



2° SCENARIO ANALYSIS



InsuranceCompanyName

2Dii PACTA MODEL

Important Information & Legal Disclaimer: MODEL OUTPUT REPORTS

IMPORTANT INFORMATION

The 2Dii PACTA Model generates a limited 'point in time' estimate of the relative alignment of the Revealed Plans of Securities in the Scope versus the economic trends embodied in the 2C Scenario(s), as identified by external data and scenario providers.

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EXECUTIVE SUMMARY

This report provides a 2°C scenario analysis of the investment portfolio.

It responds to the recommendations of the G20 Financial Stability Board Task Force on Climate-related Financial Disclosures (TCFD). Over 1,000 financial institutions have been assessed using the model applied in this report, as part of direct partnerships with over 200 institutional investors and collaborations with a number of financial supervisors.

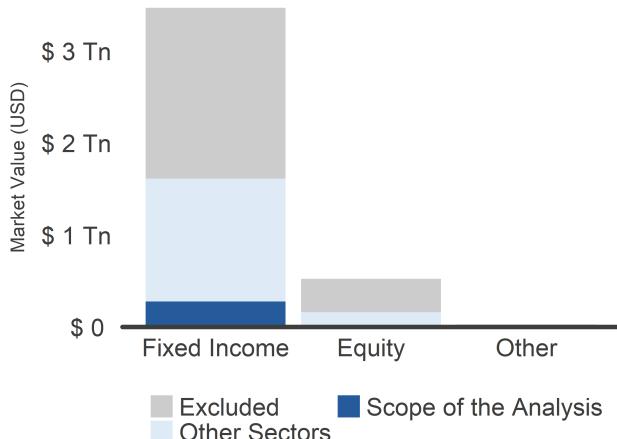
The outputs provided in this report – based on the scope of analysis summarized in the table on the right – provide an analysis of the portfolio relative to an economic transition consistent with limiting global warming to 2°C above pre-industrial levels, as well as a comparison to peers. The analysis provides answers to three questions:

1. What is the current exposure in the portfolio to economic activities affected by the transition to a low-carbon economy? (Section 2)
2. Does the portfolio increase or decrease its alignment with a 2°C transition over the next 5 years? (Section 3)
3. What is the expected future exposure to high- and low-carbon economic activities? (Section 4)

The analysis covers two asset classes: listed equity and corporate bonds, including the largest government and municipal power producers (subsequently labeled as 'fixed income' throughout this report). Notably excluded from this analysis (shown in grey in the figure below) are the insurance subsidiaries of insurance companies in the equity portion of

The figure below shows the share of the fixed income and equity portfolio included in the analysis.

AnalysisCoverage% of the portfolio is included in the analysis.



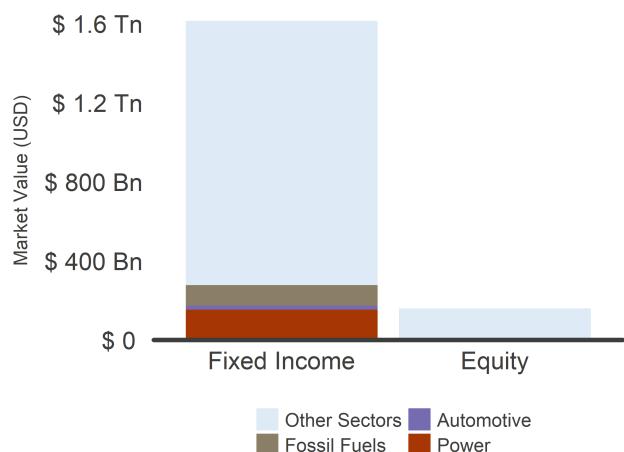
the portfolios, as well as sovereign bonds and other types of fixed income instruments.

Scope of Analysis	
Insurer Name	InsuranceCompanyName
Size of Portfolio	SizeofPortfolio
Scenario	IEA 2° Scenario
Geography - Financial Assets	Global
Geography - Economic Assets	Global
Asset Class	AssetClass
Peers	672 Insurers operating in CA with premiums over \$100 million
Portfolio Timestamp	12.31.2016
Date of Analysis	TodaysDate

The graph on the bottom left shows the share this represents in the total equity and fixed income portfolios. For the purposes of this report, this subset of the total investments is referred to as "the portfolio". Within these asset classes, the 2°C scenario analysis focuses on the fossil fuel, power, and automotive sectors, which account for roughly 90% of energy-related CO₂-emissions in a typical equity or fixed income portfolio. The chart on the bottom right shows the percentage that companies active in these sectors make up in the equity and fixed income portfolios respectively.

The figure below shows the share of the fossil fuels, power, and automotive sectors in the analysed portfolio.

ClimateRelevant% of the holdings are exposed to business activities in the fossil fuels, power, and automotive sectors.



EXECUTIVE SUMMARY

The figure below shows the estimated percent of the portfolio exposed to activities across the fossil fuel, power, and automotive sectors.

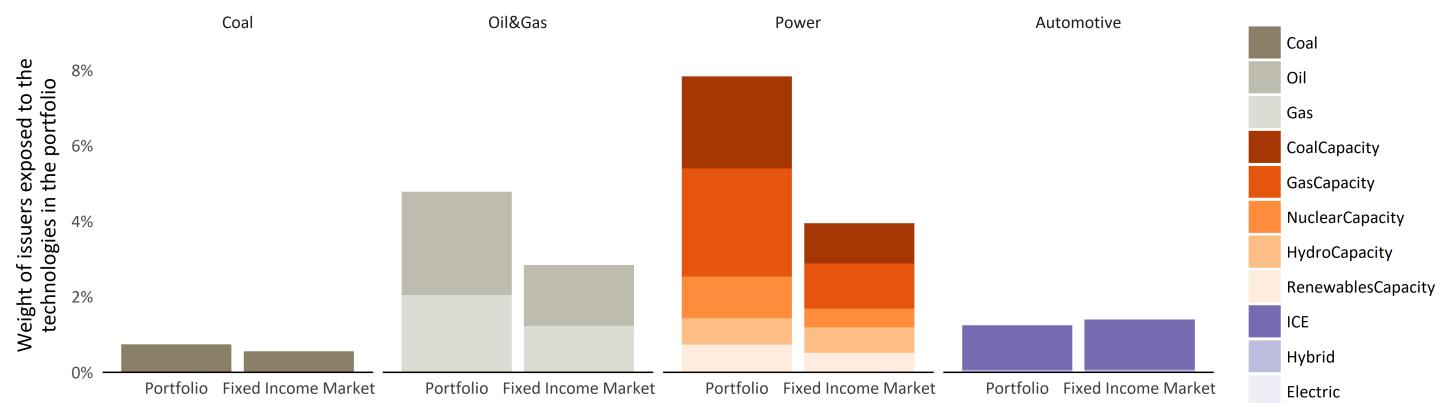
The percentages are compared to the market portfolio. The market portfolio results are calculated based on the exposure of the global universe of assets in the listed equity and fixed income markets to fossil fuel, power, and automotive. For the fixed income market, this universe is identical to that analyzed for the portfolio – specifically corporate bonds, including the largest government and municipal power producers.

The results show the share of the portfolio potentially exposed to transition risks in the fossil fuel, power, and auto-

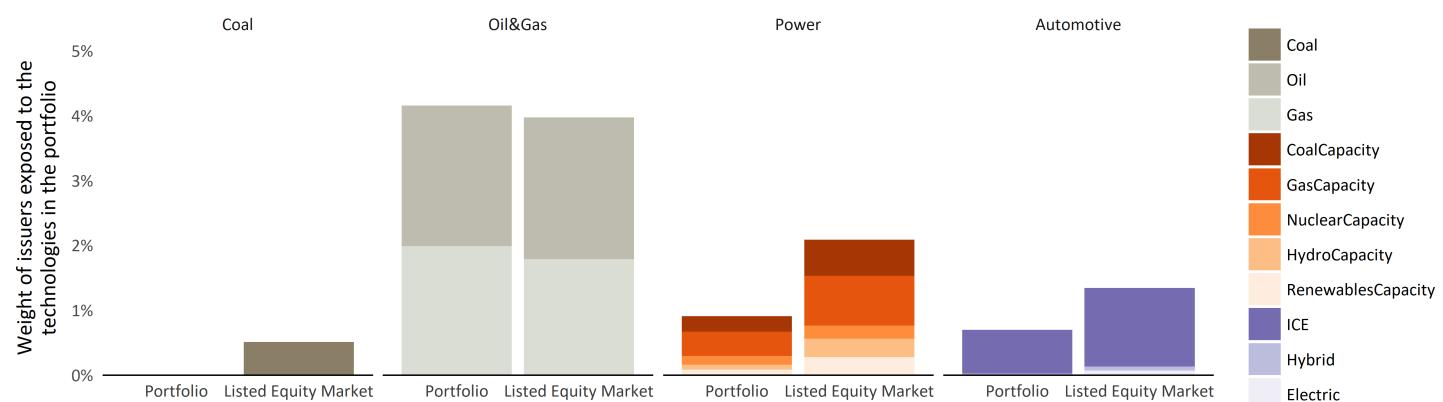
motive sectors. The results are calculated by first calculating the exposure of the portfolio to companies active in the fossil fuel, automotive, and power sector, and then calculating the specific technology exposure on the basis of the breakdown of these companies' asset base.

A value higher than the market portfolio suggests the portfolio is more exposed to transition risk than the market average. A value lower than the market portfolio suggests the portfolio is less exposed, all other things being equal. As will be outlined in the next two sections, the extent to which these risks will materialize is likely to be at least in part a function of the evolution of the companies' activities over time.

Current exposure of the fixed income portfolio to high-carbon and low-carbon activities, as % of the portfolio, compared to the fixed income market



Current exposure of the equity portfolio to high-carbon and low-carbon activities, as a % of the portfolio, compared to the equity market





SECTION 1: INTRODUCTION

This report provides a 2°C scenario analysis, following the recommendations of the G20's Financial Stability Board Task Force on Climate-related Financial Disclosures (TCFD). Specifically, it seeks to inform the reader about four issues.

1. What is the current exposure in the portfolio to economic activities affected by the transition to a low-carbon economy? (Section 2)

The first part of the report summarizes the exposures of the portfolio (in terms of % of the portfolio) to business activities potentially affected by the transition to a low-carbon economy and by extension its exposure to transition risk. Specifically, it will quantify the percent of the portfolio exposed to low-carbon and high-carbon activities across the fossil fuel, power, and automobile sectors. The results will be presented relative to the market portfolio. The analysis will also show the distribution of results across all analyzed insurance companies and the relative position in that distribution.

2. Does the portfolio increase or decrease its alignment with a 2°C transition over the next 5 years? (Section 3)

The second part of the report will quantify the extent to which the portfolio is building or reducing risk in terms of being aligned / misaligned with the 2°C scenario pathway over the next 5 years across key business activities. The analysis will focus on the fossil fuel related sectors in terms of energy (oil production, gas pro-

duction), electric power (coal power, gas power, nuclear power, renewables power), and automobile (internal combustion engine vehicles and electric vehicles). The analysis will compare currently planned production with the investment trend in the portfolio with the production with the investment that would be required under the 2°C scenario.

3. What is the expected future exposure to high- and low-carbon economic activities based on the current revealed investment and production plans of the companies in the portfolio? (Section 4)

Section 4 of this report will quantify the expected evolution of the portfolio's exposure to high-carbon and low-carbon activities in 5 years (2023) based on the current revealed investment and production plans of companies in the fossil fuel, power, and automotive sectors. The section will compare the expected mix of the portfolio's exposure to high-carbon and low-carbon activities relative to the 2°C scenario.

4. What is driving the results? (Section 5)

Section 5 will provide background as to the securities and companies behind them that are driving the results presented in the previous sections, including additional analysis on individual companies' profiles.

You will also be able to find further background information on the scenarios and modelling at the end of the report (Section 6).

Section 1: Introduction

Section 2: The current exposure

Section 3: Trajectory of the portfolio relative to a 2°C scenario

Section 4: The exposure of the portfolio to 2°C scenarios in 2023

Section 5: Company exposure

Section 6: Background to the model

Background. In June 2017, the G20 Financial Stability Board Task Force on Climate-related Financial Disclosures (TCFD) recommended that financial institutions perform scenario analysis on their portfolios to assess financial risks related to climate change. The TCFD grouped climate-related risks into two categories: physical and transition risks. Transition risks are risks generated by the policy, technology, market, and regulatory changes likely to accompany the transition to a low carbon economy. As part of its supervisory role, the California Department of Insurance engaged the 2° Investing Initiative (2Dii) to undertake a scenario analysis of the investment portfolios of insurance companies operating in California with more than \$100 million in premiums.

Goal. The goal of the scenario analysis was to assess the insurers' exposure to transition risk, individually and as a whole, based on its estimated current and future exposure to high-carbon and low-carbon activities. This report represents the results of this analysis for the portfolio.

Approach. The key elements of the analysis are:

- *Current and planned production and investment plans.* Current and projected production plans (for the fossil fuel and automotive sector) and current power capacity as well as new capacity additions (for the power sector) for the next 5 years were sourced from commercial business intelligence databases. These data providers collect production capacity and production forecasts at the physical asset level, including barrels of oil by field, cars by model and factory, and new capacity by power plant. 2Dii maps these data to their immediate owners, and then their parent company to generate a company's aggregate 'current production profile' for each technology. These production plans are then linked to the financial securities (equity and fixed income) issued by the company. The asset-level data used for this analysis was retrieved from data providers during the first half of 2017. See the 'Important Considerations and Limitations' section at the end of the report for notes on interpreting power sector capacity data.

- *Allocating the production of physical assets to financial assets.* Based on the share of total equity or debt held in a portfolio, the model allocates a portion of each corporate issuer's current production plans for each technology to the portfolio. Aggregated to the portfolio level, this is the 'portfolios' current production profile' for a technology. This also defines the insurer's current 'exposure' to each technology.
- *From macro-level scenario to micro-level targets.* To calculate production levels consistent with a climate scenario such as the IEA 2°C scenario, the model uses a 'fair share' principle that applies the changes specified by the scenario for a given technology and region equally across all owners of physical assets in that region. It creates a set of alternative production and capacity profiles consistent with the scenario, for each technology and company. These alternative profiles are then aggregated to the portfolio level to create the portfolio's target profile under the scenario. This profile is used to determine the 'insurer's target exposure' to a technology under the scenario. The 'target exposure' does not assume any change in the composition of the portfolio: it models the changes in production and investment plans that are required across the different companies held, in order to match the technology deployment roadmap. This report uses the scenarios of the International Energy Agency, specifically the 450S and the 2D scenario.

Results of the scenario analysis. The scaling of macro scenarios to micro-level targets can be mapped to the portfolio's current and projected production and investment plans by technology and fuel to derive the exposure to transition risk as well as the extent to which the portfolio aligns or misaligns transition risk over the next 5 years relative to a 2°C scenario. It is this analysis that forms the basis of the subsequent sections, with Section 6 providing further detail on the methodology.

What are transition risks? Transition risks can be broadly defined as economic and financial risks associated with the transition to a low-carbon economy. The international community has defined a mandate to limit the man-made contribution to global warming to well below 2°C above pre-industrial levels. According to best available science, achieving this objective requires decarbonizing the economy in the course of this century. This decarbonization is set to have significant implications for ‘high-carbon sectors’, most prominent among which are the fossil fuel, power, and transport sectors, contributing the majority of global anthropogenic GHG emissions.

As the economy decarbonizes, companies that fail to properly anticipate this transition are set to be exposed to economic risks. Companies well-prepared for this transition in turn are set to capitalize from this economic opportunity. Similarly, economic risks may translate into financial risks in financial markets if these risks are not properly anticipated by financial market actors.

Crucially, the transition to a low-carbon economy is set to already have dramatic impacts in the short- and medium-term. By 2040, in only 22 years, global coal production is set to decline by 46%, with a more accelerated decline expected in developed markets. Global coal power capacity in turn is similarly set to decline by 41%. The production of gasoline and diesel vehicles (internal combustion engine or ICE vehicles) is set to decline by 21%. This decline in high-carbon activity in turn will be accompanied by the commensurate deployment and growth of new technologies. Renewable power capacity and electric vehicle production in turn is set to nearly quadruple in volume by 2040.

Scenario analysis can help financial institutions assess and ultimately manage the risks and opportunities associated with the transition. In recognition of these risks, scenario analysis has been applied to date by hundreds of financial institutions as well as financial supervisors. It forms the basis of the recommendations of the FSB TCFD. The TCFD notes

that “forward-looking assessments of climate-related issues is important for investors and other stakeholders in understanding how vulnerable individual organizations are to transition and physical risks and how such vulnerabilities are or would be addressed. As a result, the Task Force believes that organizations should use scenario analysis to assess potential business, strategic, and financial implications of climate-related risks and opportunities and disclose those, as appropriate, in their annual financial filings” (TCFD Final Report, p. 33).

To clarify its scenario analysis recommendation, the Task Force explains, “A key type of transition risk scenario is a so-called 2°C scenario, which lays out a pathway and an emissions trajectory consistent with holding the increase in the global average temperature to 2°C above pre-industrial levels (TCFD Final Report, p. 35).”

It is this premise that forms the basis of this report, highlighting for the portfolio the current exposure to transition risks in the fossil fuel, power, and automotive sectors, the trends in the portfolio over time in these sectors relative to the 2°C scenario, and the expected future exposure on the basis of these trends. While these sectors do not represent all high-carbon activities and sectors, they account for both the largest share in a typical portfolio and the most significant contribution to climate change currently, as well as benefiting from well-developed scenario pathways.

The report does not provide specific estimates as to the potential loss in value that may be realised in the portfolio should these risks materialize, which is obviously associated with significant uncertainty and myriad modelling assumptions. For any individual security, the potential loss may range from 0 to 100% and may even be associated with positive returns, depending on the adaptive capacity of the company, the anticipation of the trend by financial markets, and the nature of a potential repricing. It is the proper anticipation of these risks that minimizes the loss that this report seeks to contribute to.

Technology	Total Volume Change by 2023	Total Volume Change by 2040
Renewable Power	69%	354%
Hydro Power	13%	59%
Nuclear Power	17%	89%
Gas Power	8%	31%
Coal Power	-3%	-41%
Oil Production	-2%	-23%
Gas Production	5%	8%
Coal Production	-11%	-46%
ICE Production	-9%	-21%
Hybrid Production	97%	440%
Electric Production	105%	352%



SECTION 2: THE CURRENT EXPOSURE

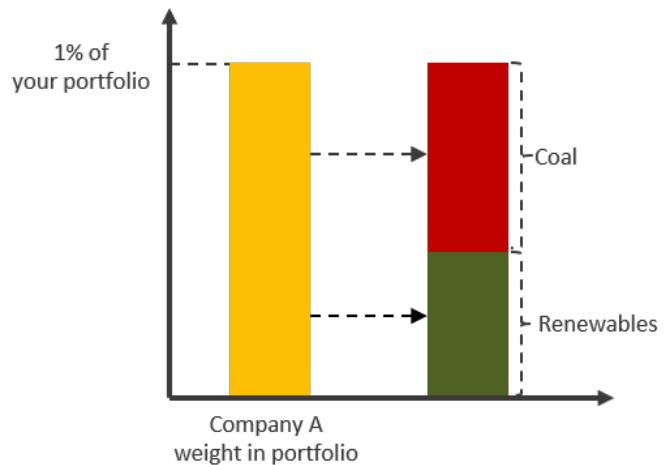
CURRENT EXPOSURE

This page provides information on the exposure of the portfolio to high-carbon and low-carbon activities in the fossil fuel, power, and automotive sectors.

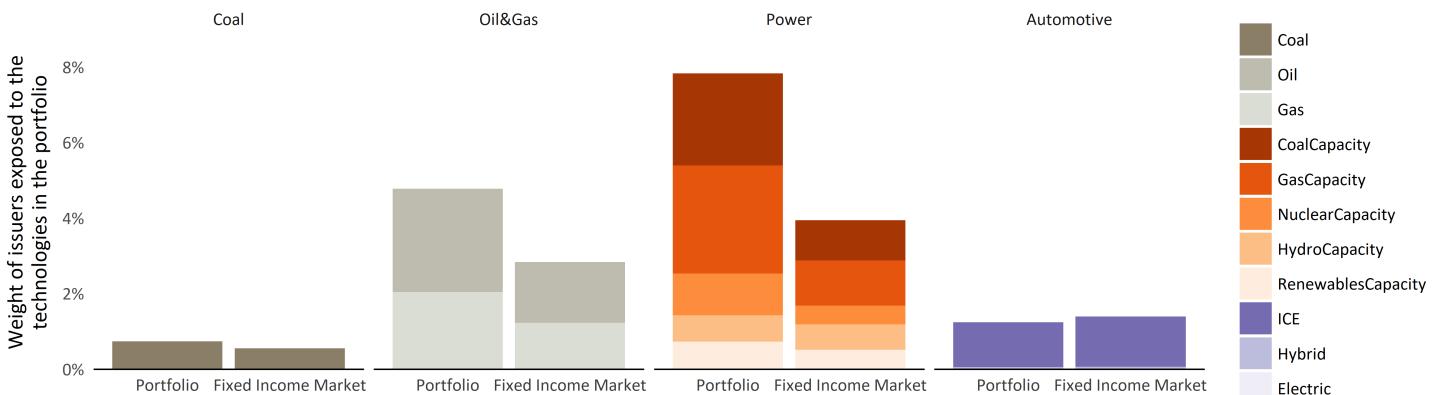
These business activities account for roughly 70-90% of energy-related CO₂-emissions in the typical investor portfolio. The figures below show the weight of each technology/fuel in the portfolio by asset class. The graphs below highlight the relative weight of high-carbon and low-carbon technologies within each sector. For context, the results for a portfolio of peer companies, the relevant equity market and fixed income market are also included in this analysis.

A value higher than the market portfolio suggests the portfolio is more exposed to transition risk than the market average. A value lower than the market portfolio suggests the portfolio is less exposed, all other things being equal. As will be outlined in the next two sections, the extent to which these risks will materialize is likely to be at least in part a function of the evolution of the companies' activities over time.

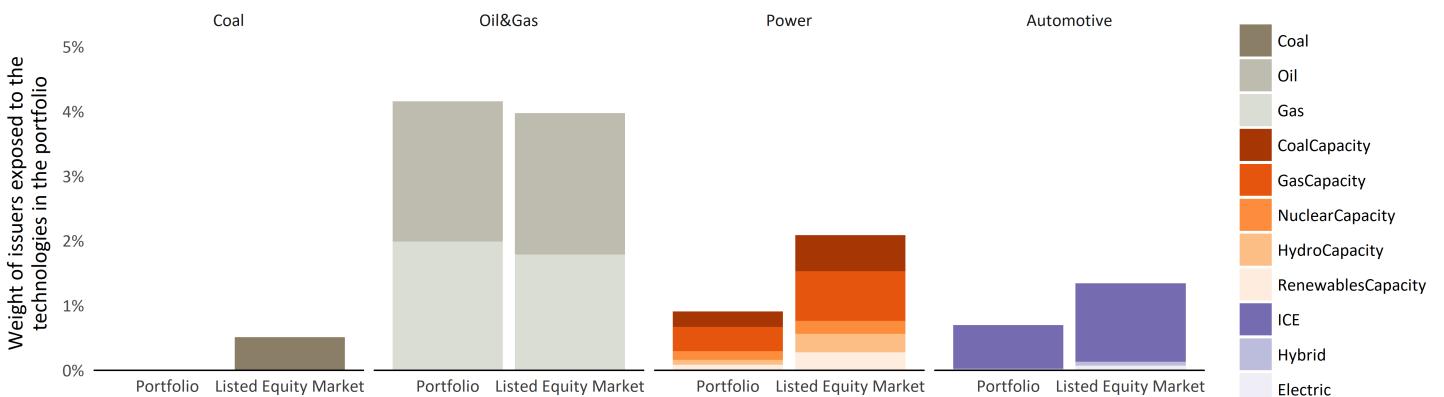
The results are calculated by first calculating the exposure of the portfolio to companies active in the fossil fuel, automotive, and power sectors, and then calculating the specific technology exposure on the basis of the breakdown of these companies' asset base (see Fig. below).



Technology breakdown of the sectors analyzed in the fixed income portfolio



Technology breakdown of the sectors analyzed in the equity portfolio



2°C SCENARIO CURRENT EXPOSURE COMPARISON TO PEERS

11

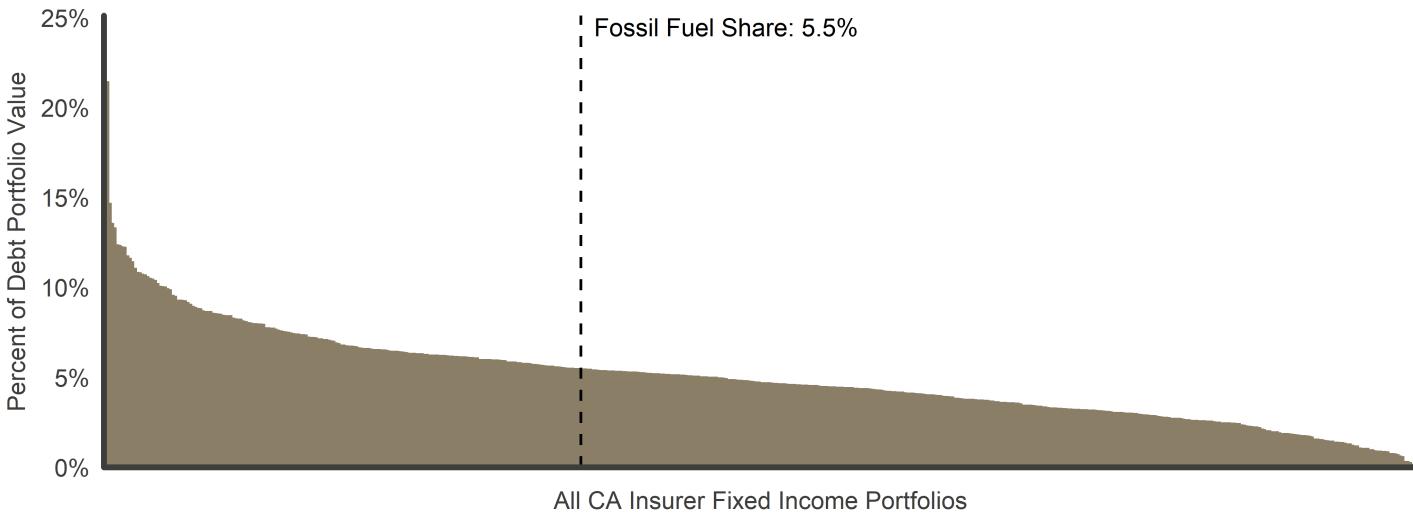
This page provides information on the comparison of the exposure of the portfolio to transition risk relative to the insurance companies operating in California.

It takes the information from the previous page and contextualizes it relative to the other insurance companies covered under this assessment. More specifically it compares the fossil fuel exposure across all insurance companies operat-

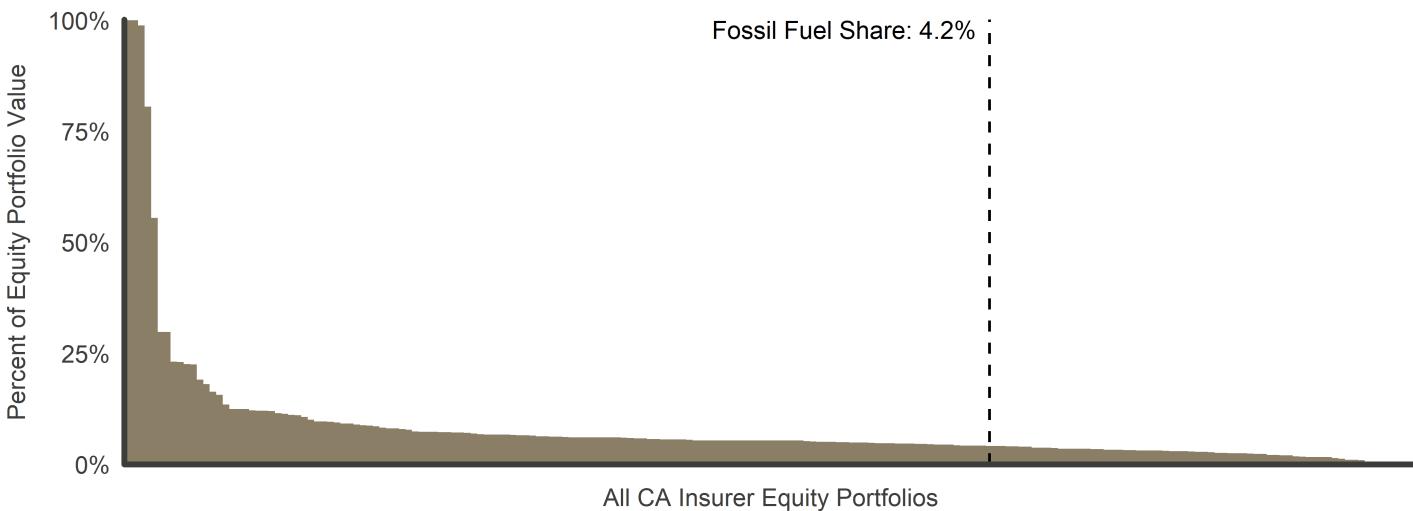
ing in California analyzed in this study. The analysis only shows the exposure to coal production and the oil and gas sectors, isolating the exposure to the fossil fuels upstream.

The distribution highlights the range of transition risk exposures across insurance companies relative to their direct fossil fuel exposure.

Distribution of exposure to fossil fuels within all fixed income portfolios



Distribution of exposure to fossil fuels within all equity portfolios





SECTION 3: TRAJECTORY OF THE PORTFOLIO RELATIVE TO A 2°C SCENARIO

5 YEAR TREND - POWER SECTOR

The analysis for the portfolio builds on the forward-looking projections of capacity additions by fuel over the next 5 years, as sourced from business intelligence data provider GlobalData. The five year time horizon is a function of the typical investment planning horizon of power capacity additions, recognizing that planning horizons for specific investments may be both longer and shorter. More long-term analysis would thus fail to identify significant further additions currently in the planning pipeline of companies. Excluded from the analysis presented here are planned power capacity additions by companies outside of the power sector (e.g. IT companies building wind parks to power their data centers). The evolution of the portfolio is based on the planned capacity additions by the companies behind the securities in the portfolio, weighted by their relative weight in the portfolio.

It is important to note that data on 'announced' or otherwise officially planned retirements of power assets is not considered in the analysis presented here. This is intentional, given both a dearth of related data, as well as the desire to show the required retirements. For technologies projected to decline under the 2° scenario, the gap between current capacity projections and capacity consistent with the 2° scenario should be seen as an estimate of the capacity that would need to be retired to be in alignment with the 2° scenario.

As outlined above, the scenarios are based on the global trends, scaled to the portfolio based on the 'fair share' approach, where the trend in the macro scenario is translated into a micro target based on the market share of the portfolio. For the power sector, this approach may of course fail to capture changes in market share across asset classes and actors, notably with the rise of household renewable power

capacity (e.g. rooftop solar), set to change the power market. While this trend implies that in practice companies are likely to lose market share, this trend is intentionally not internalized in the analysis, in order to document the potential loss of market share under a 2°C scenario – and by extension the potential accumulating transition risk.

Further information on the data and the scenarios is provided in Section 6.

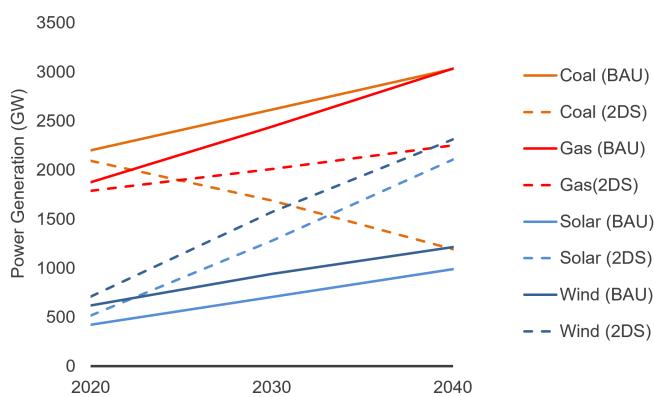
In a 2°C scenario, the power sector will decarbonize over the long-term in a shift from fossil fuel-based to renewable energy production. The International Energy Agency (IEA) says that in a 2°C scenario:

"Electricity supply worldwide is set to diversify and decarbonise, with low-carbon generation overtaking coal before 2020. Coal-fired power's share of generation is projected to fall from above 40% now to 28% in 2040. By then, wind, solar and bioenergy-based renewables combined increase their market share from 6% to 20%" (IEA World Energy Outlook 2016, p. 241).

The mix of technologies will vary greatly based on the scenario. Coal-based power generation will increase under current trends but decreases in a 2°C scenario. Wind and solar would grow more rapidly in a 2°C Scenario.

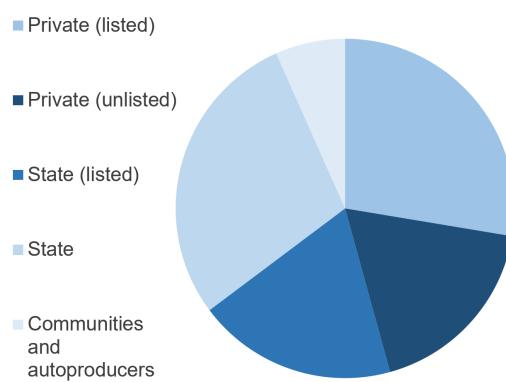
Equity and fixed income investors are exposed to these trends through the financial instruments issued by power companies. An estimated 28% of power generation assets are owned by publicly traded companies and 19% of assets are owned by listed state entities, for example municipal bond issuers (see figure below).

Power generation mix under IEA business as usual and 2DS scenarios for selected technologies



Source: IEA World Energy Outlook 2016

Ownership of global power generation assets



Source: IEA analysis and 2Dii, based on Platts, Bloomberg Professional service, Bloomberg New Energy Finance and national sources

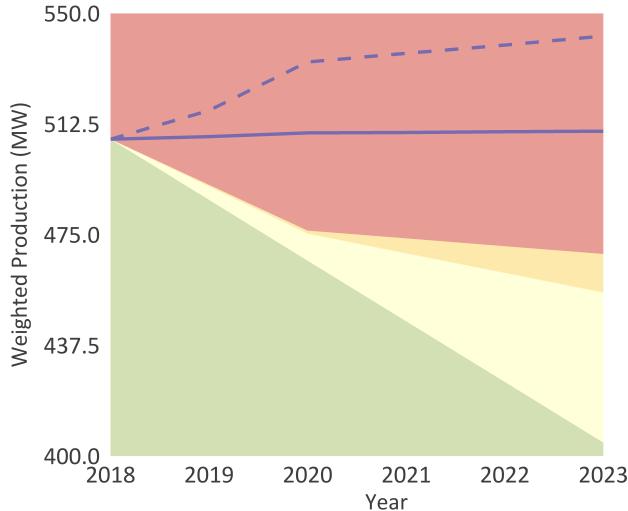
5 YEAR TREND - FIXED INCOME POWER

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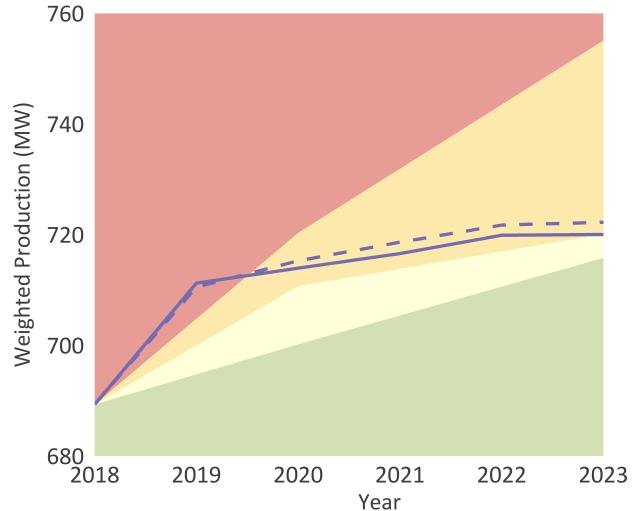
The alignment graphs below show the alignment of selected power technologies in the fixed income portfolio relative to the IEA scenarios for 2°C, 4°C and 6°C temperature

change, the global fixed income market and the average of the peers.

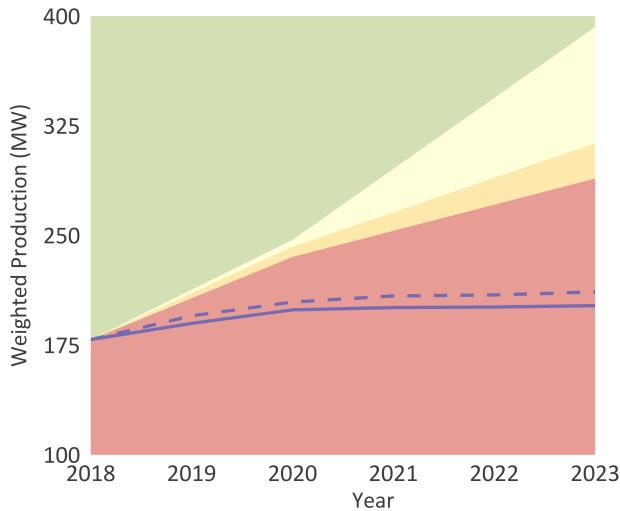
Trajectory of Coal Power Capacity



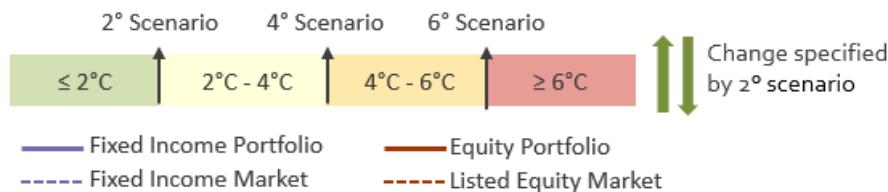
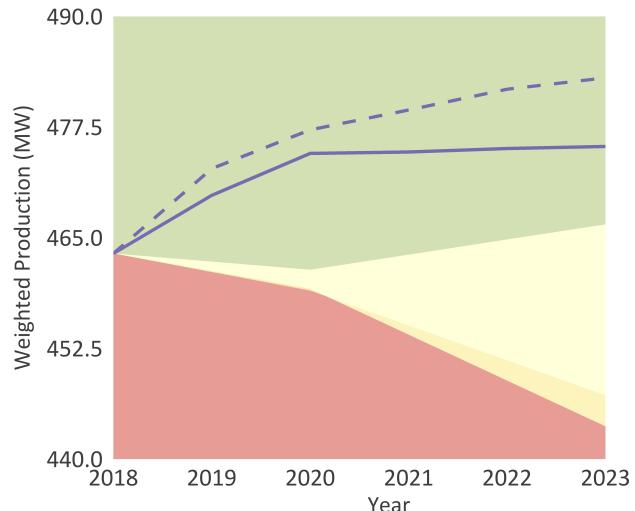
Trajectory of Gas Power Capacity



Trajectory of Renewable Power Capacity



Trajectory of Nuclear Power Capacity



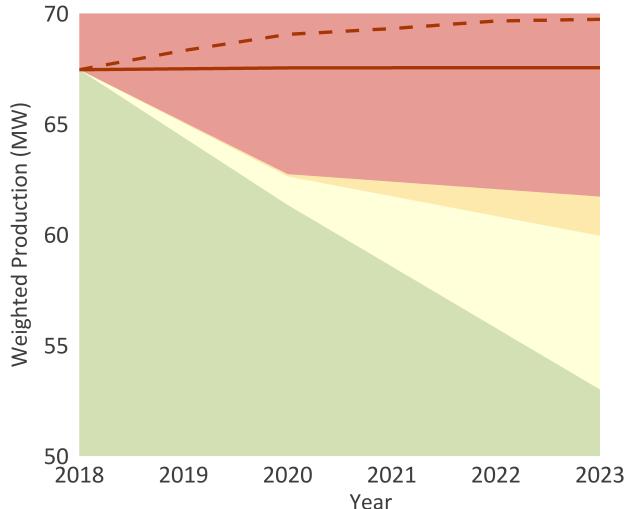
5 YEAR TREND - EQUITY POWER

15

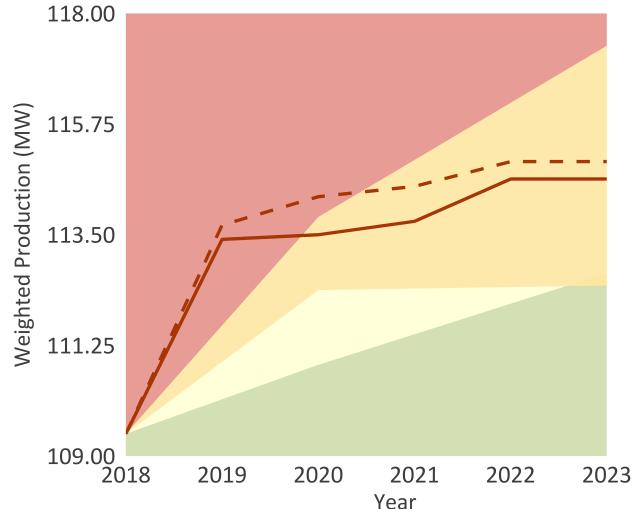
The alignment graphs below show the alignment of selected power technologies in the equity portfolio relative to the IEA scenarios for 2°C, 4°C and 6°C temperature

change, the global stock market and the average of the peers.

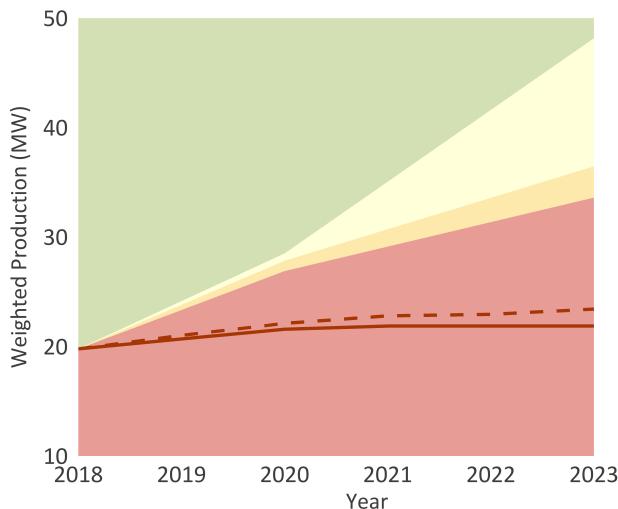
Trajectory of Coal Power Capacity



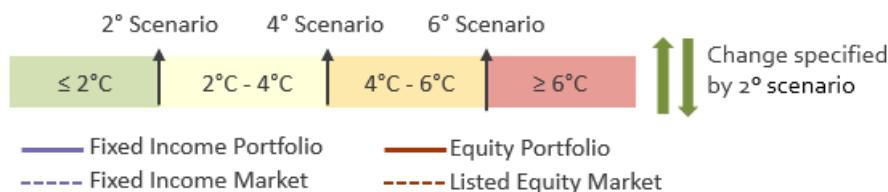
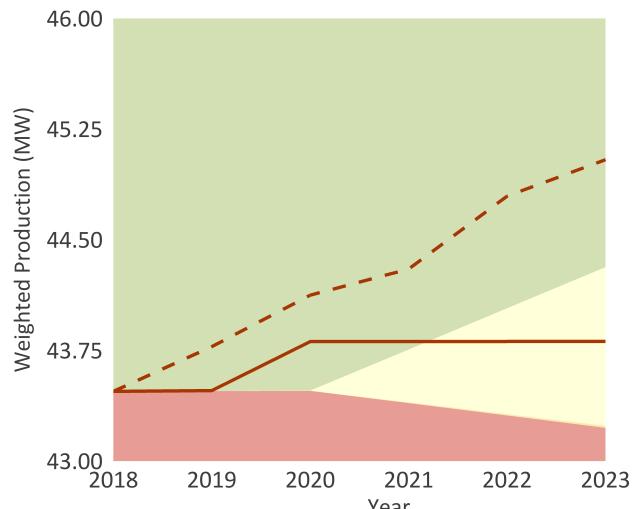
Trajectory of Gas Power Capacity



Trajectory of Renewable Power Capacity



Trajectory of Nuclear Power Capacity



5 YEAR TREND - FIXED INCOME FOSSIL FUELS AND AUTOMOTIVE

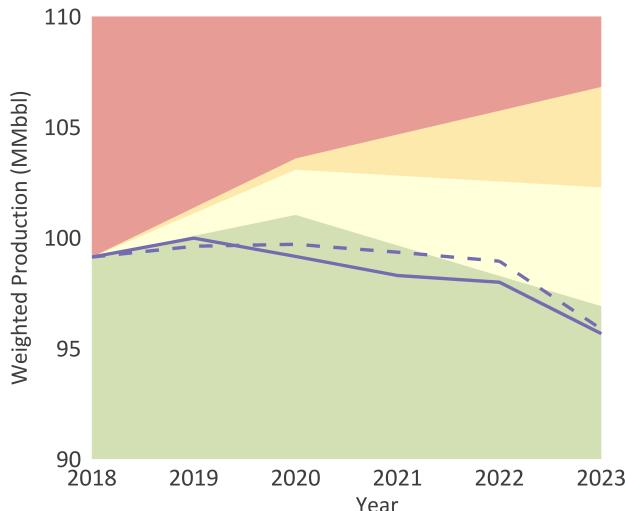
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The alignment graphs below show the alignment of selected fossil fuels and automobile technologies in the fixed income portfolio relative to the IEA scenarios for 2°C, 4°C

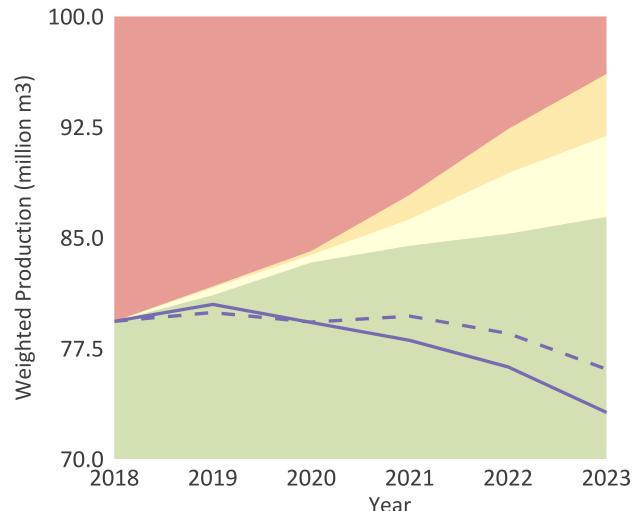
and 6°C temperature change, the global fixed income universe and the average of the peers.

Fossil Fuel Sector

Trajectory of Oil Production

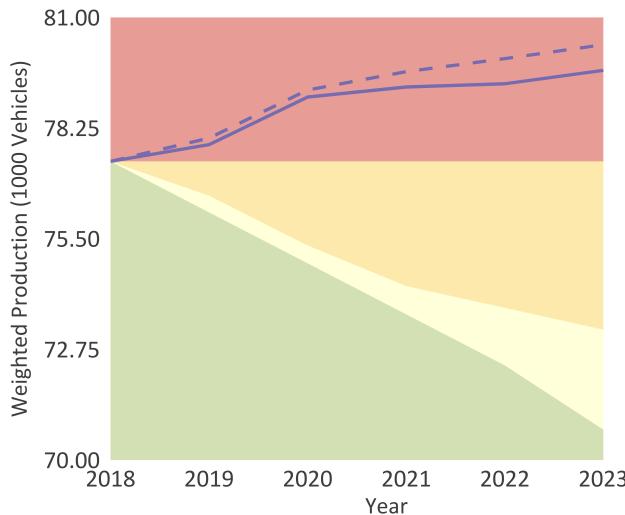


Trajectory of Gas Production

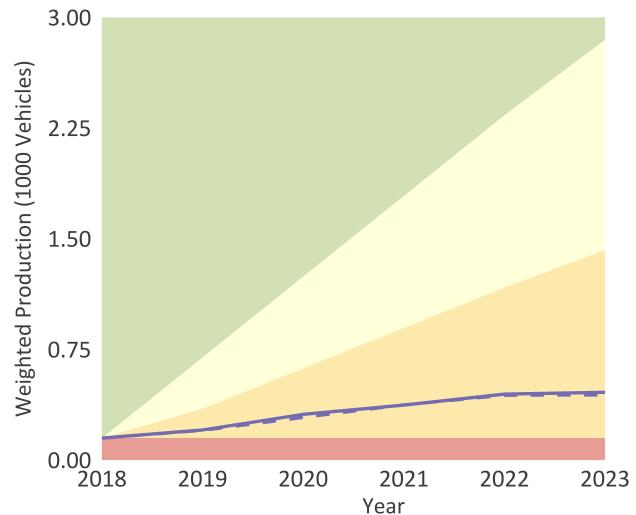


Automotive Sector

Trajectory of Combustion Engine Vehicle Production



Trajectory of Electric Vehicle Production



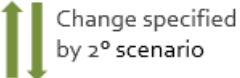
2° Scenario 4° Scenario 6° Scenario

≤ 2°C

2°C - 4°C

4°C - 6°C

≥ 6°C



Change specified by 2° scenario

— Fixed Income Portfolio

- - - Fixed Income Market

— Equity Portfolio

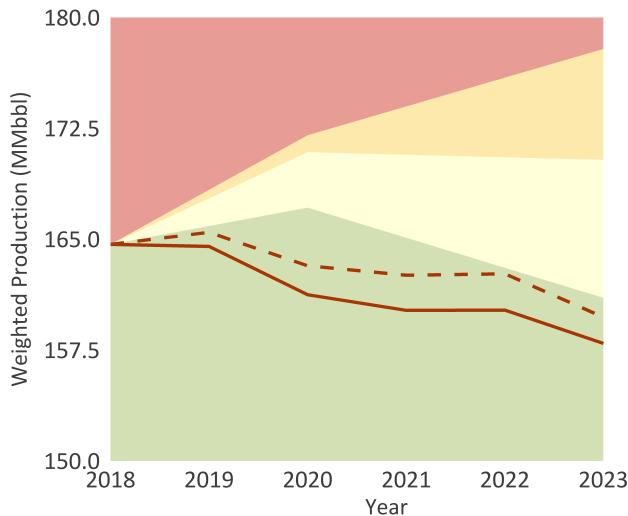
- - - Listed Equity Market

5 YEAR TREND - EQUITY FOSSIL FUELS AND AUTOMOTIVE

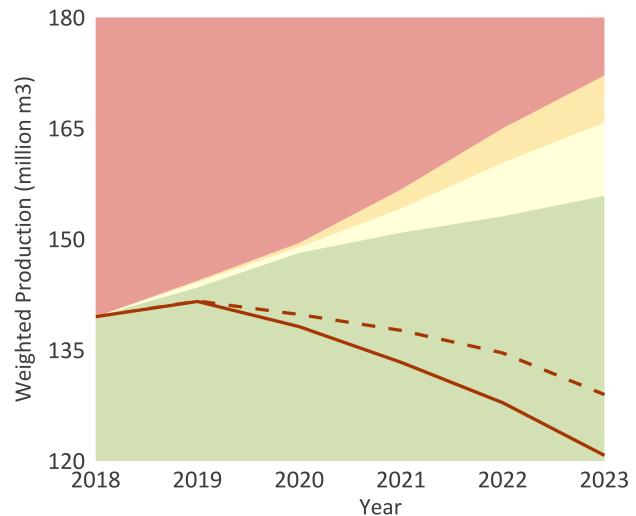
The alignment graphs below show the alignment of selected fossil fuels and automobile technologies in the equity portfolio relative to the IEA scenarios for 2°C, 4°C and 6°C temperature change, the global stock market and the average of the peers.

Fossil Fuel Sector

Trajectory of Oil Production

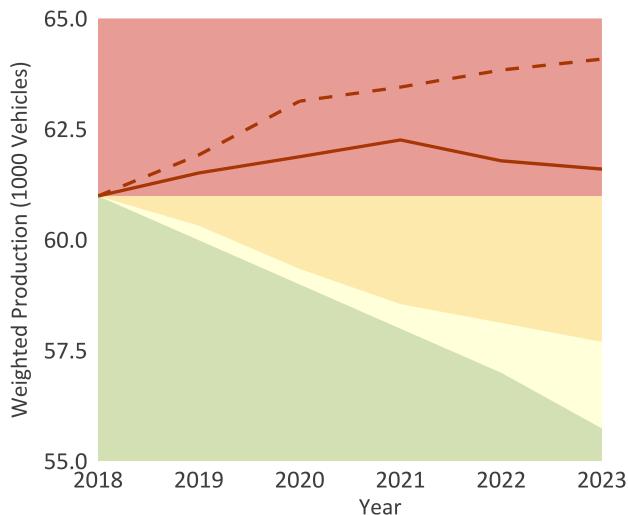


Trajectory of Gas Production

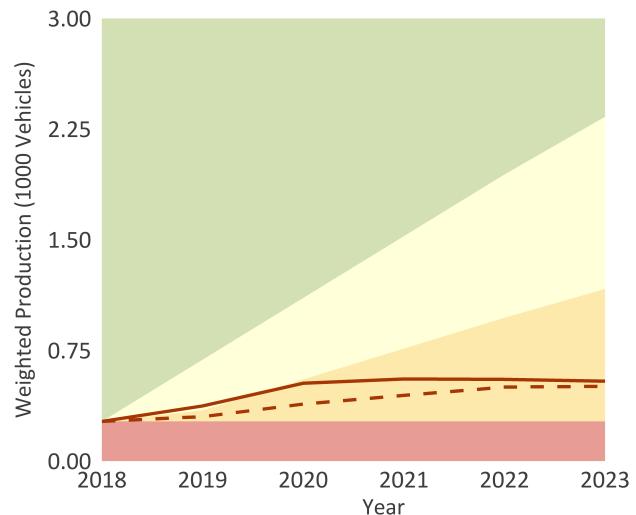


Automotive Sector

Trajectory of Combustion Engine Vehicle Production



Trajectory of Electric Vehicle Production



2°C Scenario 4°C Scenario 6°C Scenario

≤ 2°C

2°C - 4°C

4°C - 6°C

≥ 6°C

Change specified
by 2°C scenario

Fixed Income Portfolio

Fixed Income Market

Equity Portfolio

Listed Equity Market



SECTION 4: THE EXPOSURE OF THE PORTFOLIO TO 2°C SCENARIOS IN 2023

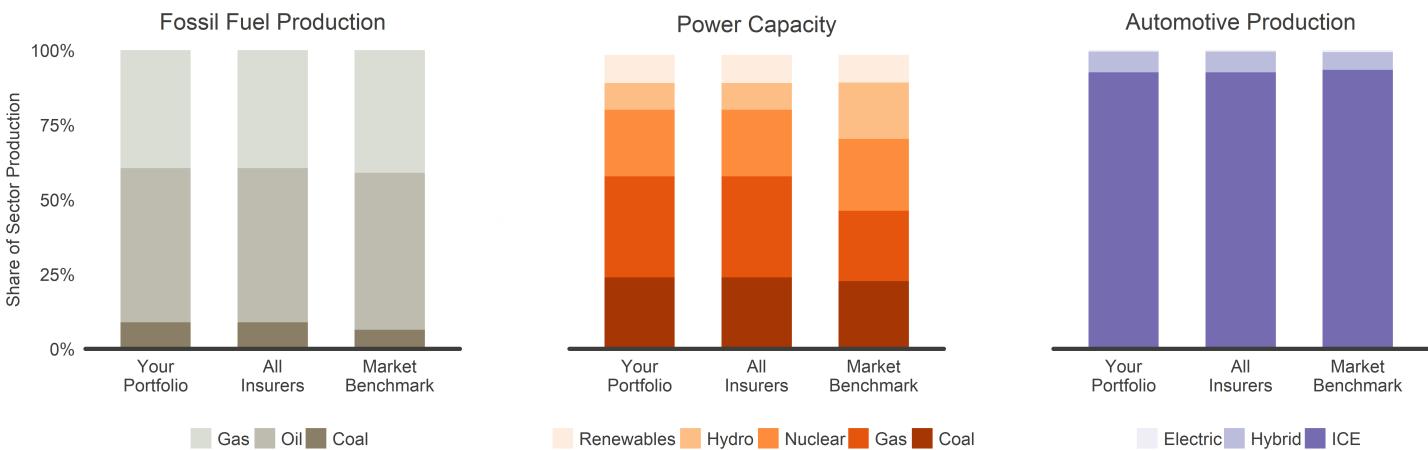
FUTURE TECHNOLOGY SHARE

The figure below shows the estimated exposure in 2023 to high-carbon and low-carbon technologies for the fossil fuels, power, and automotive sectors, in both the fixed income and equity portfolios.

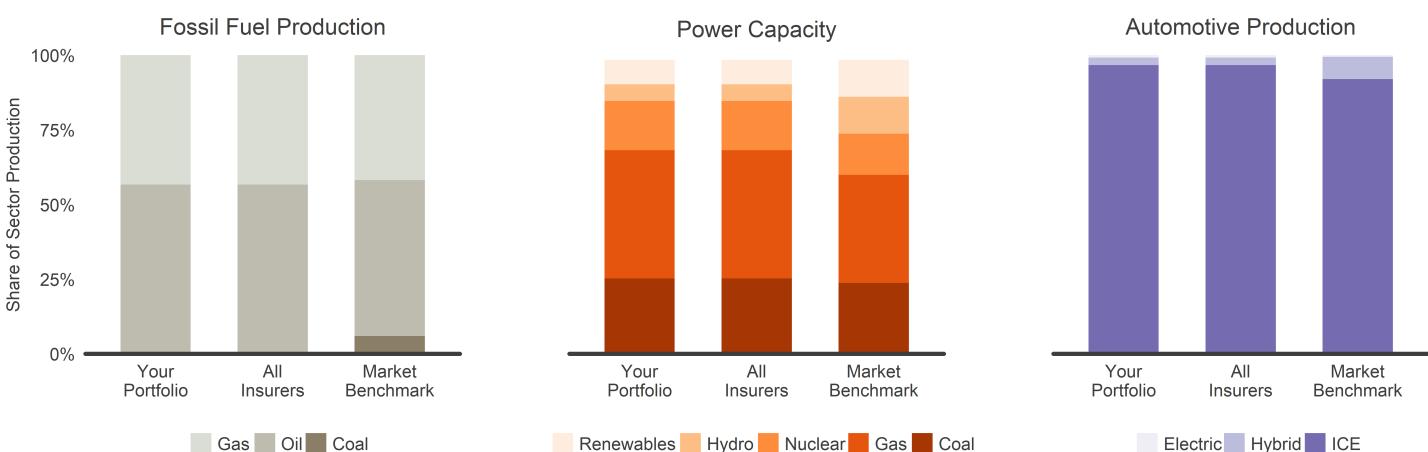
The results are a function both of the starting point of the exposure (Section 2) and the evolution of the exposure over time (Section 3) based on current revealed investment and production plans for all technologies. The results show the relative exposure of your portfolios across asset classes and technologies / fuels. The results are compared to the expected market fuel mix under a 2°C transition in 2023.

As highlighted above, the analysis does not include assumptions around changes in portfolio composition. Rather, it is limited to how the portfolio exposure to high-carbon and low-carbon technologies is set to change over time as a function of changes in companies' exposures, independent of portfolio composition changes. The results help contextualize the share of the sectoral exposure in 2023 exposed to transition risks in terms of the share of activities that can be classified as either high-carbon or low-carbon. Given the marginal nature of renewable activities across oil and gas companies, this share has not been considered in the analysis, although it may over time represent a growing share.

Fixed Income



Equity





SECTION 5: COMPANY EXPOSURE

CONTRIBUTIONS OF SECURITIES TO THE RESULTS

21

The results presented in the previous section are a function of the specific portfolio exposures to securities and the companies that issue them across all analyzed portfolios. The results thus present an aggregated picture of the weighted trajectory of each individual company in the aggregated portfolios. These companies of course will each have unique exposures, both in terms of their current asset base and the trajectory of their production or production capacity profile. The capital allocation choice by California insurance companies thus impacts these results not just in their sectoral exposures to different economic activities but also in the individual securities within each sector.

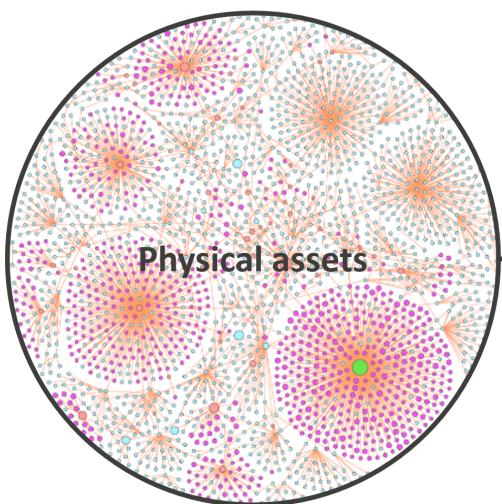
In order to help each individual insurance company understand their results, as part of the reports sent to them

this section will provide portfolio-specific information on the companies these insurance companies are exposed to as well as their exposure to high-carbon and low-carbon assets.

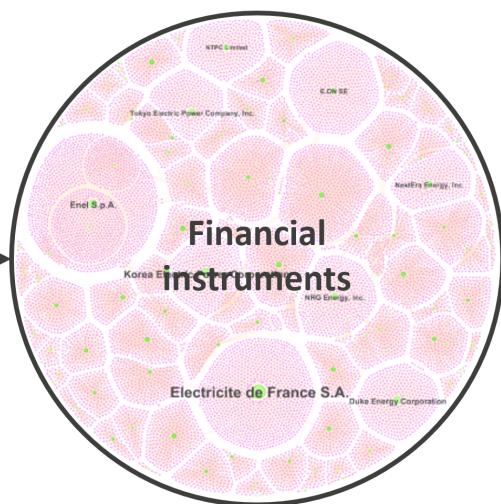
In the equity portfolios for example, California insurance companies analyzed have exposures to companies that account for around one-third of global oil and gas production, and over 90% of global auto production.

Assessing that universe requires a granular analysis of the link between individual assets, the companies that own them and their parent companies, as well as the financial instruments associated with these assets. The figure below highlights the interwoven links within the analysis.

Matching hundreds of thousands of physical assets with companies



Linking physical assets and companies to financial instruments



CONTRIBUTIONS OF SECURITIES TO THE RESULTS

The objective of this section is to provide insight into the specific securities that are driving the results.

The following pages will show results for individual securities in the oil and gas, automobile, and power sector. The analytics provided show just one piece of information related to potential scenario analysis of companies and their contribution to a portfolio's performance. A range of additional indicators could be considered that go beyond the scope of this particular report. As a result, the indicators presented here should not be understood as providing investment recommendations, but rather a summary of the exposures of the securities driving the results of the portfolio scenario analysis. Section 6 provides further detail on the data sources informing this section.

As part of a partnership with a range of technical experts, the 2° Investing Initiative is currently developing company scenario analysis report mirroring the portfolio reports presented here, designed to be made freely available and provide a more comprehensive and holistic picture of a company's positioning relative to a decarbonization scenario. This infrastructure that can be used to inform future scenario analysis and actions will be launched in the second half of 2018. The analytics in this report thus only show a snapshot of the type of data that can be explored.

The following will briefly summarize the type of data that will be shown for each sector, if it is in the portfolio.

For the oil and gas sector, three types of indicators will be shown, given its prominence as the sector to which California insurance companies in aggregate have the highest exposures. The first indicator shows the estimated change in production levels for the oil and gas companies in both the fixed income and listed equity portfolios over the next 5 years. The weighted aggregate of these changes is what determines the alignment assessment over the next 5 years of the portfolio.

It should be noted that the figures provided are based on current estimated production based on the evolution of the current asset base. Mergers, acquisitions and increases in capital expenditure relative to baselines may of course lead to changes in these trends over time.

The second indicator builds on analysis conducted by the Carbon Tracker Initiative in partnership with the UN Principles for Responsible Investment. This indicator takes a more long-term view and analyses the alignment of companies from the perspective of the cost-structure of their assets. The indicators differ in terms of the time horizon and the underlying allocation rules that allocate macro scenarios to microeconomic actors. More information on the methodology and the approach can be found at <http://www.2degreesseparation.com/>.

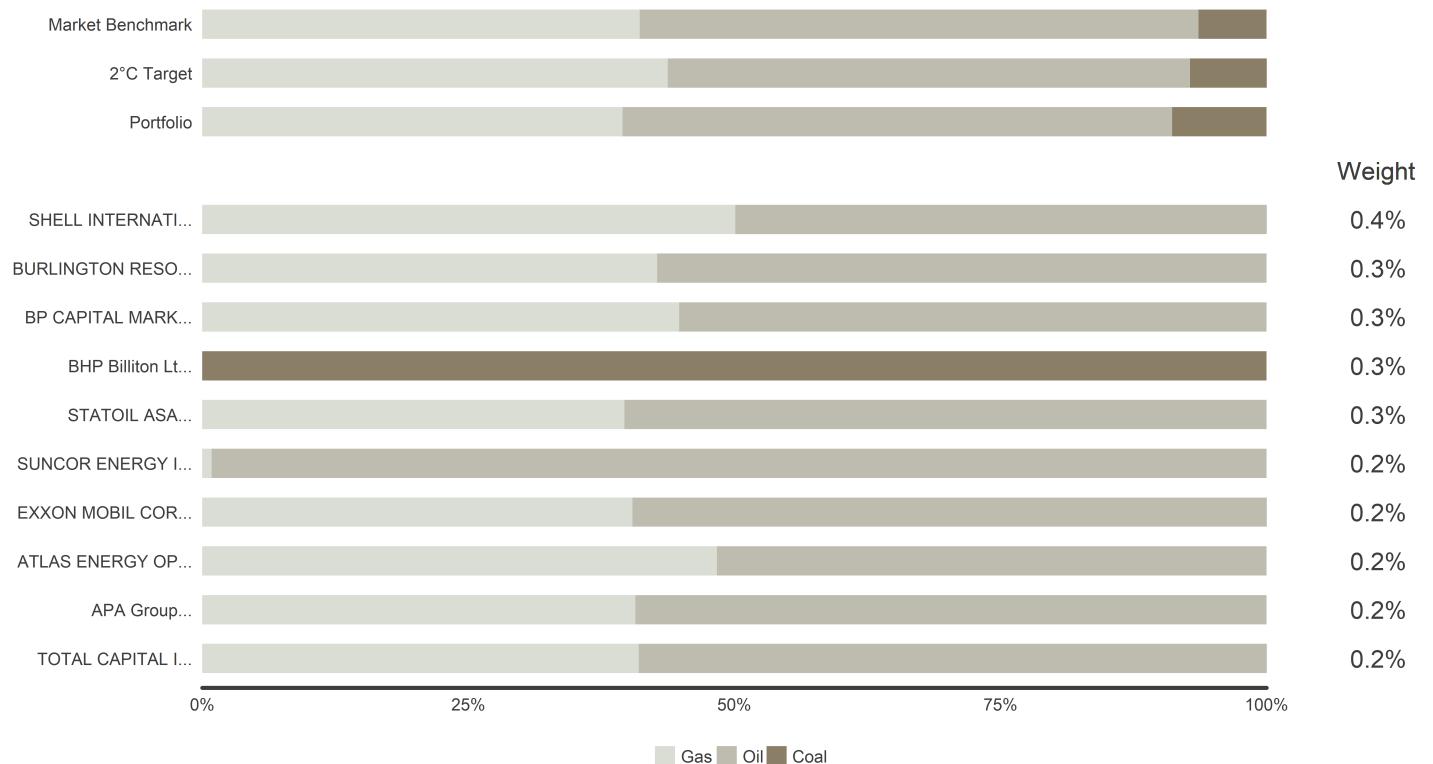
Finally, the analysis of the oil and gas sector also shows the 'fuel mix' of the oil assets for the individual companies, in terms of types of oil (conventional, tar sands). Wood Mackenzie (2018) proposes that while shifting away from high-carbon fuels towards low carbon is necessary as an overall trend, within the oil and gas industry, shifting away from particular extraction methods is a transitional alternative. This report does not comment on the emissions by extraction type however data is available on this. Companies need to look beyond resource themes and review the variations in upstream emissions intensity to see how companies can reduce their carbon footprints. Even assets of the same theme can have significantly different emissions intensity based upon maturity, location and other unique factors.

In terms of the power and automotive sectors, the security level information focuses on the fuel mix of the utilities and automotive manufacturers in the portfolio, informing in particular the results for Section 4. Additional information on the build out plans of these companies and the changes over time can be provided upon request.

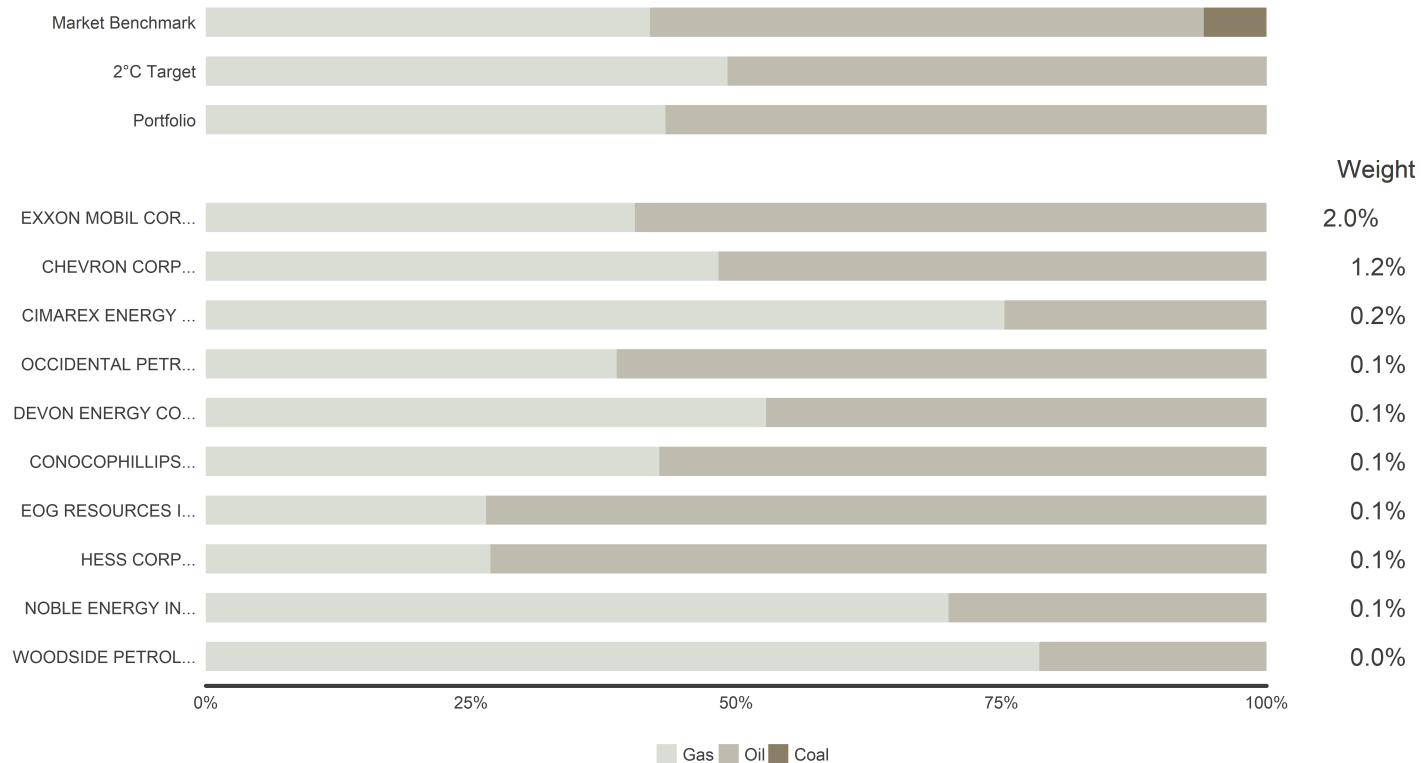
CONTRIBUTIONS OF SECURITIES TO THE RESULTS OIL AND GAS

23

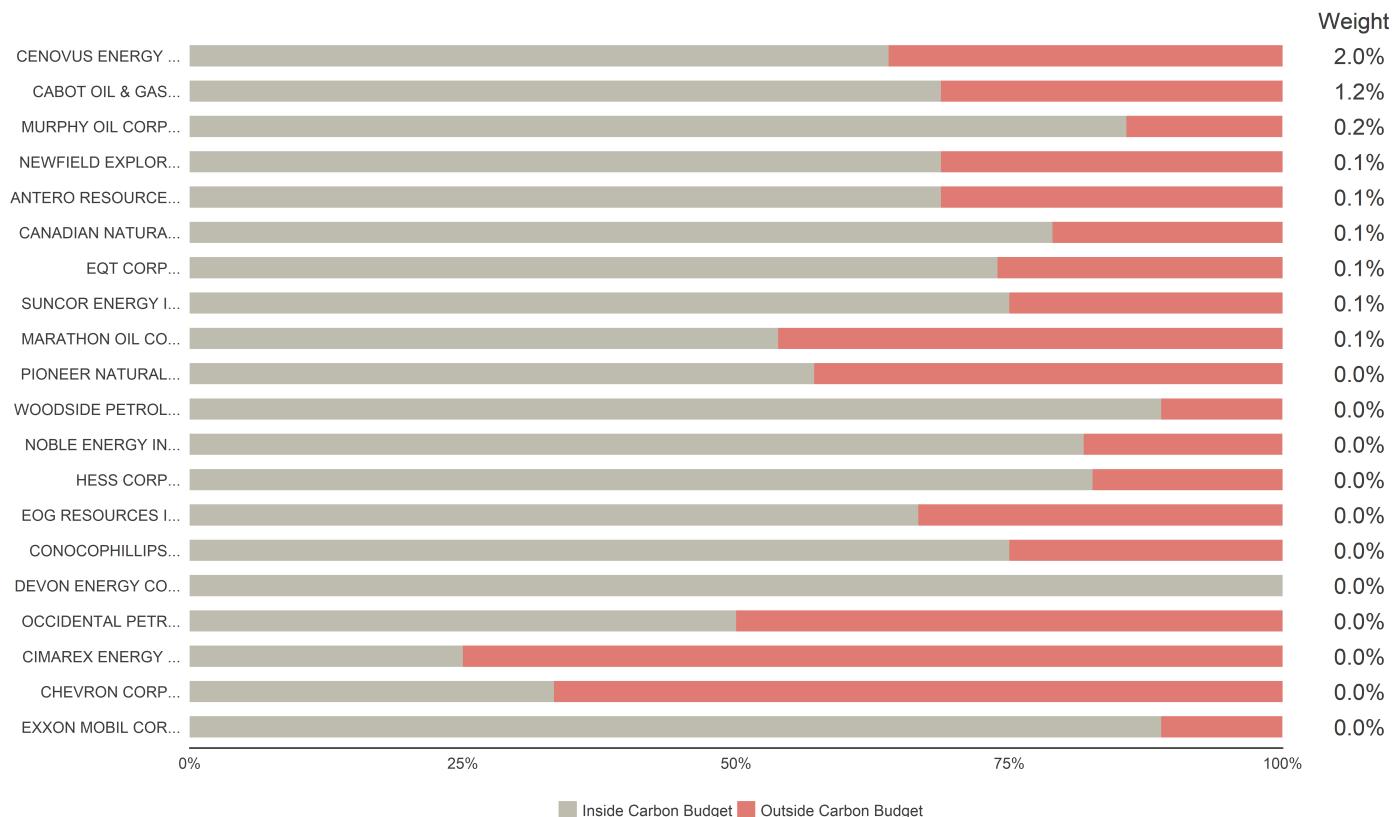
Oil build out of the companies within the fixed income portfolio



Oil build out of the companies within the equity portfolio



Carbon budget of the largest companies in the equity portfolio

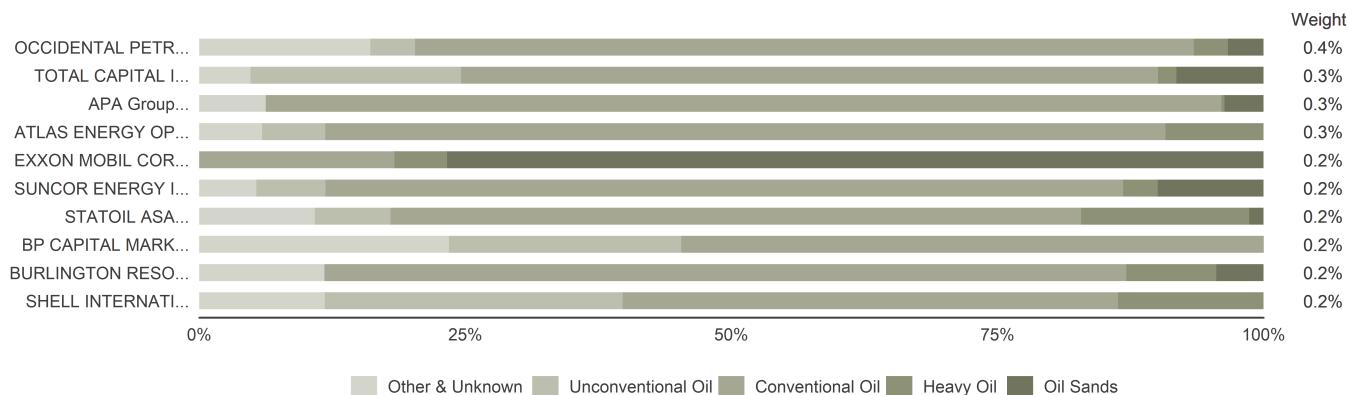


CONTRIBUTIONS OF SECURITIES TO THE RESULTS

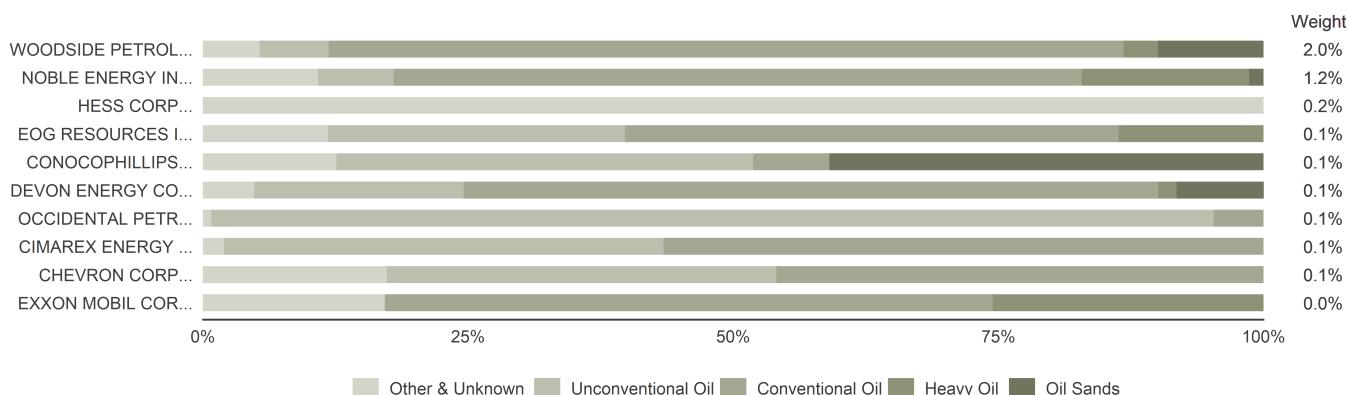
OIL

25

Resource breakdown of oil production of the largest companies in the fixed income portfolio



Resource breakdown of oil production of the largest companies in the equity portfolio

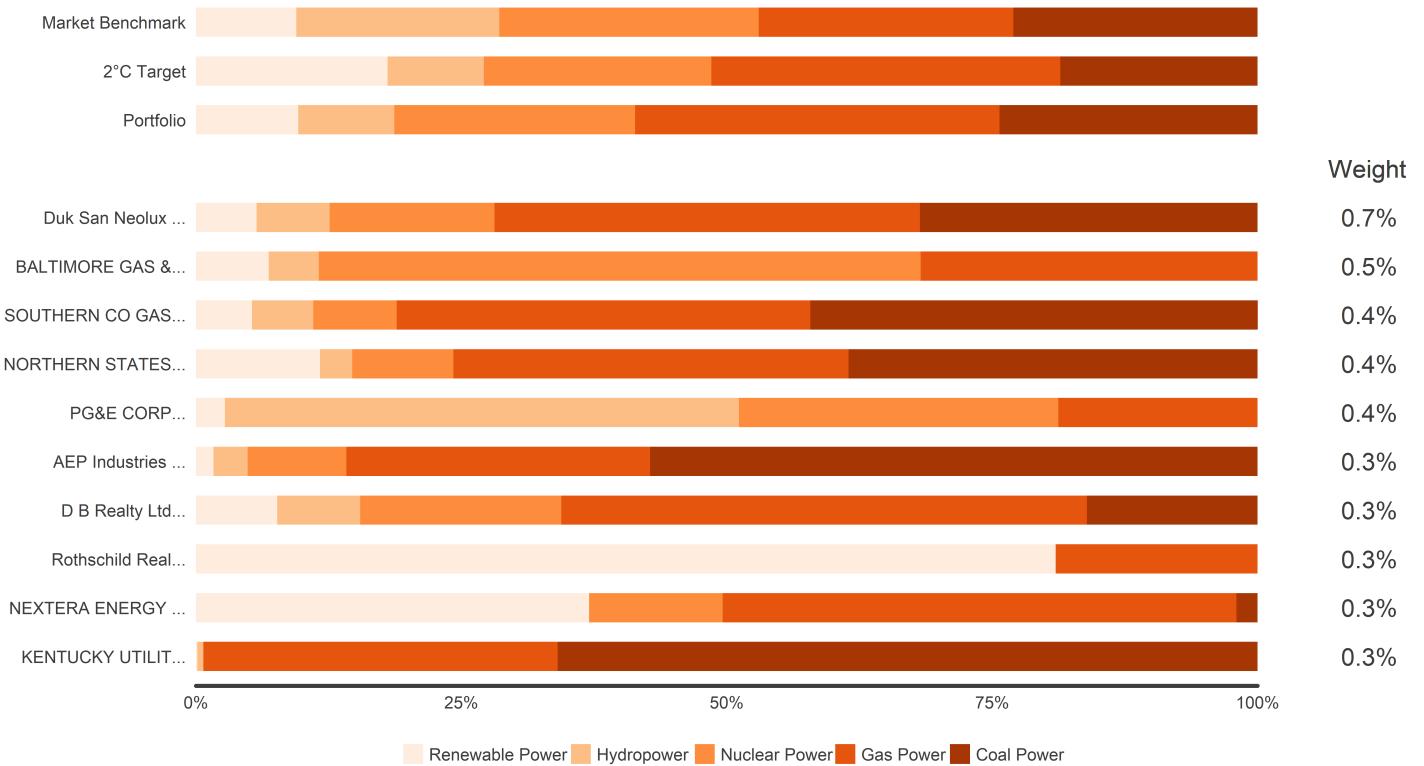


CONTRIBUTIONS OF SECURITIES TO THE RESULTS

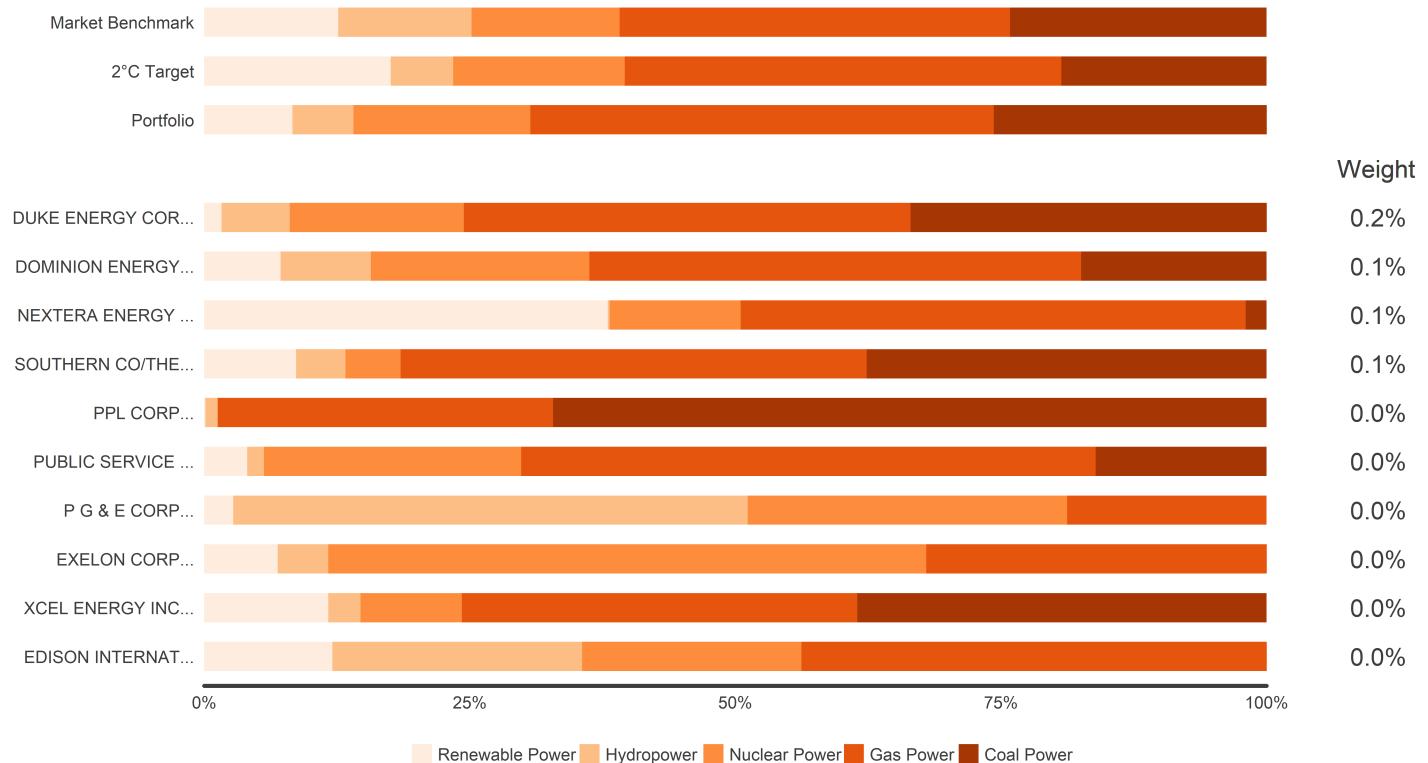
POWER

26

Technology breakdown of power companies within the fixed income portfolio



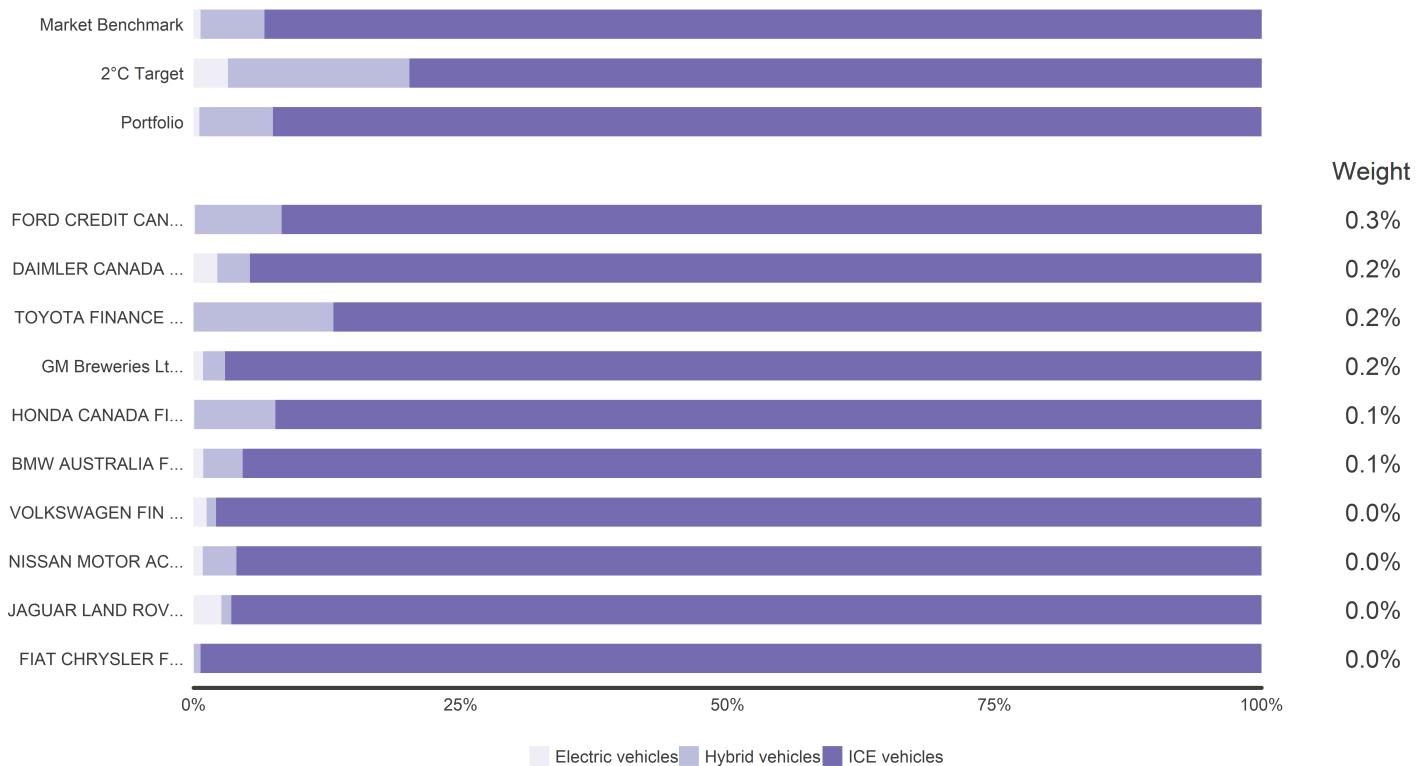
Technology breakdown of power companies within the equity portfolio



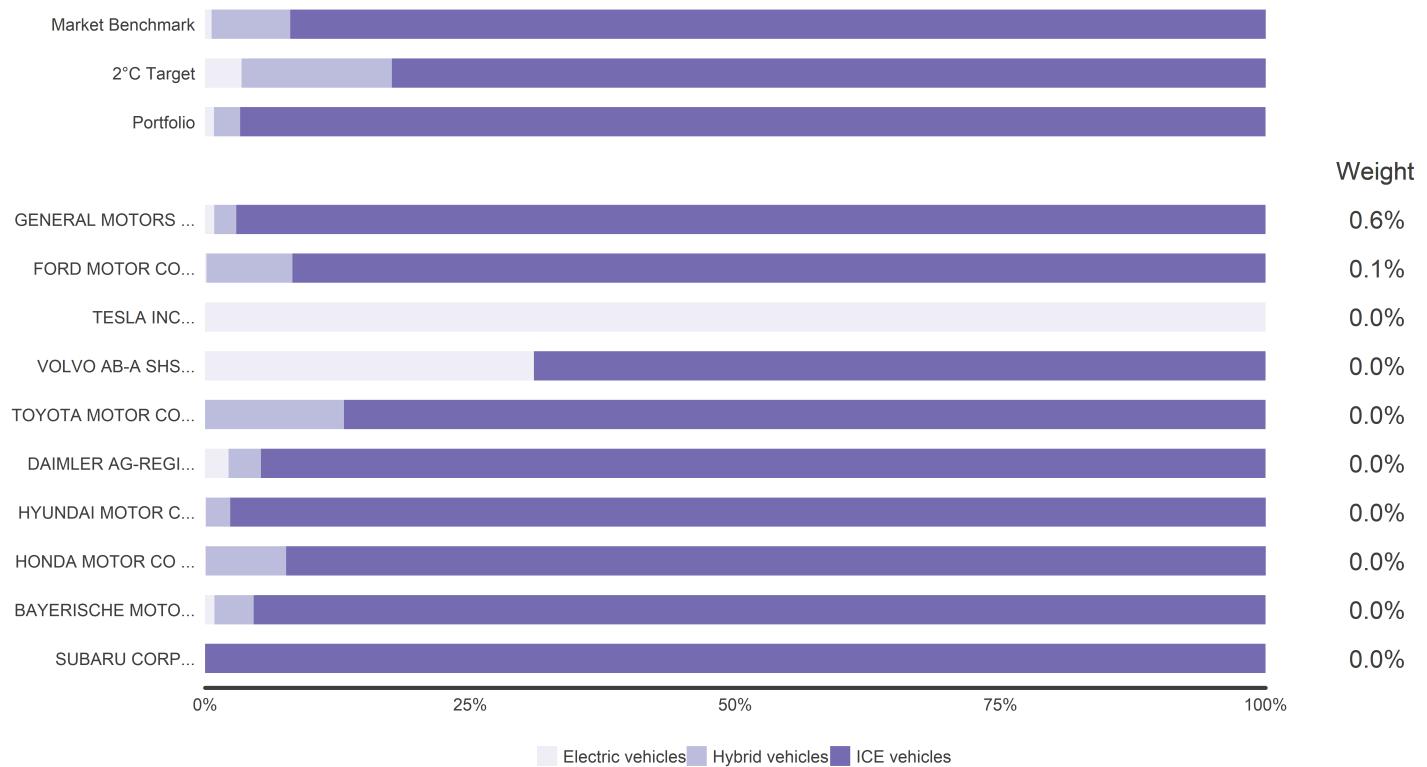
CONTRIBUTIONS OF SECURITIES TO THE RESULTS AUTOMOTIVE

28

Technology breakdown of automotive companies within the fixed income portfolio



Technology breakdown of automotive companies within the equity portfolio





SECTION 6: BACKGROUND TO THE MODEL

BACKGROUND TO THE MODEL

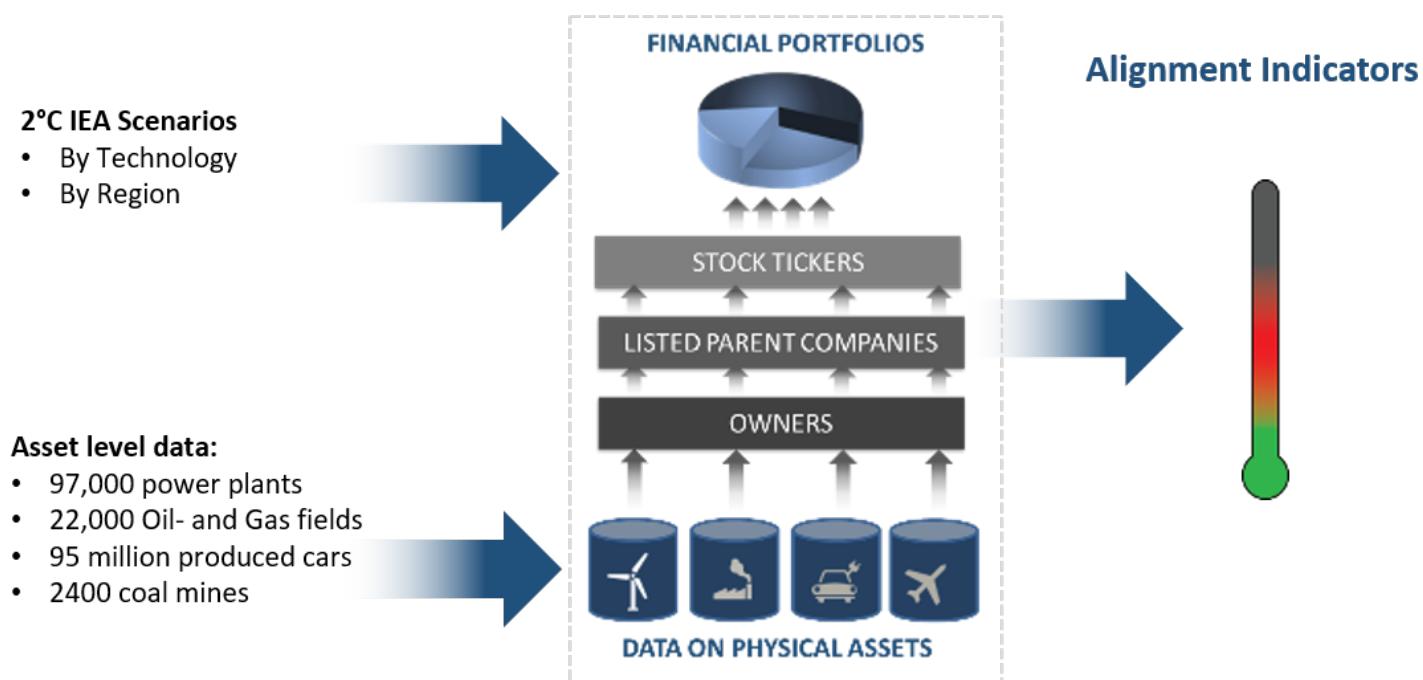
31

The objective of the assessment framework applied in this scenario analysis is to measure the alignment of financial portfolios with 2°C decarbonisation pathways. The model consists of 3 key elements that are detailed in the following pages.

- Scenarios, notably 2°C scenarios, that form the basis of the analysis and define the benchmark against which portfolio trends are compared. While in theory a range of scenarios can be applied for the model, in the interest of simplification, this analysis will rely on the scenarios of the International Energy Agency. These provide targets for each technology at a regional level.
- Financial portfolios and associated financial data to al-

low for the portfolio assessment. Within this report, the analysis will be limited to fixed income and equity portfolio. Funds within the portfolio have been identified and the underlying financial data extracted from Morningstar and included as part of the portfolio.

- Physical / industry 'asset level data' (current and forward looking) is mapped to companies, parents, and securities. This allows the link between financial portfolios and industry and production data (oil and gas production, automotive production, utilities) to be established. Consequently, this allows a comparison to the 2°C scenarios and a corresponding evaluation of the alignment of the portfolio.



Allocation Rules Based on the financial data, the asset level data is allocated to the portfolio to quantify a representative value of what the portfolio physically owns. This allocation rules varies between equity and fixed income portfolios. The assets are allocated to the portfolio based on the weight of the securities in the portfolio. For equity portfolios, the analysis is based on the ownership percentage of companies and their subsidiaries, with respect to all outstanding shares of the companies. This approach reflects the fact that the shares represent ownership ratios. In the case of debt, exposure is determined based on the share in the portfolio of

the relevant credit instrument. The underlying company exposure is defined by the technology mix (for example, the ratio of renewable to coal power).

Benchmarking Using the allocated production or capacity of technologies within the portfolio in as a starting point, an allowance based on the regional scenarios is calculated. This is extrapolated over the next 5 years to create the trajectory and this is compared to the current and future ownership. The variation of the ownership from this benchmark is used as the alignment indicator in the preceding results.

BACKGROUND TO THE MODEL

Assessing Alignment with a 2°C Transition Pathway. This analysis assesses the level of alignment with a 2°C transition pathway, using two references:

- *The portfolio's 'own' 2°C target.* This is the portfolio's target production profile 'under the 2° scenario': the changes required in the production profile of the companies held in the portfolio, in order to meet the target, based on the above-described methodology. While the 2°C scenario is the focus of this analysis, the target profiles for a 4°C and a 6°C scenario are also calculated to provide further context. Since the securities held and their weight in the portfolio are identical for the portfolio and its alternative versions, comparing them shows how aligned or misaligned the current production profiles of companies held in the portfolio are with each scenario.
- *The 2°C benchmark.* This is the target production profile of a 'market benchmark' under the 2° scenario. The same principle as described above is applied to a 'benchmark portfolio': the stock market as a whole, or the corporate fixed income market as a whole. Since the securities and their weight in the market portfolio differ from those in the portfolio, this comparison highlights 'idiosyncratic' alignment or misalignment. In other words, it shows how the current composition of the portfolio affects the alignment with the different scenarios, when the first reference only stresses the changes requested from the companies.

The alignment or misalignment of a portfolio's production and exposure to each technology relative to a scenario is one way to better understand insurers' exposure to energy transition risk. If policy, technology, market, or regulatory changes occur to bring the global real economy in line with the 2°C scenario, misalignment in a given technology would likely change the financial returns associated with those underlying physical assets. However, this analysis only assesses one dimension of energy transition risks: the assets at risk in the real economy. It does not take into account the financial resilience of the company to those changes and its capacity to adapt, which would require further financial analysis.

Scenarios

The IEA's 450 Scenario (450S) is the most well known climate scenario globally. It defines how climate-relevant technologies - essentially energy technologies - must be deployed by 2050 to reach a 50% probability of limiting warming to 2°C or 3.6°F. In addition to the 450S, the IEA also defines the New Policies Scenario (NPS) and Current Policies Scenario (CPS): other technology roadmaps that correspond to a 50% probability of maximum 4°C and 6°C warming, respectively. The 450S (also referred as "2° scenario"), NPS ("4° scenario"), and CPS ("6° scenario") all provide forward-

looking projections with enough regional detail to perform scenario analysis for 11 technologies in 3 sectors. The analysis is based on the IEA scenarios for the California Department of Insurance and covers fossil fuel extraction (oil, gas, and coal mining); production of electricity (from coal, gas, petrol, hydro, nuclear, and renewables); and, the production of cars (internal combustion engines - gasoline and diesel, hybrid, and electric).

The IEA historically has assumed significant amounts of nuclear power and carbon capture and storage in their scenarios. While the IEA has updated the names and models in 2017, given that this report uses 2016 portfolio data, 2016 scenarios were applied for this analysis. In addition, the international community has accelerated their global target from the 2°C goal to well below 2°C with a target of 1.5°C. It is important to highlight that each investor can and may want to take an individual view on the likely decarbonization scenario that may or may not relate to the scenarios modelled by the International Energy Agency or others.

The model uses the following indicators from the International Energy Agency scenario against which the portfolio is compared:

- Electric capacity by fuel expressed in MW (e.g. renewables, coal, gas, oil, hydropower, nuclear);
- Oil production expressed in barrels of oil produced / year;
- Gas production expressed in bcf / year;
- Coal produced expressed in mtoe / year;
- GHG emissions pathways in a sample of additional sectors (e.g. aviation, shipping, cement, steel).

Asset Level Data

The Asset Level data is sourced from the following data providers:

- GlobalData (Power plant data, including plants classified as active, announced, financed, partially active, permitting, temporarily shutdown, under construction, under rehabilitation and modernization, and Oil and Gas production data and forecasts until 2018-2023, as well as coal mining data);
- WardsAuto (light passenger duty vehicle, including BAU production forecasts 2018-2023);
- Bloomberg (financial data);
- S&P Cross-Reference Services (database matching securities to parents);
- Morningstar (database on funds).

IMPORTANT CONSIDERATIONS AND LIMITATIONS WHEN INTERPRETING THESE RESULTS

33

- *Stringency of scenarios.* The use of a given scenario (2°C, 4°C, and 6°C) does not constitute an assumption that this scenario is more likely to prevail than others. Similarly, the choice of IEA scenarios should not be interpreted as an endorsement of the underlying assumptions by 2Dii or the California Department of Insurance. The IEA historically has assumed significant amounts of nuclear power and carbon capture and storage in their scenarios, an assumption that is debated within the energy-climate scientific community. In addition, the international community has accelerated their global target from the 2°C goal to “well below 2°C and towards 1.5°C”. It is important to highlight that each insurer can and may want to take an individual view on the likely decarbonization scenario that may or may not relate to the scenarios modelled by the International Energy Agency.
- *A snapshot rather than forecasts.* The forward-looking production data is based on current ‘revealed’ plans from companies, and is subject to change. The estimates should thus not be interpreted as forecasts, but rather as the current plans of companies as estimated from various sources of information by industry-specific business intelligence experts - who might not know everything about the CEOs’ actual plans. Given the 5 year time horizon, it is likely that these plans will change in some way over time. Similarly, insurers are highly likely to alter the composition of their portfolio over time. Fixed income maturity is usually around 3-7 years. The average holding period of a stock by a fund manager is 20 months on average. However, this analysis seeks to be a point in time assessment of future exposures under current conditions.
- *Power sector projections.* This is a measure of "locked-in" capacity, not a capacity forecast. Distinct from the production data for the fossil fuel and automotive sectors, capacity data for the power sector does not include information on planned retirements. It should therefore be interpreted as a measure of currently "locked-in" capacity and not as a forecast of future capacity. Retirements are not included for several reasons: First, the availability of planned retirement data is highly variable across jurisdictions and regions, to the extent that including no retirement information was deemed more representative of industry capacity than including partial data. Second, in contrast to the fossil fuel sector where oil wells, gas fields, and coal mines cease production when their resource runs out, it is possible for power plants to be announced as retired or even be retired and then resume production. Given the higher level of uncertainty around planned retirements, they are not included in the power sector projections used for this analysis, and capacity projections should thus be interpreted as the potential maximum “lock-in” from current infrastructure. For technologies projected to decline under the 2° scenario, the gap between current capacity projections and capacity consistent with the 2° scenario should be seen as an estimate of the capacity that would need to be retired to be in alignment with the 2° scenario.
- *Changes in plans.* The forward-looking data is based on current ‘revealed’ plans from companies and is subject to change. The estimates should thus not be interpreted as final forecasts, but rather the current plans of companies if they don’t change. Another way to interpret the results is the call for action with regard to the required change to align with the 2°C economic trend. Given the 5 year time horizon, there is a high degree of certainty that plans will still change in some way over time. Similarly, the participating financial institutions can of course alter their portfolio exposures over time. The analysis however seeks to be a point in time assessment of future exposures under current conditions.
- *Ability to capture SRI strategies.* The model takes a diversified ‘market portfolio’ as a basis, focusing on key technologies reflected in the IEA roadmaps. By extension, thematic portfolios invested in breakthrough technologies and / or SRI portfolios with a range of environmental, social, and governmental considerations may not value these elements.

NOTES AND DISCLAIMER

34

Published Research

The methodology behind this scenario analysis, the accounting rules applied, and further information to the scenarios and data can be found in the following published research papers.

Accounting Principles: <http://www.mdpi.com/2071-1050/10/2/328>

Scenario Work: <http://et-risk.eu/toolbox/scenarios/>

Asset Level Data Analysis: http://2degrees-investing.org/IMG/pdf/assetdata_v0.pdf

Sources for the data and scenario analysis

Automobile data are from July 2017 and is provided by Ward'sAuto / AutoForecastSolutions. Power data is from July 2017 and is provided by GlobalData. Oil, gas and coal production data is from July 2017 and is provided by GlobalData. When linking asset data with companies, the data is used by the data providers mentioned above and, where possible, enriched with company data from Bloomberg. All financial data, as well as identification numbers for linking company data with financial instruments, come from Bloomberg.

Sources

IPCC (2018) <https://www.ipcc.ch/report/ar5/>

FSB (2018) <https://www.fsb-tcfd.org/publications/final-recommendations-report/>

Aviva / ECIU (2015) <https://www.aviva.com/media/thought-leadership/climate-change-value-risk-investment-and-avivas-strategicresponse/>

FSB (2018) <https://www.fsb-tcfd.org/publications/final-recommendations-report/>

WoodMacKenzie (2018) <https://www.woodmac.com/news/editorial/carbon-intensity-not-all-assets-are-created-equal/>

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