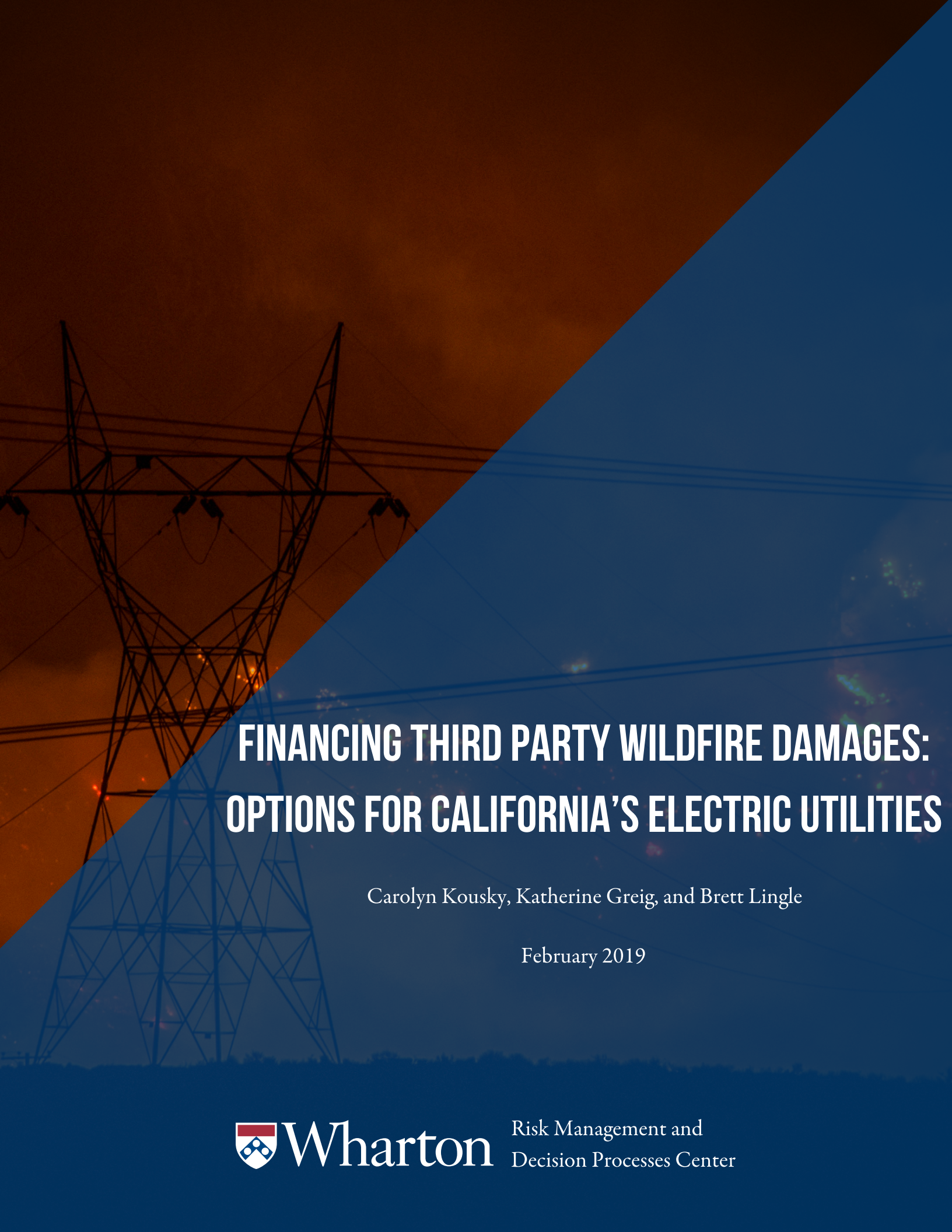

FINANCING THIRD PARTY WILDFIRE DAMAGES: OPTIONS FOR CALIFORNIA'S ELECTRIC UTILITIES

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Wharton Risk Management and Decision Processes Center

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Financing Third Party Wildfire Damages: Options for California's Electric Utilities

Carolyn Kousky, Katherine Greig, and Brett Lingle[1]

Executive Summary

- Wildfire risk is escalating in the western United States, devastating and disrupting communities and creating billions of dollars in property damage.
- Under a unique legal regime in the state of California (inverse condemnation), electric utilities are held strictly liable for property damage associated with any wildfire where utility infrastructure is found to have been a significant cause of ignition, even if the utility was not negligent in their risk management actions.
- Wildfires in 2017 and 2018 have shown that these liabilities can reach into the billions, threatening the financial health and solvency of utilities, with consequences for ratepayers, shareholders, and the state's ability to meet its climate and energy goals.
- This liability poses challenges for traditional approaches to risk financing as it is concentrated and potentially catastrophic.
- When utilities act negligently, they should bear costs proportional to their negligence. Absent reform to eliminate or modify the application of the doctrine of inverse condemnation to utilities, however, utilities need financing mechanisms that enable them to cover this growing liability.
- There are a range of mechanisms that could facilitate a utility's ability to access capital to cover this risk, including funded self-insurance, commercial insurance, catastrophe bonds, industry captives, an industry risk pool, and recovery bonds. These financing options are not mutually exclusive, and several should be layered together to ensure funding for third-party liability from wildfires of various magnitudes.
- Each of these strategies would require an annual contribution and/or initial capitalization. How those costs are distributed has implications for who ultimately bears the costs of wildfires. To align with the regulatory compact, ratepayers would shoulder cost-effective pre-wildfire financing and shareholders would pay post-loss costs in proportion to utility imprudence.
- With the significant increase in wildfire risk due to climate change and continued development in the wildland urban interface, risk mitigation by all stakeholders will be needed to complement financing efforts. This includes land use planning modifications, adoption and enforcement of strong building codes, broad education campaigns for those living in high-risk areas, and cost-effective mitigations by land owners and business owners.

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1. Overview

In California and across the west, the frequency and severity of catastrophic wildfires are increasing, as are the damages. Eight of the twenty most destructive wildfires in California history occurred in 2017 and 2018, destroying more than 31,000 structures—double the number consumed by the other twelve.[2] In the 1980s, the California Department of Forestry and Fire Protection (Cal Fire) spent an average of $61 million (2018 USD) per year on fire suppression. Since then, costs have escalated steadily and significantly, reaching an average of $121 million in the 1990s, an average of $304 million from 2000-2009, and averaging roughly $450 million annually since 2010 (all in 2018 dollars).[3] Beyond the direct property damage and suppression costs, these fires have substantial indirect damages, as well, such as lost tax revenue to local governments, health impacts from the smoke, increased carbon emissions, and lost environmental values.

In most places outside California, the direct property damages from wildfires—the focus of this paper—are borne by property owners, insurers, and taxpayers (via state or federal disaster assistance programs). In California, however, electric utilities can be required to pay all property damages for wildfires where utility infrastructure was a significant cause of wildfire ignition. The California state constitution says that private property may be "taken" or damaged for public use only when just compensation is provided.[4] Several courts in California have held this doctrine applies to electric utilities, since they have a state-granted monopoly and provide a public service. As such, in California, electric utilities are strictly liable for property damages arising from wildfires traced to their equipment; that is, they must pay for the damages even if they are without fault.[5]

Note, the reasoning for inverse condemnation, as explained by the courts, is that costs associated with activities that generate broad public benefits should be "distribute[d] throughout the community...to socialize the burden...that should be assumed by society."[6] The courts have held that utilities are able to socialize costs through rates and thus spread wildfire related costs on all those who benefit from electricity. In contrast to a classic "taking" where a government entity can raise taxes to cover the costs, whether or not these costs can be passed to ratepayers is under the control of the California Public Utilities Commission (CPUC) and is not guaranteed. In making decisions, the CPUC adheres to a standard of evaluating whether the utility acted "reasonably and prudently" in operating and managing its system.[7] This is a distinct standard from legal negligence. A party can be found negligent for a single act,

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[2] See: http://www.fire.ca.gov/communications/downloads/fact_sheets/Top20_Destruction.pdf.
[3] All figures adjusted to 2018 US dollars; data online at: http://www.fire.ca.gov/fire_protection/downloads/SuppressionCostsOnepage.pdf.
[4] Cal. Const., art. I, § 19(a) ("Private property may be taken or damaged for a public use and only when just compensation...has first been paid to, or into the court for, the owner.")
[5] For more, see: Kousky, C., B. Lingle, K. Greig, and H. Kunreuther (2018). "Wildfire Costs in California: The Role of Electric Utilities." Issue Brief. Wharton Risk Management and Decisions Processes Center, University of Pennsylvania, August. Online at https://riskcenter.wharton.upenn.edu/wp-content/uploads/2018/08/Wildfire-Cost-in-CA-Role-of-Utilities-1.pdf.
[6] Holtz v. Super. Ct., 3 Cal.3d.296, 303 (1970).
[7] For more on this in relation to recent CPUC findings, see http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M218/K019/218019946.PDF.

whereas a reasonable and prudent operator is one who operates its system consistent with the standards in place at the time even if an adverse event nonetheless occurs.

The potential costs arising from this strict liability regime in California have recently been substantial. For fires in 2007, San Diego Gas and Electric had to pay $2.4 billion in wildfire costs.[8] PG&E estimated it could face up to $15 billion in liability and hundreds of lawsuits if their infrastructure was involved in the ignition of 2018's Camp Fire.[9] The company's financial viability in the face of these liabilities has been so tested that it filed for bankruptcy at the end of January 2019. All three major rating agencies have downgraded the investor owned utilities in response to California's application of strict liability for wildfire damages.[10] Lower ratings may discourage investors from purchasing utility-issued bonds and from buying equity in the company. This makes it more difficult and expensive for utilities to refinance debt maturities and raise debt and equity capital for critical projects.

All stakeholders agree that when utilities have acted negligently, they should bear costs proportional to their negligence. However, when they have not acted negligently, this strict liability legal regime will subject California's utilities to financial hardship with risks now recognized as potentially so large, it could threaten their viability, impacting ratepayers, shareholders (who tend to be older and middle income[11]), and undermining the state's ability to meet climate and energy goals that require investments by the utility. While PG&E's bankruptcy has raised myriad questions, this paper does not address PG&E's past or future management, decision-making, or actions. The paper looks at the broader issue for all utilities of how to finance a catastrophic risk, for which traditional risk financing approaches are stressed, absent reform of the application of inverse condemnation.

Recognizing concerns about the unsustainability of the status quo, the California Legislature created a Commission on Catastrophic Wildfire Cost and Recovery to "examine issues related to catastrophic wildfires associated with utility infrastructure."[12] The Commission, seated in January 2019, is tasked with recommending policy options for action by the governor and legislature that would "socialize the costs associated with catastrophic wildfires in an equitable manner," as well as options for establishing "a fund to assist in the payment of costs associated with catastrophic wildfires." [13] Legislation has also recently been introduced to create a risk pooling mechanism for California's utilities.

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[8] Whitlock, J. (2017). "CPUC Turns Down San Diego Gas & Electric's 2007 Wildfires Request." *San Diego Business Journal*, November 30.

[9] Gold, Russell (2019) "PG&E bankruptcy: The first of many corporate casualties of climate change?" *Wall Street Journal*, January 18.

[10] See https://www.moodys.com/research/Moodys-downgrades-Pacific-Gas-Electric-to-Caa3-and-PGE-Corp--PR_393849 and https://www.moodys.com/research/Moodys-Changes-Edison-International-and-Southern-California-Edisons-Rating-Outlooks--PR_380780.

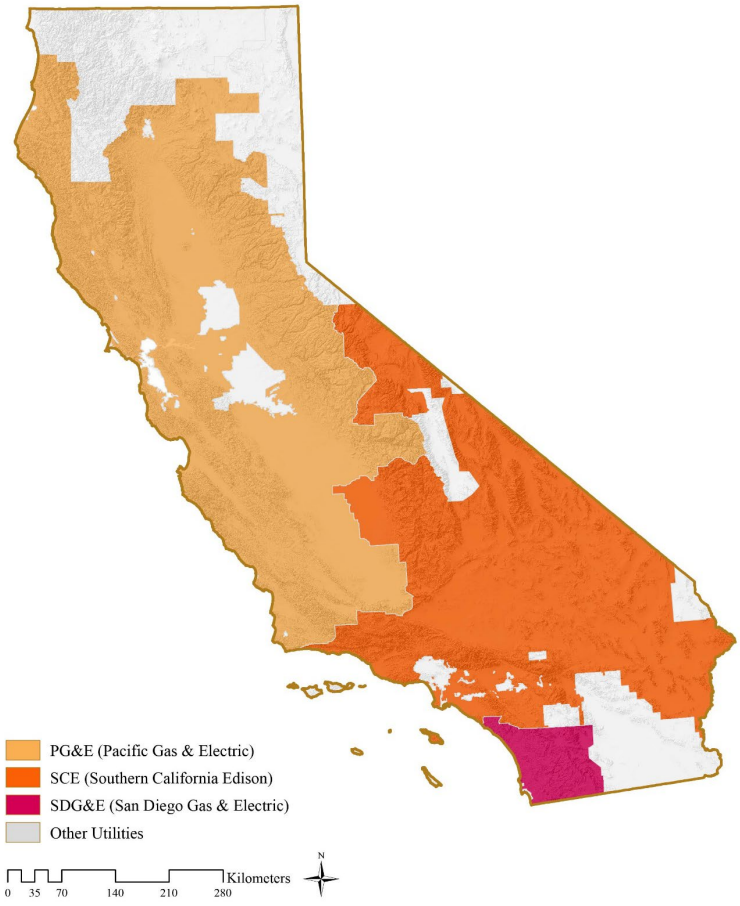
[11] Ernst & Young (2012). The Beneficiaries of the Dividend Tax Rate Reduction A Profile of Utility Shareholders. Washington, DC, Edison Electric Institute and the American Gas Association.

[12] SB 901, 2018, Reg. Session (CA 2017-2018); text available online at: https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB901.

[13] SB 901, 2018, Reg. Session (CA 2017-2018).

To inform the ongoing policy dialogue, this paper discusses potential financing options for third-party wildfire damages for California's electric utilities, assuming that the current liability regime remains in place. We focus on the state's investor-owned utilities (IOUs) since they have had the largest liabilities to date, they cover a significantly larger service area, and have commensurately greater exposure to wildfire risk. The three largest IOUs in the state—Pacific Gas and Electric (PG&E), San Diego Gas and Electric (SDG&E) and Southern California Edison (SCE)—are responsible for providing roughly three-quarters of all electricity used in California (see Figure 1 for service areas). That said, publicly-owned utilities (POUs), of which there are over 40 in the state, could also face these concerns and we discuss POUs explicitly where relevant. Indeed, the CEO of the Sacramento Municipal Utility District (SMUD) noted in a hearing to the California state legislature on August 9, 2018 that if a POU were ever found to have had equipment igniting a wildfire, that could lead to massive rate increases for customers or bankruptcy for a smaller POU.

FIGURE 1. CALIFORNIA ELECTRIC UTILITY SERVICE AREAS



Section 2 begins with an overview of the current arrangements for utilities to cover wildfire damage. Section 3 presents a range of risk financing strategies that could help facilitate access to capital to cover property damage from wildfires for which utility equipment is deemed to be a cause of ignition. This includes discussion of funded self-insurance, commercial insurance, catastrophe bonds, industry captives, an industry risk pool, and recovery bonds. The financing options are not mutually exclusive, and several could be utilized simultaneously to ensure funding for various magnitude wildfires. We discuss this in Section 4. Each of these financing strategies would require an annual contribution and/or initial capitalization to be viable. In Section 5, we present potential funding sources and mechanisms, and their distributional implications. Section 6 concludes with high-level policy recommendations.

2. Current Utility Financing Mechanisms for Wildfire Damages

The investor-owned utilities in California recover their costs through general rate cases to the California Public Utility Commission. Electricity rates are set to cover the full costs of providing service to customers plus a reasonable return. This is governed by the *regulatory compact*, an agreement that utilities will provide universal electricity—a critical and essential service—and in exchange, they will be allowed to recover the full costs of providing it.[14] The general rate cases are a mechanism for ensuring that the standard and predictable costs of electricity provision are included in the cost of electricity. These rate cases are intended to balance a range of competing objectives, involve multiple stakeholders, and may not be quick to complete. The approach, though, is designed for situations in which costs are fairly stable over time. A large, unexpected expense requires other mechanisms for determining how to recoup costs and avoid rate shock for customers. We review current mechanisms to do this here. When unexpected costs are not allowed to be recovered in rates, the utility will earn less than its authorized return on capital, which could restrict the amount of capital it can raise, and in the extreme, threaten its financial health.

While a utility's own equipment can be damaged by wildfire and require substantial expenditures to repair, a much larger expense for California's electric utilities comes from third-party liability for wildfire property damage. Unlike other states at high risk for wildfire, property owners in California can seek compensation for property damage caused by wildfires ignited by utility equipment through the application of the legal principle of inverse condemnation, rooted in Article 1, Section 19 of the state constitution (and interpreted by the California state courts), regardless of whether the utility was negligent or at fault.[15] Insurance companies can also use this doctrine to subrogate against the utilities and recoup their claims payments and attorney's fees. As noted above, the courts have adopted a strict

[14] Lazar, J. (2016). *Electricity Regulation in the US: A Guide. Second Edition*. Montpelier, VT: The Regulatory Assistance Project. Retrieved from http://www.raponline.org/knowledge-center/electricityregulation-in-the-us-a-guide-2.

[15] For more details on the operation of inverse condemnation and California's utilities, see: Kousky, C., B. Lingle, K. Greig, and H. Kunreuther (2018). "Wildfire Costs in California: The Role of Electric Utilities." Issue Brief. Wharton Risk Management and Decisions Processes Center, University of Pennsylvania, August. Online at https://riskcenter.wharton.upenn.edu/wp-content/uploads/2018/08/Wildfire-Cost-in-CA-Role-of-Utilities-1.pdf.

liability standard for inverse condemnation. As wildfire risks have sky-rocketed, California's utilities are now facing unprecedented liabilities for third-party property damage.

Currently, there are a few standard approaches for utilities to address unexpected costs. These mechanisms, discussed briefly in this section, are not enough, however, to provide financial protection to utilities from the escalating third-party wildfire risk. Some of these mechanisms are not allowed to be used for this liability (as opposed to damage to a utility's own system) and none ensure financing for the growing liability in a manner that sufficiently protects customers and utilities.

First, utilities can make use of a Catastrophic Event Memorandum Account (CEMA). These were created by the state legislature in 1991 following the Loma Prieta Earthquake in 1989. When a disaster is declared by the state or federal government, utilities can establish a CEMA to track disaster costs (such as repairing and replacing damaged infrastructure and restoring service) and later seek approval from the CPUC to recover those costs from ratepayers.[16] Once a disaster is declared, the utility may begin recording eligible costs in a CEMA, but must notify the CPUC and provide details of the disaster as well as the estimated costs to be incurred. A utility cannot record any costs incurred *before* the date of the disaster declaration; as such, risk mitigation expenses incurred in anticipation of a disaster would not be eligible for recording in a CEMA. CEMAs cannot be used for third party damage and the possible liability from the application of inverse condemnation.

For events that do not receive a formal disaster declaration, utilities may record costs and seek recovery through a mechanism called "Z-factor recovery." Z-factor recovery allows utilities the opportunity to recover costs from unforeseen, exogenous events that are not declared states of emergency and that meet the criteria for qualifying events. These criteria include that the event cannot have been preventable by management and must have had a significant financial impact on the utility.[17] Utilities must meet a deductible—typically $5 million to $10 million depending on the utility—before they can seek Z-factor recovery.[18] After identifying a Z-factor event, meeting the deductible, and recording relevant costs, utilities must request approval from the CPUC to recover costs from rates. This approach has been used by utilities to seek rate recovery due to increasing insurance costs post-wildfire.[19] The Z-factor mechanism is not generally used to recover wildfire liability costs as it has been assumed that utilities have some degree of control over general litigation costs, settlement amounts, and other legal

[16] Lau, E. (2016). "Cost Recovery Mechanisms for Electric Utilities for exogenous events occurring between GRC proceedings." Presentation to Commissioner Committee Meeting, October 26.

[17] For events to qualify for Z-factor recovery, they must meet 8 criteria: (1) the event must be exogeneous to the utility; (2) the event must occur after implementation of rates; (3) the costs are beyond the control of the utility management; (4) the costs are not a normal part of doing business; (5) the costs have a disproportionate impact on the utility; (6) the costs must have a major impact on overall costs; (7) the cost impact must be measurable; and (8) the utility must incur the cost reasonably. For more, see: http://docs.cpuc.ca.gov/published/Final_decision/3163-24.htm.

[18] This is only available for events that occur during post-test years.

[19] See, for example, https://www1.sce.com/NR/sc3/tm2/pdf/3768-E.pdf and Lau, E. (2016). "Cost Recovery Mechanisms for Electric Utilities for exogenous events occurring between GRC proceedings." Presentation to Commissioner Committee Meeting, October 26.

expenses. As such, utilities have recorded and sought recovery of wildfire liability costs through a separate mechanism—the Wildfire Expense Memorandum Account (WEMA).

WEMAs allow utilities to record (and later seek recovery for) wildfire-liability related costs such as co-insurance or deductible expenses; legal expenses incurred defending wildfire claims; increases in wildfire insurance premiums from amounts authorized in the utilities' general rate cases; and incremental wildfire liability costs, among others. Unlike CEMAs, which utilities can open at their discretion once a disaster declaration has been made, utilities must seek approval from the CPUC to establish a WEMA. Once established, the utility may keep the general account open and create sub-accounts for costs tied to individual fires. The utility may then seek cost recovery in separate, subsequent proceedings. The utility may also choose when to apply for recovery and which costs to include in the application.

There is no guarantee that the CPUC will allow the utility to recover WEMA costs from rates. For example, in 2015 SDG&E applied to recover $379 million in WEMA costs for wildfires occurring in 2007 (actual incurred liability was somewhat higher as SDG&E proposed a 90/10 split with shareholders). The CPUC denied all rate recovery for SDG&E, deciding that the utility did not "reasonably and prudently operate its facilities" connected to the fires. This clearly demonstrates that recording and recovering expenses are different decisions.[20] There can also be a time delay between the need to pay costs and the time when a recovery decision is made, during which the utility will have to have capital to address the unforeseen costs.

When the CPUC permits costs from unforeseen events to be recovered, it may allow the utility to record the recoverable costs as an asset and not take a charge against retained equity on the balance sheet. To reduce the annual rate impact, this regulatory asset can be amortized over time until the utility has recovered all costs.[21] In addition to extending recovery over a longer period, the regulatory asset can be debt financed. These details are decided by the CPUC as a part of a regulatory proceeding.

In response to the potentially large liabilities from the 2017 wildfires, newly enacted legislation (SB 901), specifies that for those wildfires, the CPUC must apply a financial stress test when allocating costs to a

[20] PG&E also uses a cost recovery mechanism known as the Major Emergency Balancing Account (MEBA). The MEBA allows the company to recover actual costs from responding to catastrophes and major emergencies that do not receive official declarations and are therefore ineligible for CEMA recovery. The MEBA is a two-way balancing account in which PG&E can only spend MEBA funds on non-CEMA emergencies and any unused funds are returned to ratepayers. If PG&E spends more than the approved amount, the CPUC must review the costs for reasonableness before they can be recovered. In contrast to PG&E, SCE and SDG&E include the forecasted costs of emergency preparedness and response in the general rate case budget and do not separate them into a balancing account. As such, SCE and SDG&E are permitted to reallocate funds to other authorized activities if they spend less than forecasted. However, if they spend more than the budgeted amount, they have to draw funds from other areas of the budget or draw from funds that would otherwise be distributed as dividends to shareholders (or, if there are insufficient funds that would be paid as dividends, go to the market to raise money through a stock or debt issuance) to pay the difference.

[21] For a broader discussion of this and other cost recovery mechanisms, see: Edison Electric Institute (2014). "Before and After the Storm: A compilation of recent studies, programs, and policies related to storm hardening and resiliency." Washington, DC.

utility's shareholders and ratepayers following a prudency review. The financial test determines the threshold amount a utility's shareholders can absorb which minimizes harm to ratepayers and acts as a cap on the shareholder allocation. That is, the CPUC must consider a utility's "financial status and determine the maximum amount the corporation can pay without harming ratepayers or materially impacting its ability to provide safe and adequate service."[22] The bill requires the CPUC to limit the wildfire costs and expenses disallowed for rate recovery to the amount determined by the stress test.

Note that these approaches are all for IOUs. POUs are generally smaller and face a different rate-setting process as they are not owned by investors. POUs can be organized in various ways, such as municipal districts, city departments, or rural cooperatives, but all tend to be non-profits managed by elected officials and/or public employees. For POUs, rates are set by the governing body of the utility or by a city council through a public process. Since they do not have shareholders, all wildfire costs would fall on ratepayers regardless of any negligence or serious misconduct by the POU.

3. Disaster Risk Financing Strategies

The risk of third-party wildfire liability for California's electric utilities poses challenges for traditional risk financing approaches. First, the risk is concentrated solely on California's electric utilities, and primarily on the large IOUs. As such, there is no appetite nationally for this risk to be part of a national risk pool or captive. When not diversified broadly, however, there are fewer options to secure affordable risk financing. Second, losses associated with this liability have clearly reached catastrophic levels, especially over the last two years. Mechanisms to provide capital for high loss levels are expensive and challenge commercial insurance markets. Indeed, as we discuss further below, California's utilities are facing a hard insurance market for this risk, where prices are high and supply is scarce.

This section discusses six options for financing this risk. We note at the outset that risk management includes both investments in cost-effective risk reduction as well as risk financing. This paper focuses on risk financing for remaining third party wildfire risk that cannot be cost-effectively mitigated. Determining optimal mitigation levels, however, especially when many of them are costly, is a critical area for additional analyses. All of the mechanisms we discuss in this section are designed to provide access to capital in high loss years and smooth costs over time. The options are not mutually exclusive and in Section 4 we discuss how they can be integrated to create a "tower" of financing for a utility.

3.1 Funded Self-Insurance

The first approach to consider is that a utility can retain all or a portion of the risk through funded self-insurance. Retaining more frequent and lower magnitude risks—and potentially higher levels—is usually cost-effective and encourages investments in risk reduction. Self-insurance through a dedicated account funded through rates as a cost of service can provide greater financial protection than other approaches

[22] See SB 901, available here: https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB901

to retaining risk, such as reducing expenditures to cover post-disaster costs, lowering dividend payouts, or keeping cash on hand (which tends to be low for utilities).

The standard approach for self-insurance would be through the creation of a wildfire reserve account. This account would grow over time (assuming there are years without catastrophic wildfires) to a predetermined adequate level and then be drawn down as needed to pay wildfire-related liabilities. The account could be designed to return back to ratepayers any amounts collected that exceed the required reserve level. Funding and initial capitalization, such as through a dedicated rate component, is discussed in Section 5.

Pre-funded reserves can benefit utilities and ratepayers in several ways. Adequately funded reserves reduce utilities' potential borrowing costs that might be incurred if the utility relied solely on post-event financing. Second, at times self-insurance can be less expensive than transferring the risk. Third, a well-funded reserve, capable of covering some portion of a potential loss, would likely increase investor confidence in the utility. Such confidence allows for continued investments in service reliability, capital improvements, and other activities.

There are, however, limitations to the role that funded reserves can play in financing catastrophic losses. One obstacle is that state regulators may be reluctant to let utilities collect pre-payments through rates to support the unquantifiable costs of future events. The funded reserve account would need to be designed specifically to prevent elected officials or regulators from clawing back funds that are not put to immediate use. As already stated, the funded reserve account would also need to be designed to return to ratepayers amounts collected that exceed required reserve levels. It is possible that such an account could only usefully cover lower levels of losses if there is regulator and consumer pushback on extraordinarily large reserves. In general, investors tend to not look favorably on simply setting aside large amounts of capital. This may make a captive more attractive for financing catastrophic loss levels, as discussed in Section 3.4.

Another issue with these accounts is that it takes time to build a reserve. One event could deplete the fund just as it is getting started and hinder future efforts to build an adequate reserve. This could be mitigated by initially capitalizing the fund with some base amount, perhaps through securitization backed by a dedicated rate component (discussed in Section 5). A second concern is that the damages from wildfires may continue to escalate, such that any fund would start to be used extremely frequently. In this case, it would be difficult to build it up over time. Essentially, the reserve would devolve into a set amount of wildfire liability financed by a dedicated rate component; other mechanisms would be needed to cover damages beyond this amount. Florida utilities have reserve accounts for storm damages, but they, too, have depleted their reserves and needed to tap other sources of capital to fully cover liabilities (see box).

Storm Reserve Accounts in Florida

Following Hurricane Andrew in 1992, Florida utilities had difficulty securing property insurance, especially for damage to their own transmission and distribution facilities. As a result, the Florida Public Service Commission (FPSC) allowed utilities to self-insure by establishing reserve accounts to cover property damages arising from severe storms and hurricanes.[23] Note, these are likely for much smaller amounts than the potential third-party liability risk facing California's utilities. FPSC regulations state that utilities may only use these funds to pay for incremental costs related to storm restoration activities such as additional labor or supplies needed to restore service and repair facilities. Florida utilities are required to file a Storm Damage Self-Insurance Reserve Study with the FPSC every five years, "including data for determining a target balance for, and the annual accrual amount to" the storm reserve account. Utilities must also file an annual report describing their efforts to secure commercial insurance for their facilities. The FPSC allows electric utilities to collect surcharges from customers for the purposes of building a storm damage reserve. If and when their reserves are exhausted (as has occurred following major storms), utilities may be able to charge customers for costs that exceed the balance of the fund.[24]

One method by which Florida utilities can recover these costs and rebuild their reserve accounts is issuing securitized bonds (see Section 3.6). For example, after Florida Power & Light's (FPL's) storm reserves were depleted by hurricanes in 2004 and 2005, the utility petitioned the FPSC to collect $1.7 billion from ratepayers to finance recovery bonds and to replenish their reserve account to $650 million. FPSC denied the request, deciding that FPL could collect only $1.13 billion from ratepayers and that the reserve could be replenished to just $200 million.[25] To collect these funds, FPL has charged its customers just over $1 per month since 2007 and will continue doing so until August 2019.

In addition to storm reserves, the commission has also permitted the use of a separate pre-funded account to cover liability costs associated with utility-caused injuries and damages. The purpose of the liability account is "to meet the probable liability, not covered by insurance for deaths or injuries to employees or others and for damages to property neither owned nor held under lease by the utility."[26] Similar accounts could potentially be structured for California utilities.

[23] Florida Administrative Code, Rule 25-6.0143. See https://www.flrules.org/gateway/ruleno.asp?id=25-6.0143.
[24] Edison Electric Institute (2014). Before and After the Storm: A compilation of recent studies, programs, and policies related to storm hardening and resiliency. Washington, DC.
[25] Pounds, M.H. and D. Fleshler (2006). "FPL Will Charge You $1 A Month for 12 Years for Storm Recovery." *South Florida Sun Sentinel*, May 16.
[26] Florida Administrative Code, Rule 25-6.0143.

3.2 Commercial Insurance

Insurance draws on principles of risk pooling to indemnify losses in exchange for regular premium payments. Investor owned utilities have historically purchased some amount of insurance to cover their liability for wildfire-related property damage to third parties. These are policies purchased from the private market. After the 2017 and 2018 wildfires, however, it has become clear that these policies are insufficient to cover the growing risk. For example, PG&E reported in their November 13, 2018 regulatory filing that the company purchased approximately $1.4 billion ($700 million for general liability and $700 million for third party property damages) in liability coverage for wildfire for the period from August 1, 2018 to July 31, 2019 (this figure includes the catastrophe bond discussed in Section 3.3). While this may appear to be a large coverage limit, the company notes that it "could be subject to significant liability in excess of insurance coverage that would be expected to have a material impact on PG&E Corporation's and the Utility's financial condition."[27] If held responsible for the 2018 wildfires, its liability could approach $15 billion.

Generally, the cost of wildfire insurance coverage is included in rates as a cost of service through the general rate case process.[28] That said, insurers have become concerned about the growing liability risks to utilities, and prices have increased substantially. For example, the CEO of SMUD noted in an August 8, 2018 hearing that their insurance costs were four times higher than in the previous year.[29] This appears to be the pattern for the IOUs, as well. PG&E's rate on line[30] sky-rocketed from 6-7% in 2017/2018 to around 25% for 2018/2019.[31] SCE saw a similarly high rate on line of 24% in the same timeframe. SCE purchased approximately $1 billion of wildfire-specific insurance, "subject to a self-insured retention of $10 million per occurrence" for the period from June 1, 2018 through May 31, 2019.[32] Rates were even higher following the Camp and Woolsey Fires.

Due to significant increases in premiums, all three IOUs have requested CPUC approval to include in rates the increased wildfire premium expenses.[33] Historically, insurance premiums have generally been recoverable in rates. With the increase in insurance premiums observed the past couple years, however, the CPUC may need to become comfortable with treating other financing mechanisms similarly should there be times when the utility ascertains another financing mechanism is more cost-effective. Insurance may also simply become less available, necessitating additional approaches. SCE noted in its

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[27] See: http://investor.pgecorp.com/financials/sec-filings/sec-filings-details/default.aspx?FilingId=13059295.
[28] Utilities have also utilized Z-factor recovery or a WEMA to seek recovery of unexpected premium increases.
[29] Hearing archived online here: http://calchannel.granicus.com/MediaPlayer.php?view_id=7&clip_id=5726.
[30] Rate on line is defined as the premium divided by the coverage limit.
[31] Hewlett, R. (2018). "Insurers and ILS investors exposed to $1.4bn PG&E Cali wildfire cover." *The Insurer*. November 15.
[32] See: https://www.edison.com/home/investors/sec-filings-financials/sec-filings.html?company=827052&company=827052&formType=.
[33] See https://www1.sce.com/NR/sc3/tm2/pdf/3768-E.pdf, https://www.pge.com/pge_global/common/pdfs/about-pge/company-information/regulation/2020-General-Rate-Case-Summary.pdf, and https://www.sdge.com/sites/default/files/SDG%2526E-27%2520%2528SCG-29%2529%2520Direct%2520Testimony%2520of%2520Neil%2520Cayabyab%2520-%2520Corporate%2520Center%2520-%2520Insurance.pdf.

request for Z-factor recovery of higher insurance premiums last year that they found some insurers have stopped offering such coverage or limited the amount they will write.[34] The combined forces of climate change escalating wildfire risk and the strict liability for third-party damages are creating a hardening of this insurance market, limiting the amount of commercial insurance that utilities can use to finance third-party wildfire liability.

3.3 Catastrophe Bonds

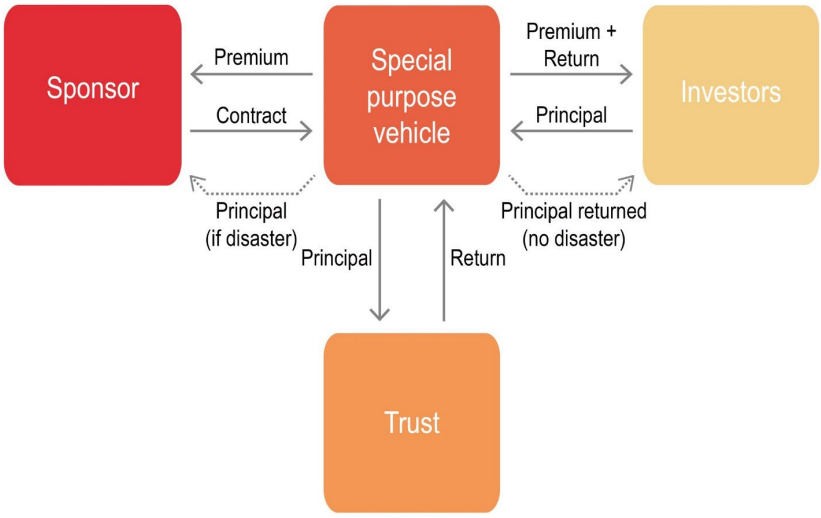
Catastrophe bonds (cat bonds) are used like insurance to transfer risk from a sponsor (here, the utility) to investors. Part of the justification for catastrophe bonds is that extreme events that might overwhelm insurance markets could potentially be more easily handled by the financial markets. In addition, securities markets tend to be more efficient in facilitating information sharing and price discovery.[35] It is generally believed that cat bonds are attractive to investors because they are not highly correlated with other financial markets and can generate higher returns. Given the potential loss of principal and different types of risks, however, they are not appropriate for all investors. And if investors, many of whom are not experts in disaster risk, do not feel comfortable with a risk, they will require much higher levels of compensation or may not be willing to invest at all. Note that to date, catastrophe bonds have been for first-party property damage, not third-party liability.

Figure 2 shows the general structure of a cat bond. The sponsor sets up a Special Purpose Vehicle (SPV) to facilitate the bond. The SPV collects principal from investors and holds it in a safe asset (labeled *trust* in the figure below) to reduce credit risk. The SPV is needed because investors cannot directly offer insurance to the sponsor without regulatory authority (a license). The investors get a return along with premium payments paid by the sponsor. If the clearly defined "triggering event" tied to a previously defined disaster occurs within the defined timeframe, the principal is given to the sponsor; if not, the principal is returned to the investors. Cat bonds can be proportional, so that greater percentages of the principal are released depending on the severity of the event. Cat bonds usually mature between one and five years (three years is most common).

[34] See: https://www1.sce.com/NR/sc3/tm2/pdf/3768-E.pdf.

[35] Cummins, D. J. and M. A. Weiss (2009). "Convergence of Insurance and Financial Markets: Hybrid and Securitized Risk-Transfer Solutions." *Journal of Risk and Insurance* 76(3): 493-545.

FIGURE 2. STRUCTURE OF A CATASTROPHE BOND



There are various types of triggers that would require release of the principal to the sponsor, including: indemnity, industry, parametric, and modeled triggers. An indemnity trigger may use a sliding scale of actual losses experienced by the issuer. An industry trigger is activated when industry-wide losses from an event hit a certain threshold. A parametric trigger describes actual weather or disaster conditions (wind speeds or earthquake intensity, for example). A modeled trigger relies on specified catastrophe model estimates that claims exceed a specified amount.[36] Parametric triggers generally allow for much more rapid payout than an indemnity trigger, which requires verification of losses. That said, parametric triggers create basis risk for the sponsor, or the possibility that losses are not equal to payouts.

Catastrophe bonds are generally used to cover just a slice of a risk. For example, they may cover losses between $1 billion and $1.5 billion. The point at which the catastrophe bond begins to cover losses—$1 billion in this example—is called the attachment point. The cap of payments is the exhaustion point—$1.5 billion in this example. It is common for cat bonds to not take a full layer, but only a share of a layer in order to provide diversification in sources of capital.

The premium spread of the bond depends on the probability of the loss for investors. For this, investors rely on estimates prepared by catastrophe modeling companies. If investors do not trust the catastrophe models or are uncomfortable with the risk, they will demand higher premium spreads.[37] This is certainly the case for third-party wildfire liability for California's electric utilities, which require not just confidence in the underlying hazard models but also in how modelers account for the likelihood that the ignition is started by a given utility and then once started, expected liabilities (which are a

[36] Edesess, M. (2015). "Catastrophe Bonds: An Important New Financial Instrument." *Alternative Investment Analyst Review*. Chartered Alternative Investment Analyst Association, Fall.
[37] Hardy, M. and F. Yang. (2017). "CAT Bond Premium Spreads." Global Risk Institute, June.

function not just of property damage but also litigation). This is unique for catastrophe bonds, which have previously been issued to cover only first-party disaster damages.

Both PG&E and Sempra (parent company of SDG&E) have attempted to use catastrophe bonds for third-party wildfire liability risk. PG&E went to market in August of 2018; this was the first issue to provide pure California wildfire protection with a trigger tied to third-party liability. Sempra's deal is similarly tied to their third-party California wildfire property liability risks. PG&E and Sempra each launched an SPV that raises capital from investors for the issuance of a cat bond that collateralizes a reinsurance agreement between the SPV and a traditional reinsurance company, which in turn provides protection to a traditional insurer, which in turn insures the utility for wildfire liability risk.[38] The PG&E cat bond is a $200 million tranche that attaches at $1.25 billion and covers a $500 million layer from that point upwards, with a franchise deductible applied for each event. In August 2018, at the time the bond was issued and before the Camp or Woolsey Fires started, price guidance was set at 6%-6.5% (see Table 1). The Sempra-sponsored cat bond is a $125 million tranche priced at 4% (in the middle of the 3.5% to 4.5% guidance). It attaches at $1.325 billion and exhausts at $1.465 billion, and Sempra is retaining the difference between the $125 million and the layer of $140 million.

TABLE 1. RECENT CALIFORNIA UTILITY CATASTROPHE BOND ISSUANCES[39]

Issuer / SPV	Cal Phoenix Re Ltd. (Series 2018-1)	SD Re Ltd. (Series 2018-1)
Cedent / Sponsor	PG&E Corporation	Sempra Energy
Placement / structuring agent(s)	GC Securities is sole structuring agent and lead bookrunner	GC Securities is sole structuring agent and lead bookrunner
Risk modelling	AIR Worldwide	AIR Worldwide
Size	$200 million	$125 million
Trigger type	Indemnity	Indemnity
Ratings	NR	NR
Date of issuance	Aug 2018	Oct 2018

The trigger for these bonds is similar to an indemnity trigger, but given the unique case of inverse condemnation in this context, payout of the bond is determined based on utility equipment being found to be the cause of the fire. These investigations, done by Cal Fire, can take months or years to complete. Further, the total amount the utility must pay will be based on the legal claims brought against it by homeowners and insurance companies. This means that investors will not be certain about the status of

[38] For PG&E, this cascades from its SPV to Tokio Millennium Re to Energy Insurance Mutual to PG&E. For Sempra, coverage cascades from its SPV to Hannover Re to Energy Insurance Mutual to Sempra. See: http://www.artemis.bm/deal_directory/cal-phoenix-re-ltd-series-2018-1/ and http://www.artemis.bm/deal_directory/sd-re-ltd-series-2018-1/.

[39] For more discussion, see: http://www.artemis.bm/blog/2018/10/08/sd-re-ltd-california-wildfire-cat-bond-to-price-at-middle-of-guidance/ and http://www.artemis.bm/deal_directory/cal-phoenix-re-ltd-series-2018-1/

the bond until well after the blaze has been contained; the bonds have limits for how long the collateral can be held.

Investors are not fully comfortable taking this new risk, as the PG&E bond failed to upsize as expected[40] and placed at over seven times its modeled expected loss.[41] This is much higher than most cat bonds. Data on the average price to expected loss by year for property (not liability) cat bonds from Artemis shows it has been under five since 2003 and under four since 2012.[42] After the 2017 and 2018 wildfires, interest in cat bonds designed with indemnity triggers exclusively for California utility third-party liability appears to have all but disappeared. Experts disagree as to whether the market may become more comfortable with this particular risk in the future. Some think this may occur, others believe that the past two wildfire seasons will permanently discourage any interest in cat bonds solely for California utilities' third-party wildfire liability.

3.4 Industry Captive

Captive insurance companies ("captives") are a type of insurance firm established by a parent company (that is itself not an insurance company) or by a group of companies to insure the risks of the owners. They date back to the 1500s and ship owners in London. Captives are essentially a form of funded self-insurance where the insurance provider is owned by the insured. The captive often operates like a traditional insurer, collecting premiums, issuing policies, and paying claims but offers these services only to the owners. The captive may, in turn, use multiple reinsurance or risk transfer mechanisms.

There are multiple benefits to and motivations for forming a captive. Specifically, they can be used to cover difficult-to-insure risks. They have also historically been established in periods of hard insurance markets as a way to save costs on risk transfer and address risk financing where commercial insurance is not available or is uneconomic. Captives can also reduce costs by providing direct access to reinsurance markets. Firms may also choose a captive in order to maintain control or ensure stability in risk transfer costs. Finally, a captive can have tax advantages since, often, contributions to a reserve are not tax deductible, but premium payments (to a captive) are deductible.

California utilities could join together and create a group captive to cover their liability for wildfire-related property damage. Generally, the owners—the utilities—would elect a board of directors to manage the captive. Many management and design options would require expert consultation, such as the setting of premiums among various participants, underwriting strategies, claims adjusting, capitalization requirements, management structures, and domicile location. Some initial capitalization would be necessary, because a captive insurer formed by the utilities would need to have adequate loss reserves. It is worth noting that any captive would have to set sufficient premiums to cover the risk, which may not necessarily be much lower than would be charged by commercial insurance. That said,

[40] Artemis (2018). "PG&E Secures First Wildfire Indemnity Corporate Cat Bond at $200 Million." August 7. Online at: http://www.artemis.bm/news/pge-secures-first-wildfire-indemnity-corporate-cat-bond-at-200m/
[41] Jasper, C. (2018). "California Wildfire Blindsides Cat Bondholders" *Global Capital* November 22.
[42] Data online here: http://www.artemis.bm/deal_directory/cat_bonds_ils_average_multiple.html.

the premiums of a captive would be retained in no-loss years and available to be rebated or used for other purposes as determined by captive owners. They may need regulatory approval before being created for this particular purpose.

Something similar is not without precedent in the energy industry. For example, in the mid-1970s, the Associated Electric & Gas Insurance Services Limited (AEGIS), an electric utility group captive, was created as a mutual. It now provides liability and property coverage to hundreds of policyholders in the energy industry and operates as a surplus lines carrier in all U.S. states. As another example, after the Three Mile Island accident, the Nuclear Mutual Limited was created as a captive because the founding utilities were unable to get the coverages and pricing they desired in the commercial insurance market. Nuclear Electric Insurance Limited (NEIL) was soon formed as a sister company and later the two merged. NEIL now insurers nuclear plants abroad, as well. As a final example, in the 1980s Energy Insurance Mutual, a mutual insurance company, was formed to provide excess liability coverage to utilities that were struggling to find coverage on the commercial market.[43] Some of these existing captives have previously offered small amounts of coverage for wildfire liability to California utilities but are unable or unwilling to provide sufficient protection for the escalating risk of strict liability for third-party damages,[44] suggesting a captive exclusively for California electric utilities may need to be created.

A related option for utilities is to form a risk retention group. These are corporations or limited liability associations governed by the Federal Liability Risk Retention Act of 1986. They are created to offer liability coverage for related members, which here would be the California utilities and their third-party wildfire damage liability. To do this, the state insurance commissioner must approve a feasibility study, business plan, and capital requirements and then license the operation.[45] Most risk retention groups are captives but there are some differences with the captives discussed above. Specifically, risk retention groups must be owned by policyholders and must have at least two policyholders (whereas a captive could be formed by a single company and write only coverage for that firm). Also, the capital requirements may differ and risk retention groups can only write liability insurance, while captives can provide quite broad coverage.[46] Risk retention groups have been used before in the industry. For example, the Public Utility Mutual Insurance Company is a risk retention group providing liability coverage to municipal utilities in the Northeast.

[43] An Energy Insurance Mutual subsidiary acted as the insurer for PG&E in connection with PG&E's cat bond, with all of Energy Insurance Mutual's coverage obligations backed by a reinsurance agreement with Tokio Millenium Re, which are in turn backed by a retrocessional reinsurance agreement with PG&E's SPV, which is funded by principal from capital markets investors.

[44] https://www1.sce.com/NR/sc3/tm2/pdf/3768-E.pdf

[45] National Association of Insurance Commissioners (2013). Risk Retention and Purchasing Group Handbook. Washington, D.C.

[46] Further, risk retention groups can operate throughout the U.S. after they are licensed in a state and do not need a fronting insurer to write policies.

3.5 Risk Pool

A risk pool is a mechanism to spread risk among a group of participants. Financial resources are combined among pool participants to cover losses whenever any of the pool participants experience a covered event. Essentially, participants exchange a share of their own risk for a share of the group risk of all members. Pools offer a couple of benefits. They are member-owned and operated, giving the participants more control over their coverages. They also tend to support risk reduction measures, through technical assistance or financial assistance in low-loss years, which would help members and lower claims for the pool.

Risk pools can at times offer affordable coverage against risks that are expensive or difficult to insure in the private market. Cost benefits from pooling risks, however, are only actualized for unpredictable and infrequent risks that can be diversified among many participants. If California frequently experiences annual fire seasons with blazes traced to utilities, a pool may not be able to offer benefits because the resources of the small pool would be insufficient without unfavorably high annual contributions. Moreover, due to overhead costs, pools will not be cost-effective if the utility is essentially simply trading dollars with the pool. A study projecting future wildfire liability to utilities would need to be undertaken to guide further exploration of a pool in this context and to determine what layer of losses would be most cost-effective to pool.

Risk pools have been used in other contexts where commercial insurance is expensive or difficult to obtain. Municipal pools, for example, are cooperative, nonprofit insurance entities owned and controlled by local governments. In general, participating local governments pay a premium into the pool and receive a coverage document, similar to an insurance policy. In the event of a covered loss, the pool pays claims to the local government. Municipal pools often cover liability, property damage to city buildings, and workers compensation for employees. Many have a consulting relationship with an actuarial firm to help them price their coverage. If funds exceed claims in a given year, the pool may retain the earnings in reserve or may return them as a dividend. The Association of Governmental Risk Pools (AGRiP) estimates that at least 80 percent of public entities in the United States participate in a risk pool.[47] A few states treat these as insurance and are, therefore, regulated by state insurance commissions, but most states do not; California Government Code section 990.8 expressly states that such pools are not to be treated as insurance.[48] Dozens of such pools operate in the state and may hold lessons for the structure of a utility risk pool.

A number of design questions would need to be explored to establish a pool for electric utilities. The first would be determining the members. Presumably, at a minimum a pool would include the three IOUs in California, but it could also include the POUs, or at least the larger ones (such as SMUD) that are concerned about their wildfire risk.

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[47] See fact sheet at https://www.nlc.org/sites/default/files/users/user118/Fact_Sheet-3.docx.

[48] Doucette, J.E. (2002). "Wading in the Pool: Interlocal Cooperation in Municipal Insurance and the State Regulation of Public Entity Risk Sharing Pools - A Survey." *Connecticut Insurance Law Journal* **8**(2): 533-564.

A risk pool for third-party wildfire claims would require both upfront capitalization as well as annual contributions funded through rates. Contributions would likely need to be securitized and approved by the CPUC in a manner similar to premium payments to a (re)insurer (for more discussion see Section 5). Pool contributions could be determined based on several metrics. Contributions, however, must be set somewhat proportional to risk or it would not be to the benefit of some participants to join the pool. Contributions could be based on a financial metric, service area size, or wildfire exposure, such as the percentage of line miles area in high wildfire risk areas. In theory, contributions could be reduced when a utility invests substantially in wildfire risk mitigation, although determining the amount of the reduction for various activities and verifying compliance may be difficult and/or contentious. Alternatively, pool membership may first require certain mitigation activities.

There is precedent for linking the risk transfer activities of a pool to risk reduction. The Caribbean Catastrophe Risk Insurance Facility (CCRIF) pools disaster risk for member Caribbean and Central American countries. Countries pay an annual premium that is proportional to their risk of the particular natural disaster (CCRIF provides policies for earthquake, tropical cyclone, and excess rainfall). Donor organizations initially capitalized the pool. The CCRIF both builds up a reserve and uses reinsurance. If losses exceed claims-paying ability, then payouts are pro-rated. Notably, CCRIF also provides hazard maps and risk information to countries to help them lower their potential losses through better land use and building regulations.[49]

The specific coverages of a utility risk pool would need to be defined in contracts akin to policy documents. These would clearly define when the pool would pay losses for a member and how much would be covered. These contracts would also establish a stop-loss for each member, or an amount beyond which the pool would not pay. If the pool grew in sophistication, it could offer member-tailored coverages that would be priced appropriately by employing the services of an actuary.

Finally, the pool would need to determine how to use unspent funds at the end of each year. Initially, some portion of unspent funds would likely be used to build up a reserve for the pool. If and when the reserve reached an adequate level, remaining funds could be given back to members for defined wildfire mitigation activities or simply pro-rated back to members.

3.6 Recovery Bonds

Pre-event financing arrangements, such as those discussed thus far, have the benefit of ensuring clear and defined mechanisms for obtaining capital to pay damages when it becomes necessary. Bonds, however, have been issued by multiple entities after natural disasters to help fund the unexpected and often high costs of these events. Such bonds are often referred to as recovery bonds. These bonds, like others, are sold to investors and then repaid with interest over a set period of time.

[49] For more information see: CCRIF SPC (2015). "Understanding CCRIF: A Collection of Questions and Answers." Grand Cayman, Cayman Islands: March.

State legislation passed in the fall of 2018 allows electric utilities in California to pay for wildfire liability costs through the sale of state-sponsored recovery bonds. Specifically, the bill authorizes the CPUC to "issue financing orders to support issuance of recovery bonds to finance costs, in excess of insurance proceeds, incurred, or that are expected to be incurred, by an electrical corporation, excluding fines and penalties, related to wildfires…"[50] This would allow recovery bonds to be securitized with a dedicated revenue source to repay the debt, which would produce a more favorable rating. Without cash receipts from such a dedicated rate component, the bonds would not be securitizable, lowering their rating and potentially causing investors to shy away from them.

Currently, the CPUC can issue a securitization order only following the reasonableness review of paid wildfire liabilities. As a result, the utilities must raise interim capital to finance the payment of wildfire liabilities without certainty of recovery. Raising the necessary capital may be difficult in this context. New legislation could enable securitization orders in advance of cost recovery determination, facilitating access to capital. A request by the utility for a securitization order pre-loss (for example, to fund any of the earlier discussed mechanisms) would be subject to review and authorization by the CPUC. If the CPUC determines post-loss that those costs are not "just and reasonable," it may disallow some portion of the utility's revenue requirement proportional to the utility's conduct while leaving the dedicated rate component servicing the securitization bonds intact. In making the "just and reasonable" determination, the law requires the CPUC to consider the utility's conduct, wildfire mitigation practices, and the extent to which costs were caused by factors beyond the utility's control, such as climate conditions and wind speed. As noted above, recent legislation also directs the CPUC to consider the utility's financial status and how much the company can pay without harming customers or adversely impacting service provision.

Uncertainty in rate recovery, coupled with shrinking equity post-wildfire, could make it harder for utilities to issue debt when most needed. That said, if the recovery bond is securitized by a dedicated rate component, this reduces the riskiness of the bond and results in a higher rating and lower interest rate. As such, when viable, recovery bonds can allow utilities to access larger amounts of capital relatively quickly. Securitized recovery bonds can also spread the cost of the disaster over multiple years and can reduce overall costs to consumers. As a consequence, securitized recovery bonds have become a fairly standard way for paying to repair systems damaged in hurricanes.[51] By way of example, in the aftermath of the 2004 hurricane season, the Florida legislature passed a law allowing utilities to recover storm damage costs and to rebuild storm reserve accounts by issuing securitized bonds. Following another series of devastating storms in 2005, Louisiana, Mississippi, and Texas followed suit.[52]

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[50] See SB 901, available here: https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB901

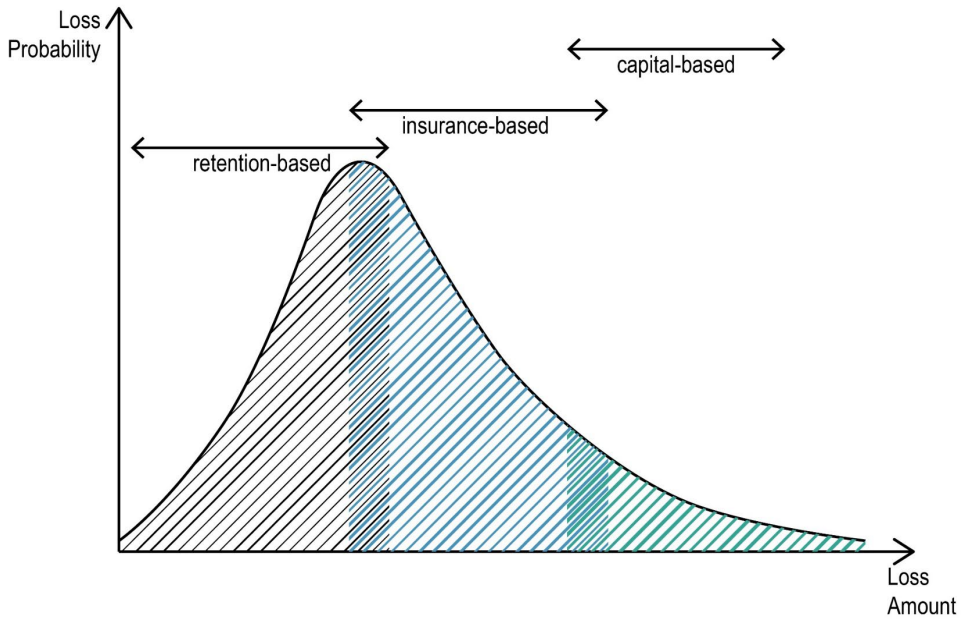
[51] For more, see: Britt, E. (2017). "Hurricanes Harvey and Irma: Electric Industry Impacts, Restoration, and Cost Recovery" *Infrastructure* 57(1).

[52] Ebert, M.E., J. Atkins, B., E.M. Jackson, J.M. Maltby, and R.L. Freeman (2016). "Critical Electric Power Infrastructure Recovery and Reconstruction: New Policy Initiatives in Four Gulf Coast States after 2005's Catastrophic Hurricanes." Fairfax, Virginia, George Mason University School of Law, Critical Infrastructure Protection Program.

4. Layering Financing

The financing solutions discussed in Section 3 fall into three overlapping categories: (1) retention-based solutions, (2) insurance-based solutions, and (3) capital-based solutions. The first are formalized approaches for the utility continuing to self-insure a portion of the risk through mechanisms such as reserve accounts. Industry captives would be quasi-retention based and quasi-insurance in so far as the captive is owned by the members it insures. Risk pools would move more toward an insurance-based solution and then, finally, there is standard commercial policies. Capital-based solutions move risk to the financial markets through various forms of bonds or other insurance-linked securities. As shown in Figure 3, these solutions can be matched to different parts of the loss distribution.[53] It is generally more cost-effective for firms to retain the high frequency and lower loss risks, transfer the lower probability and higher magnitude risks, and make use of capital markets for the tail risks (risks with low probability and high losses) where greater amounts of capital can be accessed.

FIGURE 3. RISK FINANCING STRATEGIES

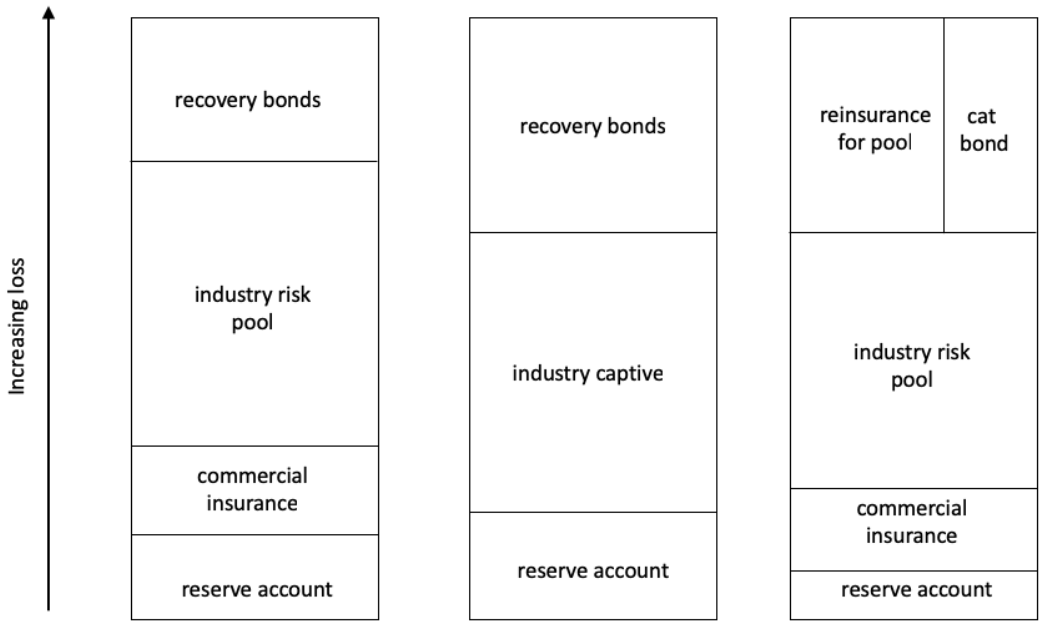


Determining optimal levels of risk retention versus risk transfer and how to choose among various institutional mechanisms is a difficult and complex decision for a company. In essence, the utility should

[53] Several analysts have explored such breakdowns in instruments previously. For example, see: Mutenga, S. and S.K. Staikouras (2007). "The Theory of Catastrophe Risk Financing: A Look at the Instruments that Might Transform the Insurance Industry." *The Geneva Papers* **32**: 222-245 and Aon (2015). "Finding the Right Retention" online at https://www.casact.org/community/affiliates/sccac/1215/Ferrell-Malbon-Rico.pdf.

layer various risk financing solutions for different levels of the risk as suggested in Figure 3. There are multiple approaches to operationalizing this as shown in the three example risk financing towers in Figure 4. Any of these financing towers—and others—are plausible approaches to financing the risk. With such a concentrated and potentially catastrophic risk, however, there are limitations to all these approaches and none will be as affordable as a risk that could be pooled more broadly or was more limited in potential downside (such as first-party wildfire damages).

FIGURE 4. EXAMPLE RISK FINANCING TOWERS



Clearly a first order metric for comparison among different options is cost-effectiveness or minimizing opportunity cost, as well as market support/availability. The cost of different options varies along the expected loss distribution; companies must also recognize the cost of retained risk. At a high level, this can be guided by Figure 3, but choosing among various insurance-based approaches would require a more detailed risk and actuarial analysis. Such a study would examine future liability for wildfire-related property damage and include a financial analysis of various options in light of the utility's risk tolerance. It would consider, as well, some challenges with risk pooling, whether in a captive or pool, among only a very small number of utilities with the potential for catastrophic losses.

Beyond a cost or financial analysis, choosing among the various risk financing approaches should also be guided by other metrics of potential interest to utilities including: control over risk transfer arrangements, regulatory requirements, stability over time, linkages with risk reduction, and the distribution of costs. Analysis of these factors and making an ultimate decision must be done in dialogue with the CPUC, because a critical component of decision-making will be the extent to which various risk

financing costs can be included in customer rates. Cost-effective risk financing, however, should be supported by the CPUC as it would benefit the customer through lower impacts on rates and improved financial health of the utility.

5. Funding

Most of the financing approaches discussed in Section 3 would need annual contributions and many would also require initial capitalization to be viable. This funding could potentially come from three sources: ratepayers, taxpayers, and shareholders. The application of inverse condemnation to electric utilities is predicated on the argument that wildfire damages are a cost of electricity provision and should be spread across all customers through rates. The CPUC does not always allow this, however, and utilities are now in a position where the distribution of these costs is quite uncertain and utility shareholders have been a source of post-loss contributions. When the company has not behaved imprudently, however, this violates the regulatory compact mentioned earlier: that utilities should be able to recover all costs of providing electricity service in exchange for universal provision—even electricity provision in high wildfire risk areas. To align with the regulatory compact, ratepayers would shoulder cost-effective pre-wildfire financing and shareholders would pay post-loss costs only in proportion to utility imprudence. In this section, we discuss in more detail contributions from all three groups.

5.1 Utility Customers

Utility rates need to cover the costs associated with providing electricity in a responsible way in a fire-prone state that requires utilities to pay for third-party property damage through a strict liability regime. The question is how much, when, and through what mechanism. Annual contributions for a reserve fund, insurance premium payments, or pool contributions could all be funded through a specific fee or dedicated rate component on ratepayers' utility bills. This would require approval by the CPUC or legislation.[54]

Historically, recovery of commercial insurance premiums in rates has been standard, as they are a cost of operation. When insurance premiums are allowed to be recovered but not other types of risk financing, however, utilities may have poor incentive to purchase excessively expensive insurance (if it is even available). In order to guarantee the financial soundness of utilities through pre-event financing, the CPUC will need to begin to broaden consideration of recovery for the other mechanisms discussed here alongside standard insurance policies. Another challenge is that rate cases have tended to look at historical losses. In a time of increasing wildfire costs, including growing insurance premiums and capacity constraints, historical numbers will fail to be accurate. Modelled future expenses will be needed in rate cases.

[54] The CPUC already allows other types of costs to be socialized among ratepayers. For example, through the California Alternate Rates for Energy (CARE) program, qualifying low income households can receive a 30-35 percent discount on their electric bill, which is paid through a surcharge levied on all other utility customers.[54] By making electricity more affordable for low-income households, the CARE program provides a public good that is believed to benefit the broader community, including the ratepayers that finance the discounts. The same logic applies for pre-financing wildfire losses. By contributing to a financial mechanism that allows utilities to effectively manage wildfire liability costs, ratepayers are providing a public good that accrues to their communities when utilities are able to continue providing service in high-risk areas.

If fees are charged to ratepayers, these could be uniform or vary across different customer segments. One general consideration is that a uniform fee on all ratepayers would likely be regressive because lower income households tend to pay a higher portion of their income toward utility bills than higher-income households. To address this concern, the wildfire risk financing fees could be waived for the lowest income ratepayers or addressed through federal and state programs already established to help lower income households pay their energy bills (e.g., the Low-Income Home Energy Assistance Program or the California Alternate Rates for Energy program).

Wildfire risk is not distributed evenly and some customers contribute more to the risk than others. The risk of igniting a wildfire is higher when lines must be hung through high fire-risk areas, such as the area called the wildland-urban interface (WUI). Accordingly, there is an equity argument to be made for charging a higher wildfire fee on ratepayers in the WUI. A differential fee does not mean that it should be zero for urban-dwellers, however, as many transmission lines that provide power for all customers must cross the WUI. While it could be challenging to define the WUI area that would face higher charges, this could be aided by the many wildfire risk designations produced by Cal Fire. The designated areas may also face different reliability standards since de-powering lines in high wind conditions would likely be needed during adverse conditions to reduce the possibility of ignition.

Determining some type of pre-wildfire or standing fee on ratepayer bills to fund potential liabilities through a pre-disaster financing mechanism discussed in Section 3 would provide greater stability for the utility and, ultimately, for ratepayers. Currently, commercial insurance is limited and expensive and interest among investors for assuming this risk is minimal, suggesting a deeper investigation of captives or risk pools is worth undertaking. While post-wildfire negotiations in the face of growing liability generally creates problematic uncertainties for all parties, recovery bonds could be used with a pre-disaster approval for securitizing them through a dedicated rate component.

5.2 Taxpayers

It is unlikely that taxpayers would be called on to finance this risk for utilities even though choices made by state and local governments around land use, building codes, and fuel management contribute to the increased risk. The contribution of these factors, combined with climate change, is not recognized in a regime that holds utilities strictly liable for property damages. This regime is increasingly pushing utilities toward financial hardship (or bankruptcy) with the possibility of cascading impacts in the state. The growing financial precariousness of utilities could, if severe enough, threaten energy reliability and California's climate change goals. As such, absent reform of strict liability, legislators may choose to provide some limited type of funding to help protect the utilities from bankruptcy and to ensure that capital is available for third parties whose homes were damaged in wildfires and/or for the insurers who paid out homeowner claims following wildfires. This could take the form of initially capitalizing a risk pool or industry captive, for example, or providing a standing state guarantee of recovery bond issuances. If and how a state contribution is made would require a more detailed analysis and discussion with various stakeholders.

5.3 Shareholders

With the current financing arrangement—or lack thereof—for third-party wildfire liability, shareholders are bearing some of the costs. For example, beginning with the fourth quarter of 2017, PG&E suspended payment of cash dividends on its common and preferred stock, due to potential wildfire liability. It should be noted that many retirees and other investors choose utilities precisely because they pay reliable dividends and tend to be low risk. This was coupled with plummeting stock value to the point where PG&E filed for bankruptcy, which could impose costs on many stakeholders. Other IOUs have also seen declines due to wildfire liabilities, impacting their shareholders as well. A study of the direct shareholders of utility stocks with qualified dividends found that around 60% were over age 65 and two-thirds had incomes under $100,000 (with 38% having incomes under $50,000).[55] When utility shareholders bear the costs, therefore, it primarily impacts older and less affluent individuals.

In addition to withholding dividends to cover wildfire damages and declines in share prices, shareholders indirectly contribute to wildfire liability costs if the company has to take on more debt or issue more stock and uses the funds to cover wildfire expenses. That said, it would be extremely difficult to issue debt or equity in an environment when dividends are suspended and the utility faces continued exposure to future large liabilities that are not adequately financed through secure pre-event mechanisms backed by ratepayer contributions. Moreover, declining credit ratings and stock prices make it more difficult and expensive for utilities to borrow funds or raise capital for critical projects. If utilities can't access funds through these means, they may rely more heavily on rate increases to pay for necessary infrastructure improvements. As a result, ratepayers will shoulder more costs through higher electricity bills.

6. Conclusion

The effects of climate change, along with development in the wildland urban interface are continuing to drive up the risk of wildfire damages in California. The state needs to adopt a sound financing strategy for its electric utilities to protect all parties and to ensure continued progress on broader climate and energy goals. The most straightforward way to achieve this may be to eliminate strict liability for third-party wildfire damages coupled with a cost recovery standard at the CPUC that is tied to universally agreed upon risk reduction activities (such as could be articulated in the utilities' SB 901 wildfire management plans). The current regime has created a risk that is difficult to finance due to its concentrated and catastrophic potential. Eliminating strict liability for third-party damages for wildfire, while simultaneously adopting new regulations on wildfire mitigation activities for electric utilities, could preserve incentives for proper risk reduction yet not threaten the ability of utilities to provide electrical service in high-risk areas by forcing them to cover escalating costs even when they are not negligent.

[55] Ernst & Young (2012). "The Beneficiaries of the Dividend Tax Rate Reduction A Profile of Utility Shareholders." Washington, DC, Edison Electric Institute and the American Gas Association.

Absent reform, addressing third-party wildfire liability for California's electric utilities will require layering together multiple risk financing options. Utilities likely need a dedicated rate component for some level of funded self-insurance as the initial financing layer. Commercial insurance and catastrophe bonds may be able to play a small role, but currently, the private market has seen rising prices and decreasing interest in assuming this risk. As such, utilities likely need to pursue, in consultation with the CPUC, some type of risk pool or industry captive. If utilities could be guaranteed pre-disaster state backing or CPUC approval of rate recovery, recovery bonds are another viable financing option. Without more certainty, however, they may not provide needed financial assurances. Ex-ante financing and guidelines are necessary to have in place, because without them, post-wildfire there are protracted negotiations between the utility, CPUC, the state legislature, and other stakeholders on how to divide costs between ratepayers and shareholders. Reducing this post-disaster confusion is in the interest of all stakeholders.

Only about 5% of wildfire ignitions are from power lines (this is just over 10% of acres burned).[56] For the state as a whole, then, property damage from wildfire is a much broader issue than electric utilities. As concerns mount about the affordability and availability of property insurance in highly wildfire-prone regions,[57] the state must have a larger policy discussion with utilities, insurers, and all other stakeholders, about how to equitably fund this growing risk and provide greater incentives for risk reduction to all parties, including local governments and households.

[56] This figure is based on analysis of Cal Fire data from 2007 to 2016, see http://www.fire.ca.gov/fire_protection/fire_protection_fire_info_redbooks.

[57] See: California Department of Insurance (2017). "The Availability and Affordability of Coverage for Wildfire Loss in Residential Property Insurance in the Wildland-Urban Interface and Other High-Risk Areas of California: CDI Summary and Proposed Solutions," December.