather can manifest in a series of synergistic, interlocking events—technological, political, market-related, and social—which combine to shape real-world outcomes.[33] Many studies on the power grid underscore the need for better tools for imagining

[25] Mark Puleo, *Damages from Feb. winter storms could be as high as $155 billion*, ACCUWEATHER (Mar. 5, 2021), https://www.accuweather.com/en/winter-weather/damages-from-feb-snowstorms-could-be-as-high-as-155b/909620.

[26] Testimony of Dr. Jesse D. Jenkins, Before the U.S. House Committee on Science, Space and Technology, Hearing on "Lessons Learned from the Texas Blackouts: Research Needs for a Secure and Resilient Grid" (Mar. 18, 2021), at 6-7, https://science.house.gov/imo/media/doc/Dr.%20Jenkins%20Testimony.pdf.

[27] Garrett Golding, Anil Kumar & Karel Mertens, *Cost of Texas' 2021 Deep Freeze Justifies Weatherization*, FED. RESERVE BANK OF DALLAS (Apr. 15, 2021), https://www.dallasfed.org/research/economics/2021/0415.

[28] ELEC. RELIABILITY COUNCIL OF TEX., ESTIMATING THE VALUE OF LOST LOAD 8 (2013), http://www.ercot.com/content/gridinfo/resource/2015/mktanalysis/ERCOT_ValueofLostLoad_LiteratureReviewandMacroeconomic.pdf.

[29] Garrett Golding, Anil Kumar & Karel Mertens, *Cost of Texas' 2021 Deep Freeze Justifies Weatherization*, FED. RESERVE BANK OF DALLAS (Apr. 15, 2021), https://www.dallasfed.org/research/economics/2021/0415.

[30] *See, e.g.*, Mitchell Ferman, *Texas Legislature approves bill to ban residential wholesale electricity plans – the first major winter storm bill sent to the governor*, TEX. TRIBUNE (May 13, 2021), https://www.texastribune.org/2021/05/13/texas-power-grid-failure-legislature/; Mose Buchele, *Texas Lawmakers Passed Changes to Prevent Blackouts. Experts Say They're Not Enough*, NPR (June 2, 2021), https://www.npr.org/2021/06/02/1002277720/texas-lawmakers-passed-changes-to-prevent-more-blackouts-experts-say-its-not-eno.

[31] Letter from Woody Rickerson, Vice President, Grid Planning and Operations, Elec. Reliability Council of Tex., Inc. to Arthur C. D'Andrea, Chairman, Pub. Util. Comm'n of Tex. (Apr. 6, 2021), http://www.ercot.com/content/wcm/lists/226521/51878_ERCOT_Letter_re_Preliminary_Report_on_Outage_Causes.pdf.

[32] Testimony of Susan F. Tierney, *supra* note 8, at 5 ("[Texas] has previously experienced extreme cold weather conditions during the winter which created electric reliability problems when power plants were not able to perform, for one reason or another.") (quoting FERC/NERC 2011 Report, *infra* note 39); *see also* James Doss-Gollin et al., *How unprecedented was the February 2021 Texas cold snap?*, ENV'T RSCH. LETTERS (forthcoming 2021) (accepted manuscript), https://iopscience.iop.org/article/10.1088/1748-9326/ac0278 (discussing five previous winter storms in Texas, and finding that three were of similar or greater severity to the 2021 storm, using a temperature-based proxy for heating demand per capita).

[33] *See* U.S. DEP'T OF ENERGY, U.S. ENERGY SECTOR VULNERABILITIES TO CLIMATE CHANGE AND EXTREME WEATHER 5-6 (2013), https://www.energy.gov/sites/default/files/2013/07/f2/20130716-Energy%20Sector%20Vulnerabilities%20Report.pdf.

how the grid might evolve in the future and how it (and the companies that depend on it) might be affected by crisis.[34] A shock like the February 2021 Crisis makes the thought experiments a bit easier, not only by adding objective information but by increasing the salience and tangibility of these scenarios.[35] In combination with the forward-looking hazard assessments and modeling addressed in Section II.C, these prior events put actors on notice.

Analyses of significant weather events by the Federal Energy Regulatory Commission ("FERC"),[36] which regulates the nation's interstate electricity system, and the North American Electric Reliability Commission ("NERC"),[37] which sets grid reliability standards, are particularly pertinent. These FERC and NERC analyses of prior weather events affecting the electric and gas systems are public and readily available to companies and state regulators.[38] These studies make clear that cold snaps are not novel in Texas. For example, FERC and NERC conducted a study of a previous February 2011 cold weather event in the Southwest (the "FERC/NERC 2011 Report"), during which "210 individual generating units within the footprint of [ERCOT] … experienced either an outage, a derate, or a failure to start," triggering a "controlled load shed affecting some 3.2 million customers," among other impacts throughout the region.[39] The 2011 FERC/NERC Report found a need for increased weatherization of the energy sector in Texas, noting that non-binding recommendations by the Public Utility Commission of Texas ("PUCT") on weatherization were apparently insufficient because "[m]any of the generators that experienced outages in [a cold weather event in] 1989 failed again in 2011."[40]

The 2011 FERC/NERC Report found a need for increased weatherization of the energy sector in Texas, noting that non-binding recommendations by the Public Utility Commission of Texas ("PUCT") on weatherization were apparently insufficient.

However, "[f]or the most part, the electric industry and gas industry in Texas did not act on" the 2011 FERC/NERC recommendations, "nor did regulators at the PUCT (for electric industry issues) or at the Texas Railroad Commission (for gas industry issues)."[41] The state did begin requiring power generators to "submit emergency plans that include details on what they will do in the event of extreme heat or cold."[42] However, most of these emergency plans are confidential; "many plants decline to disclose them, citing rules that allow them to withhold trade secrets from competitors."[43] These plans—and how they would interact with the plans of other generators and the possible

[34] *See* NAT'L ACAD. OF SCI., THE FUTURE OF ELECTRIC POWER IN THE UNITED STATES 3 (2021), https://www.nap.edu/catalog/25968/the-future-of-electric-power-in-the-united-states. ("[T]he nation needs to build and test new tools for simulation and experimentation to understand how the grid of the future will behave and how operators and policy makers can ensure its continued reliability.").

[35] *Cf.* David G. Victor, *Forecasting energy futures amid the coronavirus outbreak*, BROOKINGS INST. (Apr. 3, 2020), https://www.brookings.edu/blog/order-from-chaos/2020/04/03/forecasting-energy-futures-amid-the-coronavirus-outbreak/ ("When the waters drained from today's economy rise again, the rocks that define how the system works will be harder to see. Today's pandemic offers an opportunity for forecasters to test what they know and can predict.").

[36] FERC is the independent federal agency that regulates the sale and transmission of electricity in interstate commerce, with the mission of ensuring "economically efficient, safe, reliable, and secure energy for consumers." Fed. Energy Regul. Comm'n, About FERC, https://www.ferc.gov/about/what-ferc; *see also* Federal Power Act, 16 U.S.C. §§ 791 et seq. (creating the agency currently called FERC).

[37] NERC is a nonprofit regulatory authority under the oversight of FERC that develops and enforces grid reliability standards, assesses reliability, and monitors the bu k power system. North Am. Elec. Reliability Corp., About NERC, https://www.nerc.com/AboutNERC/Pages/default.aspx; *see also* Energy Policy Act of 2005, Pub. L. No. 109-58, 119 Stat. 594 (directing FERC to certify an electric reliability organization).

[38] North Am. Elec. Reliability Corp., Major Event Analysis Reports, https://www.nerc.com/pa/rrm/ea/Pages/Major-Event-Reports.aspx (listing 16 reports on major events affecting the U.S. electric system, including cold weather, snowstorms, fires, and hurricanes).

[39] FED. ENERGY REGUL. COMM'N & NORTH AM. ELEC. RELIABILITY CORP., REPORT ON OUTAGES AND CURTAILMENTS DURING THE SOUTHWEST COLD WEATHER EVENT OF FEBRUARY 1-5, 2011, at 10 (2011), https://www.ferc.gov/sites/default/files/2020-04/08-16-11-report.pdf [hereinafter "FERC/NERC 2011 Report"].

[40] *Id.* at 10.

[41] Testimony of Susan F. Tierney, *supra* note 8, at 5-6 (citing Molly Christian, Zack Hale & Ellie Potter, *Experts mull market, reliability rule changes amid Texas, regional outages*, S&P GLOBAL, (Feb. 16, 2021), https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/experts-mull-market-reliability-rule-changes-amid-texas-regional-outages-62688009).

[42] Lauren McGaughy & Holly K. Hacker, *Texas tells power plants to be winter ready. But how to prepare is up to them*, DALLAS MORNING NEWS (Feb. 20, 2021), https://www.dallasnews.com/news/investigations/2021/02/20/texas-tells-power-plants-to-be-winter-ready-but-it-lets-them-decide-how-to-prepare/.

[43] *Id.*

responses by regulators—are relevant to the financial performance of the generators both immediately (e.g., in times of crisis) and over the long term (e.g., if a crisis leads to policy and market reforms).[44]

In combination with the current inaccessibility of information on companies' planning, the absence of standards on extreme cold operational performance makes companies in the Texas energy sector vulnerable to cascading impacts:[45]

> While operators have financial incentives to winterize equipment, what makes short-to-medium term financial sense for plant operations doesn't add up to system-level reliability expectations. Relatedly, there is an issue of coordination failure: a natural gas plant owner needs to know that gas will reach the plant, and an owner of a wind farm that transmission lines will not fail. The need, but not requirement, to winterize the entire system means that, individually, owners of separate assets shy away from taking action, since they expect that others may not act either. This has meant that there is insufficient overall investment in winterization of the energy system in Texas, exposing the system to massive failure events . . . .

Accordingly, history has continued to rhyme, if not exactly repeat itself. Crisis occurs; hurried reports identify the causes and synergies; little of fundamental import changes. A November 2013 winter weather event in Texas affected oil and natural gas producers by causing "extensive power outages, facilities freeze-ups, trucking curtailments and limited access to production and drilling facilities."[46] Cold temperatures in January 2014 caused more than a dozen Texas power plant failures in 12 hours, "helping to bring the state's electric grid to the brink of collapse."[47] Despite these serious recurring issues, leading up to the February 2021 Crisis, "the power generation and gas production/delivery systems in Texas had not undergone the types of weatherization actions that could have enabled the provision of energy supply in the event of extreme winter temperature events."[48]

The problems are not unique to Texas, and extensive attention to similar concerns in other parts of the country offers evidence that these kinds of risks are known or knowable. The mid-Atlantic grid operator, PJM interconnection ("PJM"), experienced a similar cycle of electric system constraints during a 2014 polar vortex event.[49] The New England grid operator, ISO-NE, likewise experienced constraints during this polar vortex event.[50] Hurricane Harvey caused outages in Texas in 2017 when torrential rainfall and high winds damaged transmission and distribution infrastructure.[51] California's electric sector has been strained by increasingly severe wildfires and heatwaves, leading most recently to grid operator-forced

[44] Balancing business interests in confidentiality with investor need for disclosure is not a new exercise for the SEC. *See* Sec. & Exch. Comm'n, Confidential Treatment Applications Submitted Pursuant to Rules 406 and 24b-2, https://www.sec.gov/corpfin/confidential-treatment-applications (last visited June 7, 2021). Confidentiality should not be a barrier to top-level disclosure on firms' vulnerability and planning analyses, and such disclosure is done routinely in other areas where there is confidential information. Publicly traded companies that enjoy the benefit of raising capital through public means make the trade-off that they must provide those investors with information for decision-making.

[45] Testimony of Dr. Varun Rai, Before the U.S. House Committee on Science, Space and Technology, Hearing on "Lessons Learned from the Texas Blackouts: Research Needs for a Secure and Resilient Grid" (Mar. 18, 2021), at 2, https://science.house.gov/imo/media/doc/Dr.%20Rai%20Testimony.pdf.

[46] NGI Staff Reports, *Texas Freeze Slams Pioneer; Another Wintry Blast On Its Way*, NAT. GAS INTELLIGENCE (Dec. 2, 2013), https://www.naturalgasintel.com/texas-freeze-slams-pioneer-another-wintry-blast-on-its-way/.

[47] Jeremy Schwartz, Kiah Collier & Vianna Davila, "*Power companies get exactly what they want": How Texas repeatedly failed to protect its power grid against extreme weather*, TEX. TRIBUNE & PROPUBLICA (Feb. 22, 2021), https://www.texastribune.org/2021/02/22/texas-power-grid-extreme-weather/.

[48] Testimony of Susan F. Tierney, *supra* note 8, at 5-6 (citing Molly Christian, Zack Hale & Ellie Potter, *Experts mull market, reliability rule changes amid Texas, regional outages*, S&P GLOBAL, (Feb. 16, 2021), https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/experts-mull-market-reliability-rule-changes-amid-texas-regional-outages-62688009).

[49] Bentham Paulos, *PJM Tightens Capacity Market Rules to Improve Reliability*, POWER MAGAZINE (Dec. 18, 2014), https://www.powermag.com/pjm-tightens-capacity-market-rules-to-improve-reliability/.

[50] ISO NEW ENGLAND, JANUARY 2014 FERC DATA REQUEST 11 (2014), https://www.iso-ne.com/static-assets/documents/pubs/spcl_rpts/2014/iso_ne_response_ferc_data_request_january_2014.pdf.

[51] U.S. Energy Info. Admin., *Hurricane Harvey Caused Electric System Outages & Affected Wind Generation in Texas*, TODAY IN ENERGY (Sept. 13, 2017), https://www.eia.gov/todayinenergy/detail.php?id=32892. Analyses of Hurricane Harvey using different scientific methods found that climate change increased the amount of rainfall from that storm by between 15 to 37 percent. Michael Burger, Jessica Wentz & Radley Horton, *The Law and Science of Climate Change Attribution*, 45 COLUM. J. ENV'T L. 109-10 (2020), https://journals.library.columbia.edu/index.php/cjel/article/view/4730/2118.

outages due to extreme heat in August 2020.[52] These events have resulted in operational or organizational changes for affected power companies, ranging from new regulatory requirements[53] to bankruptcy.[54] To be sure, the details vary across regions—wildfires are different than hurricanes, and these are different from the dynamics of this extreme cold weather in Texas—but the larger point is that envisioning the impacts of these events is getting easier as the examples multiply and the hazard assessment tools advance.

c. Foreseeability of Crisis Due to Climate Science and Modeling

Though the details of any particular extreme weather event are predictable only a short time beforehand,[55] climate change is driving more frequent and intense occurrences.[56] Climate change is shifting both baseline weather patterns and extreme events, and the electricity system is highly susceptible to damage and disruption from these shifts.[57] It is not possible in a deterministic sense to foresee far in advance that a certain event will hit a certain area at a certain time, but it is possible in a probabilistic sense to foresee that frequency and severity of extreme weather events will increase; this is the sense in which the February 2021 events were foreseeable. Of specific relevance to the February 2021 storm, climate scientists have identified a potential link between the faster warming of the Arctic compared to the global average, or "Arctic amplification," and colder winter weather in the midlatitudes—factors that can lead to more variable weather as the jet stream and frontal systems meander across wider latitudinal bands.[58] Different studies have come to different conclusions on whether and how climate change may affect the intensity and frequency of winter storms, but increased risk of this

Though the details of any particular extreme weather event are predictable only a short time beforehand, climate change is driving more frequent and intense occurrences.

[52] ROMANY M. WEBB ET AL., CLIMATE RISK IN THE ELECTRICITY SECTOR: LEGAL OBLIGATIONS TO ADVANCE CLIMATE RESILIENCE PLANNING BY UTILITIES 1 (2020), https://climate.law.columbia.edu/sites/default/files/content/Full%20Report%20-%20Climate%20Risk%20in%20the%20Electricity%20Sector%20-%20Webb%20et%20al_0.pdf (citing Kavya Balaraman, *California Regulators Plan Post-Mortem to Examine Cause of Rolling Blackouts*, UTIL. DIVE (Aug. 21, 2020), https://www.utilitydive.com/news/california-post-mortem-rolling-blackouts/583923/); *see also* Press Release, CAISO, CPUC & CEC, CAISO, CPUC, *and CEC Issue Preliminary Report on Causes of August Rotating Outages* (Oct. 6, 2020), http://www.caiso.com/Documents/CAISO-CPUC-CEC-Issue-Preliminary-Report-Causes-August-Rotating-Outages.pdf ("The climate change-induced extreme heat storm across the western U.S. resulted in the demand for electricity exceeding the existing electricity resource planning targets. The existing resource planning processes are not designed to fully address an extreme heat storm like the one experienced in mid-August.").

[53] Bentham Paulos, *PJM Tightens Capacity Market Rules to Improve Reliability*, POWER MAGAZINE (Dec. 18, 2014), https://www.powermag.com/pjm-tightens-capacity-market-rules-to-improve-reliability/.

[54] Kavya Balaraman, *Wildfires pushed PG&E into bankruptcy. Should other utilities be worried?*, UTIL. DIVE (Nov. 19, 2020), https://www.utilitydive.com/news/wildfires-pushed-pge-into-bankruptcy-should-other-utilities-be-worried/588435/ ("[C]limate-change-driven wildfire activity will increase costs to utility-sector stakeholders, including investor-owned utilities, state and local governments, ratepayers, and taxpayers. These increased costs will in turn place financial stress on utility companies and crowd out essential investment in renewable energy and grid upgrades.") (quoting John MacWilliams, senior fellow at Columbia University's Center on Global Energy Policy).

[55] *See, e.g.*, ERCOT Presentation, *supra* note 11, at 9 (providing timeline of cold weather warnings issued prior to February 2021 storm).

[56] Testimony of Susan F. Tierney, *supra* note 8, at 9 ("Although Texas' winter weather in February 2021 was extraordinarily cold, and colder than expected, it is now predictable that extreme weather events will occur more frequently and be more intense as a result of climate change.").

[57] *See, e.g.*, Romany Webb & Michael Panfil, *Without planning, climate change will bring more Texas-style blackouts*, THE HILL (Feb. 23, 2021), https://thehill.com/opinion/energy-environment/539996-without-planning-climate-change-will-bring-more-texas-style; U.S. DEP'T OF ENERGY, U.S. ENERGY SECTOR VULNERABILITIES TO CLIMATE CHANGE AND EXTREME WEATHER i-iv (2013), https://www.energy.gov/sites/default/files/2013/07/f2/20130716-Energy%20Sector%20Vulnerabilities%20Report.pdf; Sinnott Murphy, Fallaw Sowell & Jay Apt, *A time-dependent model of generator failures and recoveries captures correlated events and quantifies temperature dependence*, APPLIED ENERGY (2019), Vol. 253, Art. 113513, https://doi.org/10.1016/j.apenergy.2019.113513 (finding that generators are more likely to fail at very hot or cold temperatures).

[58] *See* Judah Cohen et al., *Divergent consensuses on Arctic amplification influence on midlatitude severe winter weather*, 10 NATURE CLIMATE CHANGE 20 (2020), https://www.nature.com/articles/s41558-019-0662-y ("Observational studies overwhelmingly support that AA [Arctic amplification] is contributing to winter continental cooling."); see also Ethan Siegel, *This Is Why Global Warming Is Responsible For Freezing Temperatures Across The U.S.*, FORBES (Jan. 30, 2019), https://www.forbes.com/sites/startswithabang/2019/01/30/this-is-why-global-warming-is-responsible-for-freezing-temperatures-across-the-usa/.

specific type is plausible,[59] and increased risk of extreme weather events more broadly is highly likely.[60] Other climate change impacts that generally represent departures from historical precedent and pose significant hazards to the electric system include increasing temperature and humidity, decreasing water availability, and increasing storms, flooding, and sea level rise.[61]

Adverse consequences of climate change for specific locations, sectors, and companies are becoming increasingly foreseeable. Global climate models "simulate key aspects of the Earth's climate" and "project likely outcomes based on different emissions scenarios;" downscaling techniques allow companies and regulators to make more granular projections applicable to their operations.[62] Many companies currently have access not only to largescale climate models but to downscaled projections for use in their assessment and actions on climate vulnerabilities.[63] In addition, commercial offerings are available (with many more likely in the near future) that can provide sophisticated forward looking climate assessments along with estimates of possible damages from severe climate-related events.[64] AIR Worldwide, RMS, and EQECAT are all widely used by companies for catastrophe modeling. New risk management startups like Four Twenty Seven, risQ, Jupiter, and One Concern also offer investors and companies ways to quantify the effects of climate change. These downscaled projections can facilitate knowledge of climate risks at the company level and even the asset level. Climate risks to corporate assets should be considered rigorously and, where relevant, disclosed.

Recent efforts of several utilities have demonstrated that the advanced state of climate science makes it possible for electric system entities to learn from crises, comprehensively assess the current and future climate vulnerabilities of their operations, and develop resilience

[59] *See* Katharine Hayhoe et al., Our Changing Climate, in IMPACTS, RISKS AND ADAPTATION IN THE UNITED STATES: FOURTH NATIONAL CLIMATE ASSESSMENT, Vol. II 94 (D.R. Reidmiller et al. eds., 2018), https://nca2018.globalchange.gov/chapter/2/ ("Regarding the influence of arctic warming on midlatitude weather, two studies suggest that arctic warming could be linked to the frequency and intensity of severe winter storms in the United States; another study shows an influence of arctic warming on summer heat waves and large storms. Other studies show mixed results (e.g., Barnes and Polvani 2015, Perlwitz et al. 2015, Screen et al. 2015), however, and the nature and magnitude of the influence of arctic warming on U.S. weather over the coming decades remain open questions.")

[60] *See generally id.* at 72-144.

[61] U.S. DEP'T OF ENERGY, CLIMATE CHANGE AND THE ELECTRICITY SECTOR: GUIDE FOR CLIMATE CHANGE RESILIENCE PLANNING 10-11 (2016), https://www.energy.gov/sites/prod/files/2016/10/f33/Climate%20Change%20and%20the%20Electricity%20Sector%20Guide%20for%20Climate%20Change%20Resilience%20Planning%20September%202016_0.pdf; *see also* Michael Burger, Jessica Wentz & Radley Horton, *The Law and Science of Climate Change Attribution*, 45 COLUM. J. ENV'T L. 57, 64, 109, 121 (2020), https://journals.library.columbia.edu/index.php/cjel/article/view/4730/2118 (cataloguing events and conditions projected to increase in frequency, intensity, and/or duration due to climate change including high temperatures, sea level rise, droughts, floods, hurricanes, and wildfires).

[62] WEBB ET AL., *supra* note 52, at 5. Multiple publicly available downscaled climate projection tools, which model climate variables such as temperature and precipitation at resolutions as fine as 0.6 miles, have been developed by governmental, academic, and private entities. *See, e.g.*, U.S. Climate Resilience Too kit, Energy Data Gallery, https://too kit.climate.gov/topics/energy/energy-data-gallery (last visited June 8, 2021); Nat'l Aeronautics & Space Admin., NASA Earth Exchange (NEX) Downscaled Climate Projections (NEX-DCP30), https://www.nccs.nasa.gov/services/data-collections/land-based-products/nex-dcp30 (last visited June 8, 2021); U.S. Geological Survey, Regional Climate Change Viewer, http://regclim.coas.oregonstate.edu/visualization/rccv/index.html (last visited June 8, 2021); Bureau of Reclamation et al., Downscaled CMIP3 and CMIP5 Climate and Hydrology Projections, https://gdo-dcp.ucllnl.org/downscaled_cmip_projections/#Welcome (last visited June 8, 2021); Conservation Biology Inst., AdaptWest - A Climate Adaptation Conservation Planning Database for North America, https://adaptwest.databasin.org/ (last visited June 8, 2021); Cal-Adapt, https://cal-adapt.org/ (last visited June 8, 2021); *see* also Katharine Hayhoe et al., *Climate Models, Scenarios, and Projections*, in CLIMATE SCIENCE SPECIAL REPORT: FOURTH NATIONAL CLIMATE ASSESSMENT, Vol. I 133, 144 (D.J. Wuebbles et al. eds., 2017), https://science2017.globalchange.gov/downloads/CSSR2017_FullReport.pdf.

[63] Environmental Defense Fund & Sabin Center, FERC's Request for Comments Related to the Technical Conference on Climate Change, Extreme Weather, and Electric System Reliability (Docket No. AD21-13-000), at 14-15 (Apr. 15, 2021), https://climate.law.columbia.edu/sites/default/files/content/EDF%20Sabin%20Center%20Comments.pdf.

[64] *See, e.g.*, Roger Grenier et al., AIR Worldwide Corporation, *Quantifying the Impact from Climate Change on U.S. Hurricane Risk* (2020), https://www.air-worldwide.com/SysSiteAssets/Publications/White-Papers/documents/air_climatechange_us_hurricane_whitepaper.pdf.

plans to reduce these vulnerabilities.[65] For example, pursuant to a settlement with the New York Public Service Commission following Superstorm Sandy,[66] Consolidated Edison ("ConEd") engaged in a thorough Climate Change Vulnerability Study, which concluded in 2019 and was followed in 2020 by a Climate Change Implementation Plan to address identified vulnerabilities.[67] ConEd "analyzed projected change in temperature, humidity, precipitation, sea level, and extreme weather in ConEd's service territory over seven time periods spanning from 2020 through 2080" by engaging academic scientists and consultants "to develop downscaled climate projections for three sub-areas within its territory based [on] thirty-two [global climate models]."[68] The ConEd vulnerability study and implementation plan regarding climate risk show that it is possible for utilities to draw on downscaled climate models and other available scientific information to foresee and prepare for multiple climate risks, including ones that have not yet severely impacted that company.

As another example, following wildfires, all of the California electric utilities are under immense pressure to understand and disclose climate-related risks and there is an active proceeding under the California Public Utilities Commission ("CPUC") on related issues.[69] Pursuant to the CPUC's order directing utilities to prepare climate vulnerability assessments on risks from wildfire and other impacts, SCE recently released a draft Community Engagement Plan, describing its ongoing climate vulnerability assessment and adaptation planning actions, and its efforts to engage disadvantaged and vulnerable communities in these processes.[70] SDG&E engaged in a vulnerability assessment that found that climate change posed increasing risks to its system in the form of not only wildfires, but also sea level rise and peak demand increases.[71] California utilities, along with the State itself, are investing heavily in weather monitoring and analysis of patterns, and other climate resilience measures intended to help understand and manage such risks.[72]

> ***ERCOT did not incorporate forward-looking projections in its forecasts of expected and extreme conditions, basing supply and demand estimates solely on historical extremes.***

Despite the significance of climate change for the operation of the electric system and the availability of relevant information, Texas electric regulatory authorites have not sufficiently engaged with climate considerations, which both increases and obscures climate risks to companies and investors. First, ERCOT did not incorporate forward-looking projections in its forecasts of expected and extreme conditions, basing supply and demand estimates solely on historical extremes, in turn hindering the ability to prepare

[65] WEBB ET AL., *supra* note 52, at 4-14.

[66] Order Approving Electric, Gas and Steam Rate Plans in Accord with Joint Proposal, NY PSC Case Nos. 13-E-0030 *et al.*, (Feb. 21, 2014), https://climate.law.columbia.edu/sites/default/files/content/docs/Final-Order-2014-02-21%20(1).pdf. A coalition of NGOs and academic institutions including the Columbia Law School Center for Climate Change Law and EDF were parties to this rate proceeding. Id.

[67] ConEd Climate Change Vulnerability Study (Dec. 2019), https://www.coned.com/-/media/files/coned/documents/our-energy-future/our-energy-projects/climate-change-resiliency-plan/climate-change-vulnerability-study.pdf?la=en; ConEd Climate Change Implementation Plan, Case Nos. 19-E-0065 and 19-G-0066 (Dec. 29, 2020), http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={F59D306D-F332-4669-B023-4EFE980F65E9}; ConEd Climate Change Resilience and Adaptation: Summary of 2020 Activities (Jan. 2021), https://www.coned.com/-/media/files/coned/documents/our-energy-future/our-energy-projects/climate-change-resiliency-plan/climate-change-resilience-adaptation-2020.pdf.

[68] WEBB ET AL., *supra* note 52, at 13 (citing ConEd Climate Change Vulnerability Study at 17-19).

[69] *See* Cal. Pub. Util. Comm'n, Climate Change Adaptation, https://www.cpuc.ca.gov/climatechangeadaptation/ (last visited May 14, 2021).

[70] Southern California Edison Company's (U 338-E) Community Engagement Plan, CPUC Rulemaking 18-04-019, https://www.sce.com/sites/default/files/inline-files/SCE_Draft_2021_Climate_Adaptation_Community_Engagement_Plan.pdf (last visited May 14, 2021).

[71] RISK ASSESSMENT AND MITIGATION PHASE REPORT OF SAN DIEGO GAS & ELECTRIC COMPANY AND SOUTHERN CALIFORNIA GAS COMPANY, at E-1 – E-2 (Oct. 27, 2016), https://www.sdge.com/sites/default/files/documents/SDGE_SCG_Risk_Assessment_Mitigation_Phase_Submission_Report.pdf?nid=11781.

[72] *See, e.g.*, SDG&E's Commitment to Sustainability, SDG&E, https://www.sdge.com/more-information/environment/sustainability-approach ("Since 2007, [SDG&E has] invested more than $2 billion to strengthen the regional grid against threats posed by climate change, in particular wildfire risk.").

ERCOT itself states that under its approach, "the only entity that can confirm that a plant is 'weatherized' to any particular standard is the entity that owns or operates the plant."

for plausible outcomes.[73] Forward-looking analysis is crucial for electric regulators and regulated companies to understand relevant transition and physical climate risks. Second, as the examples above illustrate, state electric regulators have the ability to take measures on climate vulnerability assessment and resilience planning, which can reveal information about and reduce harm from climate-related impacts, but Texas regulators are not doing so. For example, the PUCT and ERCOT do not "enforce compliance with weatherization plans or enforce minimum weatherization standards"—regulatory actions which, if undertaken, could not only reduce climate-related risks but provide information on companies' risks to investors and other market participants.[74] ERCOT itself states that under its approach, "the only entity that can confirm that a plant is 'weatherized' to any particular standard is the entity that owns or operates the plant."[75] Furthermore, as shown in analysis below, financial regulation did not drive sufficient climate risk disclosure by Texas power companies in 10-Ks. Under current electric and financial regulatory requirements and disclosure practices, these companies' climate vulnerabilities, planning processes, and resilience measures remain unclear,[76] which has system-wide implications. The magnitude of companies' exposure to physical climate risk depends not only on the climate conditions in which they operate, but the regulatory and market conditions as well, so these considerations are relevant to financial regulators and investors.

[73] Testimony of Beth Garza, Before the U.S. House Committee on Science, Space and Technology, Hearing on "Lessons Learned from the Texas Blackouts: Research Needs for a Secure and Resilient Grid" (Mar. 18, 2021), ata 4, https://science.house.gov/imo/media/doc/Ms.%20Garza%20Testimony.pdf (citing Elec. Reliability Council of Texas, Seasonal Assessment of Resource Adequacy for the ERCOT Region (SARA) - Winter 2020/2021, Nov. 5, 2020, http://www.ercot.com/content/wcm/lists/197378/SARA-FinalWinter2020-2021.xlsx)).

[74] *See* ERCOT Presentation, *supra* note 11, at 17.

[75] *Id.*

[76] *See* Lauren McGaughy & Holly K. Hacker, *Texas tells power plants to be winter ready. But how to prepare is up to them*, Dallas Morning News (Feb. 20, 2021), https://www.dallasnews.com/news/investigations/2021/02/20/texas-tells-power-plants-to-be-winter-ready-but-it-lets-them-decide-how-to-prepare/ (noting that the PUCT requires Texas power companies to create extreme weather plans, but many companies assert confidentiality over these plans).

Part III

Analysis of Climate Risk Disclosures by Texas Entities

a. Background

Understanding System-Wide Climate Disclosure Trends

The above section highlights the foreseeability of extreme weather events like the February 2021 Crisis. It shows that, given past natural disasters and increasingly sophisticated climate science, companies should have the requisite information to understand plausible severe climate-related physical risks to owned assets and operations.[77]

The financial implications of these risks should presumably necessitate their disclosure to the SEC. Under Regulation S-K and Regulation S-X of the U.S. Securities Act of 1933, public companies are required to disclose financial and non-financial information relevant to investors. These disclosures are made through 10-Ks, which detail companies' history, structure, executive compensation, and financial performance. 10-Ks undergird investment decision-making and, as investors' main source of comparable and company-supplied risk information, should include discussion of climate-related risks that are material to the financial performance of the company.[78]

This section analyzes the extent to which power generators and investor-owned utilities implicated in the February 2021 Crisis incorporated climate risk information in their 10-Ks to the SEC. This analysis finds consistent underreporting of climate-related risks from power generators and investor-owned utilities in the ERCOT region of Texas. Critically, we find a systemic under-disclosure of highly relevant information—where existing SEC rules, as interpreted and applied by publicly traded firms, have resulted in investors, suppliers, customers, and the public receiving inadequate risk disclosure.

Method

This study assesses the climate risk disclosure practices of publicly-traded power generators and investor-owned utilities with operations in the ERCOT region of Texas. It focuses specifically on the electric sector and does not include companies solely engaged in the natural gas production or distribution side of the energy sector, even though they may have incidental power generation as part of their core business operations.[79] Subsequent analyses of the February 2021 Crisis should be conducted to address climate risk disclosure from the perspective of the natural gas industry. Future research might also look at other suppliers that are exposed to power generation behavior in Texas, along with power users exposed to reliability and cost of delivered electricity.

An initial list of power generators and investor-owned utilities with operations in Texas was drawn from the Public Utility Commission of Texas's market directory for the electric industry.[80] This list was screened to include only public companies or subsidiaries of public companies (because these are the companies subject to SEC disclosure requirements). The list was then screened to include only companies within the ERCOT region of Texas, given the winter storm's acute effects on the ERCOT grid. This screen yielded a universe of seven companies—three merchant power generators and four investor-owned utilities—with varying degrees of exposure to Texas. Some

[77] As noted at the outset, "climate" as used in this paper encompasses current weather patterns (including incidence of extreme weather events) and potential shifts in these patterns that may plausibly result from increased atmospheric carbon levels.

[78] *See* Commission Guidance Regarding Disclosure Related to Climate Change, Securities Act Release No. 9106, Exchange Act Release No. 61,469, 75 Fed. Reg. 6290 (Feb. 8, 2010) (SEC's 2010 Guidance confirming that existing disclosure obligations may require disclosure of climate-related risks).

[79] All of the companies analyzed have generation or utility operations in the Texas electric system. Some of the companies analyzed also have additional locations or types of operations, including gas service and gas distribution.

[80] Market Directories: Electric Companies Serving Texas, Public Utility Commission of Texas, https://www.puc.texas.gov/industry/electric/directories/Default.aspx.

companies included in this universe operate almost entirely in Texas, while others draw less than 10% of revenue from their Texas subsidiaries.

The group also featured companies with different voluntary climate risk disclosure commitments and practices. One company releases a stand-alone climate report aligned with the Task Force on Climate-related Financial Disclosures ("TCFD"), two companies include TCFD-aligned sections in their corporate sustainability reports, three companies publish "TCFD mapping reports" that tie disclosures made in other materials to the TCFD framework, while one company does not address the TCFD across any of its reports.[81] Attention to which firms are purportedly aligned with TCFD is important because TCFD alignment is often seen as a bellwether for better reporting.

The three power generators analyzed are Exelon Corporation, NRG Energy, and Vistra Corporation. The four investor-owned utilities analyzed are CenterPoint Energy, American Electric Power, Sempra Energy, and PNM Resources.

Company	Texas Financial Exposure
AEP	10% of 2020 earnings
CenterPoint	Not available
Exelon	6% of 2020 revenue
NRG	72% of 2020 revenue
PNM	25% of 2020 revenue
Sempra	15% of 2020 earnings
Vistra	81% of 2020 earnings

Figure 1: Texas Financial Exposure of Companies Sampled

This study draws on the February 2021 Crisis to determine what companies are communicating to investors about their climate-related risks. As such, we are interested in what companies reported just after the February 2021 Crisis (all filed their 2021 10-Ks after the crisis) and just before the crisis (in 10-Ks filed in 2020). Moreover, because the winter storm, though particularly extreme in 2021, is not unprecedented, we raise the same before and after questions with regard to extreme weather experienced in 2011. We thus review 10-Ks for all seven companies in four years: 2010, 2011, 2020, and 2021. This approach is employed to reveal whether companies provide the market with dynamic climate risk information that accounts for updated knowledge of climate-related physical risks. Detailed analysis of these 10-Ks can be found in the Appendix to this study.

Scope

As explained above, this study concentrates on the electric sector and excludes companies solely involved in the natural gas production or distribution side of the energy sector.

Additionally, this study focuses specifically on climate-related risk disclosure in 10-Ks. While we recognize that companies also disclose climate-related risk information in voluntary materials (e.g., TCFD reports, ESG reports, sustainability reports) and filings with energy regulators, we are interested in how climate-related information appears in financial reporting, which guides investor decision-making and capital allocation. 10-Ks are the bedrock of financial risk evaluation and fall under SEC purview. Because climate change presents clear financial risks to companies, we expect discussion of climate-related risks to appear in 10-Ks, no different from traditional financial risks. The core of our analysis thus revolves around 10-Ks.

b. Findings

Companies released their 2021 10-Ks at the end of February, one to two weeks after the February 2021 Crisis, and each company took a similar approach, both stylistically and substantively, to climate risk disclosure when compared

[81] *See* Appendix B: Companies' TCFD Reporting, A-3.

with pre-crisis filings.[82] First, high-level discussions of climate change appeared in the companies' opening "Business" sections. Firms then generally included relatively more substantive considerations of climate-related risks in their "Risk Factors" sections. Most companies devoted separate sub-sections to transition and physical risk, though a handful combined the two topics under one climate risk sub-section. Commentary on the Texas winter storm appeared in the section of companies' 10-Ks entitled, "Management's Discussion and Analysis of Financial Condition and Results of Operations." Generally, companies used broad, boiler-plate language to describe climate risk. Although firms provided more detailed insights into transition risks than physical risks, they overall did not offer investors decision-useful information on climate-related financial risks.[83]

Our evaluation of 10-Ks proceeds in five steps. First, we analyze transition risk disclosures across the full set of seven 2021 10-Ks. Second, we evaluate physical risk disclosure across the seven 2021 10-Ks. Third, we assess firms' 10-K discussion of the February 2021 Crisis and any efforts to use that crisis to reveal how extreme events—whether linked to climate or not—affect performance. Fourth, we compare companies' 2020 and 2021 physical risk disclosures. Lastly, we compare companies' 2010 and 2011 physical risk disclosures.

Transition Risks

Across these companies, the 2021 10-Ks described existing and emerging climate regulations in detail and in many instances linked company-specific decarbonization strategies to potential federal or state emissions reduction policies. Although the power industry, in various ways, is conducting extensive analysis on the costs of potential action on climate change,[84] none of these companies quantified past or projected costs of climate emissions regulation on their businesses. While some of the general information about regulatory risks is available broadly to investors, such as through industry and academic studies and power sector regulatory filings, limited company-specific information on impacts of these risks is included in 10-K filings.

> ***None of these companies quantified past or projected costs of climate emissions regulation on their businesses.***

AEP's 2021 10-K serves as one example. It summarizes recent federal energy policy and relevant state renewable energy standards, describing in particular the regulatory and legal history of the Clean Power Plan and the Affordable Clean Energy rule. It then describes how these policies may create financial risk by delineating its emissions reduction goals in subsequent paragraphs. AEP provides its 2030 and 2050 CO2 reduction targets and highlights its percentage emissions reduction from 2000 levels.[85] These metrics are company-specific, offering investors tailored climate insights not found in sub-sections on physical risk.

Specificity is lacking, however, in considering the possible misalignment between business operations and climate emissions regulation. The 10-K states, for instance, that "excessive costs to comply with future legislation or regulations has led to the announcement of early plant closures."[86] This is a general statement not linked to

[82] We are mindful that companies released their 10-Ks shortly after the February 2021 Crisis. However, previous extreme weather events across the industry, as detailed in previous sections, had already shown companies the potential financial implications of climate-related risks and therefore should have given companies a foundation for analysis.

[83] Madison Condon et al., *Mandating Disclosure of Climate-Related Financial Risk,* 23 N.Y.U. J. LEGIS. & PUB. POL'Y (forthcoming 2021), at 11 http://blogs.edf.org/climate411/files/2021/02/Mandating_Climate_Risk_Financial_Disclosures.pdf ("Information needs to be of a kind and quality that allows users to 'integrate climate risk disclosure into their decision-making.' Relevant decisions include not just those regarding whether and how much to invest, but also ownership, engagement, and proxy-voting related decisions.").

[84] *See, e.g.*, ELEC. POWER RSCH. INST., POWERING DECARBONIZATION: STRATEGIES FOR NET-ZERO CO2 EMISSIONS (2021), https://www.epri.com/research/products/000000003002020700.

[85] AEP 2021 10-K, at 74.

[86] AEP 2021 10-K, at 74.

particular plants or their generating capacity or financial impacts. Nor is there an estimate of possible impacts of future regulation on other plants in the AEP fleet, even though the company surely has done that analysis itself. To be useful for investors, these disclosures would need assessments of likely impacts on specific facilities and operations and their financial materiality. The 10-K's generic reference to "excessive costs" does not contain sufficient information to guide investment decisions.

We highlight AEP's 10-K to illustrate system-wide trends, for the practices at AEP are typical based on our sample. Across the industry, disclosures generally discuss policy developments and emissions reductions strategies yet do not offer estimates that quantify potential transition costs resulting from the retirement of carbon-intensive assets, regulatory scrutiny, or litigation. PNM's 10-K, for example, considers state renewable portfolio standards in the states where it operates and federal clean energy goals. It additionally describes and quantifies its emission reduction efforts with detailed, company-specific information. When addressing transition costs more explicitly, however, the 10-K does not provide quantifiable, specific estimates. It reports that "because of PNM's dependence on fossil-fueled generation, legislation or regulation that imposes a limit or cost on GHG could impact the cost at which electricity is produced."[87] Without quantifying and identifying what elements of its business could be subject to emissions regulation, PNM, like AEP, provides investors with minimal information about how it is responding to climate-related policy exposure. Similar disclosure practices manifested across all other surveyed companies, with 10-Ks generally describing relevant regulation but not quantifying how those regulations would affect business.

Physical Risks

Transition risk disclosures are incomplete, even with information that firms likely have on hand as part of their strategic planning. But the situation for physical risks is far worse. Here, companies uniformly relied on generic, boiler-plate language to characterize physical risks caused by climate change. Few companies provided firm-specific physical risk data, and no company quantified potential future damages resulting from extreme weather let alone extreme weather patterns that might vary due to climate change. This is particularly important because the science of climate change impacts has shown, repeatedly, that the actual impacts of climate-related events (and chronic conditions) depend on two factors—the severity of the event itself and preparedness for the event.[88] Most policy debates have focused on the former, but often the latter is much more important.

> ***No company quantified potential future damages resulting from extreme weather let alone extreme weather patterns that might vary due to climate change.***

Findings were consistent across all companies reviewed, with each using boiler-plate language to disclose their exposure to physical risks resulting from climate change. Vistra's 10-K, for example, noted that "the potential physical effects of climate change, such as increased frequency and severity of storms, floods, and other climatic events, could disrupt our operations and cause us to incur significant costs to prepare for or respond to these effects."[89] Similarly, Sempra (the parent of Oncor, a Texas utility) reported that as weather-related incidents become "more prevalent, unpredictable and severe as a result of climate change," physical risks could "have a material adverse effect on our businesses, financial condition, results of operations, cash flows and/or prospects."[90]

[87] PNM 2021 10-K, at 57.

[88] *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014, IMPACTS, ADAPTATION, AND VULNERABILITY 40, 42 (2014), https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-PartA_FINAL.pdf; see also Section II, supra (discussing heightened climate vulnerabilities of companies on the ERCOT grid due to limitations of planning processes and lack of resilience requirements).

[89] Vistra 2021 10-K, at 43.

[90] Sempra 2021 10-K, at 38.

This information is generic and of essentially no value to an investor or other market participant; disclosures of this generality could apply generally to almost any company across the economy. The disclosure provides no details related to the specific risks of any assets or operations, nor does it quantify probabilities or impacts of those risks. Additionally, the disclosure does not offer useful information related to how the company may be acting to address specific risks and impacts. This lack of relevant information prevents investors and other market participants from adequately assessing the climate-related risks of the company, which is essential in determining not only the value of the company but whether and under what terms other market participants may want to engage in business with the company.

At best, firms offered qualitative insights specific to the power sector. CenterPoint stated that "if climate changes occur that result in warmer temperatures in our service territories… natural gas could be adversely affected through lower natural gas usage."[91] These comments are an improvement relative to boiler-plate disclosures more common in other industries, but still have little value to investors seeking to make company-specific asset allocation decisions.[92] Exelon's 10-K illustrated a similar approach, conveying that "extreme weather conditions or storms could affect the availability of generation and … transmission, limiting [Exelon's] ability to source or send power to where it is sold."[93] This language, mirrored by the other companies included in this study, lacks the specificity and precision needed to inform investor analysis.

In sum, the firms reviewed did not provide comparable, specific, or decision-useful physical risk information. Based in boiler-plate generalities, companies' analyses of extreme weather events suggest a system-wide deficiency in climate-related disclosures and financial reporting in particular.

Discussion of the February 2021 Crisis

In addition to the high-level climate-related physical risk disclosures described above, companies' most recent 10-Ks included separate disclosures specific to the February 2021 Crisis. Most commonly, this information was conveyed in a portion of the physical risk sub-section or featured in a stand-alone sub-section about the storm elsewhere in the 10-K.

Companies' comments on the February 2021 Crisis focused principally on quantifying weather-related financial impacts. NRG, for example, devoted half of its Texas storm sub-section to explaining its process for estimating financial damages, noting that the event likely altered the company's 2021 income by approximately $100 million.[94] Every company besides Sempra estimated the financial impacts of the winter weather, which is perhaps not surprising since only a small portion of Sempra's total earnings are from its regulated Texas power business. Firms considered the immediate business ramifications of the storm a top priority.[95]

Notably, firms generally framed the February 2021 Crisis as a point-in-time, rare event, unlikely to recur. In fact, such extreme weather events are uncommon but historically well-known, and could become more frequent and thus salient to investment decisions in light of climate change. PNM, for example, emphasized that the winter storm delivered "the coldest temperatures in 100 years for many parts of the state."[96] Portraying the storm in this manner implies that the winter freeze was extremely improbable rather than amenable to estimation, as prior experience and analysis suggests.[97] With this framing, companies also fixated on estimated damages from the particular extreme winter weather event without connecting the incident to larger patterns: neither previous winter-related blackouts nor future, increasingly frequent and severe climate-induced disasters. Indeed, the February 2021 Crisis was

[91] CenterPoint 2021 10-K, at 32.

[92] PARKER BOLSTAD ET AL., BROOKINGS INST., FLYING BLIND: WHAT DO INVESTORS REALLY KNOW ABOUT CLIMATE CHANGE RISKS IN THE U.S. EQUITY AND MUNICIPAL DEBT MARKETS? 3 (2020), https://www.brookings.edu/wp-content/uploads/2020/09/WP67_Victor-et-al.pdf.

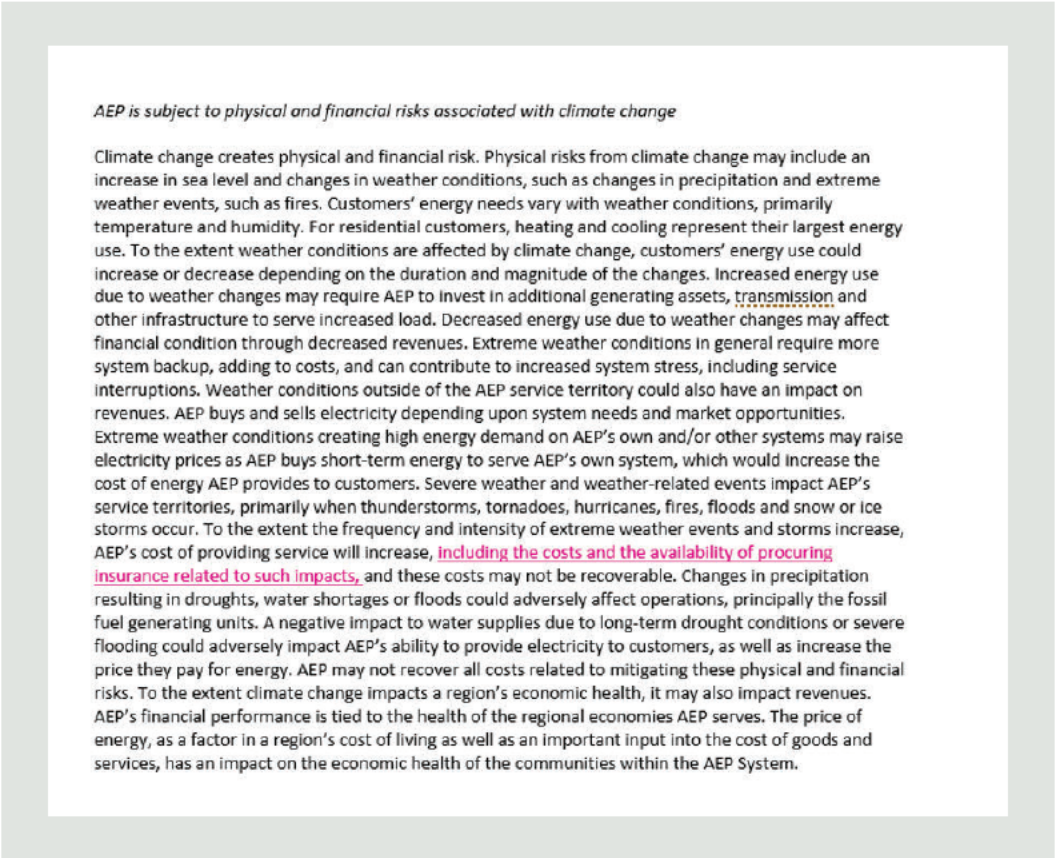
[93] Exelon 2021 10-K, at 35.

[94] NRG 2021 10-K, at 50.

[95] Many companies also filed 8-Ks on the financial repercussions of the February 2021 Crisis.

[96] PNM 2021 10-K, at 20.

[97] FERC/NERC 2011 Report, *supra* note 39.



AEP is subject to physical and financial risks associated with climate change

Climate change creates physical and financial risk. Physical risks from climate change may include an increase in sea level and changes in weather conditions, such as changes in precipitation and extreme weather events, such as fires. Customers' energy needs vary with weather conditions, primarily temperature and humidity. For residential customers, heating and cooling represent their largest energy use. To the extent weather conditions are affected by climate change, customers' energy use could increase or decrease depending on the duration and magnitude of the changes. Increased energy use due to weather changes may require AEP to invest in additional generating assets, transmission and other infrastructure to serve increased load. Decreased energy use due to weather changes may affect financial condition through decreased revenues. Extreme weather conditions in general require more system backup, adding to costs, and can contribute to increased system stress, including service interruptions. Weather conditions outside of the AEP service territory could also have an impact on revenues. AEP buys and sells electricity depending upon system needs and market opportunities. Extreme weather conditions creating high energy demand on AEP's own and/or other systems may raise electricity prices as AEP buys short-term energy to serve AEP's own system, which would increase the cost of energy AEP provides to customers. Severe weather and weather-related events impact AEP's service territories, primarily when thunderstorms, tornadoes, hurricanes, fires, floods and snow or ice storms occur. To the extent the frequency and intensity of extreme weather events and storms increase, AEP's cost of providing service will increase, including the costs and the availability of procuring insurance related to such impacts, and these costs may not be recoverable. Changes in precipitation resulting in droughts, water shortages or floods could adversely affect operations, principally the fossil fuel generating units. A negative impact to water supplies due to long-term drought conditions or severe flooding could adversely impact AEP's ability to provide electricity to customers, as well as increase the price they pay for energy. AEP may not recover all costs related to mitigating these physical and financial risks. To the extent climate change impacts a region's economic health, it may also impact revenues. AEP's financial performance is tied to the health of the regional economies AEP serves. The price of energy, as a factor in a region's cost of living as well as an important input into the cost of goods and services, has an impact on the economic health of the communities within the AEP System.

Figure 2: Comparison of AEP's 2020 and 2021 10-Ks

often defined as "unprecedented"[98] when, in fact, it was precedented.[99] This characterization obscures the knowable and material risks that this event demonstrates—that owned assets and operations may be increasingly exposed to climate-amplified extreme weather. Only one company detailed its winter season preparation process.[100]

Companies' long-term, forward-looking analysis was generally limited. No company observed in its section on the February 2021 Crisis that events like this could become more frequent and severe due to climate change, nor did any company outline potential plans in its 10-K to successfully manage future extreme weather events of this magnitude.[101] The only forward-looking disclosures drawing on the February 2021 Crisis revolved around possible regulatory changes resulting from the Texas blackout. This

No company observed in its section on the February 2021 Crisis that events like this could become more frequent and severe due to climate change, nor did any company outline potential plans in its 10-K to successfully manage future extreme weather events of this magnitude.

[98] CenterPoint 2021 10-K, at 30.

[99] *See, e.g.*, James Doss-Gollin et al., *How unprecedented was the February 2021 Texas cold snap?*, ENV'T RSCH. LETTERS (forthcoming 2021) (accepted manuscript), https://iopscience.iop.org/article/10.1088/1748-9326/ac0278 (discussing five previous severe winter storms in Texas).

[100] Vistra 2021 10-K, at 52.

[101] Some companies did, however, discuss updated risk management plans in their first quarter 2021 10-Qs, which are filed later than 10-Ks.

commentary remained narrow, offering investors little to no information on corporate climate risk management.

Firms' discussions of the February 2021 Crisis reveal the prevalence of short-term thinking undergirding corporate disclosure of climate-related risks. Companies did not consider the storm in the context of past winter freezes or acknowledge that extreme weather events like the storm could become more frequent as a result of climate change. Rather, they focused almost entirely on the singular financial impacts of the event as a discrete occurrence. This static framing—a rare oddity, improbable to be repeated—fails to present investors with a complete picture of climate-related risk or corporate risk management.

Changes in Climate Disclosure Between 2020 and 2021

If 2021 were seen as a watershed moment—a wakeup call about the kinds of events that could become more likely with climate change—then we might expect big differences between the 10-Ks filed after the crisis and those prior. Empirically, the 10-Ks show no such epiphany—with the caveat, of course, that the 2021 filings occurred just weeks after the crisis. Despite its substantial financial impacts, the February 2021 Crisis did not trigger significant changes to firms' physical risk disclosure. In fact, aside from time-sensitive regulatory updates and stand-alone sub-sections on the event, the climate sections of companies' 2020 and 2021 10-Ks are almost identical. These findings demonstrate the insufficiency of current disclosure requirements and practices in promoting dynamic risk reporting responsive to evolving climate science and experience.

Directly comparing companies' 2020 and 2021 10-Ks revealed that firms copied their climate disclosures almost verbatim from year to year. AEP provides a case study. Between 2020 and 2021, the company changed only 13 of 409 words in its discussion of physical risks, adding a short phrase about insurance procurement. Although the February 2021 Crisis left AEP's Texas subsidiary with over $40 million of restoration expenditures, it did not prompt the company to offer more specific or detailed climate risk information.[102]

This near-identical consistency between AEP's 2020 and 2021 reports prevents investors from tracking corporate progress on climate risk management. For additional comparisons of physical risk disclosure in companies' 2020 and 2021 10-Ks, see the Appendix.[103]

Exelon offers another example of static climate risk reporting between 2020 and 2021. The company's disclosure of physical climate risks in both years is the same except for two sentences added to the 2021 10-K that explain the relevance of climate change to extreme weather.[104] While this mention of climate change is important, it does not provide enough depth to inform investor decision-making on Exelon. Comparing other companies' 2020 and 2021 10-Ks yields analogous results; companies rely on a fixed climate disclosure template and deviate from that template only slightly over time.

The similarities between companies' 2020 and 2021 reports suggest that existing climate risk disclosure standards and regulatory requirements are not creating sufficient incentive for firms to reveal more information about how they are assessing potentially material climate impacts—even though, as an industry whose financial prosperity hinges on the performance of weather-exposed assets, most if not all of these firms are assessing their exposures. Our review shows that companies behaved with relative uniformity in providing essentially no decision-useful climate information to investors in their 10-Ks. Companies seem to check the boxes on disclosure, cutting and pasting text from one year to another, without updating their reporting with new insights beneficial to investors. In turn, investors are unable to evaluate corporate progress on climate risk management and react to relevant risks corporate entities face.

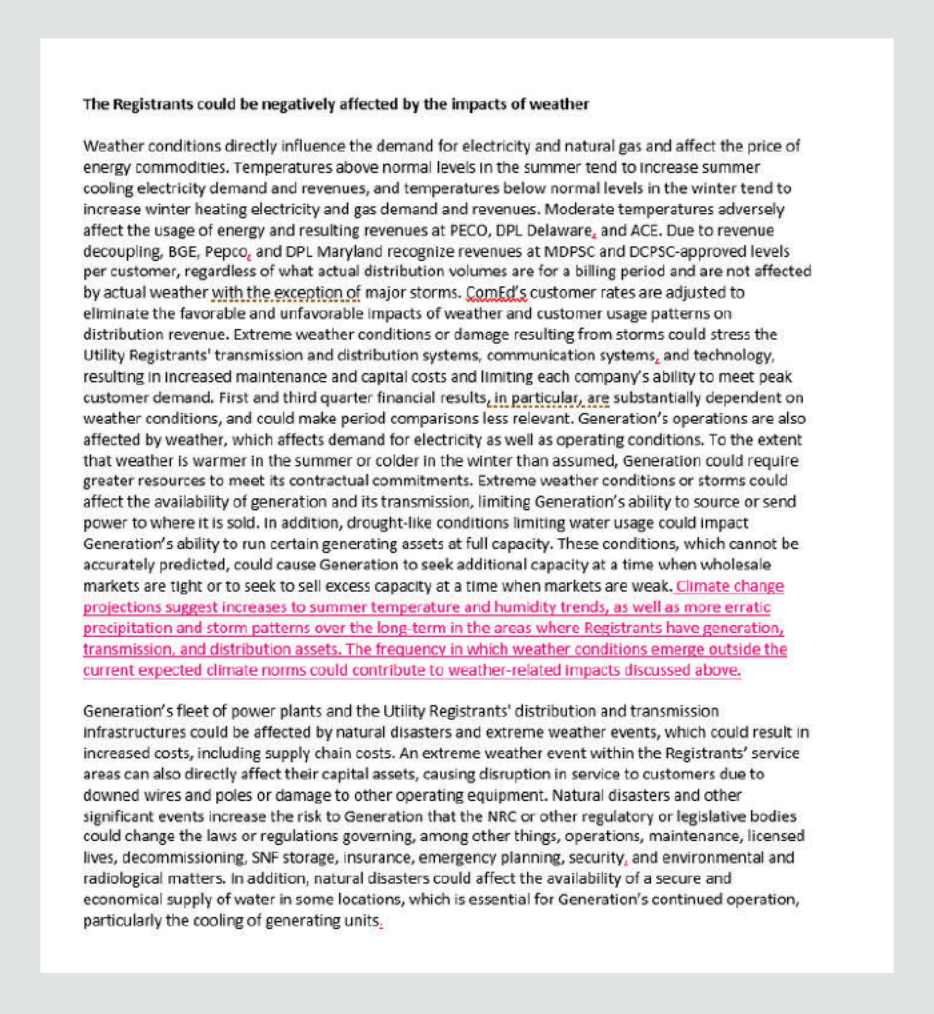
Climate Risk Disclosure Over Time

Though companies largely treated the February 2021 Crisis as an isolated occurrence, Texas, as previously mentioned, had experienced a comparable freeze in 2011. This sub-section analyzes companies' 2010 and 2011 10-K

[102] AEP 2021 10-K, at 67.

[103] *See* Appendix C: Comparison of Companies' 2020 and 2021 10-Ks, A-4.

[104] Exelon 2021 10-K, at 35.



The Registrants could be negatively affected by the impacts of weather

Weather conditions directly influence the demand for electricity and natural gas and affect the price of energy commodities. Temperatures above normal levels in the summer tend to increase summer cooling electricity demand and revenues, and temperatures below normal levels in the winter tend to increase winter heating electricity and gas demand and revenues. Moderate temperatures adversely affect the usage of energy and resulting revenues at PECO, DPL Delaware, and ACE. Due to revenue decoupling, BGE, Pepco, and DPL Maryland recognize revenues at MDPSC and DCPSC-approved levels per customer, regardless of what actual distribution volumes are for a billing period and are not affected by actual weather with the exception of major storms. ComEd's customer rates are adjusted to eliminate the favorable and unfavorable impacts of weather and customer usage patterns on distribution revenue. Extreme weather conditions or damage resulting from storms could stress the Utility Registrants' transmission and distribution systems, communication systems, and technology, resulting in increased maintenance and capital costs and limiting each company's ability to meet peak customer demand. First and third quarter financial results, in particular, are substantially dependent on weather conditions, and could make period comparisons less relevant. Generation's operations are also affected by weather, which affects demand for electricity as well as operating conditions. To the extent that weather is warmer in the summer or colder in the winter than assumed, Generation could require greater resources to meet its contractual commitments. Extreme weather conditions or storms could affect the availability of generation and its transmission, limiting Generation's ability to source or send power to where it is sold. In addition, drought-like conditions limiting water usage could impact Generation's ability to run certain generating assets at full capacity. These conditions, which cannot be accurately predicted, could cause Generation to seek additional capacity at a time when wholesale markets are tight or to seek to sell excess capacity at a time when markets are weak. Climate change projections suggest increases to summer temperature and humidity trends, as well as more erratic precipitation and storm patterns over the long-term in the areas where Registrants have generation, transmission, and distribution assets. The frequency in which weather conditions emerge outside the current expected climate norms could contribute to weather-related impacts discussed above.

Generation's fleet of power plants and the Utility Registrants' distribution and transmission infrastructures could be affected by natural disasters and extreme weather events, which could result in increased costs, including supply chain costs. An extreme weather event within the Registrants' service areas can also directly affect their capital assets, causing disruption in service to customers due to downed wires and poles or damage to other operating equipment. Natural disasters and other significant events increase the risk to Generation that the NRC or other regulatory or legislative bodies could change the laws or regulations governing, among other things, operations, maintenance, licensed lives, decommissioning, SNF storage, insurance, emergency planning, security, and environmental and radiological matters. In addition, natural disasters could affect the availability of a secure and economical supply of water in some locations, which is essential for Generation's continued operation, particularly the cooling of generating units.

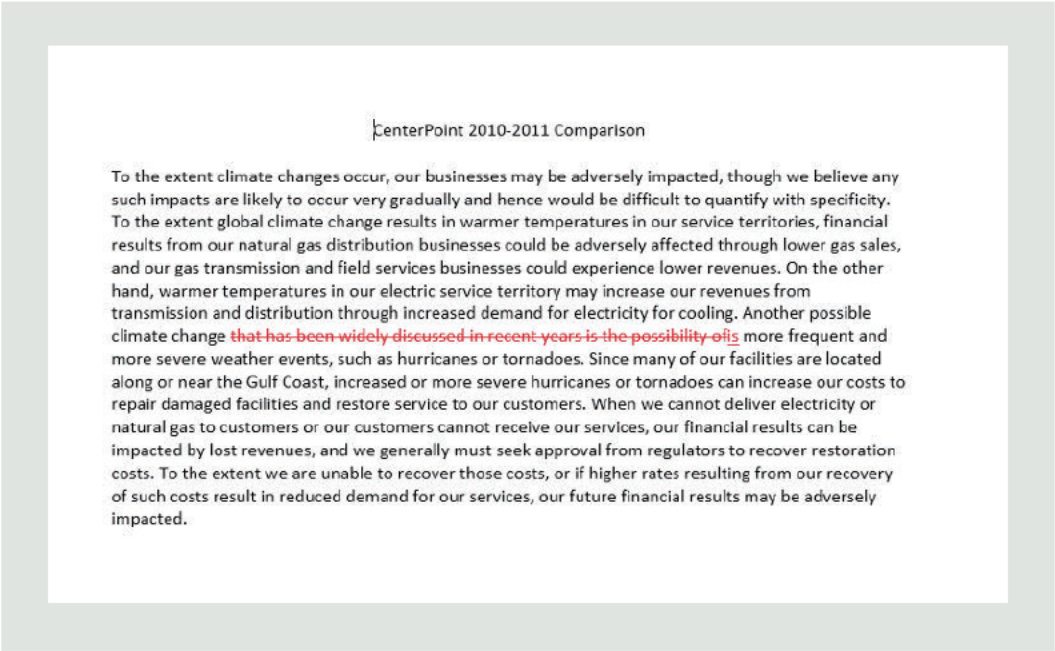
Figure 3: Comparison of Exelon's 2020 and 2021 10-Ks

submissions to ascertain how companies altered climate disclosures following the 2011 winter storm, focusing specifically on disclosures of climate-related physical risks.[105] Using 2011 as a case study provides additional data to determine whether existing rules compel companies to disclose extreme weather event information. Ultimately, this section determines that, even more so than in 2021, corporate disclosures in 2011 were unresponsive to severe winter weather. These findings underscore the inadequacy of risk disclosure requirements.

As described above, companies acknowledged the February 2021 Crisis in their 2021 10-Ks. However, the 2011 Texas freeze was not mentioned in 2011 reports, even though companies had more time to update their 10-Ks after the 2011 freeze than they did in 2021.[106] Companies discussed inclement weather in broad, high-level terms, with no mention of Texas-specific winter weather events. Overall, companies did not incorporate any direct learning from the 2011 Texas winter event into their 2011 10-Ks. From the

[105] Not all companies included in this study are featured in this section because not all were public or had Texas operations in 2011.

[106] The 2011 Texas freeze took place from February 1, 2011 to February 5, 2011, with companies filing their 10-Ks at the end of February or beginning of March. By contrast, the February 2021 Crisis took place in mid-February, with companies filing their 10-Ks one-to-two weeks later.



CenterPoint 2010-2011 Comparison

To the extent climate changes occur, our businesses may be adversely impacted, though we believe any such impacts are likely to occur very gradually and hence would be difficult to quantify with specificity. To the extent global climate change results in warmer temperatures in our service territories, financial results from our natural gas distribution businesses could be adversely affected through lower gas sales, and our gas transmission and field services businesses could experience lower revenues. On the other hand, warmer temperatures in our electric service territory may increase our revenues from transmission and distribution through increased demand for electricity for cooling. Another possible climate change ~~that has been widely discussed in recent years is the possibility of~~is more frequent and more severe weather events, such as hurricanes or tornadoes. Since many of our facilities are located along or near the Gulf Coast, increased or more severe hurricanes or tornadoes can increase our costs to repair damaged facilities and restore service to our customers. When we cannot deliver electricity or natural gas to customers or our customers cannot receive our services, our financial results can be impacted by lost revenues, and we generally must seek approval from regulators to recover restoration costs. To the extent we are unable to recover those costs, or if higher rates resulting from our recovery of such costs result in reduced demand for our services, our future financial results may be adversely impacted.

Figure 4: Comparison of CenterPoint's 2010 and 2011 10-Ks

perspective of 10-K reporting, there was no incentive to remember the event or imagine how similar future events could unfold.

Moreover, companies did not significantly adjust their discussions of physical climate risk between 2010 and 2011 to account for updated interpretations of climate change following the 2011 extreme weather incident. Similarities in reporting over these two years are even more striking than similarities between 2020 and 2021 disclosures. CenterPoint, for example, did not alter any substantive points about extreme weather or climate-related risks across its 10-Ks for 2010 and 2011. Between 2010 and 2011, the company deleted twelve words from its 226-word paragraph on physical climate-related risks.[107] Most companies employed this approach, repeating information on climate-induced risks from 2010 to 2011.

In the aftermath of two similar extreme weather events in 2011 and in 2021, power generators and investor-owned utilities in Texas made no substantive changes to their climate risk disclosure practices. Put simply, the companies treated extreme weather events as one-off incidents with few implications for subsequent physical risk disclosure.

The disclosures we reviewed suggest strongly that the companies have not interpreted their disclosure obligations in a manner that keeps pace with increasing physical and transition climate risks. System-wide lags between corporate disclosures and climate realities expose investors and other market participants to heightened risks, inhibiting them from pricing assets accurately and allocating their resources efficiently.

In the aftermath of two similar extreme weather events in 2011 and in 2021, power generators and investor-owned utilities in Texas made no substantive changes to their climate risk disclosure practices.

[107] CenterPoint 2011 10-K, at 35.

c. Analysis

Based on the above findings, we identify four deficiencies, each explored in greater detail below: (1) existing SEC rules do not result in the disclosure of comparable, specific, and decision-useful climate risk information, (2) alignment with the TCFD, a voluntary disclosure framework, does not drive sufficient climate risk information in company 10-Ks, (3) companies fail to remember and integrate insights from past weather events into 10-Ks, and (4) companies fail to imagine and consider the forward-looking implications of climate change in 10-Ks. These themes apply to every company included in this study, revealing potential shortcomings of the current SEC disclosure rules.

Current Disclosures Fail to Provide Comparable, Specific, and Decision-Useful Information

Current corporate climate risk disclosures fail to provide comparable, specific and decision-useful information for investors. Boiler-plate language constituted the bulk of climate risk sections in companies' 2021 10-Ks. Discussions of physical risks, in particular, lacked specificity and utility. Companies commented on extreme weather events in generic terms that could have applied to any firm across many sectors or, at the very least, any firm that owned or operated power generation, transmission or distribution assets. Additionally, companies did not estimate the financial costs of climate-induced extreme weather events. These gaps leave investors in the dark, struggling to compare companies that, on paper, have seemingly identical risk profiles and risk management practices. To prepare for incidents like the February winter storm and push companies to de-risk accordingly, investors need more detailed, firm-specific climate risk information. The current reporting regime hinders investors' ability to make informed investment decisions.

Limitations of Voluntary Disclosure Frameworks

Although companies included in the study supported the TCFD to varying degrees, all companies analyzed displayed similar climate reporting limitations. Both TCFD-aligned and non-TCFD-aligned companies relied on boiler-plate language to describe transition and physical risks in 10-Ks. Similarly, all companies, regardless of TCFD-alignment, issued nearly identical climate risk information before and after the February 2021 Crisis. These reporting deficiencies suggest that although the TCFD provides a valuable framework to draw upon for development of mandatory climate-related financial disclosure standards, it is not sufficient as a voluntary regime to ensuring the release of specific, decision-useful climate risk information in 10-Ks. This conclusion aligns with existing studies of climate-related risk disclosure, which find that "[d]isclosure can be lacking even where corporations have committed to and are ostensibly seeking to align reporting with the TCFD framework."[108]

Both TCFD-aligned and non-TCFD-aligned companies relied on boiler-plate language to describe transition and physical risks in 10-Ks.

Failures of Memory

The point-in-time framing companies used to describe the February 2021 Crisis highlights what we term a "failure of memory:" the failure to address patterns that emerge from a series of similar events. Here, analysis reveals that company 10-Ks treat the February 2021 Crisis as an isolated event, without connecting the event to previous weather-induced power crises.

By failing to consider the connections between extreme weather events, disclosure filings may fail to convey lessons relevant to investors' climate risk reduction needs. Events like the February 2021 Crisis are relevant beyond static, descriptive text and have probative value to inform forward-looking risk profiles to company assets and operations. Likewise, companies could have drawn on analyses like the FERC/NERC 2011 Report for insights on winterizing

[108] Condon et al., *supra* note 83, at 22.

operations and improved capacity to predict how extreme weather, informed by the past, could affect future financial performance. Information on assets affected by previous winter storms could also have helped firms model extreme winter weather and prepare for the February 2021 freeze. With the right data, climate risks are increasingly knowable. Disclosure requirements should ensure that companies collect and report knowable metrics, leveraging lessons of the past to guide present climate analysis.

Failures of Imagination

Companies' point-in-time framing of the Texas event also underscores what we term a "failure of imagination" among companies included in this study—that is, the failure to use information about how the system has performed under stress, along with predictive models, to evaluate the potential future impacts of climate change. No company mentioned climate change when discussing the February 2021 Crisis. Moreover, most companies did not make substantive edits to the physical risk sections of their 10-Ks between 2020 and 2021, despite a massive disruption in 2021 that highlighted the kinds of futures that need imagining. These findings suggest that existing disclosure rules do not effectively prompt companies to report the implications of extreme weather events for their future operations. Companies experienced inclement weather and its cascading consequences but, like in 2011, did not adjust their disclosures accordingly, maintaining the same reporting practices despite new climate lessons. In short, companies are not showing investors how they will prepare for extreme events that will become increasingly frequent and severe. Updated disclosure rules should compel companies to look forward and imagine climate risks—and to explore the unknowns, as well as the knowns—providing investors with the projections they need to account for climate-related financial risks.

Part IV

Implications for the Securities and Exchange Commission and Industry Disclosure Practices

The above analysis identifies 10-K disclosure trends across all companies included in this study, highlighting four key gaps: (1) SEC rules did not yield disclosure of specific and decision-useful climate risk information, (2) voluntary climate risk disclosure frameworks had little impact on the quantity and quality of climate reporting, (3) companies did not reveal through their disclosures whether they integrated insights from past extreme weather events into their business strategies, and (4) companies did not indicate whether or how they imagined forward-looking implications of the February 2021 Crisis. That every company displayed these disclosure limitations suggests regulatory failures (and failures of standard industry practice).

Current disclosure rules and practices do not seem to elicit climate-related information that investors or other market participants will need as they exercise their business judgments to value, buy, or sell a company's securities; vote in key corporate decisions; lend to the company; negotiate for employment with a company; offer tax breaks or other incentives for a company; buy from the company; sell products or services to a company, or take other actions. All of these decisions may directly impact the company's longer-term financial prospects. This system-wide issue necessitates regulatory intervention on climate-related financial disclosures and thus demands SEC attention, as it implicates the SEC's "long-standing tripartite mission—to protect investors, maintain fair, orderly, and efficient markets, and facilitate capital formation."[109]

Based on our findings, we recommend that the SEC: (1) require the disclosure of climate-related information from exposed firms that investors and other market participants need to make informed business decisions that are the bedrock of "fair, orderly, and efficient" markets; (2) update its rules to require disclosures that make the TCFD framework mandatory and build on it to require more detailed, specific information; and (3) continue to update and refine disclosure requirements over time to align corporate reporting with advances in climate science. While our third recommendation will take time to develop and implement, the first two recommendations demand immediate action and should not be delayed by considerations specific to the third recommendation.

Requiring the Disclosure of Climate-Related Information to Support Investors and Fair, Orderly, and Efficient Markets

The SEC should urgently move to require the disclosure of climate-related information that investors and other market participants need to make informed business decisions. Current disclosure rules, as demonstrated by the 10-Ks scrutinized in this study, do not elicit adequate information. Companies did not quantify the projected impact of emerging climate regulations on their operations. And even when companies acknowledged that certain climate policies would lead to the early retirement of assets, they did not tell investors which assets would be affected or estimate the financial loss that such retirements would entail. These types of details on transition risk influence investor decision-making and should be disclosed to enhance market efficiency.

The disclosure of physical risk information demands even more attention. The plausibility of the February 2021 Crisis was knowable given past winter weather events in Texas and available climate science. In fact, some utilities in other regions have assessed their current and future climate risks, with new technologies emerging to help companies conduct sophisticated analyses. Still, companies included in this study used vague, boiler-plate language in 10-Ks to describe their exposure to extreme weather both before and after the storm. These practices prevent investors from accurately accounting for firm-specific climate vulnerabilities. Distinct, quantifiable physical risk information supports informed business decision-making and should be disclosed.

[109] Sec. & Exch. Comm'n, Our Goals, https://www.sec.gov/our-goals.

Building on the TCFD Framework

The SEC should issue rulemaking that makes mandatory and builds on the TCFD framework, but does not treat TCFD alignment as sufficient to ensure specific, decision-useful climate reporting. Since its creation in 2017, the TCFD has become the leading voluntary climate risk disclosure framework. Investors with over $54 trillion in assets, including the world's largest asset manager BlackRock, have called on companies to align their disclosures with the TCFD framework, setting a new industry standard for corporate climate reporting.[110] We recognize the value in leveraging a framework well understood by investors and companies and encourage the SEC to use the TCFD as a foundation on which to build out its mandatory disclosure rules. Making this voluntary framework mandatory as a part of regulatory action will provide immediate benefit through ensuring that more relevant disclosures are made through 10-Ks.

Our analysis indicates, however, that the TCFD framework by itself does not prompt sufficient climate risk reporting, at least in its voluntary formulation. TCFD-aligned companies featured in our analysis exhibited the same disclosure limitations as their non-TCFD-aligned counterparts in 10-Ks, discussing transition and physical risks in non-specific terms that failed to meet investor needs. Given these reporting gaps consistent across TCFD-aligned firms, we suggest that SEC rulemaking builds on and goes beyond the TCFD with additional disclosure requirements.

Aligning Disclosure Requirements with Advances in Climate Science and Improved Methods for Assessing Climate Impacts on Corporate Assets and Practices

Finally, the SEC should enhance its internal capacity to update disclosure requirements over time to align corporate climate reporting with advances in asset-level climate risk measurement. The needs of investors and other market participants for climate-related information are evolving rapidly as the impacts of climate change are growing. At the same time, climate science is improving, making new information about climate change increasingly available to companies, investors, and market participants. The SEC can continue to protect investors and promote healthy financial markets by ensuring that this evolving information is integrated into corporate disclosures. Without regulatory support, as previously demonstrated, companies lack the voluntary incentives to imagine the long-term implications of climate change. Too often, firms re-use the same disclosure templates year-to-year, failing to assimilate new climate science into existing reporting practices.

There are many ways to advance this agenda. One would be for the SEC, along with other financial regulators, to form an inter-agency working group convened in collaboration with relevant agencies like the National Oceanic and Atmospheric Administration and other organizations in the federal government that are responsible for climate impact analysis.[111] The working group, which could also assist other government institutions grappling with the need for asset-specific damages—such as the Federal Emergency Management Agency and the National Climate Assessment—would be charged with identifying robust techniques to estimate climate-related damages.[112] The working group would benefit from collaboration with relevant stakeholders—including catastrophe risk modeling groups—to stay abreast of the frontier and to ensure that innovative developments inform federal action. To further inform that process, the SEC might also invite volunteer companies to participate in a kind of "sandbox" exercise where diverse experiences are tested and evaluated and best practices can be identified. These measures can push corporate climate reporting to keep pace with climate science and investor needs.

We recognize that these collaborative processes would take time and consideration to orchestrate. The demands of this endeavor should not, however, delay the SEC in executing the two prior recommendations. With the effects of climate change only becoming more frequent and severe, investors need improved, decision-useful information now to manage risks effectively.

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[110] Climate Action 100+, "Initiative Snapshot," https://www.climateaction100.org/

[111] *See* Condon et al., *supra* note 83, at 37-38.

[112] SADIE FRANK, ERIC GESICK & DAVID G. VICTOR, BROOKINGS INST., INVITING DANGER: HOW FEDERAL DISASTER, INSURANCE AND INFRASTRUCTURE POLICIES ARE MAGNIFYING THE HARM OF CLIMATE CHANGE, (2021), https://www.brookings.edu/research/inviting-danger-how-federal-disaster-insurance-and-infrastructure-policies-are-magnifying-the-harm-of-climate-change/.

Part V

Conclusion

Through shifting global weather patterns, increasingly severe and frequent extreme weather events, and cascading impacts of these shifts, climate change poses significant risks to the American financial system.[113] This reality makes disclosure of climate-related risks key to efficient capital allocation, informed business decisions, and fair, orderly, and efficient markets. With enhanced climate-related information, investors, corporate lenders, workers, customers, and other market participants can better assess climate risk, allocating their resources to less risky firms and, in turn, incentivizing enhanced corporate climate planning. Insights from past weather events and advances in climate science make the effects of climate change increasingly knowable. Investors and other market participants can at least partially reduce their climate-related financial risks provided that they have comparable, specific, and decision-useful climate information from companies.

This report examines the February 2021 Crisis as a case study to spotlight how public companies are responding to current disclosure rules and practices. We find that although extreme weather events endanger human life, devastate families and communities, and upend business operations and critical services, as manifested in the February 2021 Crisis, prior to the crisis companies did not provide investors with the information needed to evaluate firms' exposure to the event and its associated risks. Companies used (and still use) vague, boiler-plate language to characterize both transition and physical risks. Moreover, firms did not connect the February 2021 Crisis to past extreme weather events or the forward-looking implications of climate change, leaving investors, lenders, workers, customers, and other market participants with information insufficient to making financial decisions. Because these disclosure gaps applied to all companies analyzed, we conclude that strengthened regulatory oversight is best suited to remedy the current gaps in climate risk disclosure. We thus encourage the SEC to require the disclosure of climate-related information that is needed by investors and other market participants to make informed business decisions, issue rulemaking that builds on the TCFD framework, and prepare to update disclosure requirements over time to align with advances in climate science.

As extreme weather events become more common and scientific research becomes more sophisticated, our understanding of climate change will improve as will the capacity to connect that scientific assessment to the performance of specific assets and firms. To inform investors and maintain fair, orderly, and efficient markets, corporate disclosures should do the same, moving in tandem with leading risk analysis to provide investors with up-to-date climate data that promotes informed capital allocation. Investors and other market participants can take measures to prepare for events like the February 2021 Crisis and can push companies to do the same—they just need information. Updated SEC rulemaking on mandatory disclosure of climate-related risks can catalyze this process, making the financial system more resilient to the effects of climate change.

[113] COMMODITY FUTURES TRADING COMM'N CLIMATE-RELATED MARKET RISK SUBCOMM. OF THE MARKET RISK ADVISORY COMMITTEE, MANAGING CLIMATE RISK IN THE U.S. FINANCIAL SYSTEM 11 (2020), https://www.cftc.gov/sites/default/files/2020-09/9-9-20%20Report%20of%20the%20Subcommittee%20on%20Climate-Related%20Market%20Risk%20-%20Managing%20Climate%20Risk%20in%20the%20U.S.%20Financial%20System%20for%20posting.pdf.

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Appendix:

What Investors and the SEC Can Learn from the Texas Power Crises

Stephanie H. Jones, Gabriel Malek,
Michael Panfil, and David G. Victor

June 2021

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Appendix A: Companies' Financial Exposure to Texas

Company	Texas Financial Exposure
AEP	10% of 2020 earnings
CenterPoint	Not available
Exelon	6% of 2020 revenue
NRG	72% of 2020 revenue
PNM	25% of 2020 revenue
Sempra	15% of 2020 earnings
Vistra	81% of 2020 earnings

Appendix B: Companies' TCFD Reporting

Company	Alignment with TCFD Framework
AEP	Releases a stand-alone TCFD mapping report
CenterPoint	Does not release a TCFD report; does include TCFD-aligned section in its sustainability report; does not mention TCFD in its 2021 10-K
Exelon	Includes TCFD-aligned section in its corporate sustainability report
NRG	Releases a stand-alone TCFD mapping report
PNM	Releases a stand-alone TCFD mapping report
Sempra	Includes TCFD-aligned section in its corporate sustainability report
Vistra	Releases a stand-alone climate report aligned with the TCFD

Appendix C: Comparison of Companies' 2020 and 2021 10-Ks[1]

AEP

AEP is subject to physical and financial risks associated with climate change (Page 42 of 2021 10-K)

Climate change creates physical and financial risk. Physical risks from climate change may include an increase in sea level and changes in weather conditions, such as changes in precipitation and extreme weather events, such as fires. Customers' energy needs vary with weather conditions, primarily temperature and humidity. For residential customers, heating and cooling represent their largest energy use. To the extent weather conditions are affected by climate change, customers' energy use could increase or decrease depending on the duration and magnitude of the changes. Increased energy use due to weather changes may require AEP to invest in additional generating assets, transmission and other infrastructure to serve increased load. Decreased energy use due to weather changes may affect financial condition through decreased revenues. Extreme weather conditions in general require more system backup, adding to costs, and can contribute to increased system stress, including service interruptions. Weather conditions outside of the AEP service territory could also have an impact on revenues. AEP buys and sells electricity depending upon system needs and market opportunities. Extreme weather conditions creating high energy demand on AEP's own and/or other systems may raise electricity prices as AEP buys short-term energy to serve AEP's own system, which would increase the cost of energy AEP provides to customers. Severe weather and weather-related events impact AEP's service territories, primarily when thunderstorms, tornadoes, hurricanes, fires, floods and snow or ice storms occur. To the extent the frequency and intensity of extreme weather events and storms increase, AEP's cost of providing service will increase, including the costs and the availability of procuring insurance related to such impacts, and these costs may not be recoverable. Changes in precipitation resulting in droughts, water shortages or floods could adversely affect operations, principally the fossil fuel generating units. A negative impact to water supplies due to long-term drought conditions or severe flooding could adversely impact AEP's ability to provide electricity to customers, as well as increase the price they pay for energy. AEP may not recover all costs related to mitigating these physical and financial risks. To the extent climate change impacts a region's economic health, it may also impact revenues. AEP's financial performance is tied to the health of the regional economies AEP serves. The price of energy, as a factor in a region's cost of living as well as an important input into the cost of goods and services, has an impact on the economic health of the communities within the AEP System.

Seasonality (Page 24 of 2021 10-K)

The consumption of electric power is generally seasonal. In many parts of the country, demand for power peaks during the hot summer months, with market prices also peaking at that time. In other areas, power demand peaks during the winter. The pattern of this fluctuation may change due to the nature and location of AEP's facilities and the terms of power sale contracts into which AEP enters. In addition, AEP has historically sold less power, and consequently earned less income, when weather conditions are milder. Unusually mild weather in the future could diminish AEP's results of operations. Conversely, unusually extreme weather conditions could increase AEP's results of operations.

Seasonality (Page 26 of 2021 10-K)

[1] This comparison focuses on physical risk information in companies' 2010 and 2011 10-Ks. This information was compiled and aggregated across multiple sections of each companies' 10-Ks. Companies' discussions of the February 2021 Crisis were excluded from this comparison because they generally appeared in 2021 10-Ks as separate sub-sections.

The delivery of electric power is generally seasonal. In many parts of the country, demand for power peaks during the hot summer months. In other areas, power demand peaks during the winter months. The pattern of this fluctuation may change due to the nature and location of AEP's transmission and distribution facilities. In addition, AEP transmission and distribution has historically delivered less power, and consequently earned less income, when weather conditions are milder. In Texas, and to a lesser extent, in Ohio, where there is residential decoupling, unusually mild weather in the future could diminish AEP's results of operations. Conversely, unusually extreme weather conditions could increase AEP's results of operations.

CenterPoint

Global Climate Change (Page 15 of 2021 10-K)

To the extent climate changes may occur and such climate changes result in warmer temperatures in the Registrants' or Enable's service territories, financial results from the Registrants' and Enable's businesses could be adversely impacted. For example, CenterPoint Energy's and CERC's ~~NGD~~Natural Gas could be adversely affected through lower natural gas sales and Enable's natural gas gathering, processing and transportation and crude oil gathering businesses could experience lower revenues. On the other hand, warmer temperatures in CenterPoint Energy's and Houston Electric's electric service territory may increase revenues from transmission and distribution and generation through increased demand for electricity for cooling. Another possible result of climate change is more frequent and more severe weather events, such as hurricanes ~~or~~, tornadoes and flooding. Since many of the Registrants' facilities are located along or near the Gulf Coast, increased or more severe hurricanes or tornadoes could increase costs to repair damaged facilities and restore service to customers. When the Registrants cannot deliver electricity or natural gas to customers, or customers cannot receive services, the Registrants' financial results can be impacted by lost revenues, and they generally must seek approval from regulators to recover restoration costs. To the extent the Registrants are unable to recover those costs, or if higher rates resulting from recovery of such costs result in reduced demand for services, the Registrants' future financial results may be adversely impacted.

Disruptions at power generation facilities owned by third parties or directives issued by regulatory authorities could interrupt Houston Electric's sales of transmission and distribution services and adversely affect its reputation, results of operations, financial condition and cash flows (Page 24 of 2021 10-K)

Houston Electric transmits and distributes to customers of REPs electric power that the REPs obtain from power generation facilities owned by third parties. Houston Electric does not own or operate any power generation facilities. ~~If power generation is disrupted or if power generation capacity is inadequate~~ In February 2021, the Texas electric system experienced an unprecedented power shortage due to extreme winter weather conditions. The state's power generation fell short of demand, resulting in significant electricity outages across Texas, including in Houston Electric's service territory. See Note 22 to the consolidated financial statements for further information on the February 2021 Winter Storm Event. If power generation is disrupted or if power generation capacity is inadequate or if ERCOT issues directives to TDUs (such as Houston Electric) to implement controlled outages, both of which recently occurred during the February 2021 Winter Weather Event, Houston Electric's sales of transmission and distribution services may be diminished or interrupted, and its reputation, results of operations, financial condition and cash flows could be adversely affected.

Our revenues and results of operations are seasonal (Page 32 of 2021 10-K)

A significant portion of Houston Electric's revenues is derived from rates that it collects from each REP based on the amount of electricity it delivers on behalf of such REP. Similarly, Indiana Electric's revenues are derived from rates it charges its customers to provide electricity. Natural Gas' revenues are primarily derived from natural gas sales. Consequently, Houston Electric's ~~and~~, Indiana Electric's and Natural Gas' revenues and results of operations are subject to seasonality, weather conditions and other changes in electricity and natural gas usage, as applicable. Houston Electric's revenues are generally higher during the warmer months. As in certain past years, unusually mild weather in the warmer months could diminish Houston Electric's results of operations and harm its financial condition. Conversely, as in certain past years, extreme warm weather conditions could increase Houston Electric's results of operations in a manner that would not likely be annually recurring. A significant portion of Indiana Electric's sales are for space heating and cooling. Consequently, as in certain past years, Indiana Electric's results of operations may be adversely affected by warmer-than-normal heating season weather or colder-than-normal cooling season weather, while more extreme seasonal weather conditions could increase Indiana Electric's results of operations in a manner that would not likely be annually recurring.

~~NGD's and CES's revenues are primarily derived from natural gas sales. Thus, their revenues and results of operations are subject to seasonality, weather conditions and other changes in natural gas usage, with revenues being~~ Natural Gas' revenues are customarily higher during the winter months. As in certain past years, unusually mild weather in the winter months could diminish ~~our~~Natural Gas' results of operations and harm ~~our~~its financial condition. Conversely, as occurred in certain past years, extreme cold weather conditions could increase ~~our~~its results of operations in a manner that would not likely be annually recurring. For information related to our weather hedges, see Note 9(a) to the consolidated financial statements.

Climate changes could adversely impact financial results from our businesses and result in more frequent and more severe weather events that could adversely affect our results of operations (Page 32 of 2021 10-K)

A changing climate creates uncertainty and could result in broad changes, both physical and financial in nature, to our service territories. If climate changes occur that result in warmer temperatures in our service territories, financial results from our ~~and Enable's~~ businesses could be adversely impacted. For example, ~~NGD~~Natural Gas could be adversely affected through lower natural gas ~~sales and Enable's natural gas gathering, processing and transportation and crude oil gathering businesses could experience lower revenues~~usage. Another possible result of climate change is more frequent and more severe weather events, such as hurricanes, tornadoes or severe winter weather conditions, including ice storms. Since ~~many~~certain of our facilities are located along or near the Gulf Coast, increased or more severe hurricanes or tornadoes could increase our costs to repair damaged facilities and restore service to our customers. For example, in 2020, eight named storms occurred along the Gulf Coast. Of these eight storms, we experienced four named hurricanes in our service territories, which impacted our Natural Gas facilities. Our electric and Natural Gas operations in our services territories were impacted due to the February 2021 Winter Storm Event. For further information on the February 2021 Winter Storm Event, see Note 22 to the consolidated financial statements and "—The February 2021 Winter Storm Event has caused severe disruptions to our customers and our markets in certain of our jurisdictions and could have a material adverse impact to our financial condition, results of operations, cash flows and liquidity" above. When we cannot deliver electricity or natural gas to customers or our customers cannot receive our services, our financial results can be impacted by lost revenues, and we generally must seek approval from regulators to recover restoration costs. To the extent we are unable to recover those costs, or if higher rates resulting from our recovery of such costs result in reduced demand for our services, our future financial results may be adversely impacted. Any such decreased energy use may also require us to retire current infrastructure that is no longer needed. Further, we may be subject to climate change lawsuits, which could result in substantial penalties or damages.

Factors Influencing Our Businesses and Industry Trends (Page 46 of 2021 10-K)

Performance of the ~~Houston~~ Electric ~~T&D~~ reportable segment and the Natural Gas ~~Distribution~~ reportable segment is significantly influenced by energy usage per customer, which is significantly impacted by weather conditions. For Houston Electric, revenues are generally higher during the warmer months when more electricity is used for cooling purposes. ~~For CERC's NGD~~For Indiana Electric, a significant portion of its sales are for space heating and cooling. Consequently, as in certain past years, Indiana Electric's results of operations may be adversely affected by warmer-than-normal heating season weather or colder-than-normal cooling season weather. For CERC's Natural Gas, demand for natural gas for heating purposes is generally higher in the colder months. Therefore, we compare our results on a ~~weather-adjusted~~weatheradjusted basis. In ~~2019~~2020, the Houston area experienced weather that was ~~closer to~~warmer than normal compared to ~~2018~~2019. Although the summer months~~, particularly August and September,~~ were somewhat hotter than normal, ~~this was offset during~~ the ~~remaining months of the year due to milder than normal weather. While overall rainfall was higher~~warmer than normal temperatures started early in ~~2019 largely due to Tropical Storm Imelda, it did not rise to the record rainfall levels experienced in 2017 that occurred largely due to Hurricane Harvey. After~~the year with a ~~return to more normal weather in 2018, our NGD~~mild winter. Our Natural Gas service territories experienced warmer weather in ~~2019 in all areas except~~2020 than it has since 2017. Historically, both CenterPoint Energy's TDU and CERC's Natural Gas have utilized weather hedges to help reduce the impact of mild weather on their financial results. CenterPoint Energy's TDU and CERC's Natural Gas entered into a weather hedge for the 2019–2020 winter heating season in Texas where no weather normalization mechanisms exist. In CERC's non-Texas jurisdictions, weather normalization mechanisms or decoupling in the Minnesota division help to mitigate the impact of abnormal weather on our financial results.

Exelon

~~Exelon has utility and generation assets, and customers, that are and will be further subject to the impacts of climate change. Accordingly, Exelon is engaged in a variety of initiatives to understand and mitigate these impacts, including investments in resiliency, partnering with federal, state and local governments to minimize impacts, and, importantly, advocating for public policy that reduces emissions that cause climate change. Exelon, as a producer of electricity from predominantly low- and zero-carbon generating facilities (such as nuclear, hydroelectric, natural gas, wind and solar photovoltaic), has a relatively small GHG emission profile, or carbon footprint, compared to other domestic generators of electricity (Exelon neither owns nor operates any coal-fueled generating assets). Exelon's natural gas and biomass fired generating plants produce GHG emissions, most notably, CO2. However, Generation's owned-asset emission intensity, or rate of carbon dioxide equivalent (CO2e) emitted per unit of electricity generated, is among the lowest in the industry. Other GHG emission sources at Exelon include natural gas (methane) leakage on the natural gas systems, sulfur hexafluoride (SF6) leakage from electric transmission and distribution operations, refrigerant leakage from chilling and cooling equipment, and fossil fuel combustion in motor vehicles. Exelon facilities and operations are subject to the global impacts of climate change and Exelon believes its operations could be significantly affected by the physical risks of climate change.~~

The Registrants could be negatively affected by the impacts of weather (Page 35 of 2021 10-K)

Weather conditions directly influence the demand for electricity and natural gas and affect the price of energy commodities. Temperatures above normal levels in the summer tend to increase summer cooling electricity demand and revenues, and temperatures below normal levels in the winter tend to increase winter heating electricity and gas demand and revenues. Moderate temperatures adversely affect the usage of energy and resulting revenues at PECO, DPL Delaware, and ACE. Due to revenue decoupling, BGE, Pepco, and DPL Maryland recognize revenues at MDPSC and DCPSC-approved levels per customer, regardless of what actual distribution volumes are for a billing period and are not affected by actual

weather with the exception of major storms. ComEd's customer rates are adjusted to eliminate the favorable and unfavorable impacts of weather and customer usage patterns on distribution revenue. Extreme weather conditions or damage resulting from storms could stress the Utility Registrants' transmission and distribution systems, communication systems, and technology, resulting in increased maintenance and capital costs and limiting each company's ability to meet peak customer demand. First and third quarter financial results, in particular, are substantially dependent on weather conditions, and could make period comparisons less relevant. Generation's operations are also affected by weather, which affects demand for electricity as well as operating conditions. To the extent that weather is warmer in the summer or colder in the winter than assumed, Generation could require greater resources to meet its contractual commitments. Extreme weather conditions or storms could affect the availability of generation and its transmission, limiting Generation's ability to source or send power to where it is sold. In addition, drought-like conditions limiting water usage could impact Generation's ability to run certain generating assets at full capacity. These conditions, which cannot be accurately predicted, could cause Generation to seek additional capacity at a time when wholesale markets are tight or to seek to sell excess capacity at a time when markets are weak. Climate change projections suggest increases to summer temperature and humidity trends, as well as more erratic precipitation and storm patterns over the long-term in the areas where Registrants have generation, transmission, and distribution assets. The frequency in which weather conditions emerge outside the current expected climate norms could contribute to weather-related impacts discussed above.

The Registrants are subject to risks associated with climate change (Page 41 of 2021 10-K)

~~Physical plants could be placed at greater risk of damage should changes in the global climate produce unusual variations in temperature and weather patterns, resulting in more intense, frequent and extreme weather events, unprecedented levels of precipitation and a change in sea level. The Registrants'~~ The Registrants periodically perform analyses to better understand how climate change could affect their facilities and operations. The Registrants primarily operate in the Midwest and East Coast of the United States, areas that historically have been prone to various types of severe weather events, such that the Registrants have well ~~-~~developed response and recovery programs based on these historical events. ~~Still disruption or failure~~However, the Registrants' physical facilities could be placed at greater risk of ~~electric generation, transmission or distribution systems or natural gas production, transmission, storage or distribution systems~~damage should changes in the ~~event~~global climate impact temperature and weather patterns, resulting in more intense, frequent and extreme weather events, unprecedented levels of ~~a hurricane, tornado~~ precipitation, sea level rise, increased surface water temperatures, and/or other ~~severe weather event, or otherwise, could prevent~~effects. In addition, changes to the climate may impact levels and patterns of demand for energy and related services, which could affect Registrants' operations. Over time, the Registrants may need to make additional investments to protect facilities from ~~operating their business in the normal course~~physical climate-related risks and/or adapt to changes in operational requirements as a result of climate change.

Natural disasters, war, acts and threats of terrorism, pandemic, and other significant events could negatively impact the Registrants' results of operations, their ability to raise capital and their future growth (Page 44 of 2021 10-K)

Generation's fleet of power plants and the Utility Registrants' distribution and transmission infrastructures could be affected by natural disasters and extreme weather events, which could result in increased costs, including supply chain costs. An extreme weather event within the Registrants' service areas can also directly affect their capital assets, causing disruption in service to customers due to downed wires and poles or damage to other operating equipment. Natural disasters and other significant events increase the risk to Generation that the NRC or other regulatory or legislative bodies could change the laws or regulations governing, among other things, operations, maintenance, licensed lives, decommissioning,

SNF storage, insurance, emergency planning, security, and environmental and radiological matters. In addition, natural disasters could affect the availability of a secure and economical supply of water in some locations, which is essential for Generation's continued operation, particularly the cooling of generating units.

Results of Operations—PECO (Page 91 of 2021 10-K)

The demand for electricity and natural gas is affected by weather conditions. With respect to the electric business, very warm weather in summer months and, with respect to the electric and natural gas businesses, very cold weather in winter months are referred to as "favorable weather conditions" because these weather conditions result in increased deliveries of electricity and natural gas. Conversely, mild weather reduces demand. For the year ended December 31, ~~2019~~2020 compared to the same period in ~~2018 RNF was~~ 2019, Operating revenues related to weather decreased ~~by~~due to the impact of unfavorable weather conditions in PECO's service territory.

NRG

Seasonality and Price Volatility (Page 17 of 2021 10-K)

The sale of electric power to retail customers is a seasonal business with the demand for power generally peaking during the summer months. In connection with the acquisition of Direct Energy, the Company acquired a large natural gas customer portfolio, which generally experiences peak demand during the winter months. As a result, net working capital requirements for the Company's retail operations generally increase during summer and winter months along with the higher revenues, and then decline during off-peak months. Weather may impact operating results and extreme weather conditions could have a material impact. The rates charged to retail customers may be impacted by fluctuations in total power prices and market dynamics, such as the price of natural gas, transmission constraints, competitor actions, and changes in market heat rates. Annual and quarterly operating results of the Company's generation portfolio can be significantly affected by weather and energy commodity price volatility. Significant other events, such as the demand for natural gas, interruptions in fuel supply infrastructure and relative levels of hydroelectric capacity can increase seasonal fuel and power price volatility. The preceding factors related to seasonality and price volatility are fairly uniform across the regions in which the Company operates~~.~~

Volatile power and gas supply costs and demand for power and gas could adversely affect the financial performance of NRG's retail operations (Page 29 of 2021 10-K)

The ~~retail businesses'~~Company's earnings and cash flows could also be adversely affected in any period in which its customers' actual usage of electricity or gas significantly varies from the forecasted usage, which could occur due to, among other factors, weather events, changes in usage patterns, competition and economic conditions.

NRG's businesses are subject to physical, market and economic risks relating to potential effects of climate change, and policies at the national, regional and state levels to regulate GHG emissions and mitigate climate change could adversely impact NRG's results of operations, financial condition and cash flows (Page 37 of 2021 10-K)

Fluctuations in weather and other environmental conditions, including temperature and precipitation levels, may affect consumer demand for electricity~~.~~ or natural gas. In addition, the potential physical effects of climate change, such as increased frequency and severity of storms, floods and other climatic events, could disrupt NRG's operations and supply chain, and cause ~~them~~it to incur significant costs in preparing for or responding to these effects. These or other ~~meteorological~~ changes in climate could lead

to increased operating costs~~,~~ or capital expenses ~~or power purchase costs.~~. NRG's ~~commercial and residential~~ customers may also experience the potential physical impacts of climate change and may incur significant costs in preparing for or responding to these efforts, including increasing the mix and resiliency of their energy solutions and supply. Hazards customary to the power production industry include the potential for unusual weather conditions, which could affect fuel pricing and availability, the Company's route to market or access to customers, i.e., transmission and distribution lines, transportation and delivery, or critical plant assets. The contribution of climate change to the frequency or intensity of weather-related events could affect NRG's operations and planning process. Climate change could also affect the availability of a secure and economical supply of water in some locations, which is essential for the continued operation of NRG's generation plants. NRG monitors water risk carefully. If it is determined that a water supply risk exists that could impact projected generation levels at any plant risk mitigation efforts are identified and evaluated for implementation.

Business Environment (Page 48 of 2021 10-K)

Weather conditions in the regions of the U.S. in which NRG does business influence the Company's financial results. Weather conditions can affect the supply and demand for electricity and fuels and may also impact the availability of the Company's generating assets. Changes in energy supply and demand may impact the price of these energy commodities in both the spot and forward markets, which may affect the Company's results in any given period. Typically, demand for and the price of electricity is higher in the summer and the winter seasons, when temperatures are more extreme. The demand for and price of natural gas is also generally higher in the winter. However, all regions of the U.S. typically do not experience extreme weather conditions at the same time, thus NRG's operations are typically not exposed to the effects of extreme weather in all parts of its business at once. A significant portion of the Company's business is located within Texas, and extreme weather conditions occurring in Texas may have a material impact on the Company's financial position.

PNM

Natural Gas (Page A-9 of 2021 10-K)

The natural gas used as fuel for the electric generating plants is procured on the open market and delivered by third-party transportation providers. The supply of natural gas can be subject to disruptions due to extreme weather events and/or pipeline or facility outages. PNM has contracted for firm gas transmission capacity to minimize the potential for disruptions due to extreme weather events. Certain of PNM's natural gas plants are generally used as peaking resources that are highly relied upon during seasonally high load periods and/or during periods of extreme weather, which also may be the times natural gas has the highest demand from other users. ~~PNM's reliance on its natural gas generating resources has increased with the December 2017 retirement of SJGS Units 2 and 3.~~ Substantially all of PNM's natural gas costs are recovered through the FPPAC.

The impact of wildfires could negatively affect PNM's and TNMP's results of operations (Page A-19 of 2021 10-K)

PNM and TNMP have large networks of electric transmission and distribution facilities. Weather conditions in the U.S. Southwest region and Texas vary and could contribute to wildfires in or near PNM's and TNMP's service territories. PNM and TNMP take proactive steps to mitigate wildfire risk. However, wildfire risk is always present and PNM and TNMP could be held liable for damages incurred as a result of wildfires caused, or allegedly caused, by their transmission and distribution systems. In addition, wildfires could cause damage to PNM's and TNMP's assets that could result in loss of service to customers or make it difficult to supply power in sufficient quantities to meet customer needs. These

events could have negative impacts on the Company's financial position, results of operations, and cash flows.

The operating results of PNMR and its operating subsidiaries are seasonal and are affected by weather conditions, including regional drought (Page A-20 of 2021 10-K)

Electric generation, transmission, and distribution are generally seasonal businesses that vary with the demand for power. With power consumption typically peaking during the hot summer months, revenues traditionally peak during that period. As a result, quarterly operating results of PNMR and its operating subsidiaries vary throughout the year. In addition, PNMR and its operating subsidiaries have historically had lower revenues resulting in lower earnings when weather conditions are milder. Unusually mild weather in the future could reduce the revenues, net earnings, and cash flows of the Company.

~~Assured supplies of water are important for PNM's generating plants.~~ Drought conditions in New Mexico, especially in the "four corners" region, where SJGS and Four Corners are located, may affect the water supply for PNM's generating plants. ~~-~~ If inadequate precipitation occurs in the watershed that supplies that region, PNM may have to decrease generation at these plants. This would require PNM to purchase power to serve customers and/or reduce the ability to sell excess power on the wholesale market and reduce revenues. Drought conditions or actions taken by the court system, regulators, or legislators could limit PNM's supply of water, which would adversely impact PNM's business. Although SJGS and Four Corners participate in voluntary shortage sharing agreements with tribes and other water users in the "four corners" region, PNM cannot be certain these contracts will be enforceable in the event of a major drought or that it will be able to renew these contracts in the future.

TNMP's service areas are exposed to extreme weather, including high winds, drought, flooding, ice storms, and periodic hurricanes. Extreme weather conditions, particularly high winds and severe thunderstorms, also occur periodically in PNM's service areas. These severe weather events can physically damage facilities owned by TNMP and PNM. Any such occurrence both disrupts the ability to deliver energy and increases costs. Extreme weather can also reduce customers' usage and demand for energy or could result in the Company incurring obligations to third parties related to such events. These factors could negatively impact results of operations and cash flows.

Business Focus (Page A-38 of 2021 10-K)

With reliability being the primary role of a transmission and distribution service provider in Texas' deregulated market, TNMP continues to focus on keeping end-users updated about interruptions and to encourage consumer preparation when severe weather is forecasted. ~~In August 2017, Hurricane Harvey made landfall in the gulf coast region and TNMP employees worked to restore power safely and efficiently for affected customers. In addition, PNMR made donations to support relief and restoration efforts in the gulf coast region. TNMP employees who were impacted by Hurricane Harvey were provided emergency crisis funds supported by the PNM Resources Foundation and other employee donations~~This summer, TNMP provided a 33- person team for two weeks in support of another utility that experienced significant damage to their transmission and distribution system as a result of Hurricane Laura.

Other Climate Change Risks (Page A-57 of 2021 10-K)

PNM's generating stations are located in the arid southwest. Access to water for cooling for some of these facilities is critical to continued operations. Forecasts for the impacts of climate change on water supply in the southwest range from reduced precipitation to changes in the timing of precipitation. In either case, PNM's generating facilities requiring water for cooling will need to mitigate the impacts of climate

change through adaptive measures. Current measures employed by PNM generating stations such as air cooling, use of grey water, improved reservoir operations, and shortage sharing arrangements with other water users will continue to be important to sustain operations.

PNM's service areas occasionally experience periodic high winds and severe thunderstorms. TNMP has operations in the Gulf Coast area of Texas, which experiences periodic hurricanes and other extreme weather conditions. In addition to potentially causing physical damage to Company-owned facilities, which disrupts the ability to transmit and/or distribute energy, weather and other events of nature can temporarily reduce customers' usage and demand for energy. In addition, other events influenced by climate change, such as wildfires, could disrupt Company operations or result in third-party claims against the Company.

Sempra

Severe weather conditions, natural disasters, pandemics, accidents, equipment failures, explosions or acts of terrorism could materially adversely affect our businesses, financial condition, results of operations, cash flows and/or prospects (Page 37 of 2021 10-K)

Like other ~~major industrial~~capital intensive businesses, our facilities~~, ours~~ and infrastructure may be damaged by severe weather conditions~~,~~ and natural disasters such as fires, earthquakes, tornadoes, hurricanes, other storms, tsunamis, heat waves, rising sea levels, floods, mudslides, drought, solar events and electromagnetic events; pandemics; accidents~~,~~; equipment failures~~,~~; explosions; or acts of terrorism, vandalism, war or criminality. Because we are in the business of using, storing, transporting and disposing of highly flammable and explosive materials, as well as radioactive materials, and operating highly energized equipment, the risks such incidents may pose to our facilities and infrastructure, as well as the risks to the surrounding communities for which we could be held responsible, are substantially greater than the risks such incidents may pose to a typical business. The facilities and infrastructure that we own or in which we have interests that may be subject to such incidents include, ~~but are not limited to~~among others: ▪ natural gas, propane and ethane pipelines, storage and compressor facilities ▪ electric transmission ~~and~~, distribution and battery storage equipment ▪ power generation plants, including renewable energy and natural gas-fired generation ▪ marine and inland ethane and liquid fuels, LNG~~,~~ and LPG facilities, terminals and storage ▪ nuclear power facilities~~,~~ and nuclear fuel and nuclear waste storage facilities (through SDG&E's ~~20%~~ minority interest in SONGS, which is currently being decommissioned) Such incidents could result in severe business disruptions~~,~~; prolonged power outages~~,~~; property damage, injuries or loss of life~~,~~ for which our businesses could be liable; significant decreases in revenues and earnings~~,~~; and/or other significant additional costs to us, including as a result of higher maintenance costs or restoration expenses, amounts to compensate third parties, and regulatory fines, penalties and disallowances. For our regulated utilities, these liabilities or increased costs may not be recoverable in rates. Such incidents that do not directly affect our facilities may impact our business partners, supply chains and transportation, which could negatively impact construction projects and our ability to provide natural gas and electricity to our customers. ~~Other global incidents could have similar effects to the extent they reach and impact the territories in which we operate, the customers we serve or the employees who operate our businesses. For example, the coronavirus outbreak currently affecting China and elsewhere has resulted in travel restrictions and impacts on the global economy that could affect our operations in a manner that is not presently possible to predict.~~Moreover, weather-related incidents have become more prevalent, unpredictable and severe as a result of climate change or other factors, and we are currently in the midst of a severe global pandemic, any of which could have a greater impact on our businesses than is currently anticipated and, for our regulated utilities, rates may not be adequately or timely adjusted to reflect any such increased impact. Any such incident could have a material adverse effect on our businesses, financial condition, results of operations, cash flows and/or prospects. Depending on the nature and location of the facilities and infrastructure affected, any such incident also could cause

catastrophic fires; natural gas, natural gas odorant, propane or ethane leaks; releases of other GHG emissions; radioactive releases; explosions, spills or other significant damage to natural resources or property belonging to third parties; or personal injuries, health impacts or fatalities~~;~~, or could present a nuisance to impacted communities. Any of these consequences could lead to significant claims against us. In some cases, we may be liable for damages even though we are not at fault, such as in cases ~~where~~in which the doctrine of inverse condemnation applies. We discuss how the application of this doctrine in California imposes strict liability on ~~a~~an electric utility whose equipment is determined to be a cause of a fire (meaning the utility may be found liable regardless of fault) below under "Risks Related to the California Utilities – ~~The Wildfire Legislation may not adequately protect SDG&E from liability from catastrophic wildfires in its service territory."~~Operational Risks." Insurance coverage may significantly increase in cost or become prohibitively expensive, may be disputed by the insurers, or may become unavailable for certain of these risks or at sufficient levels, and any insurance proceeds we receive may be insufficient to cover our losses or liabilities due to the existence of limitations, exclusions, high deductibles, failure to comply with procedural requirements, and other factors, which could materially adversely affect our businesses, financial condition, results of operations, cash flows and/or prospects, as well as the trading prices of our common stock, preferred stock and debt securities.

~~Frequent and more severe drought conditions, unseasonably warm temperatures, very low humidity and stronger winds have increased the degree and prevalence of wildfires in California including in SDG&E's and SoCalGas' service territories, which could place third party property and our electric and natural gas infrastructure in jeopardy and reduce the availability of hydroelectric generators. This could result in temporary power shortages in SDG&E's and SoCalGas' service territories and/or catastrophic destruction of third-party property for which SDG&E or SoCalGas may be liable and unable to recover from ratepayers or may have inadequate insurance coverage. The Wildfire Legislation, signed into law in July 2019, includes a number of measures primarily intended to address certain important issues related to catastrophic wildfires in the State of California, including wildfire mitigation, cost recovery standards and requirements, a wildfire fund, a cap on liability, and the establishment of a wildfire safety board. However, in the event of a significant wildfire involving SDG&E equipment, the standards prescribed by the Wildfire Legislation may not be applied by the State of California consistently or the Wildfire Fund could be completely exhausted due to fires in other California IOUs' service territories, by fires in SDG&E's service territory or by a combination thereof, which could impact our ability to timely access capital necessary to address, in whole or in part, inverse condemnation and other liabilities. In addition, the State of California has been subject to housing shortages such that certain local land use policies and forestry management practices have been relaxed in certain cases to allow for the construction and development of residential and commercial projects in high risk fire areas that may not have the infrastructure or contingency plans necessary to address such risk. Severe rainstorms and associated high winds in our service territories, as well as flooding and mudslides where vegetation has been destroyed as result of human modification or wildfires, could damage our electric and natural gas infrastructure, resulting in increased expenses, including higher maintenance and repair costs and interruptions in natural gas and electricity delivery services. As a result, these events can have significant financial consequences, including regulatory penalties and disallowances if the California Utilities encounter difficulties in restoring service to their customers on a timely basis. Further, the cost of storm restoration efforts may not be fully recoverable through the regulatory process. Any such events could have a material adverse effect on our businesses, financial condition, results of operations and cash flows. Events or conditions caused by climate change, including risk of wildfires, severe weather conditions and flooding caused by rising sea levels, could have a greater impact on the California Utilities' operations than the California Utilities currently 40 anticipate. If the CPUC fails to adjust the California Utilities' rates to reflect the impact of events or conditions caused by climate change or if a major fire is determined to be caused by our equipment, Sempra Energy's and the California Utilities' business, financial condition, results of operations, liquidity, and cash flows could be materially affected.~~

The California Utilities are subject to risks arising from the operation, maintenance and upgrade of their natural gas and electricity infrastructure and information technology systems, which, if they materialize, could materially and adversely affect Sempra Energy's and the California Utilities' financial results (Page 44 of 2021 10-K).

The California Utilities own and operate electric transmission and distribution facilities and natural gas transmission, distribution and storage facilities, which are, in many cases, interconnected and/or managed by information technology systems. ~~The~~Even though the California Utilities undertake substantial capital investment projects to construct, replace, maintain, improve and upgrade these facilities and systems~~, but while these capital investment projects are in process and even once completed~~, there is a risk of, among other things, potential breakdown or failure of equipment or processes due to aging infrastructure and information technology systems, human error in operations or maintenance, shortages of or delays in obtaining equipment, material and labor, operational restrictions resulting from environmental requirements and governmental interventions, and performance below expected levels~~. In addition, as discussed above, weatherrelated incidents and other natural disasters can disrupt generation, transmission and distribution delivery systems.~~, and these risks could be amplified while capital investment projects are in process. Because our transmission facilities are interconnected with those of third parties, the operation of our facilities could also be adversely affected by ~~unexpected or uncontrollable~~ events occurring on the systems of such third parties, some of which may be unanticipated or uncontrollable by us. Additional risks associated with the ability of the California Utilities to safely and reliably operate, maintain, improve and upgrade their facilities and systems, many of which are beyond the California Utilities' control, include~~: ▪ challenges associated with meeting~~, among others: ▪ failure to meet customer demand for natural gas and/or electricity ~~that results in customer~~, curtailments, controlled~~/~~ or uncontrolled gas outages, or gas surges back into homes~~,~~ that could cause serious personal injury or loss of life~~;~~ ▪ a prolonged widespread electrical black-out that results in damage to the California Utilities' equipment or damage to property owned by customers or other third parties~~; inadequate emergency preparedness plans and the failure to respond effectively to a catastrophic event that could lead to public or employee harm or extended outages; severe weather events such as storms, tornadoes, floods, drought, earthquakes, tsunamis, fires, pandemics, solar events, electromagnetic events or other natural disasters;~~ ▪ the release of hazardous or toxic substances into the air, water or soil, including gas leaks ~~from~~ ▪ severe weather events or natural ~~gas pipelines or storage facilities; and ▪~~disasters, pandemics, or attacks by third parties~~, including~~ such as cyber-attacks, acts of terrorism, vandalism or war~~.~~, the effects of which we discuss above under "Risks Related to All Sempra Energy Businesses – Operational Risks" ▪ inadequate emergency preparedness plans and the failure to respond effectively to catastrophic events that could lead to public or employee harm or extended outages. The occurrence of any of these events could affect demand for natural gas or electricity~~;~~, cause unplanned outages~~;~~, damage the California Utilities' assets and/or operations~~;~~, damage the assets and/or operations of third parties on which the California Utilities rely~~;~~, damage property owned by customers or others~~;~~, and cause personal injury or death. ~~As a result, the California Utilities could incur costs to purchase replacement power, to repair assets and restore service, and to compensate third parties.~~ Any such events could materially adversely affect Sempra Energy's and one or both of the California Utilities' financial condition, cash flows and/or results of operations.

Wildfires in California pose a significant risk to the California Utilities' (particularly SDG&E's) and Sempra Energy's business, financial condition, results of operations and/or cash flows (Page 45 of 2020 10-K)

In 2020, California experienced some of the largest wildfires (measured by acres burned) in its history. Frequent and more severe drought conditions, inconsistent and extreme swings in precipitation, changes in vegetation caused by these precipitation swings or other factors, unseasonably warm temperatures, very low humidity and stronger winds have increased the ~~degree~~duration of the wildfire season and the intensity and prevalence of wildfires in California, including in SDG&E's and SoCalGas' service

territories, ~~which could place third party property and our~~ and have made these wildfires increasingly difficult to predict and contain. Changing weather patterns, including as a result of climate change, could cause these conditions to become even more extreme and unpredictable. These wildfires could place third-party property and the California Utilities' electric and natural gas infrastructure in jeopardy and reduce the availability of hydroelectric generators~~. This~~, and these wildfires and the associated weather conditions could result in temporary power shortages in SDG&E's and SoCalGas' service territories ~~and/or catastrophic destruction of third-party property for which SDG&E or SoCalGas may be liable and unable to recover from ratepayers or may have inadequate insurance coverage. The Wildfire Legislation, signed into law in July 2019, includes a number of measures primarily intended to address certain important issues related to catastrophic wildfires in the State of California, including wildfire mitigation, cost recovery standards and requirements, a wildfire fund, a cap on liability, and the establishment of a wildfire safety board. However, in the event of a significant wildfire involving SDG&E equipment, the standards prescribed by the Wildfire Legislation may not be applied by the State of California consistently or the Wildfire Fund could be completely exhausted due to fires in other California IOUs' service territories, by fires in SDG&E's service territory or by a combination thereof, which could impact our ability to timely access capital necessary to address, in whole or in part, inverse condemnation and other liabilities.~~. In addition, ~~the State of California has been subject to housing shortages such that certain~~ certain of California's local land use policies and forestry management practices have been relaxed ~~in certain cases~~ to allow for the construction and development of residential and commercial projects in high-~~-~~risk fire areas that may not have the infrastructure or contingency plans necessary to address ~~such risk. Severe rainstorms and associated high winds in our service territories, as well as flooding and mudslides where vegetation has been destroyed as result of human modification or wildfires, could damage our electric and natural gas infrastructure, resulting in~~ wildfire risks, which could lead to increased ~~expenses, including higher maintenance and repair costs and interruptions in natural gas and electricity delivery services. As a result, these events can have significant financial consequences, including regulatory penalties and disallowances if the California Utilities encounter difficulties in restoring service to their customers on a timely basis. Further, the cost of storm restoration efforts may not be fully recoverable through the regulatory process. Any such events could have a material adverse effect~~ third-party claims and greater losses for which SDG&E or SoCalGas may be liable. We discuss the effects wildfires or other natural disasters could have on our businesses, ~~financial condition, results of operations and cash flows. Events or conditions caused by climate change, including risk of wildfires, severe weather conditions and flooding caused by rising sea levels, could have a greater impact on the California Utilities' operations than the California Utilities currently 40 anticipate. If the CPUC fails to adjust~~including the ways in which they could materially adversely affect the California Utilities' ~~rates to reflect the impact of events or conditions caused by climate change or if a major fire is determined to be caused by our equipment,~~ and Sempra Energy's ~~and the California Utilities'~~ business, financial condition, results of operations~~, liquidity, and~~ and/or cash flows, in this risk factor below and above under "Risks Related to All Sempra Energy Businesses – Operational Risks."

Although we spend significant resources on measures designed to mitigate wildfire risks, there is no assurance that these measures will be successful or effective in reducing our wildfire-related losses or that their costs will be fully recoverable in rates. The California Utilities are required by applicable California law to submit annual wildfire mitigation plans for approval by the Wildfire Safety Division of the CPUC and could be subject to increased risks if these plans are not approved in a timely manner and fines or penalties for any failure to comply with the approved plans. One of our wildfire mitigation tools is to de-energize certain of our facilities when weather conditions become extreme and there is elevated wildfire ignition risk, in an effort to help mitigate this safety risk to the public. Such "public safety power shutoffs" have been subject to significant scrutiny by various stakeholders, including customers, regulators and law makers, that could lead to legislation or rulemaking that increases the risk of penalties and liability for damages associated with these events. Such costs may not be recoverable in rates. Unrecoverable costs, adverse legislation or rulemaking, scrutiny by key stakeholders or other negative

effects associated with wildfire mitigation efforts could materially adversely affect Sempra Energy's and SDG&E's financial condition, cash flows ~~could be materially affected.~~and/or results of operations.

Vistra

Seasonality (Page 9 of 2021 10-K)

The demand for and market prices of electricity and natural gas are affected by weather. As a result, our operating results are impacted by extreme or sustained weather conditions and may fluctuate on a seasonal basis. Typically, demand for and the price of electricity is higher in the summer and winter seasons, when the temperatures are more extreme, and the demand for and price of natural gas is also generally higher in the winter. More severe weather conditions such as heat waves or extreme winter weather have made, and may make such fluctuations more pronounced. ~~However, not all regions of the U.S. typically experience extreme weather conditions at the same time, so Vistra Energy is typically not exposed to the effects of extreme weather in all parts of its business at once.~~ The pattern of this fluctuation may change depending on, among other things, the retail load served and the terms of contracts to purchase or sell electricity~~.~~

Our revenues, results of operations and operating cash flows generally are affected by price fluctuations in the wholesale power market and other market factors beyond our control (Page 22 of 2021 10-K)

Extreme weather events can also materially impact power prices or otherwise exacerbate conditions or circumstances that result in volatility of power prices. For example, in February 2021, the U.S. experienced winter storm Uri and extreme cold temperatures in the central U.S., including Texas. This severe weather event substantially increased the demand for natural gas used in our electric power generation business, and the cold further limited the availability of renewable generation across the region contributing to extremely high market prices for natural gas and electricity, which resulted in substantial increases in the costs to procure sufficient fuel supply and increased collateral posting requirements. See "We may be materially and adversely affected by the effects of extreme weather conditions and seasonality" and Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations for additional discussion about the expected impacts of extreme weather, including the winter storm.

We may be materially and adversely affected by the effects of extreme weather conditions and seasonality (Page 43 of 2021 10-K)

We may be materially affected by weather conditions and our businesses may fluctuate substantially on a seasonal basis as the weather changes. In addition, we ~~could be~~are subject to the effects of extreme weather conditions, including sustained or extreme cold or hot temperatures, hurricanes, floods, storms, fires, earthquakes or other natural disasters, which could stress our generation facilities and grid reliability, limit our ability to procure adequate fuel supply, or result in outages, damage or destroy our assets and result in casualty losses that are not ultimately offset by insurance proceeds, and could require increased capital expenditures or maintenance costs, including supply chain costs. Moreover, an extreme weather event could cause disruption in service to customers due to downed wires and poles or damage to other operating equipment, which could result in us foregoing sales of electricity and lost revenue. Similarly, ~~an~~certain extreme weather ~~event might~~events have previously affected, and may in the future, affect, the availability of generation and transmission capacity, limiting our ability to source or deliver power where it is needed or limit our ability to source fuel for our plants ~~(~~, including due to damage to rail or natural gas pipeline infrastructure~~).~~. Additionally, extreme weather has resulted, and may in the future result, in (i) unexpected increases in customer load, requiring our retail operation to procure additional electricity supplies at wholesale prices in excess of customer sales prices for electricity~~. These~~, (ii) the

failure of equipment at our generation facilities, (iii) a decrease in the availability of, or increases in the cost of, fuel sources, including natural gas, diesel and coal, or (iv) unpredictable curtailment of customer load by the applicable ISO/RTO in order to maintain grid reliability, resulting in the realization of lower wholesale prices or retail customer sales. See Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations for a discussion of the expected impacts of winter storm Uri. Additionally, climate change may produce changes in weather or other environmental conditions, including temperature or precipitation levels, and thus may impact consumer demand for electricity . In addition, the potential physical effects of climate change, such as increased frequency and severity of storms, floods, and other climatic events, could disrupt our operations and cause us to incur significant costs to prepare for or respond to these effects. Weather conditions, which cannot be reliably predicted, could have adverse consequences by requiring us to seek additional sources of electricity when wholesale market prices are high or to sell excess electricity when market prices are low, as well as significantly limiting the supply of, or increasing the cost of our fuel supply, each of which could have a material adverse effect on ~~us~~our business, results of operations, financial condition and liquidity.

Appendix D: Comparison of Companies' 2010 and 2011 10-Ks[2]

AEP

Global Warming (Page 9 of 2011 10-K)

Global warming creates the potential for physical and financial risk. The materiality of the risks depends on whether any physical changes occur quickly or over several decades and the extent and nature of those changes. Physical risks from climate change could include changes in weather conditions. Our ~~customers'~~customers' energy needs currently vary with weather conditions, primarily temperature and humidity. For residential customers, heating and cooling today represent their largest energy use. To the extent weather patterns change significantly, ~~customers'~~customers' energy use could increase or decrease depending on the duration and magnitude of any changes. Increased energy use due to weather changes could require us to invest in more generating assets, transmission and other infrastructure to serve increased load, driving the overall cost of electricity ~~up~~higher. Decreased energy use due to weather changes could affect our financial condition through lower sales and decreased revenues. Extreme weather conditions in general require more system backup, adding to costs, and can contribute to increased system stresses, including service interruptions and increased storm restoration costs. We may not recover all costs related to mitigating these physical and financial risks. Weather conditions outside of our service territory could also have an impact on our revenues, either directly through changes in the patterns of our off-system power purchases and sales or indirectly through demographic changes as people adapt to changing weather. We buy and sell electricity depending upon system needs and market opportunities. Extreme weather conditions that create high energy demand could raise electricity prices, which could increase the cost of energy we provide to our customers and could provide opportunity for increased wholesale sales. To the extent climate change impacts a ~~region's~~region's economic health, it could also impact our revenues. Our financial performance is tied to the health of the regional economies we serve. The price of energy, as a factor in a region's cost of living as well as an important input into the cost of goods, has an impact on the economic health of our communities. The cost of additional regulatory requirements would normally be borne by consumers through higher prices for energy and purchased goods.

CenterPoint

Global Climate Change (Page 21 of 2011 10-K)

To the extent climate changes occur, our businesses may be adversely impacted, though we believe any such impacts are likely to occur very gradually and hence would be difficult to quantify with specificity. To the extent global climate change results in warmer temperatures in our service territories, financial results from our natural gas distribution businesses could be adversely affected through lower gas sales, and our gas transmission and field services businesses could experience lower revenues. On the other hand, warmer temperatures in our electric service territory may increase our revenues from transmission and distribution through increased demand for electricity for cooling. Another possible climate change ~~that has been widely discussed in recent years is the possibility of~~is more frequent and more severe weather events, such as hurricanes or tornadoes. Since many of our facilities are located along or near the Gulf Coast, increased or more severe hurricanes or tornadoes can increase our costs to repair damaged

[2] This comparison focuses on physical risk information in companies' 2010 and 2011 10-Ks. This information was compiled and aggregated across multiple sections of each companies' 10-Ks. Sempra, Exelon, and Vistra are all excluded from this comparison. Neither Exelon nor Vistra were public in 2010 or 2011. Sempra did not have operations in Texas in 2010 or 2011.

facilities and restore service to our customers. When we cannot deliver electricity or natural gas to customers or our customers cannot receive our services, our financial results can be impacted by lost revenues, and we generally must seek approval from regulators to recover restoration costs. To the extent we are unable to recover those costs, or if higher rates resulting from our recovery of such costs result in reduced demand for our services, our future financial results may be adversely impacted.

NRG

Policies at the national, regional and state levels to regulate GHG emissions could adversely impact NRG's result of operations, financial condition and cash flows (Page 41 of 2011 10-K)

Hazards customary to the power production industry include the potential for unusual weather conditions, which could affect fuel pricing and availability, the Company's route to market or access to customers, i.e. transmission and distribution lines, or critical plant assets. To the extent that climate change contributes to the frequency or intensity of weather related events, NRG's operations and planning process could be impacted.

Seasonality and Price Volatility (Page 14 of 2011 10-K)

The sale of electric power to retail customers is also a seasonal business with the demand for power ~~peaking during the summer months.~~generally peaking during the summer months. As a result, net working capital requirements for the Company's retail operations generally increase during summer months along with the higher revenues, and then decline during off-peak months. Weather may impact operating results and extreme weather conditions could materially affect results of operations. The rates charged to retail customers may be impacted by fluctuations in the price of natural gas, transmission constraints, competition, and changes in market heat rates~~.~~

Significant events beyond the Company's control, such as hurricanes and other weather-related problems or acts of terrorism, could cause a loss of load and customers and thus have a material adverse effect on the Company's Texas retail business (Page 43 of 2011 10-K)

The uncertainty associated with events beyond the Company's control, such as significant weather events and the risk of future terrorist activity, could cause a loss of load and customers and may affect the Company's results of operations and financial condition in unpredictable ways. In addition, significant weather events or terrorist actions could damage or shut down the power transmission and distribution facilities upon which the retail business is dependent. Power supply may be sold at a loss if these events cause a significant loss of retail customer load.

PNM

Climate Change Issues (Page A-59 of 2011 10-K)

Given the geographic location of ~~our~~its facilities and customers, ~~we~~PNM generally ~~have~~has not been exposed to the extreme weather events and other physical impacts commonly attributed to climate change, with the possible exception of drought conditions periodically, and ~~we generally do not expect~~ physical changes are generally not expected to be of material consequence ~~to us~~ in the near-term. Drought conditions in northwestern New Mexico could impact the availability of water for cooling coal-fired generating plants. Water shortage sharing agreements have been in place since 2003, although no shortage has been declared due to sufficient ~~snow pack~~precipitation in the San Juan Basin. PNM also has a supplemental water contract in place with the Jicarilla Tribe to help address any water shortages from primary sources. The contract expires December 31, 2016. TNMP, First Choice, and Optim Energy have

operations in the Gulf coast area of Texas, which experiences periodic hurricanes. In addition to potentially causing physical damage to Company or Optim Energy owned facilities, which disrupt the ability to transmit, distribute, and/or generate energy, hurricanes can temporarily reduce customers' usage and demand for energy.

Water Supply (Page B-98 of 2011 10-K)

Because of New Mexico's arid climate and periodic drought conditions, there is a growing concern in New Mexico about the use of water for power plants. PNM has secured water rights in connection with the existing plants at Afton, Luna, and Lordsburg. Water availability does not appear to be an issue for these plants at this time. The "four corners" region of New Mexico, in which SJGS and Four Corners are located, experienced drought conditions during 2002 through 2004 that could have affected the water supply for PNM's generation plants. in that region. In future years, if adequate precipitation is not received in the watershed that supplies the four corners region, the plants could be impacted. Consequently, PNM, APS, and BHP Billiton have undertaken activities to secure additional water supplies for SJGS, Four Corners, and related mines. PNM has reached an agreement for a voluntary shortage sharing agreement with tribes and other water users in the San Juan Basin for a term ending December 31, 2012. Further, PNM and BHP Billiton have reached agreement on a long-term supplemental contract relating to water for SJGS with the Jicarilla Apache Nation that ends in 2016. APS and BHP Billiton have entered into a similar contract for Four Corners.APS is continuing to work with area stakeholders to implement agreements to minimize the effect, if any, on future operations of Four Corners. Although the Company does not believe that its operations will be materially affected by the drought conditions at this time, it cannot forecast the weather situation or its ramifications, or how regulations and legislation may impact the Company's situation in the future, should the shortages occur in the future. In April 2010, APS signed an agreement on behalf of the PVNGS participants with five cities to provide cooling water essential to power production at PVNGS for the next forty years.

The operating results of PNMR and its operating subsidiaries and Optim Energy are affected by weather conditions and regional drought and may fluctuate on a seasonal and quarterly basis (Page A-22 of 2011 10-K)

Electric power generation, transmission, and distribution are generally seasonal businesses with demand for power from PNMR's and Optim Energy's electric operations traditionally peaking during the hot summer months. As a result, the operating results of PNMR and, its operating subsidiaries, and Optim Energy will likely fluctuate substantially on a seasonal basis. In addition, the sale of PNM Gas on January 30, 2009 and the absence of revenues from gas operations, which peaked in the winter months, changed quarterly earnings distribution. In addition, PNMR and its operating subsidiaries have historically sold less power, and consequently earned less income, when weather conditions are milder. Unusually mild weather in the future could reduce the revenues, net earnings, available cash, and borrowing ability of PNMR and its operating subsidiaries. Drought conditions in New Mexico generally, and especially in the "four corners" region, in which SJGS and the Four Corners plant are located, may affect the water supply for PNM's generating plants. If adequate precipitation is not received in the watershed that supplies that region, PNM may have to decrease generation at these plants, which would require the purchase of power to serve PNM's customers and/or reduce PNM's ability to sell excess power on the wholesale market and reduce its revenues. Drought conditions or actions taken by regulators or legislators could limit PNM's supply of water, and PNM's and PNMR's business may be adversely impacted. Although PNM has been able to maintain adequate access to water through supplemental contracts and voluntary shortage sharing agreements with tribes and other water users in the "four corners" region, PNM cannot be certain that it will be able to do so in the future. TNMP, First Choice, and Optim Energy have operations in the Gulf coast area of Texas, which experiences periodic hurricanes. In addition to potentially causing physical damage to Company or Optim Energy owned facilities, which disrupt the ability to transmit, distribute,

and/or generate energy, hurricanes can reduce customers' usage and demand for energy. These factors could reduce ~~revenues~~results of operation and ~~earnings~~cash flows.