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Power Lines: Climate Change and the Politics of Undergrounding

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Note

Power Lines: Climate Change and the Politics of Undergrounding

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After years of enduring devastating loss of property and life, toxic air quality and intermittent power shutoffs, the public is primed for dramatic change to ensure a safe and resilient power grid. To achieve this, Californians are demanding that utilities bury the wires. As the court in Town of Tiburon v. Bonander *emphasized over a decade ago, "it requires no independent research to support the self-evident conclusion that placing overhead utility wires underground will reduce the risk of weather-related power outages as well as the safety risk posed by downed utility poles and lines."*[1] *Wholesale undergrounding is not the cure-all to California's megafires, but the evidence demonstrates that a wholesale review and revision of California's regulatory system for permitting and implementing undergrounding is required. This Note brings together the available research on undergrounding in the backdrop of climate change and its social, environmental and economic impacts on California. The findings establish that a "holistic evaluation of costs and benefits" substantiates the public's desire for undergrounding.*[2] *The outsized benefit of lowering the risk and costs of megafires for the state and its citizens demands that California take action to cause utilities to underground power lines wherever feasible.*

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1. 180 Cal. App. 4th 1057, 1079 (2009).

2. FRANK ACKERMAN & LISA HEINZERLING, PRICELESS: ON KNOWING THE PRICE OF EVERYTHING AND THE VALUE OF NOTHING 210 (2004). Ackerman and Heinzerling advocate for an extension to the conventional cost-benefit analysis, proposing the incorporation of four principles for protection of public health and the environment: "holistic, rather than atomistic, methods of evaluating costs and benefits[;] [l]earn from the military: moral imperatives are more powerful than cost comparisons[;] [a]dopt a precautionary approach to uncertain, potentially dangerous risks[; and,] [p]romote fairness—toward the poor and powerless today, and toward future generations." *Id*.

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I. THE NEW ABNORMAL

In the aftermath of the recent megafires that engulfed California, which caused billions of dollars in damage and left devastating scars on communities across the state, Californians are demanding that state officials address the wildfire threat posed by overhead power lines.[3] Ignitions from power lines and other outdated electrical equipment are responsible for nearly half of the state's twenty most destructive fires.[4] Between 2014 and 2017, equipment from California's three largest investor-owned utilities (IOU), which provide power to the vast majority of the state, sparked over 2000 fires.[5] Then in 2017 and 2018, California endured six of the ten most destructive fires in state history.[6] Undergrounding, the process of burying overhead power lines, would greatly lower the risk of fire.[7] Despite the promise of undergrounding, however, many observers consider it exorbitantly expensive and, ultimately, cost prohibitive.[8]

This Note focuses on Pacific Gas and Electric Co. (PG&E), California's largest IOU and power provider, as its power lines span 70,000-square miles covering Northern and Central California.[9] For years, opponents of PG&E have decried the company and argued that it should be customer-owned to ensure safe and reliable service.[10] While sound leadership and governance are critical to providing safe service to millions of Californians, the more immediate issue is PG&E's failing power grid infrastructure. Whoever leads PG&E in the future will bear the responsibility of hardening its vast network of distribution and transmission lines—nearly all of which are past their useful life.[11]

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3. *See, e.g.*, A.B. 281, 2019–2020 Gen. Assemb. (Cal. 2019); Letter from Staci Heaton, Senior Regulatory Affairs Advocate, Rural Cty. Representatives of Cal., to Caroline Thomas Jacobs, Dir., Wildfire Safety Div. 4 (Apr. 6, 2020), ftp://ftp.cpuc.ca.ggov/WMP/PublicComments/ (follow "Joint Local Govts Comments 2020 WMP.pdf" hyperlink).

4. *Top 20 Most Destructive California Wildfires*, CAL FIRE, http://www.fire.ca.gov/media/5511/top20_destruction.pdf (last visited June 28, 2020).

5. Taryn Luna, *California Utility Equipment Sparked More than 2,000 Fires in Over Three Years*, L.A. TIMES (Jan. 28, 2019, 12:05 AM), https://www.latimes.com/politics/la-pol-ca-california-utilities-wildfires-regulators-20190128-story.html.

6. Cal. Exec. Order N-05-19 (Jan. 8, 2019), https://www.gov.ca.gov/wp-content/uploads/2019/01/1.8.19-EO-N-05-19.pdf.

7. David R. Baker, *Underground Power Lines Don't Start Wildfires. But They're Really Expensive*, S.F. CHRON. (Oct. 21, 2017), https://www.sfchronicle.com/bayarea/article/Underground-power-lines-don-t-cause-wildfires-12295031.php?psid=3moHS.

8. *Id.*

9. *Company Profile*, PG&E, https://www.pge.com/en_US/about-pge/company-information/profile/profile.page (last visited June 28, 2020).

10. Rebecca Smith, *San Jose to Propose Turning PG&E into Giant Customer-Owned Utility*, WALL ST. J., https://www.wsj.com/articles/san-jose-to-propose-turning-pg-e-into-giant-customer-owned-utility-11571685117 (last updated Oct. 21, 2019); *see* S.B. 917, 2019–2020 Leg. (Cal. 2020); Judy Lin, *What Happens if California Takes Over PG&E?*, CALMATTERS (Feb. 5, 2020), https://calmatters.org/politics/2020/02/what-happens-if-california-takes-over-pge/ ("Gov. Gavin Newsom has threatened a public takeover of Pacific Gas & Electric unless it can transform into a provider of affordable, reliable, clean and—above all—safe energy.").

11. Anne C. Mulkern, *Options to Cut Wildfire Risk Include State Takeover of PG&E*, E&E NEWS: CLIMATEWIRE (Jan. 27, 2020), https://www.eenews.net/climatewire/stories/1062188183 ("[I]f California took over PG&E's system entirely . . . it would be responsible for future wildfire costs associated with PG&E lines. That could potentially affect the creditworthiness of the state.").

This dying infrastructure is at the center of the megafires ravaging Northern California and needs to be rebuilt. California has an opportunity to build a power grid resilient to climate change by migrating the lines underground wherever possible. Yet, PG&E estimates the cost of migrating overhead distribution lines underground at around $3 million per mile.[12] With approximately 81,000 miles of overhead distribution lines,[13] this estimate would place the cost for undergrounding PG&E's entire distribution network at roughly $243 billion.[14] Thus, conventional wisdom is that undergrounding is not a viable option to minimize California's fire risk because of the steep sticker price. Adding credence to this assumption is that, while ratepayers may desire undergrounding, their tolerance for rate hikes to cover the costs of undergrounding is minimal.[15] The Edison Electric Institute (EEI), which represents all of the United States' IOUs, released a report in 2012 that found that less than 10% of polled customers would be amenable to their bills increasing twofold, which EEI states is necessary to pay for the cost of undergrounding.[16]

Given this resistance to undergrounding, there is little academic scholarship exploring the feasibility of undergrounding, particularly in California.[17] This Note aims to augment that scholarship by analyzing the undergrounding of PG&E's network in the context of California's regulatory framework and climate change's impact on the state. In response to the Camp Fire that destroyed Paradise, California, in 2018, then-Governor Jerry Brown famously stated that "[t]his is not the new normal, this is the new abnormal. And this new abnormal will continue, certainly in the next ten to fifteen to twenty years. And unfortunately, the best science is telling us that dryness, warmth, drought, all those things, they're going to intensify."[18] Undergrounding is not the panacea to California's wildfire risks, but it can no longer be written off as simply infeasible due to cost. Rather, the costs related to the new abnormal California faces dictate that the narrative around undergrounding must change. Treating undergrounding as an all-or-nothing solution, which makes undergrounding cost-prohibitive, is no longer relevant given the dramatic impacts of climate change on California's environment. Indeed, the impacts of the new abnormal demonstrate that selective undergrounding is necessary for the creation of a resilient power grid.

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12. *Facts About Undergrounding Electric Lines*, PG&E (Oct. 31, 2017), http://www.pgecurrents.com/2017/10/31/facts-about-undergrounding-electric-lines/.

13. *Id.*

14. The author approximated this estimate by multiplying PG&E's $3 million per mile estimate by 81,000. This estimate is meant as an illustration and should not be cited as the precise cost estimate for undergrounding all of PG&E's above ground distribution network.

15. KENNETH L. HALL, EDISON ELECTRIC INST., OUT OF SIGHT, OUT OF MIND 2012: AN UPDATED STUDY ON THE UNDERGROUNDING OF OVERHEAD POWER LINES, at v (2012), http://www.eei.org/issuesandpolicy/electricreliability/undergrounding/Documents/UndergroundReport.pdf.

16. *Id.*

17. Peter H. Larsen, *A Method to Estimate the Costs and Benefits of Undergrounding Electricity Transmission and Distribution Lines*, 60 ENERGY ECON. 47, 47 (2016).

18. Cal OES, *Live: Emergency Officials Provide Wildfire Update at State Operations Center*, YOUTUBE (Nov. 11, 2018), https://www.youtube.com/watch?v=hAVF-SWaPOQ&feature=emb_title.

Therefore, the debate around undergrounding should focus on the regulatory mechanisms necessary to ensure that selective undergrounding projects in high fire risk zones are prioritized and that project management best practices mitigate the cost and timelines of implementation. To facilitate this debate, this Note examines multiple issues: (1) It looks at how California's new state of "abnormal" makes fires more destructive and appraises the attendant costs; (2) it reviews the California Public Utilities Commission's (CPUC) Electric Rule 20 (Rule 20) program, which currently governs ratepayer funded undergrounding projects; (3) it attempts to determine the full costs of undergrounding and examines PG&E's history with undergrounding; (4) it summarizes California's legislative response to the megafires and PG&E's Wildfire Mitigation Plan (WMP); and (5) it analyzes the feasibility of PG&E's WMP achieving the state's legislative aims.

The analysis reveals that ensuring safe, reliable service that limits the risk of wildfire requires an overhaul of PG&E's distribution line infrastructure. The data demonstrate that the preventive measures currently proposed by PG&E are woefully insufficient to provide the necessary resilience for withstanding the new abnormal.[19] Rather, the realities of executing those measures indicate that undergrounding should be given a priority position in the mix of fire risk reduction strategies—above both vegetation management and de-energization measures—to ensure that the state's largest power provider is able to deliver energy effectively. The impacts of climate change on California's landscape now require that power grid infrastructure be moved underground, where feasible, particularly in high fire-threat zones to ensure the long-term health and safety of the state's residents as well as their property. Furthermore, a resilient power grid is necessary to facilitate California's shift away from fossil fuels to achieve the state's ambitious goal of reducing greenhouse gas emissions by 40% below 1990 levels by 2030.[20]

A. DRIVERS OF THE NEW ABNORMAL

1. Climate Change

The new abnormal is a consequence of many factors, several of which stem from climate change. In the past decade, California has experienced some of its hottest years on record, resulting in a severe and protracted drought.[21] The

19. *See Out of Control: The Impact of Wildfires on our Power Sector and the Environment: Hearing Before the Subcomm. on Energy & Subcomm. on Env't & Climate Change of the H. Comm. on Energy & Commerce*, 116th Cong. 1–2 (2020) (testimony of William D. Johnson, Chief Executive Officer and President, PG&E Corp.) [hereinafter *Hearing on Wildfires*] ("[E]lectric transmission and distribution lines and related infrastructure are vulnerable to extreme weather conditions, including winds over 70 miles per hour.").

20. S.B. 32, 2015–2016 Leg. (Cal. 2016) (adding CAL. HEALTH & SAFETY § 38566).

21. CAL. OFFICE OF ENVTL. HEALTH HAZARD ASSESSMENT, INDICATORS OF CLIMATE CHANGE IN CALIFORNIA: REPORT SUMMARY 4 (2018), https://oehha.ca.gov/media/downloads/climate-change/report/2018indicatorssummary.pdf ("The last four years were notably warm, with 2014 being the warmest on record, followed by 2015, 2017, and 2016."). *Id.* at 5 ("Five of the eight years of severe to extreme drought . . . occurred between 2007 and 2016, with unprecedented dry years in 2014 and 2015. The record warmth from 2012 to 2016

warmed, parched environment, a concomitant effect of the drought, enabled a plague of bark beetles to attack weakened trees across the state,[22] resulting in the death of nearly 150 million trees since 2010.[23] Examining the causes of the new abnormal and increased scale of California's wildfires, the California Department of Forestry and Fire Protection ("CAL FIRE") found that: the fire season is now more than two months longer than historical data show, and that "reduced snowpack, and earlier spring snowmelt create longer and more intense dry seasons that increase moisture stress on vegetation . . . ."[24] The "unusually warm temperatures intensif[y] the effects of very low precipitation and snowpack and create[] conditions for extreme, high severity wildfires that spread rapidly."[25] Moreover, the state's "forests and woodlands are responding to climate change" with an increase in growth of smaller trees and oak trees, which provide fuel for wildfires.[26]

2. Forest Management

While climate change is responsible for many of the conditions that fuel wildfires, the state's and federal government's forest management practices have intensified the scale of devastation. Research indicates that "[a] century of aggressive fire suppression and decades of restricted timber harvesting have resulted in an unnatural accumulation of fuels on many California forestlands. Where 50–70 trees per acre stood before the Gold Rush, California forests now average over 400 trees per acre."[27] Overgrown forests increase fire fuel supply and prevent snowfall from being added to the snowpack, which is a critical component of the state's water supply system "and is expected to decline as a result of rising temperatures."[28] In response to Governor Gavin Newsom's directive under Executive Order N-05-19 to recommend "administrative, regulatory and policy changes . . . necessary to prevent and mitigate wildfires to the greatest extent possible, with an emphasis on environmental sustainability and protection of public health,"[29] CAL FIRE reviewed its policies and found that "California's forest management efforts have not kept pace with these growing [climate change-related] threats."[30] In fact, evaluation of California's

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coincided with consecutive dry years, including a year of record low snowpack, leading to the most extreme drought since instrumental records began in 1895.").

22. FOREST SERVS., USDA, BARK BEETLES IN CALIFORNIA CONIFERS: ARE YOUR TREES SUSCEPTIBLE? 1 (2015), https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5384837.pdf.

23. *Hearing on Wildfires*, *supra* note 19, at 1.

24. *See* CAL. DEP'T OF FORESTRY & FIRE PROT., COMMUNITY WILDFIRE PREVENTION & MITIGATION REPORT: IN RESPONSE TO EXEC. ORDER N-05-19, at 4 (2019), https://www.fire.ca.gov/media/5584/45-day-report-final.pdf.

25. CAL. OFFICE OF ENVTL. HEALTH HAZARD ASSESSMENT, *supra* note 21, at 9.

26. *Id.*

27. Christopher Dicus, *Fire on the Landscape: Current Policies and a Changing Climate Lead Toward Higher Costs, More Severe Wildfire*, 13 CAL. FORESTS 16, 16 (2009).

28. S.B. 901 § 1(c), 2017–2018 Leg. (Cal. 2018).

29. Cal. Exec. Order N-05-19 (Jan. 8, 2019), https://www.gov.ca.gov/wp-content/uploads/2019/01/1.8.19-EO-N-05-19.pdf.

30. CAL. DEP'T OF FORESTRY & FIRE PROT., *supra* note 24, at 4.

forests indicates that fifteen million acres require care and that the current levels of state, federal, and private forest management are "inadequate to improve the health of millions of acres of forests and wildlands,"[31] which is necessary to mitigate the intensity and frequency of wildfires.

3. Land Use Practices

Increased development within these vulnerable forests is another important factor.[32] Communities in the wildland-urban interface (WUI), defined by CAL FIRE as "[t]he line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels,"[33] face the greatest risk. Building in this transition zone, areas naturally susceptible to wildfires, greatly increases the risk of fire.[34] Yet, between 1990 and 2010, roughly a million homes were built in California WUIs.[35] WUIs span a wide-range of communities from Bay Area cities like Berkeley to rural communities that dot the foothills of the Sierra Nevada to metropolitan areas between Los Angeles and Orange counties.[36] Additionally, exposure to fire has not deterred residents from rebuilding in WUIs.[37] From 1970 to 2009, "49 percent of burned buildings [in California] were rebuilt within six years," according to United States Forest Service researcher Miranda H. Mockrin.[38] Although homes built after 1991 must meet the nation's strictest fire regulations, the average California home dates from the 1950s.[39] Therefore, a significant portion of the population lives in homes vulnerable to fire risk.

Paradise, California, is representative of a WUI community that endured the horrific effects of wildfire-related devastation. Founded in the late 1800s, the town is nestled in the forests of the Sierra Nevada foothills.[40] The town's population of nearly 27,000 was composed of retirees and those looking for a more affordable alternative to California's expensive coastal cities and towns.[41] In recent years, like many other California towns, Paradise developed further and further into overgrown forested areas with little fire planning or zoning

31. *Id.*

32. Kendra Pierre-Louis & Jeremy White, *Americans Are Moving Closer to Nature, and to Fire Danger*, N.Y. TIMES (Nov. 15, 2018), https://www.nytimes.com/2018/11/15/climate/california-fires-wildland-urban-interface.html.

33. CAL. DEP'T OF FORESTRY & FIRE PROT., *supra* note 24, at 20.

34. Pierre-Louise & White, *supra* note 32.

35. *Id.*

36. *See id.*

37. *Id.*

38. *Id.*

39. *Id.*

40. Kirk Siegler, *"Reimaging Paradise"—Making Plans to Rebuild a Town Destroyed by Wildfire*, NPR (Mar. 7, 2019, 9:29 AM), https://www.npr.org/2019/03/07/700825538/re-imagining-paradise-making-plans-to-rebuild-a-town-destroyed-by-wildfire.

41. *Id.*; Dale Kasler & Ryan Lillis, *Paradise Will "Rise from the Ashes" After Camp Fire. Is That a Good Idea?*, SACRAMENTO BEE (Dec. 16, 2018, 12:00 PM), https://www.sacbee.com/news/california/fires/article222900130.html.

forethought.[42] In 2013, Butte County, where Paradise is situated, estimated that 99% of "Paradise residents lived in areas facing a very high risk of wildfire."[43] In fact, the community weathered twelve fires in nearly twenty-years before the Camp Fire destroyed 90% of Paradise, tragically claiming eighty-five lives and razing close to 19,000 structures.[44]

In calling for reducing fire risk, former CAL FIRE Director and thirty-year veteran of the force, Ken Pimlott stressed that "[w]e have hundreds of communities like Paradise all over the state" and "[against] a fire that's burning like a blowtorch . . . our way of fighting fire isn't going to work."[45] Indeed, Paradise is one of 1329 WUI communities designated as high fire risk in California.[46] Mr. Pimlott recommended officials consider prohibiting development in these fire prone areas; because, even though California "has the nation's most robust building requirement programs for new homes in fire-prone areas," they have not been sufficient to stave off wildfire risk as megafires have only grown in size and frequency.[47] Rather than prohibiting development in WUIs as a fire reduction measure, the state should consider requiring undergrounding of power lines, wherever feasible, in these communities to remove a frequent source of wildfire ignition.

B. THE NEW ABNORMAL'S COST

The overall cost of the new abnormal justifies the expense of undergrounding. As the atmosphere continues to warm towards 1.5 degrees Celsius ("1.5C") (2.7 degrees Fahrenheit) above pre-1990 levels, the country and world will increasingly experience more dangerous natural disasters.[48] The U.S. Global Change Research Program reports that "[m]ore frequent and intense extreme weather and climate-related events, as well as changes in average climate conditions, are expected to continue to damage infrastructure, ecosystems, and social systems that provide essential benefits to communities."[49] In the past few years, communities in the United States have experienced natural disasters on a scale not previously seen, such as massive

42. Siegler, *supra* note 40.

43. Kasler & Lillis, *supra* note 41.

44. Siegler, *supra* note 40.

45. Steve Schoonover, *Feds Make Push for More Forest Management After Camp Fire*, CHICO ENTERPRISE-RECORD, https://www.chicoer.com/2018/11/26/feds-make-push-for-more-forest-management/ (last updated Nov. 26, 2018).

46. *Communities at Risk List*, CAL FIRE, https://osfm.fire.ca.gov/divisions/wildfire-planning-engineering/fire-plan/communities-at-risk / (last visited June 28, 2020).

47. Don Thompson, *Official: California Must Mull Home Ban in Fire-Prone Areas*, CHI. TRIBUNE (Dec. 11, 2018, 2:52 PM), https://www.chicagotribune.com/news/nationworld/ct-california-fires-home-ban-20181211-story.html.

48. U.N. Env't Programme & World Meteorological Org., Intergovernmental Panel on Climate Change [IPCC], *IPCC Special Report on Global Warming of 1.5°C: Summary for Policymakers* 9 (Valérie Masson-Delmotte et al. eds., 2018), https://www.ipcc.ch/site/assets/uploads/2018/10/SR15_SPM_version_stand_alone_LR.pdf.

49. U.S. GLOB. CHANGE RESEARCH PROGRAM, FOURTH NATIONAL CLIMATE ASSESSMENT: SUMMARY FINDINGS 25 (2018), https://nca2018.globalchange.gov/downloads/NCA4_Ch01_Summary-Findings.pdf.

mudslides, vast flooding, ruinous hurricanes, and deadly wildfires.[50] The National Oceanic and Atmospheric Administration reports that in 2019 alone, fourteen climate-related catastrophes led to losses exceeding $1 billion each across the United States "with a total cost of $45.0 billion."[51] Moreover, 2017 was the "costliest year on record for natural disasters in the United States, with a price tag of *at least* $306 billion."[52]

1. The New Abnormal's Impact on California's Economy and Public Welfare

Calculating the full costs of California's wildfires requires extending the costs reflected in the conventional cost benefit analysis to include the broader impacts on society. Insurers have already paid out over $24 billion in losses related to the 2017 and 2018 fires in California,[53] and damage from the 2019 fires is estimated at $25.4 billion.[54] Yet, these totals likely significantly underestimate the full scale of economic losses from the wildfires.[55] For instance, more and more private insurers are refusing to issue policies for wildfire prone areas, which exacerbates the state's housing crisis by adding expensive government and wrap-around insurance costs to already steep housing prices.[56] Additionally, unreliable power threatens California's economy as technology companies that require massive amounts of power for their operations may move to other states, taking with them their share of the state's revenues from the innovation economy.[57] The fires and unreliable power also pose severe threats to tourism as well as California's wine industry and its "$57.6

50. Umair Irfan & Brian Resnick, *Megadisasters Devastated America in 2017. And They're Only Going to Get Worse*, VOX, https://www.vox.com/energy-and-environment/2017/12/28/16795490/natural-disasters-2017-hurricanes-wildfires-heat-climate-change-cost-deaths (last updated Mar. 26, 2018); *Tens of Millions Face Flooding Threat Across Midwest*, CBS NEWS (Sept. 3, 2018, 7:56 AM), https://www.cbsnews.com/news/flooding-threat-midwest-today-2018-09-03/.

51. NAT'L CTRS. FOR ENVTL. INFO., NAT'L OCEANIC ATMOSPHERIC ADMIN., *Billion-Dollar Weather and Climate Disasters: Time Series*, https://www.ncdc.noaa.gov/billions/time-series (last visited June 28, 2020).

52. Irfan & Resnick, *supra* note 50.

53. Nicole Friedman, *High Cost of Wildfire Insurance Hurts California Home Sales*, WALL ST. J. (Jan. 5, 2020, 5:30 AM), https://www.wsj.com/articles/high-cost-of-wildfire-insurance-hurts-california-home-sales-11578220200.

54. Nic Querolo & Brian K. Sullivan, *California Fire Damage Estimated at $25.4 Billion,* BLOOMBERG, https://www.bloomberg.com/news/articles/2019-10-28/california-fire-damages-already-at-25-4-billion-and-counting (last updated Oct. 29, 2019).

55. For a detailed account, see Figure 6 captioned "The Protection Gap Has Widened Over Time." *Storms, Wildfires and Floods: How Climate Change Amplifies Insurance Risk*, SWISS RE GROUP (Apr. 7, 2020), https://www.swissre.com/risk-knowledge/mitigating-climate-risk/how-climate-change-amplifies-insurance-risk.html.

56. *Id.* While the State placed a moratorium on insurers dropping homes in high-risk fire zones, the moratorium only applies to existing policies and does not ease the barrier to entry for new home purchases. Nicole Friedman, *California Bans Insurers from Dropping Homes in Wildfire Areas*, WALL ST. J., https://www.wsj.com/articles/california-bans-insurers-from-dropping-homes-in-wildfire-areas-11575585626?mod=article_inline (last updated Dec. 5, 2019).

57. J.D. Morris, *PG&E Electricity Rates Could Double After More Wildfires, Report Says*, S.F. CHRON., https://www.sfchronicle.com/business/article/California-electricity-rates-could-surge-50-13757757.php (last updated Apr. 11, 2019).

billion state economic impact."[58] Furthermore, the megafires pose great health risks, not only to those in the line of fire but also to those in the surrounding region who are susceptible to respiratory illness as a result of impacted air quality,[59] potentially stressing California's public health system and causing unnecessary loss of life. It is estimated that nearly 340,000 people worldwide die annually from wildfire smoke.[60] Forebodingly, the U.S. Forest Service estimates that "[b]y 2050 . . . wildfires will be twice as destructive as they are today; in some places, the area burned could grow fivefold,"[61] indicating that wildfire costs borne by society will only increase.

In addition to the health, insurance, and economic costs associated with megafires, California is also managing the implications of PG&E's bankruptcy filing.[62] In January 2019, PG&E filed a defensive bankruptcy to limit its "estimated $30 billion or more in liabilities" stemming from recent megafires.[63] In response to the filing, Governor Newsom issued a statement declaring that PG&E's choice to seek reorganization in bankruptcy court did not alter his commitment to ensuring "that Californians have access to safe, reliable and affordable service, that victims and employees are treated fairly, and that California continues to make forward progress on our climate change goals."[64] However, achieving these goals may prove impossible without rebuilding PG&E's infrastructure to withstand the new abnormal.

2. The New Abnormal's Impact on Climate Change Policy

In a letter to Ana Matosantos, Governor Newsom's Cabinet Secretary, Steven Weissman, a lecturer at U.C. Berkeley's Goldman School of Public Policy, stressed that electric rates could "skyrocket . . . by 50%" as a result of

58. *Media & Trade*, CAL. WINE INST., https://discovercaliforniawines.com/media-trade/statistics/ (last visited June 28, 2020); *see also* Vivian Ho, *After the Wildfires: Tourist Firms in California's Wine Country Say No One Is Coming*, GUARDIAN (Feb. 8, 2020, 6:00 AM), https://www.theguardian.com/us-news/2020/feb/08/guerneville-wine-country-climate-crisis-business; Ester Mobley, *Wildfires and Wine Country: How the Industry Is Adapting to New Realities*, S.F. CHRON., www.sfchronicle.com/wine/article/Wildfires-and-Wine-Country-How-the-Industry-is-14563760.php (last updated Oct. 28, 2019).

59. U.S. GLOB. CHANGE RESEARCH PROGRAM, *supra* note 49, at 27.

60. David Wallace-Wells, *The Uninhabitable Earth*, N.Y. MAG.: INTELLIGENCER (July 10, 2017), http://nymag.com/intelligencer/2017/07/climate-change-earth-too-hot-for-humans.html.

61. *Id.*

62. *See PG&E Bankruptcy*, CAL. PUB. UTILS. COMM'N, http://www.cpuc.ca.gov/pgechapter11 (last visited June 28, 2020); *PG&E Corporation and Pacific Gas and Electric Company*, U.S. BANKR. CT., N.D. CAL., http://www.canb.uscourts.gov/case-info/pge-corporation-and-pacific-gas-and-electric-company (last visited June 28, 2020).

63. G. Marcus Cole, *Stanford Law's Marcus Cole on PG&E Bankruptcy: No Free Lunches*, STAN. L. SCH. BLOGS: LEGAL AGGREGATE (Mar. 1, 2019), https://law.stanford.edu/2019/03/01/stanford-laws-marcus-cole-on-the-pge-bankruptcy/; Peter Eavis & Ivan Penn, *Can PG&E Survive the California Wildfires?*, N.Y. TIMES (Oct. 29, 2019), https://www.nytimes.com/2019/10/29/business/energy-environment/pge-bankruptcy.html. As part of its bankruptcy proceeding, PG&E reached a $13.5 billion settlement with fire victims and plead guilty to involuntary manslaughter charges arising from the Camp Fire. Ivan Penn & Peter Eavis, *PG&E Will Plead Guilty to Involuntary Manslaughter in Camp Fire*, N.Y. TIMES (Mar. 23, 2020), https://www.nytimes.com/2020/03/23/business/energy-environment/pge-camp-fire-manslaughter.html.

64. Press Release, Gavin Newsom, Governor of California, Governor Newsom Statement on PG&E Bankruptcy Filing (Jan. 29, 2019), https://www.gov.ca.gov/2019/01/29/pge-bankruptcy-filing/.

the liabilities accrued from the 2017 and 2018 wildfires.[65] Mr. Weissman warned that such a dramatic increase in cost to the consumer would make accomplishing the state's 2030 emissions reductions goals impossible because increasing the cost of electricity may lead customers to not use electric cars or convert to electric appliances and heating, which are critical components of the state's climate change policies.[66] In an interview with the *San Francisco Chronicle*, Mr. Weissman underscored that "if the expectation is that, on an ongoing basis, ratepayers are going to be covering the costs of these wildfires if they're triggered by utilities, that is going to make it far more challenging to try to accomplish a significant conversion from using fossil fuels to using electricity."[67]

Adding to California's challenges for meeting its greenhouse gas reduction goals are the smoke emissions from megafires, which contribute a shocking amount of black carbon, a short-lived climate pollutant, to the atmosphere.[68] For example, CAL FIRE found that "[t]he 2013 Rim Fire, which burned 257,000 acres [near Yosemite], generated roughly 15 million metric tons of greenhouse gas emissions, as much pollution as 2.3 million vehicles generate in a given year."[69] It is estimated that emissions from a single year of statewide wildfires, roughly twenty-five million tons, can negate the transportation fuel carbon reduction gains of the next decade.[70] Furthermore, wildfires that destroy forests damage a critical carbon sink supporting the state's climate change response.[71] The legislature found that unless meaningful change is made to the status quo to "reduce[] the risk and intensity of wildfires," achievement of the state's greenhouse gas emission reduction programs will be impossible.[72] Taking into account the full costs of wildfires shows that, given the imperative to reduce greenhouse gas emissions and the ongoing impact wildfires have on public health, well-being and the economy, it is time to change the way the state approaches fire management. The steep upfront cost of undergrounding should not be permitted to stand in the way of the significant long-term benefits and savings achievable by avoiding the exorbitant costs incurred from wildfires year after year.

65. Memorandum from Steven Weissman, Lecturer, U.C. Berkeley's Goldman Sch. of Pub. Policy, to Ana Matosantos, Cabinet Sec'y for Governor Gavin Newsom, The Massive Costs of the "New Normal" in Wildfires & Climate Change Era (Apr. 10, 2019), https://gspp.berkeley.edu/news/news-center/the-massive-cost-of-the-new-normal-in-wildfires-climate-change-era.

66. *Id.*; *see also* S.B. 350, 2015–2016 Leg. (Cal. 2015); CAL. AIR RES. BD., CALIFORNIA'S 2017 CLIMATE CHANGE SCOPING PLAN 74 (2017), https://ww3.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf.

67. Morris, *supra* note 57.

68. *See* S.B. 901 § 1(e), 2017–2018 Leg. (Cal. 2018).

69. *Id.* § 1(f).

70. *Id.*

71. CAL. ENVTL. PROT. AGENCY, STATE AGENCY GREENHOUSE GAS REDUCTION REPORT CARD tbl.3-1 (2018), https://www.energy.ca.gov/sites/default/files/2019-12/2018_CalEPA_Report_Card.pdf.

72. S.B. 901 § 1(f).

C. AUSTRALIA'S WILDFIRES: A PORTENT FOR CALIFORNIA

California has yet to determine the final costs of the megafires, but the California Department of Insurance announced that the 2018 wildfires "were the world's most expensive natural disasters, with more than $12 billion in total insured losses reported to date."[73] This determination was made prior to the 2019–2020 Australian wildfires, the immense scale of which is a forceful warning for California.[74] Where the 2018 California fires burned 1.7 million acres, the Australian bush fires burned roughly 30 million acres.[75] Professor Rob Jackson of Stanford University predicts that "emissions from this fire season will be close to a billion tons of carbon dioxide by the time the bush fires are finally extinguished,"[76] which is twice the amount of Australia's annual emissions from all other sources.[77] The Met Office, the United Kingdom's national meteorological service, expects that "[e]missions from the Australian bushfires will make up one-fifth" of the world's annual increase in carbon emissions, pushing the "world closer to 1.5C of global heating."[78] Horrifically, Professor Chris Dickman, an ecologist at the University of Sydney's Faculty of Science, estimates that the fires have killed more than one billion animals.[79] Finally, the impact of the haze caused by the wildfires on Sydney's economy is calculated to be between $12 million and $50 million in Australian dollars per day.[80] Without significant action to reduce California's wildfire risk, the state may be vulnerable to fire of the magnitude suffered by Australia. If the state were to endure a burn of 30 million acres, the losses would be staggering and may easily rival the $243 billion estimate for undergrounding PG&E's entire distribution network.

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73. Press Release, Cal. Dep't of Ins., Insurance Commissioners Visit Site of California's Most Destructive Wildfire During Risk and Resilience Summit (May 2, 2019), http://www.insurance.ca.gov/0400-news/0100-press-releases/2019/release036-19.cfm.

74. Ed Johnson, *Australia's Wildfire Crisis: Key Numbers Behind the Disaster*, BLOOMBERG, https://www.bloomberg.com/news/articles/2020-01-02/australia-s-wildfire-crisis-key-numbers-behind-the-disaster (last updated Jan. 15, 2020); Amy Corderoy & Lisa Cox, *Counting the Cost of Australia's Summer of Dread*, GUARDIAN (Feb. 11, 2020), https://www.theguardian.com/environment/ng-interactive/2020/feb/11/counting-the-cost-of-australias-summer-of-dread.

75. Johnson, *supra* note 74.

76. Andrew Freedman, *Australia's Greenhouse Gas Emissions Effectively Double as a Result of Unprecedented Bush Fires*, WASH. POST (Jan. 24, 2020), https://www.washingtonpost.com/weather/2020/01/24/australia-bush-fires-have-nearly-doubled-countrys-annual-greenhouse-gas-emissions/.

77. Denise Chow, *Australia Wildfires Unleash Millions of Tons of Carbon Dioxide*, NBC NEWS (Jan. 22, 2020, 10:57 AM), https://www.nbcnews.com/science/environment/australia-wildfires-unleash-millions-tons-carbon-dioxide-n1120186.

78. Fiona Harvey, *Australian Bushfires Will Cause Jump in CO2 in Atmosphere, Say Scientists*, GUARDIAN (Jan. 23, 2020, 7:01 PM), https://www.theguardian.com/environment/2020/jan/24/australian-bushfires-will-cause-jump-in-co2-in-atmosphere-say-scientists.

79. *More than One Billion Animals Killed in Australian Bushfires*, UNIV. SYDNEY (Jan. 8, 2020), https://sydney.edu.au/news-opinion/news/2020/01/08/australian-bushfires-more-than-one-billion-animals-impacted.html#.XhWtKc7PatE.whatsapp.

80. Tim McDonald, *Australia Fires: The Huge Economic Cost of Australia's Bushfires*, BBC (Dec. 20, 2019), https://www.bbc.com/news/business-50862349.

II. UNDERGROUNDING: A POTENTIAL SOLUTION

A. THE INHERENT RISK OF OVERHEAD POWER LINES

Electrical systems are a complex network of transmission, distribution, and service lines.[81] Power is provided through transmission lines, which transmit electricity from a power generation facility to sub-stations.[82] Distribution lines then carry the electricity from sub-stations to a transformer.[83] Service lines then transfer that electricity to the consumer by transmission of power from the transformer to the customer's weather-head, the entry point for service to a building.[84] While providing a necessary service, this technology is vulnerable to fire and a common source of ignition for major fires.[85] A 2016 report on the causes of wildland fires, by the National Wildfire Coordinating Group,[86] found that sources of power line fire ignition include: high winds; equipment failure; contact with vegetation, either as a result of inadequate clearances for standing vegetation or other vegetation on the ground;[87] contact with animals and litter; and poor equipment maintenance and cleaning.[88] Furthermore, distribution networks are a more likely cause of fire than transmission lines, because distribution networks are closer to vegetation.[89]

The circumstances surrounding an ignition depend on its source. For example, fires stemming from conductor failure occur when power poles, linking lines together, break and fall to the ground allowing the lines to arc.[90] In other instances, although regulations require utilities to account for line sag in high temperatures and wind conditions, these circumstances cause numerous fire ignitions.[91] Additionally, a fire may ignite due to the re-energizing of a line after a manual or automatic re-closure of the line or due to an arc caused by contact with birds.[92] Further risk is posed by insulators, the large coils attached to conductors, which can erupt in fire due to failures from a variety of factors ranging from dirt and bird manure to high humidity and lightning strikes.[93]

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81. NAT'L WILDFIRE COORDINATING GRP., GUIDE TO WILDLAND FIRE ORIGIN AND CAUSE DETERMINATION 245 (2016), https://www.nwcg.gov/sites/default/files/publications/pms412.pdf.

82. *Id.*

83. *Id.*

84. *Id.* at 246.

85. *Id.* at 245.

86. Members of the National Wildfire Coordinating Group include: Bureau of Indian Affairs (U.S. Department of the Interior), Bureau of Land Management (U.S. Department of the Interior), Fish and Wildlife Service (U.S. Department of the Interior), Forest Service (U.S. Department of Agriculture), International Association of Fire Chiefs, Intertribal Timber Council, National Association of State Foresters, National Park Service (U.S. Department of the Interior), United States Fire Administration (Federal Emergency Management Agency). *The National Wildfire Coordinating Group*, NAT'L WILDFIRE COORDINATING GRP., https://www.nwcg.gov/ (last visited June 28, 2020).

87. NAT'L WILDFIRE COORDINATING GRP., *supra* note 81.

88. *Id.* at 246.

89. *Id.* at 245–46.

90. *Id.* at 248.

91. *Id.*

92. *Id.*

93. *Id.* at 251–52.

A review of 414 incidents, reported from 2015 to 2017 in PG&E's high fire-threat districts,[94] found power line and equipment failure accounted for the vast majority of ignitions.[95] Dry vegetation and the failure of conductors and connectors, or hardware and other equipment failures accounted for 49% and 28% of ignitions, respectively.[96] In contrast, third-party contact constituted 13% of ignitions and animals caused 8% of ignitions.[97] Finally, unknown ignitions, defined by PG&E as, "situations where PG&E was unable to determine the cause of ignition," but "it appeared that the ignition may have been attributable to PG&E facilities" represented 3% of ignitions.[98]

The high risk of fire due to power line and equipment failure underscores the imperative for utilities to vigilantly monitor their distribution, transmission, and service line systems. Yet, in investigating the causes of the Camp Fire, the CPUC found that PG&E systematically failed to adequately inspect its lines.[99] The company regularly deferred maintenance on its oldest lines and failed to climb towers to inspect equipment not visible from the ground.[100] Confirming this failure, PG&E's Chief Executive Officer, William Johnson, acknowledged in recent testimony to the House of Representatives' sub-committees on Energy and Environment and Climate Change that in 2019 PG&E undertook "an *unprecedented process* to inspect every element of our electric system within the high fire-threat areas."[101]

While the company has now reviewed "almost 750,000 transmission, distribution and substation structures and over 25 million electrical components in those areas"[102] much of its grid remains past its useful life. PG&E estimates that "the average age of its towers [i]s 68 years, but the mean life expectancy [i]s only 65 years."[103] The Caribou-Palermo transmission line, which sparked the Camp Fire, has been operating since 1921.[104] When the company requested to replace the Caribou-Palermo line's wires, it declined to update the line's towers, indicating that PG&E may adhere to the notion of running equipment to

94. *See FireMap*, CAL. PUB. UTILS. COMM'N, https://ia.cpuc.ca.gov/firemap/ (last visited June 28, 2020).

95. PAC. GAS & ELEC. CO., PACIFIC GAS AND ELECTRIC COMPANY'S WILDFIRE MITIGATION PLAN 26–27 (2019), http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M263/K673/263673423.PDF.

96. *Id.*

97. *Id.*

98. *Id.* at 26.

99. Russel Gold & Katherine Blunt, *PG&E Had Systemic Problems with Power Line Maintenance, California Probe Finds*, WALL ST. J., https://www.wsj.com/articles/pg-e-had-systemic-problems-with-power-line-maintenance-california-probe-finds-11575338873 (last updated Dec. 3, 2019, 12:27 PM); *see also* PAC. GAS & ELEC. CO. ET AL., JOINT MOTION OF PACIFIC GAS AND ELECTRIC COMPANY (U 39 E), THE SAFETY AND ENFORCEMENT DIVISION OF THE CALIFORNIA PUBLIC UTILITIES COMMISSION, COALITION OF CALIFORNIA UTILITY EMPLOYEES, AND THE OFFICE OF THE SAFETY ADVOCATE FOR APPROVAL OF SETTLEMENT AGREEMENT (2019), https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2019/I.19-06-015_Joint%20Motion%20for%20Approval%20of%20Settlement%20Agmt_12-17-19PDFA.pdf.

100. *Id.*

101. *Hearing on Wildfires*, *supra* note 19, at 3 (emphasis added).

102. *Id.*

103. Gold & Blunt, *supra* note 99.

104. *Id.*

failure before replacing it.[105] Adding to the danger posed by outdated equipment is the fact that much of PG&E's service area is situated among roughly 100 million trees "with the potential to grow into or fall into the lines."[106] Thus, the risk of overhead power line ignition combined with the force-multipliers of climate change, dead and at-risk vegetation, and development in the WUI, emphasize that current fire prevention systems for overhead power lines are not sufficient.[107]

B. TAKING ADVANTAGE OF UNDERGROUNDING

Undergrounding is not a silver bullet for wildfires; but the days of blindly accepting that it is cost prohibitive, and therefore a non-starter, are over. The new abnormal requires a holistic approach to cost-benefit analysis rather than an "atomistic and reductionist approach adopted in the dominant style of Cost-Benefit Analysis."[108] This is because the holistic approach responds to the "nature of the risks involved, the questions of fairness and distribution of burdens, and the importance of providing for the future, [which] all affect the policies that should be adopted to protect health and the environment."[109] Not all of the system can or should be migrated underground, but there are high-risk areas where investment in undergrounding of distribution lines would save the state massive losses of life, health, and property.[110]

The benefits of undergrounding outweigh the costs. Noted benefits include: (1) robustness to most weather events, (2) less exposure to wildlife and trees, (3) increased reliability during high winds and storms, (4) easier obtainment of an easement, and (5) better public safety.[111] Significantly, undergrounding removes the entire cost of vegetation management.[112] However, key costs of undergrounding include: (1) the expense of installation, (2) higher replacement costs, (3) increased material costs and longer installation timeframes, (4) increased repair times, and (5) susceptibility of the system to damage from those digging improperly.[113] While the costs associated with undergrounding are mostly related to labor, and therefore can be held to a minimum through skillful project management, utilities cannot replicate the benefits associated with undergrounding any other way. Utilities should take the opportunity to move towards undergrounding as their primary means to remove most of the ignition

105. Ivan Penn et al., *How PG&E Ignored Fire Risks in Favor of Profits*, N.Y. TIMES (Mar. 18, 2019), https://www.nytimes.com/interactive/2019/03/18/business/pge-california-wildfires.html.

106. PAC. GAS & ELEC. CO., *supra* note 95, at 19.

107. CAL. DEP'T OF FORESTRY & FIRE PROT., *supra* note 24, at 4.

108. ACKERMAN & HEINZERLING, *supra* note 2, at 211.

109. *Id.* at 212–13.

110. *See* J.D. Morris, *Put PG&E's Power Lines Underground? It Can Be Done—Expensively and Slowly*, S.F. CHRON., https://www.sfchronicle.com/california-wildfires/article/Put-PG-E-s-power-lines-underground-It-can-be-14565060.php (last updated Oct. 27, 2019). Undergrounding is not appropriate in areas susceptible to earthquake or flooding. *Id.*

111. HALL, *supra* note 15, at 25.

112. *Id.* at 26.

113. *Id.*

risks associated with overhead distribution lines and maximize the resilience of their networks.

To facilitate an increase in the use of undergrounding, Governor Newsom should convene a commission of experts tasked specifically with developing a regulatory framework for carrying out undergrounding projects efficiently and expeditiously. Nearly 85% of the cost of undergrounding is related to digging trenches and repairing infrastructure damaged by that digging,[114] and the average timeline for an undergrounding project is five to seven years.[115] However, streamlined permitting processes and best practices for project implementation could greatly mitigate costs. To expedite projects, third-party contractors could be utilized instead of relying entirely on utility employees. As California counties argue, "[i]f local governments are able to perform the work themselves, or if a private company can be selected through a competitive solicitation, local governments will not be dependent on the IOUs' schedule and constraints."[116] Undergrounding PG&E's network offers the state a major jobs creation opportunity that can be used to revitalize local economies by supporting third-party businesses and local municipalities.[117] Furthermore, an increased focus on undergrounding over vegetation management would allow the Forest Management Task Force to take the lead on implementing programs that maximize forest health and carbon sequestration in line with the state's climate change policies.

Addressing the barriers to undergrounding requires a commission of experts who can reconcile: the nuances of the state's wide ranging climate change laws and the Rule 20 program; permitting requirements of the California Environmental Quality Act, National Environmental Policy Act, Endangered Species Act, and other statutory restrictions; PG&E's complex network of easements; the labor shortage for qualified line workers; and creative financing options. It also requires experts in supply chain and project management, who can unwind the various material, design, and labor costs associated with "trenching, conduit, substructures, cabling and connections, meter panel modifications, cutover work, and . . . removal from service of poles and wires," which the CPUC states "represent all costs associated with the undergrounding

114. David R. Baker, *Wine Country Fires: PG&E Often Diverts Money for Undergrounding Power Lines*, S.F. CHRON., https://www.sfchronicle.com/business/article/Wine-Country-fires-PG-E-often-diverts-money-for-12742239.php (last updated Mar. 13, 2018).

115. CAL. PUB. UTILS. COMM'N, AUDIT OF PG&E RULE 20A UNDERGROUNDING PROGRAM 34 (2019), https://www.cpuc.ca.gov/General.aspx?id=4403 (follow "PG&E's Rule 20A program" hyperlink).

116. Counties of Mendocino, Napa, & Sonoma, Comments on the Scoping Memo of the Order Instituting Rulemaking to Consider Revisions to Electric Rule 20 and Related Matters 7 (Jan. 11, 2019), http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M258/K310/258310682.PDF.

117. The COVID-19 outbreak in the United States erupted while this Note was already in the publication process. The United States, including the state of California, is experiencing unprecedented unemployment rates. As of May 2020, California has received 4.5 million unemployment claims with Governor Gavin Newsom predicting that "[u]nemployment numbers . . . will be north of 20 percent." George Avalos, *Coronavirus Unemployment: One-Fourth of California Workers Could Lose Jobs*, MERCURY NEWS, https://www.mercurynews.com/2020/05/11/coronavirus-unemployment-layoff-job-california-great-depression-newsom-tech-retail-restaurant-hotel-construction/ (last updated May 12, 2020).

effort."[118] Doing so requires state intervention as the local municipalities, CPUC and PG&E are overburdened with other pressing matters, including those arising from wildfires; and the Wildfire Safety Division (WSD) and Wildfire Safety Advisory Board (WSAB), tasked with overseeing implementation of WMPs,[119] are not suited to reconcile the specific issues constraining undergrounding.

C. THE CURRENT REGULATORY FRAMEWORK FOR IOU UNDERGROUNDING

The Rule 20 program governs IOU undergrounding projects. Developed in 1967, the program allows municipalities and utilities to designate projects for undergrounding, and it provides compensation to utilities for executing the project through credits that are approved as part of the utility's general rate case.[120] Approval of a Rule 20A project, the provision of Tariff Rule 20 governing municipal projects, requires that the project be in the public interest.[121] A public interest project is currently defined as one that: "[e]liminate[s] an unusually heavy concentration of overhead lines; [i]nvolve[s] a street or road with a high volume of public traffic; [b]enefit[s] a civic or public recreation area or area of unusual scenic interest; [or is listed] as an arterial street."[122] Under Rule 20A's structure, municipalities are the drivers for undergrounding projects. That is, municipalities must identify projects, hold public hearings, consult with the utility to determine if a project qualifies for utility ratepayer funds, and designate Underground Utility Districts (UDD) by resolution.[123] Rule 20A projects are often a result of organized neighborhood groups interested in undergrounding for aesthetic and property value reasons.[124] Notably, while Rule 20A's criteria are limited and do not include wildfire mitigation, the CPUC specially approved San Diego Gas and Electric's (SDG&E) consideration of wildfire risk as a criterion.[125] In 2014, the CPUC issued Rule 20D—a SDG&E-specific rule governing undergrounding in areas SDG&E identifies as high fire risk and determines that undergrounding would reduce wildfires and ensure reliability of service.[126] Communities that implement conversions pursuant to Rule 20D "receive 100% of utility funding."[127]

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118. *CPUC Undergrounding Programs: Conversion of Overhead Electric Lines to Underground Facilities and Construction of New Underground Electric Lines*, CAL. PUB. UTILS. COMM'N, http://www.cpuc.ca.gov/General.aspx?id=4403 (last visited June 28, 2020).

119. *See infra* notes 183–186 and accompanying text.

120. *CPUC Undergrounding Programs*, *supra* note 118.

121. *Id.*

122. *Id.*

123. *Id.*

124. *See* CAL. PUB. UTILS. COMM'N, OVERHEAD TO UNDERGROUND CONVERSION PROGRAMS 8, 10–11 (on file with *Hastings Law Journal*).

125. Order Instituting Rulemaking to Consider Revisions to Elec. Rule 20 & Related Matters, Cal.P.U.C., No. R. 17-05-010, 2017 WL 2269097, at *10 (May 11, 2017).

126. *Id.*

127. *Undergrounding Frequently Asked Questions*, CAL. PUB. UTILS. COMM'N, https://www.cpuc.ca.gov/General.aspx?id=6442465120 (last visited June 28, 2020).

Rule 20 should facilitate the annual undergrounding of a reasonable portion of a utility's network, but it does not. The CPUC estimates that the current Rule 20A program costs ratepayers $1 per month with an average of $95 million of credits allocated annually to over 500 jurisdictions statewide.[128] Yet, a 2016 CPUC review of the program found that SDG&E was the only energy company that sufficiently utilized the program.[129] SDG&E converts roughly fifteen miles of overhead lines per year and aims to relocate San Diego's remaining 1000 overhead utility lines within the next fifty-four years.[130] San Diego's undergrounding initiative is paid for with funds from the state's Rule 20A program and a surcharge applied to San Diego residents' utility bills, which generates $60 million annually and has facilitated San Diego's acceleration of undergrounding.[131] Furthermore, Rule 20 does not promote undergrounding in rural and suburban areas, which are predominantly the high fire-threat zones. Instead, the report shows that from 2011 to 2015 the majority of credits were allocated to the Bay Area, Los Angeles, Ventura, Orange County, and San Diego, which are predominantly urban counties.[132] Significantly fewer credits were issued to the Central Coast, Central Valley, Desert, Inland Empire, North State, or Sierra Foothills.[133] For instance, of the roughly $106.6 million of annual allocations that were made in 2015, less than $20 million went to municipalities in these high fire-threat regions.[134] Moreover, between 2005–2017, nearly $760

128. MARTIN KURTOVICH & MARZIA ZAFAR, CAL. PUB. UTILS. COMM'N, PROGRAM REVIEW: CALIFORNIA OVERHEAD CONVERSION PROGRAM RULE 20A, at iv (2016), https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/About_Us/Organization/Divisions/Policy_and_Planning/PPD_Work_Products_(2014_forward)(1)/PPD_Rule_20-A.pdf; CAL. PUB. UTILS. COMM'N, *supra* note 124, at 9.

129. KURTOVICH & ZAFAR, *supra* note 128, at v.

130. *Utilities Undergrounding Program*, CITY OF SAN DIEGO, https://www.sandiego.gov/undergrounding/overview (last visited June 28, 2020).

131. *Id.*; David Garrick, *San Diego Will Double the Pace of Utility Undergrounding Work as Size of Task Grows*, SAN DIEGO UNION-TRIBUNE (Feb. 18, 2018, 6:00 AM), https://www.sandiegouniontribune.com/news/politics/sd-me-utility-underground-20180218-story.html.

132. KURTOVICH & ZAFAR, *supra* note 128, at 7 fig.8; *see also Undergrounding Frequently Asked* Questions, *supra* note 127.

133. KURTOVICH & ZAFAR, *supra* note 128, at 7 fig.8.

134. *Id.* at 6. According to the comments from California counties on instituting Rule 20, the current system of credit allocation:

> [I]t takes local governments years, if not decades or centuries, to accumulate enough credits to underground a single mile of overhead powerlines, whether they bank the credits first or perform the work and pay off the deficit afterward. For example, as of late 2016, the County of Napa had a roughly $12 million undergrounding deficit for projects performed in St. Helena; with Napa's $155,792 per year credit allocation, it will be 77 years before the debt is retired. The city of Fort Bragg in Mendocino County will need approximately 27 years, at an annual allocation of $36,697, to accumulate $1 million, which is the median cost of undergrounding a single mile of overhead power lines in a rural area. Point Arena, which receives $2,950 per year in allocations, will need 339 years to bank $1 million in credits. The cities of Cloverdale and Cotati in Sonoma County, which receive between $20,000 and $25,000 per year in credits, will have to wait 40 to 50 years to accumulate $1 million, and between 55 and 68 years to reach the roughly $1.367 million median for suburban undergrounding.

Counties of Mendocino, Napa, & Sonoma, *supra* note 116, at 2–3.

million went to San Francisco, San Diego, Los Angeles, Long Beach, Oakland, San Jose, Chula Vista, Fresno and San Bernardino County.[135]

Acknowledging the program's failures, the CPUC issued a rulemaking for revisions to the Rule 20A program in May 2017.[136] The rulemaking is ongoing and is assessing whether the criteria for public interest should be adjusted, how joint utility and telecommunications infrastructure poles can be migrated underground, and how to distribute credits and financing of undergrounding projects fairly across localities.[137] Changes to Rule 20 are critical to promote modern public interest projects, but Rule 20 cannot alone solve the complexities of building a resilient power grid as it has not ensured timely completion of undergrounding projects on a schedule that comports with California's climate change laws; nor does it facilitate the prioritization of undergrounding by utilities outside the Rule 20 program.

D. INVESTIGATING THE COSTS OF UNDERGROUNDING

While considerable, the actual cost of undergrounding may not be as high as PG&E's estimates imply.[138] For example, EEI reports that although utilities quote the cost of undergrounding each circuit mile to be in the millions, actual costs are dependent on a number of factors, including location and whether the installation is a new install or a migration of existing equipment.[139] The EEI found that the average cost per mile for converting overhead to underground distribution ranged from $158,100 to $1.96 million in rural areas, $313,600 to $2.42 million in suburban regions, and $1 million to $5 million in urban areas.[140] Moreover, many utilities include the cost of installing new underground facilities in existing rates,[141] and IOU capital projects often include a 25% overhead adder.[142] Therefore, publicly available data on the costs of undergrounding are likely not precise.

A recent independent audit investigating PG&E's undergrounding program found that much of PG&E's undergrounding costs were above industry standards.[143] These costs were due to delayed project costs and inflated cost estimates approved in PG&E's general rate cases.[144] PG&E's average cost for

135. *Undergrounding Frequently Asked Questions*, *supra* note 127.

136. Order Instituting Rulemaking to Consider Revisions to Elec. Rule 20 and Related Matters, *supra* note 125, at *2.

137. *Id.* at *11–14; *see also* ASSIGNED COMMISSIONER'S SCOPING MEMO AND RULING, CAL. PUB. UTILS. COMM'N 4–8 (2018), https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M239/K744/239744695.PDF.

138. In June 2020, the CPUC updated its website and public information on undergrounding. The site includes revised undergrounding costs for PG&E in 2019 dollars. PG&E now estimates undergrounding projects to cost between $3.4 million and $6.1 million per mile, which substantially exceeds the costs revealed in the audit of PG&E's undergrounding program. *Compare CPUC Undergrounding Programs*, *supra* note 118, *with* CAL. PUB. UTILS. COMM'N, *supra* note 115, at 22–24.

139. HALL, *supra* note 15, at 31.

140. *Id.*

141. *Id.* at 4.

142. Counties of Mendocino, Napa, & Sonoma, *supra* note 116, at 7.

143. *Undergrounding Frequently Asked Questions*, *supra* note 127.

144. CAL. PUB. UTILS. COMM'N, *supra* note 115, at 20.

migrating distribution lines from overhead to underground between 2007 and 2016 was approximately $3.5 million for urban lines, $4.8 million for suburban lines and $2.5 million for rural lines.[145] While the urban costs were within EEI's maximum range, PG&E's suburban and rural costs were 189% and 123% of the EEI category maximums, respectively.[146] PG&E rationalized its upward costs because of increased population densities in suburban and rural regions.[147] However, the audit found much of the bloated costs stemmed from delays caused by poor project management. Shockingly, PG&E failed to track costs related to inactive projects that accrued material, labor, and overhead costs, rendering it impossible to separate real project costs from project delay costs.[148]

Therefore, there is limited data on the actual costs of undergrounding PG&E's network. Much of the roughly 20% of PG&E's 106,681 circuit miles distribution network that is already underground[149] was paid for by developers.[150] Thus, the $243 billion undergrounding cost estimated above[151] does not reflect the potential savings resulting from developers undergrounding when rebuilding in areas destroyed by wildfires or migrating infrastructure when developing in existing communities.[152] It also does not reflect that not all of the network can or should be migrated underground because of vulnerabilities due to flooding and earthquakes.[153] Additionally, the simple dollar cost estimate does not factor in the reductions that may be possible by distributing costs among telecommunications and internet providers that piggyback on PG&E's existing infrastructure. Nor does it take into account that some of the costs of undergrounding will be offset by PG&E's rate of return on capital investments, which hovers steadily around 8%.[154]

Intriguingly, PG&E and the state have resources to put towards the costs of undergrounding. For example, a portion of PG&E's revenues could be put towards undergrounding, increasing the fixed assets of the company upon which stockholders would earn a rate of return. Even amidst the chaos of wildfires, PG&E's 2018 electrical operating revenues were $12.7 billion, and the company generated "approximately $16.8 billion in total revenue."[155] Alternatively,

145. *Id.* at 22.

146. *Id.*

147. *Id.* at 23–24.

148. *Id.* at 20.

149. *Id.* at 7.

150. Baker, *supra* note 114.

151. *See supra* notes 12–14 and accompanying text.

152. *See Facts About Undergrounding Electric Lines*, *supra* note 12 ("In the counties of Butte, Calavaras, Lake, Mendocino, Napa, Sonoma and Yuba affected by the October 2017 North Bay Fires, 118 miles of the 650 distribution miles are underground. Of the 118 miles, 80 of these underground miles are located in the Santa Rosa area. Most of these underground lines were installed as part of new residential and commercial subdivision developments.").

153. *Id.*; Morris, *supra* note 110.

154. *See Rate of Return (ROR) (Actual and Authorized)*, CAL. PUB. UTILS. COMM'N, https://www.cpuc.ca.gov/General.aspx?id=12093 (last visited June 28, 2020); *What is Cost of Capital (CoC)?*, CAL. PUB. UTILS. COMM'N, https://www.cpuc.ca.gov/General.aspx?id=10457 (last visited June 28, 2020).

155. CAL. PUB. UTILS. COMM'N, *supra* note 115, at 7.

PG&E could sell property in its real estate portfolio;[156] or after emerging from bankruptcy, PG&E could issue bonds for financing infrastructure projects. On the other hand, if the state wanted to capitalize on a jobs program, it could provide advances to PG&E or local municipalities from revenue bonds or the state's Greenhouse Gas Reduction Fund to contract undergrounding projects with third parties.[157] Additionally, municipalities could redeem the $1 billion in currently unused Rule 20A allocations.[158] Finally, federal programs such as the Federal Communications Commission's Broadband Deployment Advisory Committee's Dig Once initiative, which advocates for coordinated installation of fiber-optic cable, phone lines and power lines,[159] offer options for distributing costs. Ultimately, determining how to cover the upfront costs of undergrounding is a task for the Governor's commission of experts, drawing on their expertise in economics, accounting, and investment banking as well as environmental, energy, land use, local government, social justice, and state regulatory laws.

E. AN AVERSION TO UNDERGROUNDING

Despite Californians' interest in undergrounding for safety, reliability, aesthetic, and property value reasons,[160] the CPUC and PG&E exhibit an aversion for undergrounding. For example, PG&E routinely failed to prioritize undergrounding and to spend funds to implement Rule 20 projects. Illustrating this failure, the company has only depleted its undergrounding budget three times since 2000—the last of which occurred in 2006.[161] Although PG&E has invested "more than $300 million" to underground overhead lines since 2012,[162] the company has failed to spend $150 million in budgeted funds for undergrounding since 2000 and instead has reprioritized the funds for undisclosed projects.[163] Alarmingly, the audit of PG&E's Rule 20 program

156. PAC. GAS & ELEC. CO. & PAC. GAS & ELEC. CORP., 2017 JOINT ANNUAL REPORT TO SHAREHOLDERS 44 (2017), http://www.pgecorp.com/investors/financial_reports/annual_report_proxy_statement/ar_pdf/2017/2017_Annual_Report.pdf; Spencer Silva, *PG&E Owns Land Across California. What Will Happen to It?*, S.F. CHRON., https://www.sfchronicle.com/travel/article/PG-E-owns-land-across-California-What-will-14028654.php (last updated June 24, 2019). The sale of properties in PG&E's real estate portfolio could also be used to repay the $150 million in reprioritized Rule 20A funds. *See infra* note 163 and accompanying text.

157. *See Background*, CAL. CLIMATE INVESTMENTS, http://www.caclimateinvestments.ca.gov/about-cci (last visited June 28, 2020) ("Proceeds from the Cap-and-Trade Program facilitate comprehensive and coordinated investments throughout California that further the State's climate goals. These investments support programs and projects that reduce greenhouse gas (GHG) emissions in the State and also deliver major economic, environmental, and public health benefits for Californians, including meaningful benefits to the most disadvantaged communities.").

158. Order Instituting Rulemaking to Consider Revisions to Elec. Rule 20 and Related Matters, *supra* note 125, at *11; CAL. PUB. UTILS. COMM'N, *supra* note 115, at 11.

159. Jeffrey Pfeffer, *Open Forum: Cost of Undergrounding Power Lines Is No Excuse for PG&E*, S.F. CHRON. (Mar. 4, 2019), https://www.sfchronicle.com/opinion/openforum/article/Open-Forum-Cost-of-under grounding-power-lines-is-13658984.php.

160. Counties of Mendocino, Napa, & Sonoma, *supra* note 116, at 9; *see infra* notes 206–07 and accompanying text.

161. Baker, *supra* note 114.

162. *Facts About Undergrounding Electric Lines*, *supra* note 12.

163. CAL. PUB. UTILS. COMM'N, *supra* note 115, at 44.

characterized this reprioritization, coupled with the company's lack of reporting documentation, as indicative of fraud risk factors.[164] Municipalities eager to proceed with undergrounding projects, therefore, find themselves up against this culture of disinterest, which leads to long project timelines and ballooning costs.[165]

Further evidence of an aversion is that, in June 2020, the CPUC updated its public information on undergrounding emphasizing that it is "10 times more expensive than installing new distribution overhead lines" and "8 times more expensive than insulating (covering) the conductors (wires) to prevent them from igniting when contacting vegetation and other foreign objects."[166] The CPUC cites Southern California Edison's (SCE) "assert[ion] that installing covered conductors and metal poles has a mitigation benefit-to-cost ratio that is significantly higher than . . . undergrounding . . . ."[167] According to SCE, "full deployment of covered conductors and metal poles in [high fire-threat districts] are estimated to mitigate approximately 60 percent of fires associated with SCE's electrical distribution facilities in [high fire-threat districts]."[168] In contrast, "[u]ndergrounding theoretically would mitigate 100 percent of such fires, all else equal."[169] Therefore, even if covered conductors and metal poles were fully deployed, 40% of the current fire risk would remain. Significantly, the CPUC does not provide information about how SCE calculated the mitigation effectiveness-to-cost ratio.

In addition, the CPUC does not verify IOU undergrounding costs.[170] Rather, to determine whether "IOUs provide 'reasonable' cost estimates for the various components of individual undergrounding projects," the CPUC encourages municipalities to internally audit or utilize a third party to verify.[171] Moreover, the $3.8 million average cost per mile for undergrounding now provided by the CPUC is derived from the average of the low and high cost estimates provided by the IOUs.[172] Importantly, the high end of the IOU ranges likely reflects the cost of undergrounding in a fully developed, urban environment like San Francisco or Los Angeles, which requires navigating and replacing as necessary existing underground infrastructure and strict permitting requirements. PG&E's 2019 estimates range from $3.4 million to $6.1 million.[173] These estimates vary significantly from PG&E's prior disclosures,[174] as well as SDG&E's 2019 cost range of $2.64 million to $3.696 million per

164. *Id.* at 39.
165. Baker, *supra* note 114.
166. *CPUC Undergrounding Programs*, *supra* note 118.
167. *Undergrounding Frequently Asked Questions*, *supra* note 127.
168. *Id.*
169. *Id.*
170. *See id.*
171. *Id.*
172. *Id.*
173. *CPUC Undergrounding Programs*, *supra* note 118.
174. *See Facts About Undergrounding Electric Lines*, *supra* note 12.

mile,[175] and SCE's $3 million estimate used in its mitigation effectiveness-to-cost ratio.[176]

The deviation in cost estimates indicates that an independent body of experts is required to review utilities' material, design, labor, regulatory compliance and permitting costs to determine a standardized assessment for reasonable costs, applying a holistic cost benefit analysis rather than a conventional and atomistic cost benefit analysis to determine the mitigation effectiveness-to-cost ratio. This is because many cities and counties see undergrounding as a practical, long-term solution to safeguard the public interest and require a defensible estimate of reasonable costs for undergrounding projects.[177] Supporting this view and the viability of undergrounding, 73,500 miles of distribution lines have been placed underground since the 1960s.[178] Thus, the cost of undergrounding cannot actually be cost prohibitive at all times. Therefore, it is time for an independent assessment of costs to be provided to the public, municipalities, CPUC, and policy makers so that the debate over undergrounding is not dictated by opaque and unexamined cost estimates provided by the industry.

III. CALIFORNIA'S RESPONSE TO THE MEGAFIRES

A. SENATE BILL NO. 901 (2017–2018)

In response to the devastating loss of life and property, the rising costs of recovery and rebuilding, the outsized impact of megafires on the utilities' ability to provide service, and the immense dangers of carbon emissions into the atmosphere and impacts on air quality, California lawmakers have taken steps to address the effects of climate change and megafires. In the fall of 2018, California's legislature passed Senate Bill No. 901 (S.B. 901), the most sweeping wildfire prevention bill passed in decades.[179] At the time, Governor Brown called S.B. 901 "absolutely necessary."[180] Introduced and authored by California Senator Bill Dodd, a representative of Napa, S.B. 901 aims to: improve forest health to reduce the risk of wildfires and greenhouse gases; enhance ecosystem function; improve wildlife habitats and water quality; increase water supply and carbon sequestration; and, importantly, reduce the cost to the state for rebuilding from and responding to wildfires.[181] The act recognizes that, in order to reduce the risk and frequency of catastrophic fires, all stakeholders must take drastic steps to achieve that goal. Significantly, the

175. *CPUC Undergrounding Programs*, *supra* note 118.

176. *Id.*

177. Counties of Mendocino, Napa, & Sonoma, *supra* note 116, at 9.

178. *CPUC Undergrounding Programs*, *supra* note 118.

179. John Myers, *As Climate Changes Worsens Wildfires, California Will Spend $1 Billion and Give Utilities New Ways to Shrink Their Fire Expenses*, L.A. TIMES (Sept. 21, 2018, 11:20 AM), https://www.latimes.com/politics/la-pol-ca-wildfire-prevention-law-signed-20180921-story.html.

180. *Id.*

181. S.B. 901 § 1(g), 2017–2018 Leg. (Cal. 2018).

act requires agencies and departments across state government to take action within a short timeframe to update guidance documents, implement mitigation plans, and train personnel, all with the state's climate change goals in mind.

In addition to the law's direct goals to protect California's landscape and achieve the state's goals for reducing greenhouse gas emissions, S.B. 901 also targets the practices of public utilities. For instance, the law governs utility contracting for private fire safety services,[182] and includes measures for catastrophic wildfire ratepayer protection financing.[183] While the law's measures are critical of the utilities' practices, the act declares that "California's electric and gas utilities provide essential services to California residents and businesses, which are necessary to maintaining the vitality of California's economy."[184] The legislature underscored that "[s]afe and reliable electric and gas utility service is vital to public health, public safety, air quality, and reducing emissions of greenhouse gases."[185] To ensure reliable service, S.B. 901 mandates utilities "construct, maintain, and operate its electrical lines and equipment in a manner that will minimize the risk of catastrophic wildfire posed by those electrical lines and equipment."[186]

Each utility must submit a WMP for review by CPUC and CAL FIRE and that plan must then be formally approved by CPUC.[187] The law provides, in part, that WMPs shall include: a description of responsible persons; objectives for the WMP, including prevention strategies and programs the utility will adopt "to minimize the risk of its electrical lines and equipment causing catastrophic wildfires, including consideration of dynamic climate change risks;"[188] protocols for de-energizing the utility's network that consider public safety impacts;[189] details of the utility's vegetation management program;[190] "plans for inspections of the [utility's] electrical infrastructure;"[191] identification of all risks for wildfires within the utility's service territory;[192] and plans describing how the utility will restore service following a wildfire.[193]

Importantly, the law calls for details regarding the "[r]isks and risk drivers associated with design, construction, operations, and maintenance of the electrical corporation's equipment and facilities"[194] and the measures utilities will take to protect their systems and "achieve the highest level of safety, reliability, and resiliency."[195] Utilities are to ensure that their systems are

182. *Id.* § 31 (adding CAL. PUB. UTIL. CODE § 764).
183. *Id.* § 32 (adding CAL. PUB. UTIL. CODE, art. 5.8).
184. *Id.* § 34(a)(1) (adding CAL. PUB. UTIL. CODE § 854.2).
185. *Id.* § 34(a)(2).
186. *Id.* § 38(a) (amending CAL. PUB. UTIL. CODE § 8386).
187. *Id.* § 38(b).
188. *Id.* § 38(c)(1)–(3).
189. *Id.* § 38(c)(6).
190. *Id.* § 38(c)(8).
191. *Id.* § 38(c)(9).
192. *Id.* § 38(c)(10).
193. *Id.* § 38(c)(16)(A).
194. *Id.* § 38(c)(10)(A).
195. *Id.* § 38(c)(12).

"prepared for a major event, including hardening and modernizing its infrastructure with improved engineering, system design, standards, equipment, and facilities, such as undergrounding, insulation of distribution wires, and pole replacement."[196] Importantly, utilities must demonstrate that they are adequately staffed to accomplish the requirements of Public Utilities Code section 8386 and their approved WMPs. S.B. 901's requirements emphasize the state's concern with the utilities' ability to manage their networks in a manner that will significantly reduce the risk of catastrophic fire and prevent loss of property and life.

As a follow up to S.B. 901, the legislature enacted Assembly Bill No. 1054 (A.B. 1054) in the summer of 2019. The law reaffirms that "the state's electrical corporations must invest in hardening of the state's electrical infrastructure and vegetation management to reduce the risk of catastrophic wildfire."[197] The law provides many measures aimed at accomplishing this goal, including creation of a wildfire insurance fund intended to "support[] the credit worthiness of electrical corporations, and provide[] a mechanism to attract capital for investment in safe, clean, and reliable power for California at a reasonable cost to ratepayers."[198] In addition, A.B. 1054 established the WSD and the WASB to oversee development and implementation of WMPs.[199] The WSD approves and audits the utilities' WMPs.[200] The WASB is comprised of seven members selected from "industry experts, academics, and persons with labor and workforce safety experience"[201] that are to meet "no less often than quarterly" to provide guidance to the WSD regarding the contents of WMPs.[202]

B. PG&E'S PLAN WILL NOT REDUCE CATASTROPHIC FIRES

In its 2019 WMP, PG&E acknowledged that, because of the size and volume of its overhead power lines, the company faces high-risk and immense challenges.[203] PG&E's system includes the majority of California's high-density forest area and has more distribution lines in high risk fire zones than any other utility in the state.[204] Fifty-two percent of PG&E's 70,000-square-mile service area is classified as "extreme (Tier 3) or elevated (Tier 2) fire-threat areas."[205] To mitigate the fire threat, PG&E's 2019 WMP utilized "a risk-based approach, meaning highest risk areas [would] be addressed first."[206] It outlined how PG&E planned to attack the growing wildfire threat by: enacting enhanced vegetation

196. *Id.*
197. A.B. 1054 § 2(b), 2019–2020 Leg. (Cal. 2019).
198. *Id.* § 1(a)(5).
199. *Id.* § 2(e).
200. *Wildfire Safety Division*, CAL. PUB. UTILS. COMM'N, https://www.cpuc.ca.gov/wsd/ (last visited June 28, 2020).
201. A.B. 1054 § 4(b) (adding CAL. PUB. UTIL. CODE § 326.1).
202. *Id.* § 4(c); *id.* § 5(c) (adding CAL. PUB. UTIL. CODE § 326.2)
203. PAC. GAS & ELEC. CO., *supra* note 95, at 18.
204. *Id.* at 19.
205. *Id.* at 7.
206. *Id.*

management measures, which included removal of trees that have a high potential to fall, as well as removal of vegetation near power lines;[207] expanding inspections; developing system hardening measures that include "replacing bare overhead conductor with covered conductor, select undergrounding" and upgrading equipment with low fire risk equipment and more resilient poles;[208] increasing situational awareness, meaning knowledge of environmental and weather conditions; enhancing controls to allow for remote reclosing; and expanding PG&E's Public Safety Power Shutoff (PSPS) program.[209] A CPUC guidance decision on this WMP stressed that current prevention measures do not adequately address ways to stop utility-caused wildfires and that the CPUC understands the need to increase efforts to reduce the risk of megafires.[210]

A challenge to the feasibility of PG&E's WMP is that the WMP objectives rely on the participation of third-party actors. For example, PG&E cautioned that all of its WMP objectives are contingent on cooperation by, but not limited to, property owners and environmental permitting agencies.[211] Additionally, included in both the overview of PG&E's system hardening program and vegetation management program were caveats that the estimated work and costs are related to the company's ability to adequately staff the proposed programs. For instance, PG&E estimates that it will take nearly ten years to implement its system hardening program, which aims to upgrade 7100 circuit miles in areas of high fire risk by rebuilding the overhead distribution system, replacing assets that have aged past their useful date, and clearing vegetation near the system,[212] because of "constraints on available qualified personnel and materials."[213]

Further illustrating the fact that PG&E's WMP is not sufficient to adequately reduce fire risk, PG&E submitted a second amendment to the company's WMP on April 25, 2019[214] that highlights the challenges the company faced in meeting its "ambitious goals."[215] In particular, the company underscored that its new Wildfire Safety Inspection Program (WSIP) criteria were much stricter than historical criteria and, accordingly, the company identified "greater numbers of necessary actions, which require additional resources."[216] Some of the amendments to PG&E's WMP included: extensions of time to accomplish targets set by the WSIP program due to inclement weather as well as enhancements to programs that require obtaining additional land rights; an increased focus on de-energization; and a caveat that the company will

207. *Id.* at 5.

208. *Id.*

209. *Id.* at 5–6.

210. Order Instituting Rulemaking to Implement Elec. Util. Wildfire Mitigation Plans Pursuant to Senate Bill 901 (2018), Cal.P.U.C., No. D. 19-05-036, 2019 WL 2474155, at *1–3, *6 (May 30, 2019).

211. *Id.* at 55.

212. *Id.* at 63.

213. *Id*.

214. PAC. GAS & ELEC. CO., SECOND AMENDMENT TO PACIFIC GAS AND ELECTRIC COMPANY'S (U 39 E) WILDFIRE MITIGATION PLAN (2019), http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M283/K824/283824582.PDF.

215. *Id.* at 3.

216. *Id.*

assess 100 million trees, but will only document those trees needing work.[217] Significantly, the company altered its timelines by replacing specific completion dates with open ended language.[218] These amendments underscore the impracticalities of PG&E's WMP.

PG&E's second amended filing coincided with comments made by California municipalities to the CPUC responding to the utilities' WMPs.[219] The cities requested that utilities work with them to make mitigation plans as the municipalities were particularly concerned with the utilities' emphasis on de-energizing. For example, the City of Moorpark underscored that de-energizing a distribution system would shift the burden to local government workers to perform activities typically done through electronic means, like directing traffic when traffic signals shut down.[220] The City of Placerville echoed the sentiment of stressing the importance of proper communication between local governments and utilities. In particular, Placerville asked utilities to address the impact on cities not in a wildfire threat zone that must still endure the related outages from de-energization associated with a high-risk zone.[221] In addition to calls for the utilities to work with localities and provide clarification on de-energization, a number of cities and counties emphasized the need for increased undergrounding.[222]

In approving PG&E's 2020 WMP, the WSD acknowledged the concerns of the municipalities and included significant conditions for approval.[223] For example, WSD found that the plan's proposed expenditure of $9.54 billion between 2020 and 2022 will fail to adequately reduce the risk of fire without substantially improved vegetation management, grid hardening, risk analysis and resource allocation, and PSPS measures.[224] In particular, PG&E's "vegetation management work indicates there may be a problem with the quality of the work, as reflected by low pass rates of quality assurance checks . . . ."[225] Additionally, the plan fails to account for "external costs to the community

217. *Id.* at 6–7.

218. *Id.* at 12.

219. *See* Order Instituting Rulemaking to Consider Revisions to Elec. Rule 20 and Related Matters, *supra* note 125.

220. Letter from Troy Brown, City Manager, City of Moorpark, to Michael Picker, President, Cal. Pub. Utils. Comm'n (Dec. 11, 2018), http://cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2018/City%20of%20Moorpark%20Letter.pdf.

221. City of Placerville, Comments on the Proposed Decision on Pacific Gas and Electric Company's Wildfire Mitigation Plan 5 (Oct. 25, 2018), https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M292/K932/292932597.PDF.

222. *See, e.g.*, City of Laguna Beach, Comments on Rulemaking 18-10-007, at 1–2 (Oct. 25, 2018), https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M238/K011/238011237.PDF; City of Malibu, Comments on Wildfire Mitigation Plans 5 (Oct. 25, 2018), https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M273/K180/273180160.PDF: County of Santa Clara, Comments on the Proposed Wildfire Mitigation Plan Templates and Other Evaluative Materials 5 (Jan. 7, 2020), https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M323/K764/323764313.PDF.

223. Letter from Cal. Pub. Utils. Comm'n to Stakeholders, Pac. Gas & Elec. Co. 1, 4 (May 7, 2020), https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M336/K461/336461920.PDF.

224. *Id.* at 4, 12–13.

225. *Id*. at 12.

impacted by power shutoffs and assumes 100 percent wildfire mitigation where power is shut off."[226] It also relies on the marketing phrase "smarter, smaller, and shorter" rather than detailed data to show how it intends to reduce the "number of customers affected by PSPS events by 30 percent."[227] Significantly, WSD found that "the plan lacks significant details for the WSD to be fully convinced that PG&E will be able to execute on its plan fully and on time."[228]

Thus, as evidenced by PG&E's WMPs, PG&E's preferred mitigation measures are impractical for both PG&E and municipalities; meanwhile, undergrounding is still not a priority method at PG&E for mitigating the risk of wildfire. In its decision on PG&E's 2019 WMP, the CPUC found that PG&E intended to use undergrounding for system resiliency in "rare cases."[229] Mr. Johnson's December 2019 congressional testimony further confirms PG&E's disinterest in undergrounding as it is only mentioned once in relation to system hardening projects and was not included in his action plan summary.[230] Moreover, PG&E's Test Year 2020 General Rate Case states that "undergrounding is not a prominent feature of that funding request because of its higher cost to benefit ratio."[231] Additionally, PG&E's 2020 WMP "does not separately report undergrounding from its overall $5.1 billion system hardening planned spend, making it impossible to determine how much PG&E spends on undergrounding and difficult to assess the various initiatives within this program."[232] This, despite S.B. 901's requirement that each utility pursue undergrounding "to ensure its system will achieve the highest level of safety, reliability, and resiliency . . . ."[233]

C. THE REALITIES OF IMPLEMENTING PG&E'S WMP

PG&E's WMPs will not ensure system resiliency nor do they adequately account for the full costs of PG&E's preferred wildfire mitigation strategies. For instance, while vegetation management is a top priority, its vegetation management plan is unsustainable. Achievement of its goal, set in 2019, of a 235% increase in vegetation management, requires maintaining a workforce of 3000 qualified tree workers.[234] To determine if that is even feasible, PG&E reviewed data from the Bureau of Labor Statistics for the entire "Tree Trimmers and Pruners" occupation, which showed national employment of roughly 41,000 individuals with fewer than 6000 based in California.[235] Furthermore, few of these tree trimmers are qualified to be line clearance certified, which is required

226. *Id.* at 13.
227. *Id*. at 53.
228. *Id.* at 5.
229. Order Instituting Rulemaking to Implement Elec. Util. Wildfire Mitigation Plans Pursuant to Senate Bill 901 (2018), 351 P.U.R. 4th 406 (May 30, 2019).
230. *Hearing on Wildfires*, *supra* note 19, at 3.
231. *Undergrounding Frequently Asked Questions*, *supra* note 127.
232. Letter from Cal. Pub. Utils. Comm'n to Stakeholders, *supra* note 225, at 17.
233. S.B. 901 § 38(c)(12), 2017–2018 Leg. (Cal. 2018).
234. PAC. GAS & ELEC. CO., *supra* note 95, at 82.
235. *Id.* at 82–83.

for working next to power lines.[236] Qualified personnel must also be able to scale the incredible heights of trees in PG&E's service area, which further limits the pool of those who can be line clearance certified,[237] making maintenance of a 3000 tree trimmer workforce problematic. Moreover, the costs of vegetation management will only continue to rise as vegetation management requires annual maintenance, because—as we all know well—trees grow back.[238] Therefore, this annual expenditure will continue to increase as the company clears more miles of overhangs, driving the overall long-term cost of the company's vegetation management program upward.[239]

Adding to this unsustainability is the scope of the vegetation management strategy. PG&E estimates that it will take until 2026 to address the 100 million dead trees in PG&E's service territory.[240] Furthermore, even proper vegetation management can start wildfires as it did in the Butte Fire that erupted due to a downed tree which was weakened by previous PG&E vegetation management.[241] In response to this reality, Santa Cruz, in its motion for party status for the Order Instituting Rulemaking to Implement Electric Utility Wildfire Mitigation Plans Pursuant to Senate Bill 901, requested that utilities invest in "measures that will have proven benefits" such as undergrounding.[242] The city cited that "Southern California Edison has already concluded, preventing contact with vegetation is difficult if not impossible."[243] Therefore, rather than rely on vegetation management, the city emphasized that "[t]he safest course is to design a system that can *withstand* contact."[244] Mr. Johnson reaffirmed this reality in his congressional testimony stating, "[t]o manage vegetation risks along our rights-of-way alone, PG&E has spent approximately $3.8 billion since 2009."[245] Although PG&E has met "state and federal vegetation and fire safety standards through routine vegetation management work,"[246] the program has not prevented ignitions from vegetation.

The challenges of accomplishing PG&E's preferred mitigation strategies were also underscored in PG&E's updated progress report for its 2019 WMP filed in compliance with Administrative Law Judge Sarah Thomas' December

236. *Id.* at 83; *see also Hearing on Wildfires*, *supra* note 19, at 3 ("[I]n 2019 PG&E hired more than 2,000 additional contractors, most of whom are qualified IBEW represented members, and employees to conduct this important vegetation work.").

237. Lauren Hepler, *As California Wildfire Looms, Finding Tree Trimmers Is a New Problem*, N.Y. TIMES (May 23, 2019), https://www.nytimes.com/2019/05/23/business/energy-environment/pge-wildfire-trees.html.

238. Letter from Cal. Pub. Utils. Comm'n to Stakeholders, *supra* note 238, at 45.

239. PAC. GAS & ELEC. CO., *supra* note 95, at 75.

240. *Id.* at 82.

241. Russell Gold et al., *PG&E: Wired to Fail*, WALL ST. J. (Dec. 28, 2019, 12:01 AM), https://www.wsj.com/articles/pg-e-wired-to-fail-11577509261.

242. COUNTY OF SANTA CRUZ, MOTION FOR PARTY STATUS OF COUNTY OF SANTA CRUZ 4 (2018), https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M251/K668/251668327.PDF.

243. *Id*.

244. *Id*.

245. *Hearing on Wildfires*, *supra* note 19, at 3.

246. *Id*.

2019 ruling.[247] The report shows that PG&E failed to complete enhanced vegetation management of 1000 circuit miles within the required timeframe. Although the company completed its goal five months later, the quality of that work scored 30% below the "92 percent 'meets expectations' performance" target.[248] Additionally, the report shows that vegetation management, system hardening and the WSIP faced delays due to "a combination of factors, including inclement weather; the availability of equipment, materials, and qualified personnel; objections from property owners or governmental agencies; and environmental permitting requirements."[249] This indicates that PG&E's concerns raised in its 2019 WMP regarding the feasibility of completing its plans have been realized.

Likewise, de-energization is an inadequate mitigation measure due to the fact that PSPS events will quickly become politically untenable. De-energization of a utility network can effectively reduce the risk of wildfire to a community. Although it is the quickest and most cost-effective way for the company to reduce the risk of wildfires, it is not the best long-term solution for Californians.[250] PG&E customers acutely experienced the consequences of PG&E's prioritization of de-energization in the fall of 2019. In particular, the chaos and confusion surrounding the de-energizing of the Caldecott Tunnel, which straddles Alameda and Contra Costa Counties and is a critical transit artery for the Bay Area, consummately illustrated the unintended consequences of simply shutting off the power.[251] There, PG&E failed to inform California Department of Transportation (Caltrans) that both counties might lose power, something Caltrans had never prepared for and thus did not have the necessary back-up generators in place to ensure continuation of service. This failure to communicate left thousands of commuters uncertain of whether they would be stranded going to or from work.[252] In addition to commute disruptions, the PSPS events disproportionately impacted low-income Californians and other vulnerable populations that depend on reliable service for basic, everyday necessities such as lighting, air conditioning, and refrigeration.[253]

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247. PAC. GAS & ELEC. CO., UPDATED PROGRESS REPORT OF PACIFIC GAS AND ELECTRIC COMPANY (U 39 E) WILDFIRE MITIGATION PLAN (2020), https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2020/R1810007%20PGE%20WMP%20Status%20Update%201-15-20.pdf.

248. *Id.* at 5.

249. *Id.* at 3.

250. Underscoring this point, WSD guidelines for effective, world class WMPs now require that "[t]he result should be that with each passing year California is safer from wildfire threats, with a significant reduction and eventual elimination of the need to use Public Safety Power Shutoffs (PSPS) as a mitigation action." Letter from Cal. Pub. Utils. Comm'n to Stakeholders, *supra* note 238, at 3.

251. Annie Sciacca et al., *CalTrans, PG&E Court Commuters' Anger with Confusion Over Major Tunnels*, MERCURY NEWS, https://www.mercurynews.com/2019/10/08/caldecott-tom-lantos-tunnels-to-close-amid-power-outage/ (last updated Oct. 9, 2019).

252. *Id.*

253. *See, e.g.*, Jackie Botts, "*We Need the Food that We Lost." Low-Income Families Still Reeling from Blackouts*, CALMATTERS (Nov. 22, 2019), https://calmatters.org/projects/california-psps-power-shutoffs-poverty-spoiled-food-hunger/; DEP'T OF EMERGENCY MGMT., SONOMA CTY., TESTIMONY ON THE IMPACT OF THE SONOMA COUNTY PG&E POWER SHUTOFFS ON MEDICALLY FRAGILE OLDER ADULTS AND RESIDENTS WITH

Following a poorly executed PSPS that left nearly 740,000 Californians across thirty-five counties without power for many days, Governor Newsom demanded that the CPUC open an investigation into PG&E's de-energization practices and hold the utility accountable for the disruption caused.[254] Governor Newsom underscored that "[t]his lack of preparation and poor performance is particularly alarming given that, prior to the event, PG&E responded to the scrutiny and questioning of multiple state and local agencies by asserting that it could handle a PSPS event without the need for additional assistance."[255] In addition to the impact the poor execution had on Californians, the full costs of the PSPS event are not yet known. However, Michael Wara, Director of Stanford University's Climate and Energy Policy Program, estimated that "[a] PSPS for a representative 600 [thousand] accounts that lasted just [twenty-four hours] would cause $1.8 billion in costs."[256] If PSPSs are to be used regularly for multiple days at a time, over multiple years, the costs will add up quickly. Analysis of PG&E's WMP and corporate attitude therefore illustrate that their preferred measures to reduce wildfire risk, vegetation management and de-energization, are inadequate to safeguard public health, welfare, and the environment.

Yet even if system hardening, vegetation management, and PSPS events were to accomplish the goals of S.B. 901, the new abnormal demonstrates that overhead power lines are an outdated technology. PG&E's PSPS, issued on October 25, 2019, evidenced this issue, as the company cut power to an expected 850,000 accounts in response to predictions of historic winds ranging from forty-five to seventy miles per hour.[257] The company warned that "[w]inds of this magnitude pose a higher risk of damage and sparks on the electric system and rapid wildfire spread."[258] As Mr. Johnson stated in his congressional testimony, "[l]ike any home, building or other infrastructure, electric transmission and distribution lines and related infrastructure are vulnerable to . . . winds over 70 miles per hour."[259] A report published by *Nature Climate Change* provides evidence that this increase in high wind speeds will continue for at least a

DISABILITIES, https://www.chhs.ca.gov/wp-content/uploads/2020/01/cpuc-AA-PSPS-impact-11-15-v2.pdf (last visited June 28, 2020).

254. Letter from Gavin Newsom, Governor of Cal., to Marybel Batjer, President, Cal. Pub. Utils. Comm'n (Oct. 14, 2019), https://www.gov.ca.gov/wp-content/uploads/2019/10/10.14.19-CPUC-Letter.pdf.

255. *Id.*

256. Michael Wara (@MichaelWWara), TWITTER (Oct. 8, 2019, 12:35 AM), https://twitter.com/MichaelWWara/status/1181473102414221312.

257. Press Release, PG&E, Forecasts Indicate Potential for Historic Wind Event This Weekend; Approximately 850,000 Customers Notified that They May Be Impacted Beginning Saturday Evening (Oct. 25, 2019), https://www.pge.com/en/about/newsroom/newsdetails/index.page?title=20191025_forecasts_indicate_potential_for_historic_wind_event_this_weekend_approximately_850000_customers_notified_that_they_may_be_impacted_beginning_saturday_evening.

258. *Id.*

259. *Hearing on Wildfires*, *supra* note 19, at 1.

decade.[260] Commenting for an investigative report by the *Wall Street Journal* into PG&E's safety culture and track record, retired CPUC Administrative Law Judge Janice Grau emphasized that both the CPUC and PG&E were unprepared for the change in winds and particularly the risks posed by Diablo winds.[261] Diablo winds pose high fire threats to the Bay Area and are characterized by San Jose State's Fire Weather Research Laboratory as "California's Critical Fire Weather Pattern."[262] Winds of such high speed and intensity dry vegetation and threaten the overhead power line system.[263]

State legislators are recognizing the limitations of current mitigation measures and the public's desire for undergrounding. Assembly Bill No. 281 (A.B. 281), introduced by Assembly Member Jim Frazier of the 11th Assembly district, which includes Solano County and parts of Sacramento County, is winding its way through committee review.[264] A.B. 281 would require utilities to underground power lines in high fire-threat areas.[265] Senate Bill No. 584, introduced by Senator John Moorlach of the 37th Senate district, which includes portions of Orange County, would obligate the CPUC to develop matching fund programs to finance municipal undergrounding projects in Tier 3 districts.[266] Senate Bill No. 70 (S.B. 70), enacted in October 2019, requires that utilities include a description in their WMPs of "where and how the [utility] considered undergrounding electrical distribution lines within those areas of its service territory identified to have the highest wildfire risk."[267] S.B. 70 is a significant step in the right direction, but likely does not go far enough to ensure undergrounding is made a top priority at the utilities. At the time of writing, this law is seven months old and the practical impacts are not yet measurable; they will need to be studied in the context of the 2020 WMPs.

The new abnormal requires more than the replacement of the current overhead distribution system to ensure Californians' safety and accessibility to reliable power because the current technology is not suited for the new abnormal. Although this Note focuses on PG&E, the principles expressed should apply to all California electrical utilities. Even if the state expands reliance on

260. *See generally* Zhenzong Zheng et al., *A Reversal in Global Terrestrial Stilling and Its Implications for Wind Energy Production*, 9 NATURE CLIMATE CHANGE 979, 984 (2019) ("[T]he increases in wind speeds should continue for at least a decade because these oscillations change over decadal time frames.").

261. Katherine Blunt & Russell Gold, *"Safety Is Not a Glamour Thing": How PG&E Regulators Failed to Stop Wildfire Crisis*, WALL ST. J. (Dec. 8, 2019, 2:46 PM), https://www.wsj.com/articles/pg-e-caused-over-400-fires-in-2018-where-were-the-regulators-11575834385.

262. *Diablo Winds-California's Critical Fire Weather Pattern*, FIRE WEATHER RES. LAB., https://www.fireweather.org/diablo-winds (last visited June 28, 2020).

263. Jason Samenow & Andrew Freedman, *What's Driving the Historic California High-Wind Events, and Worsening the Wildfires*, WASH. POST (Oct. 28, 2019), https://www.washingtonpost.com/weather/2019/10/28/whats-driving-historic-california-high-wind-events-worsening-wildfires/ ("The winds have the critical effect of drying out the air as the air descends after passing over mountain peaks. When the ultradry air overlays parched vegetation, tinderbox conditions develop that are ripe for extreme fire growth.").

264. A.B. 281, 2019–2020 Gen. Assemb. (Cal. 2019).

265. *Id.*

266. S.B. 584, 2018–2019 Leg. (Cal. 2019).

267. S.B. 70, 2019–2020 Leg. (Cal. 2019).

microgrids[268] and distributive generation technologies[269] in support of its greenhouse gas reduction goals, it will still need a reliable grid network.[270] As we invest in the electric technologies of the future, why rebuild our grid in a century old model? As Mr. Weissman states, "we really only [use overhead power lines] now because it's cheap. . . . The fact that there are now these very large liabilities for losses coming from failure of the lines, arguably that ought to change the way we assess the cost of these things."[271]

CONCLUSION

If Governor Newsom is serious about ensuring that Californians have "access to safe, reliable and affordable service . . . and that California continues to make forward progress on our climate goals,"[272] then PG&E's distribution network—of poorly maintained lines built nearly a century ago[273]—must be remade. While the upfront costs are expensive, the benefits of undergrounding greatly outweigh those costs by eliminating the sparks that ignite the megafires of the new abnormal. Utilities would save the annual expense of costly vegetation management, system hardening, drone and helicopter inspections, and the liabilities associated with being responsible for megafires.[274] Californians who may not have had direct connections to fire zones would no longer experience smoke-filled skies for weeks on end and power outages for days. Our state and its current economy, health care system, and greenhouse gas reduction programs cannot withstand decades of the new abnormal. Providing reliable electric service will require a regulatory system that approaches the state's energy needs from a preemptive rather than a reactive perspective. The Governor's commission of experts should provide the leadership for determining when, where and how selective undergrounding will be done. Their report should act as guidance for municipalities, utilities and the CPUC on how to implement undergrounding expeditiously in California. For environmental sustainability and public health reasons, a holistic cost benefit analysis shows that it is no longer reasonable to write off burying wires as too expensive. Selective undergrounding is cheaper and less costly to life and property than the horror and devastation of megafires. The urgency of climate change demands that the state take action to cause utilities to remediate obsolete technology, such

268. David Roberts & Alvin Chang, *Meet the Microgrid, the Technology Poised to Transform Electricity*, VOX, https://www.vox.com/energy-and-environment/2017/12/15/16714146/greener-more-reliable-more-resilient-grid-microgrids (last updated May 24, 2018).

269. *Distributed Generation of Electricity and Its Environmental Impacts*, ENVTL. PROT. AGENCY, https://www.epa.gov/energy/distributed-generation-electricity-and-its-environmental-impacts (last visited June 28, 2020).

270. *See* 1 CAL. ENERGY COMM'N, 2018 INTEGRATED ENERGY POLICY REPORT 16–19 (2018), https://ww2.energy.ca.gov/2018publications/CEC-100-2018-001/CEC-100-2018-001-V1_spreads.pdf.

271. Cathy Bussewitz, *California Power Outages: Isn't There an Easier Way?*, PRESS DEMOCRAT (Oct. 10, 2019), https://www.pressdemocrat.com/news/10159681-181/california-power-outages-isnt-there?sba=AAS.

272. Press Release, *supra* note 64.

273. Gold et al., *supra* note 241.

274. *See* PAC. GAS & ELEC. CO., *supra* note 95, at 1–3, attach. E.

as overhead power lines, and to improve regulatory structures to ensure a resilient power grid able to withstand the new abnormal.