



Department of
Consumer and
Business Services



OFFICE of the
**INSURANCE
COMMISSIONER**
WASHINGTON STATE



1
IN
1000

Executive Summary

The hidden cost of delaying climate action for West Coast insurance markets

A first-ever regulator stress test of investment portfolios using PACTA and 1-in-1000 transition risk tools.

About the Report

This report describes an analysis of the investments of insurers licensed in three Pacific coast U.S. states – California, Oregon, and Washington. It describes the exposure of these investments to fossil fuel and clean, low-emission technologies, the alignment of these investments with a set of future climate scenarios, and the impacts that could arise to profitability of these portfolios in the event of a rapid disorderly transition to meet the goals of the 2015 Paris Agreement.¹ The analysis and results here represent the first climate stress test by U.S. state insurance regulators. The intent of this report is to understand the position of insurers operating in the contiguous Pacific coast states relative to the transition to a low carbon economy, and to demonstrate the utility for companies and regulators of new tools for forward-looking climate risk assessment. It represents just one step in the California Department of Insurance’s long-term strategy for employing and promoting forward-looking climate risk assessments for the insurance sector. It also represents an important collaboration between U.S. state insurance regulators.

The data for this analysis was generated by RMI, which stewards the Paris Agreement Capital Transition Assessment (PACTA) tool, and Theia Finance Labs (formerly 2 Degrees Investing Initiative Germany), which developed the 1-in-1000 TRISK climate stress testing framework.

Authors/Contributors

Kara Voss, Ph.D., Climate Finance Specialist, California Department of Insurance

Rabab Charafeddine, Climate Risk Specialist, California Department of Insurance

Ope Oyewole, Science Fellow, California Council on Science and Technology

Mike Peterson, Deputy Commissioner for Climate and Sustainability, California Department of Insurance

Oregon Department of Consumer and Business Services – Division of Financial Regulation

Washington State Office of the Insurance Commissioner

RMI and Theia Finance Labs

Reviewers

Jay Bruns, Senior Climate Policy Advisor, Washington Office of the Insurance Commissioner

Antonio Buller, Analyst, Theia Finance Labs

Jakub Červenka, Research Manager, Theia Finance Labs

Brian Fjeldheim, Senior Policy Advisor, Oregon Division of Financial Regulation

George Harris, PACTA for Banks Lead, RMI

Ted Lamm, Senior Research Fellow, UC Berkeley Center for Law, Energy, & the Environment

Sarah LaMonaca, Principal, RMI

Daisy Pacheco, PACTA for Supervisors Lead, RMI

Release: February 2024

¹ See The UNFCCC Paris Agreement:

https://unfccc.int/files/essential_background/convention/application/Probability_of_defaultf/english_paris_agreement.Probability_of_defaultf

Executive Summary

Climate resilience is a sprint to understand the risks and a marathon to address them. The earlier we understand, the earlier we can plan, and the better the outcome for the public. In this report, we focus on some of the climate risk scenarios that insurance companies may face in the next three decades. Scenario planning is the essential next step to sustainable insurance markets. Three key principles are true, but the ultimate outcomes from these principles for the insurance sector remain uncertain:

1. The Paris Agreement, signed by 195 parties in 2015, sets emissions reduction targets that must be met to avoid the worst consequences of climate change
2. Certain changes in local and national economies are already evident. Among many shifts with economic consequences: Washington has set a target of zero-carbon power generation by 2045, Oregon has emission reductions goals of at least 45% below 1990 emissions levels by 2035 and 80% by 2050, in addition to commitments to stronger building codes and energy efficiency standards; California has targets for 300,000 zero-emission heavy duty trucks by 2029, and numerous other initiatives working towards the goal of being carbon neutral by 2045.
3. Further changes are certain, but the speed of change and the abruptness of change are uncertain.

Shifting insurance company strategies and shifting financial markets can create challenges and opportunities. An initial challenge for each sector of the economy is to be forward-looking, and design the scenario planning tools necessary to moderate disruption to local, state, and national economies striving to align with the Paris Agreement. Insurance companies that evolve to meet the needs of a transition towards zero-carbon energy and low-carbon technology will position themselves for growth opportunities.

Why the insurance sector?

For the insurance sector, planning for climate risks includes risk management across each part of an insurance company's business. Each company has a portfolio of policies, insuring businesses or individuals or governments, and promoting risk reduction among those policyholders is essential. Insurance companies also have operations and risk management tools that can be further aligned with climate scenarios to ensure sustainable practices. However, this report focuses on the categories of investments that insurance companies hold as a backstop to ensure their ability to pay future claims.

How does this report advance scenario planning?

Understanding the risks that climate change poses to the insurance sector, and the opportunities that arise from a transition to a low-carbon economy, is critical to maintaining reliable insurance markets.

Insurance is a substantial part of the U.S. economy, representing about 2.6% of Gross Domestic Product (GDP).² Insurance companies invest the proceeds of the premiums that they collect from people and businesses, making them some of the largest institutional investors in the U.S. with approximately \$8.2 trillion in cash and invested assets reported in 2022.³ As some of the largest institutional investors,

² See Insurance Sector's Share of Gross Domestic Product (GDP), 2018-2022; Insurance Information Institute: <https://www.iii.org/publications/a-firm-foundation-how-insurance-supports-the-economy/driving-economic-progress/contribution-to-gdp>

³ See NAIC Capital Markets Special report: [Growth in U.S. Insurance Industry's Cash and Invested Assets Declines to 1.3% at Year-End 2022](#)

insurance companies can be exposed to climate risks and are also well positioned to take advantage of opportunities to invest in low-emissions technology.

This work represents the first ever regulator-run climate stress test of U.S. insurers and the first financial regulator use of the 1-in-1000 TRISK analysis, a climate stress testing tool. The analysis focuses on a subset of insurance companies' investments – those held in the form of corporate bonds, which represent the largest single tranche of insurer investments, and listed equities (stocks) for medium- to large-sized insurers licensed in California, Washington, and Oregon – summing to \$2.29 trillion in assets under management. This report also represents a follow-up to the California Department of Insurance's prior climate scenario analysis, which was published in 2019 and used the Paris Agreement Capital Transition Assessment (PACTA) tool.

The Paris Agreement recognizes that if substantial actions are not taken to reduce greenhouse gas emissions, impacts in the form of damages to physical structures, human lives and livelihoods, ecosystems, and supply chains will continue to balloon, with consequences throughout local, national, and international economies.⁴ At COP28, the parties to the Paris Agreement formally agreed to transition away from fossil fuels in energy systems. While this call fell short of a "phase-out", leaving the door open for some carbon-intensive sources, it was an important signal of what's to come for global energy systems. The development of defined scenarios for future climate change and climate action with corresponding pathways for technology development in those scenarios, provide powerful tools for the assessment of the forward-looking view of risks and opportunities for investment portfolios. Investment portfolios vary in the magnitude of their exposure to sectors that are anticipated to undergo major changes due to climate change, and portfolios with heavy investments in sectors that either rely on fossil fuels, or are highly exposed to climate risks, may face financial consequences. At the same time, businesses are not static and those that have stated plans to align their business with scenarios that lead to a low-carbon future may be better positioned to withstand these changes. These complementary measures of exposure and alignment can allow companies and supervisors to assess, compare, and track climate risks to investments.

Scenario Analysis and Climate Stress Testing Approaches

Financial analysis and risk tools are central to the role of insurance regulators. The PACTA tool provides a visualization of exposure of investments to climate-relevant sectors and how the forward-looking production plans of investee firms within an investor's portfolio align with the economic changes that would be required to meet a defined scenario for slowing or halting climate change. It compares what needs to happen in sectoral decarbonization pathways determined through climate scenarios, with financial actors' exposures to companies in climate-relevant sectors. It is open source and makes scenario analysis readily accessible for a range of stakeholders. PACTA uses a five-year time horizon for forward looking production plans. The PACTA tool is available for individual use by asset owners through a free-to-use web browser application, as well as for the benefit of financial regulators for larger analysis through partnership with RMI.

⁴ See The UNFCCC Paris Agreement: https://unfccc.int/files/essential_background/convention/application/Probability_of_defaultf/english_paris_agreement.Probability_of_defaultf

The 1-in-1000 TRISK Climate Stress Test developed by Theia Finance Labs estimates the additional costs for the financial sector when climate action by companies is delayed. The climate stress testing analysis uses the exposure and forward-looking plans of investee companies, as represented in the PACTA output, and climate financial scenarios until the year 2050 to test the impact that a transition shock scenario would have on the portfolio's earnings. The transition shock scenario is a situation of sudden transition policy change in which companies within defined climate-relevant sectors are, in a specific year, required to change production to align with a target climate scenario, and compensate for any production that was out-of-alignment in previous years. The model also may introduce a carbon tax which puts additional production cost shocks on high-carbon emitting firms' profits. The analysis uses asset level data to project transition impacts on the profitability of publicly listed firms in climate-relevant sectors in terms of probability of default and expected losses for corporate bonds, and relative net present value change for listed equities.

Two firms with the same current emissions today could face different transition risks based on their forward-looking production plans and adaptive capacity. Investors, in turn, require a clear understanding of those differing risks to make informed forward-looking decisions. While many central banks and supervisors rely on historical and projected carbon emissions as a proxy for transition risk, the PACTA Analysis and 1-in-1000 Climate Stress Test approaches account for firm-specific forward-looking production plans. These plans are provided by Asset Impact, which collects the forward-looking information from companies' business intelligence, public strategic planning documents, and annual reports. Firms that are planning to transition to sustainable technologies will likely be less vulnerable to policy or demand-driven shocks that require rapid phase down of high-emitting technologies, regardless of their current or historical carbon emissions. Additionally, firm-specific forward-looking plans can help investors strategically invest in firms that are supporting the transition to a clean energy economy, rather than employing sector-wide divestment. This is important, given that firms belonging to traditionally high carbon sectors, such as the energy sector will need access to low-cost capital to finance their transition to a clean economy while expanding capacity to meet demand.⁵

⁵ [The Cost for the Financial Sector if Firms Delay Climate Action](#)

Table 1. Climate scenarios are used to represent pathways (of energy, technological change, development, emissions, etc.) implied by current policies or leading to achievement of specific climate goals and targets. The following scenarios were used in the PACTA and 1-in-1000 TRISK analysis:

Representing Current Policies		Representing Goals and Targets	
Scenario	Analysis	Scenario	Analysis
IEA WEO Stated Policies Scenario (STEPS) v2021	PACTA, 1-in-1000	IEA WEO Announced Pledges Scenario (APS) v2021	PACTA
NGFS GCAM Current Policies v2021	1-in-1000	IEA WEO Sustainable Development Scenario (SDS) v2021	PACTA, 1-in-1000
NGFS REMIND Current Policies v2021	1-in-1000	IEA WEO Net Zero Energy by 2050 (NZ 2050) v2021	PACTA, 1-in-1000
JRC Current Policies v2021	1-in-1000 (Auto only)	NGFS GCAM Below 2 Degrees Scenario v2021	1-in-1000
		NGFS REMIND Below 2 Degrees Scenario v2021	1-in-1000
		JRC 1.5°C-Uniform v2021	PACTA, 1-in-1000 (Auto only)

Included Investments

The makeup of insurer investment portfolios is driven by the insurance business model. Insurers invest the premiums they receive from their policyholders in longer-term, mostly fixed income, assets in order to have resources available to pay future claims. This analysis focuses exclusively on the corporate bond and listed equity (stock) holdings of insurers licensed in California, Oregon, and Washington earning over \$100M in national premium which, in total, represents \$2.29 trillion in assets under management. Insurance companies hold a large variety of other asset types, including municipal bonds, U.S. treasury and other sovereign bonds, mortgage-backed securities, cash and cash equivalents, among other assets. However, corporate bonds are the largest single tranche of insurer’s investments. According to research by the National Association of Insurance Commissioners, in 2022 corporate bonds comprised 56% of U.S. insurers’ bond holdings, and bonds comprised 62.3% of U.S. insurers’ cash and invested assets.³ Common stocks represented the second largest single tranche of U.S. insurers’ investments, contributing 13.2% of total cash and invested assets. The breakdown between asset classes varies by insurer line of business. In this analysis, the breakdown of insurers’ investments is presented as a fraction of only those investments included in this analysis.

Highlights from the Results

PACTA Scenario Analysis Results

Overall, the exposure results show that P&C, Life, Health, and Fraternal insurers operating in California, Oregon, and Washington have significant appetite for investment in transition technologies such a renewable power capacity production, which is likely to grow in alignment with state and federal investments, and also have significant exposure to transition risks through their investments in fossil fuel extraction and fossil fuel-based power production, including gas power. Insurers had more exposure to oil & gas extraction than the market benchmark, which is commonly used as a comparison for financial performance.

Insurers' corporate bond portfolios display very different exposure to climate-relevant sectors than their listed equity portfolios, with more exposure to climate-relevant sectors in bond portfolios than in listed equities. This is particularly important for the insurance sector, given that insurers' portfolios are often weighted towards bonds. However, there are distinct differences between the composition of the assets included in this analysis for different types of insurance business. For example, Life insurers' assets included in the analysis are almost entirely (nearly 90%) corporate bonds while P&C insurers hold a more even mix of corporate bonds (39%) and listed equities (57%).⁶

Within corporate bonds the share of portfolio-associated production from renewables, hydropower, and nuclear made up more than a third of the total from power capacity production across all insurer peer groups. Life, P&C, and Fraternal insurers has a higher fraction of their portfolio-associated production in renewables than the market benchmark.

Exposure of investments to fossil fuel extraction varies widely between insurers. No aggregate insurer group (Life, P&C, Health, Fraternal) has more than 4.5% of their analyzed corporate bond portfolio and 2.5% of their analyzed listed equity portfolio exposed to fossil fuel extraction. However, some individual insurers have up to 95% and 30% exposure in their analyzed corporate bond and listed equity portfolios, respectively.

Life insurers have the most value invested in the oil & gas extraction sector (\$150B) and the power sector (\$100B), based upon the analyzed investments. P&C insurers have the smallest share of their listed equity portfolio value in oil & gas extraction (~1%) but this still amounts to \$6 billion in assets. P&C insurers have very little of their portfolio invested in coal extraction. P&C has significant exposure to fossil-based power production (~5% of portfolio value amounting to \$4B). Another upwards of \$6 billion of their investments are in steel and cement production.

Investee companies are not static. The forward-looking plans of insurers' investee companies indicate a ramp up of zero-carbon technologies (e.g., renewable power, electric cars), but not at a pace that is aligned with what will be required to meet the needs of a timely transition to a low-carbon economy in accordance with the Paris Agreement or to meet the pathway implied by the policies in place in 2021. Moreover, the forward-looking plans of insurers investee companies in climate-relevant sectors are generally misaligned with even the least ambitious policy scenarios. While these plans generally show a slowing of fossil fuel-related production they do not bend the curve sufficiently to align with the Paris Agreement, which indicates exposure to transition risk in the event of rapid climate action towards this goal.

However, the analyzed insurers' investments in coal power capacity are generally in companies that are planning for a decline in production that aligns with a sustainable development scenario. This is critical given that coal power production faces early and steep declines in the scenarios that meet the goals of the Paris Agreement.

For many sectors (oil power, oil extraction, coal mining), the plans of the companies associated with the aggregate portfolio of insurers are not aligned even with the current energy and climate policies

⁶ Asset-class breakdowns are presented as a percent of only those assets included in the analysis (corporate bonds and listed equities), and does not include other asset types. For more comprehensive information on U.S. insurer asset breakdowns see NAIC Capital Markets Special Report: [Growth In U.S. Insurance Industry's Cash and Invested Assets Declines to 1.3% at year-end 2022](#)

that were implemented in 2021, implying exposure to transition risk even in the absence of any additional collective climate action, whether by policy, societal preferences, or technological advancement.

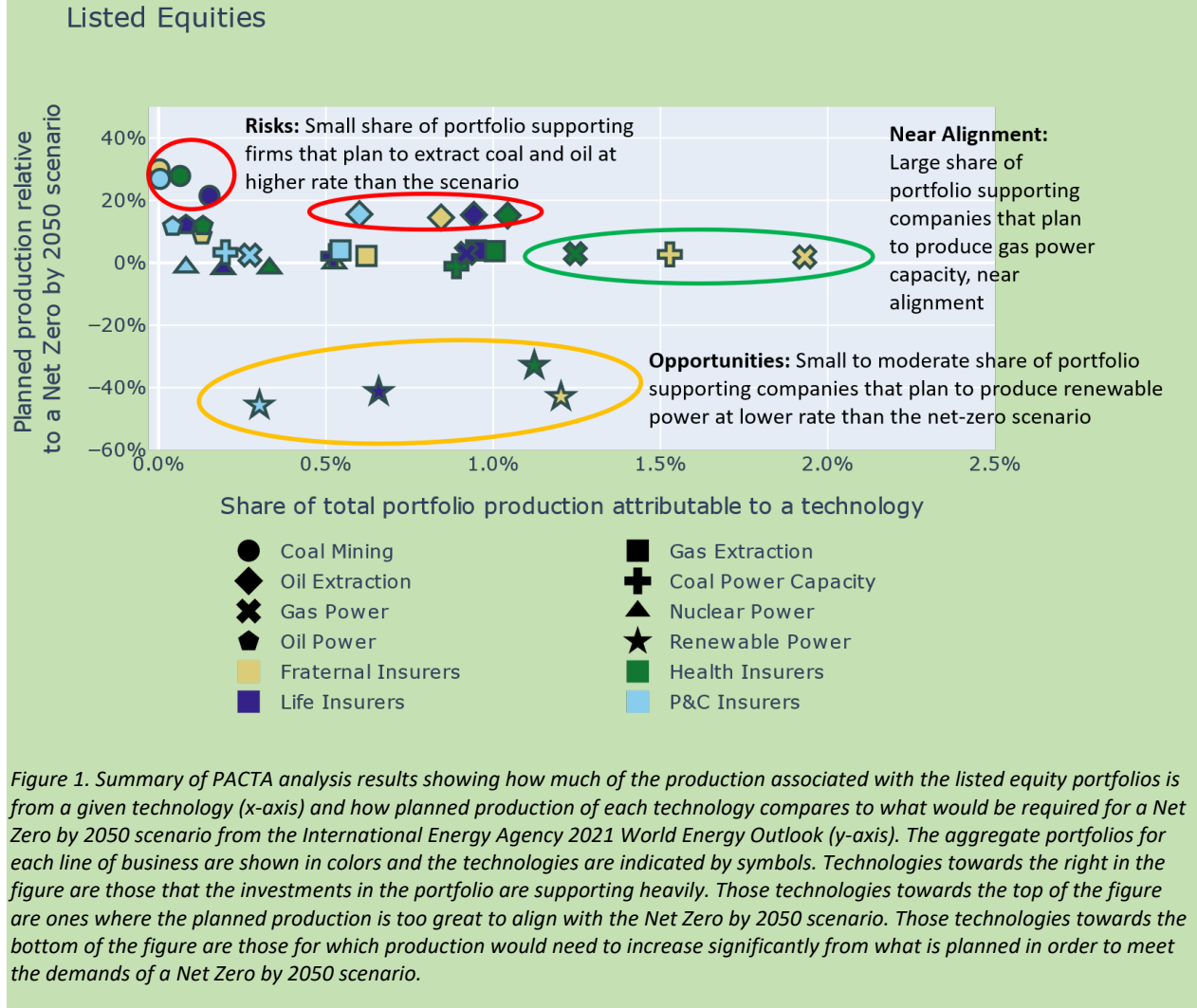


Figure 1. Summary of PACTA analysis results showing how much of the production associated with the listed equity portfolios is from a given technology (x-axis) and how planned production of each technology compares to what would be required for a Net Zero by 2050 scenario from the International Energy Agency 2021 World Energy Outlook (y-axis). The aggregate portfolios for each line of business are shown in colors and the technologies are indicated by symbols. Technologies towards the right in the figure are those that the investments in the portfolio are supporting heavily. Those technologies towards the top of the figure are ones where the planned production is too great to align with the Net Zero by 2050 scenario. Those technologies towards the bottom of the figure are those for which production would need to increase significantly from what is planned in order to meet the demands of a Net Zero by 2050 scenario.

Corporate Bonds

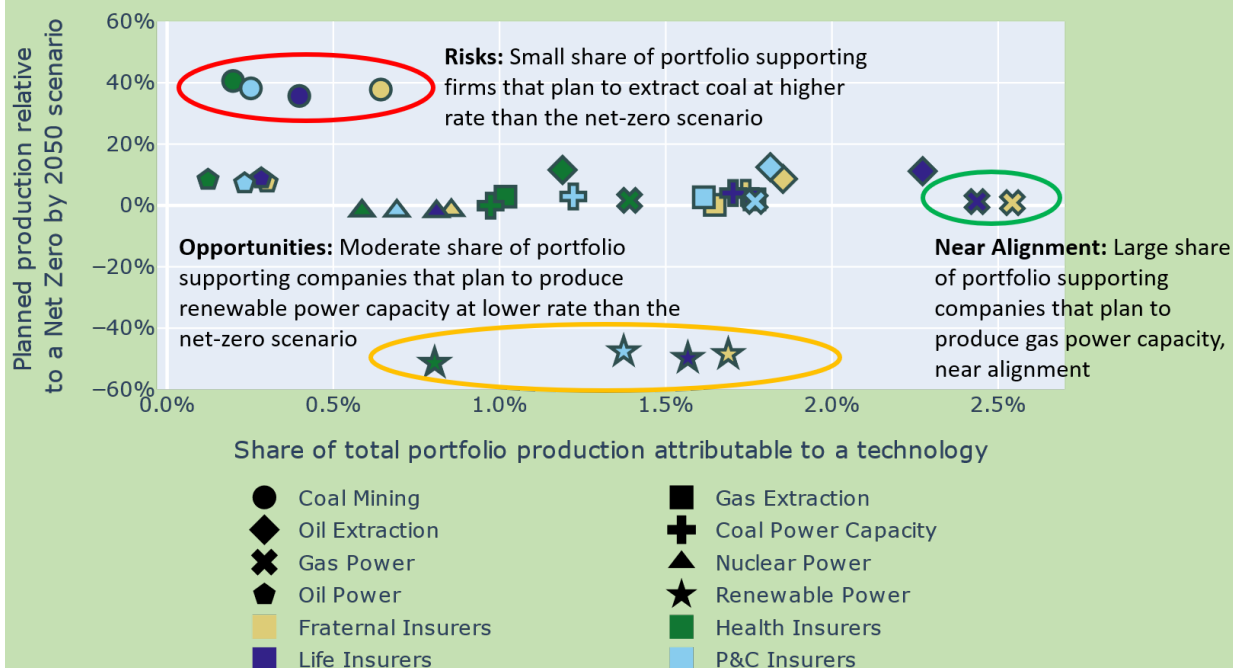


Figure 2. Summary of PACTA analysis results showing how much of the production associated with the corporate bond portfolios is from a given technology (x-axis) and how planned production of each technology compares to what would be required for a Net Zero by 2050 scenario from the International Energy Agency 2021 World Energy Outlook (y-axis). The aggregate portfolios for each line of business are shown in colors and the technologies are indicated by symbols. Technologies towards the right in the figure are those that the investments in the portfolio are supporting heavily. Those technologies towards the top of the figure are ones where the planned production is too great to align with the Net Zero by 2050 scenario. Those technologies towards the bottom of the figure are those for which production would need to increase significantly from what is planned in order to meet the demands of a Net Zero by 2050 scenario.

For most technologies/sectors the production plans of insurers' investee companies were similar to the plans of the investee companies of the market benchmark. Exceptions to this were found for nuclear power technology and in electric vehicle technology, where the market benchmark displayed greater growth in these clean technologies as compared to insurers' investments. This indicates that insurance companies' investment portfolios are associated not only with less electric vehicle and nuclear power production than what is implied in any climate action scenario, but that they are also behind the market in leveraging these investment opportunities.

1-in-1000 Climate Stress Test Results

The 1-in-1000 TRISK Climate Stress test estimates the additional costs to the financial sector when climate action by companies is delayed. The stress test considers a scenario in which companies associated with an investment portfolio are subject to a sudden transition policy shock, in a specified "shock year", which compels them to transition their production from a baseline scenario (a projection of current production plans into the future) to meet a target scenario (a projection of how production would need to change for the company to contribute its share to meeting the target set through the

Paris Agreement). The 1-in-1000 model may also subject the firms to a carbon tax shock associated with the scenario that places additional financial pressure on high carbon-emitting firms. This transition shock scenario reflects the concept that pathways to achieving the targets set forth in the Paris Agreement are not static, as they involve keeping to a specific budget of emissions. The pathway to remaining within that budget becomes more difficult and costlier the longer actions to reduce emissions are delayed.

The results show that there are significant impacts to insurers' bond portfolios even with a transition that begins as early as 2026, indicating a disorderly (or disruptive) transition. In addition, each year that the transition is delayed leads to more significant negative impacts to the profitability of insurers' investments. A delayed onset of the shock transition from the benchmark (business-as-usual) to the target (net-zero emissions by 2050) scenario, generally yields greater probability of default, more value loss, and more transition risk, because of the growing divergence of the production volumes under the baseline and the target scenarios and because there would have been more time where production was out of alignment prior to the shock that must be compensated for to remain within the emissions budget. That would require more abrupt changes throughout the economy, creating potentially significant changes for investors both through heightened risks and increased opportunities.

Of all scenario providers and pathways tested, the largest increases in probability of default for the bonds in the covered insurers' portfolios in the shock scenarios were for coal extraction-related bonds followed by oil & gas extraction. These ranged from just over 10% to near 50% depending on the shock year and scenario. Shock year (timing of transition) had a greater effect on the result than the specific transition details of a given scenario, indicating that delaying the transition would result in increased costs regardless of the pathway chosen for decarbonization on the stated timeline.

While there were significant increases in the probability of default for fossil-fuel based elements of the power sector in the transition shock scenarios, these were accompanied by decreases in the probability of default for renewable power, leading to only small decreases in creditworthiness in the shock scenarios for the power sector as-a-whole. Therefore, it is important for transition risk assessments and resulting decisions to consider separately the different technologies in the power sector to reflect that some technologies in the sector present risks in the event of sustained climate action while others represent opportunities for new investment.

The average probability of default is not necessarily representative, as some firms in the portfolio have much greater probabilities of default for oil & gas, automotive, or coal related assets while others show minimal impact. This supports tailored strategies such as targeted engagement with individual high-transition risk firms in the portfolio, rather than sector-based divestment, for improving the transition risk profile of the aggregate portfolio. That said, the efficacy of these strategies is somewhat dependent on the onset and speed of transition. When a transition is begun early (2026), there is significant variation in the level of financial impact different firms. However, when the transition onset significantly delayed (2036) the impacts to firms are both larger and impact more firms, limiting the efficacy of investment strategies that rely on firm-specific action.

Expected losses for analyzed bonds (related to coal, oil & gas, power, and automotive sectors) within insurer's portfolios under all scenarios are large, and losses increase dramatically the longer the transition is delayed. Across the coal mining, oil & gas, power, and automotive sectors the aggregate expected losses on bonds range from \$7 to 28 billion, depending on the pathway, with a shock transition in the year 2026 but more than double to range between \$14 and near 40 billion if the transition is

delayed by just eight years (to 2034). This is on scale with the 2017 California wildfires which cost an estimated \$22.7 billion in losses. This indicates that the annual impact of delaying the transition can be billions of dollars.

Early onset of the transition shock (2026) resulted in expected losses around \$5-7 billion for Oil & Gas under most scenarios, with the exception of the WEO global scenario which reflected expected losses above \$10 billion with a 2026 shock year. Considering a later (2034) onset of the transition shock, expected losses increased to between \$9 and \$16 billion for most scenarios, and over \$20 billion for the WEO global scenario.

Expected losses for power sector-related bonds within insurer's portfolios under all scenarios are also large, ranging from around \$2 billion dollars to over \$25 billion dollars depending on the onset of the transition shock and scenario. Early onset of the transition (2026) resulted in expected losses around \$2-10 billion for power. Considering a later (2034) onset of the transition, expected losses increased to between \$4 and \$25 billion, with the WEO North America and NGFS REMIND scenarios reflecting much higher losses than the NGFS GCAM or WEO global scenarios.

Expected losses for coal are relatively low (<\$1 billion), because these assets make up a relatively small portion of insurers' portfolios, and auto sector-related losses are even less significant.

The relative value changes for listed equities associated with fossil-fuel related sectors are dramatic for all shock scenarios. Coal related assets (both extraction and coal power) lose in excess of 80% of their value due to the transition shock, for all shock years considered. However, it's worth noting that these assets makeup a relatively small fraction of insurers' portfolios. Gas power related assets, which makeup a large fraction of insurer's assets, experience greater than 40% decreases in value in the NGFS GCAM and WEO global scenarios and over 80% in the NGFS REMIND and WEO North America scenarios. Oil power capacity assets and ICE vehicle related assets lose between 60 and 90% of their value depending on which shock year is chosen. Impacts to gas and oil extraction are very scenario dependent, with the NGFS REMIND showing decreases in value between 15% and 30% but most other scenarios showing value decreases between 60% and 90%. Coal extraction-related assets also have relative value losses close to 100% in the GCAM REMIND scenario.

In contrast, renewable-related power and automotive sector investments gain significant value in the shock scenarios reflecting opportunities for investment. Electric vehicle-related assets gain nearly 40% increases in value, hybrid vehicle investments experience value increases over 50% (although these assets are not common in insurer's portfolios). Renewable power experiences value increases over 20%. This reinforces the opportunities that decarbonization presents for investment in clean energy and zero emission automotive technology.