Moody's Analytics

Better Faster Decisions

Transition Scenario Analytics

Education Session

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Speakers

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Objectives of the session

Transition Scenario Analytics: What this session is and is not

What this session <u>is</u>
We have organised this transition scenario analytics education session to showcase the art of the possible and ensure market participants have a foundation to feed into possible solutions across four use cases; Disclosure, Risk Management, Strategy and Underwriting.
It aims to illustrate a starting point for providing context for the emissions footprinting numbers such as the type of outputs produced in the Baselining workstream.

What this session <u>is not</u>
This session does not represent training on analysis designed for a specific use case.

Key learning outcomes

- What transition scenarios are, where they come from
- What currently possible outputs around a forward-looking view on climate transition are
- How others are already using scenarios
- What this analysis can help with and what it can't - transparency & limitations

Agenda:

1. Introduction: Use cases & drivers (5 mins)
2. Theory: Fundamentals and analytical principles of transition scenarios (15 mins)
3. Practice: Creating a forward-looking view (25 mins)
4. Summary & Q&A (10 mins)

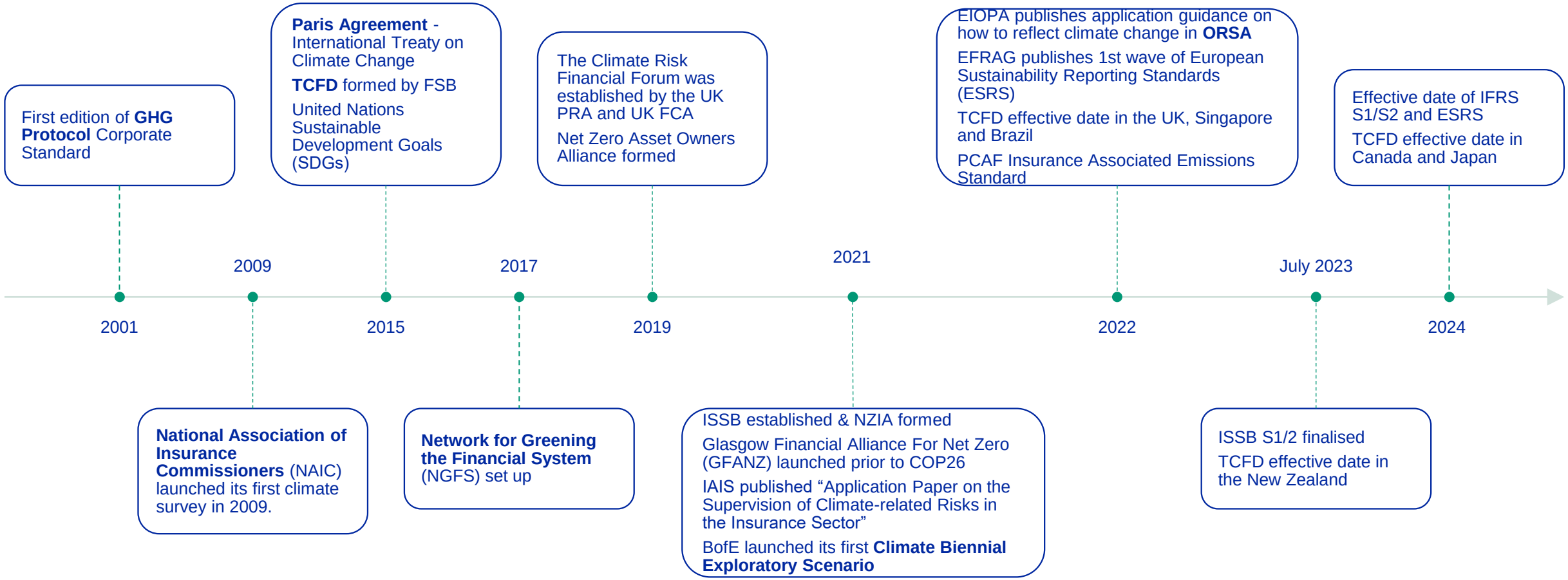
1

Introduction

Use cases & drivers

Climate & Transition Considerations

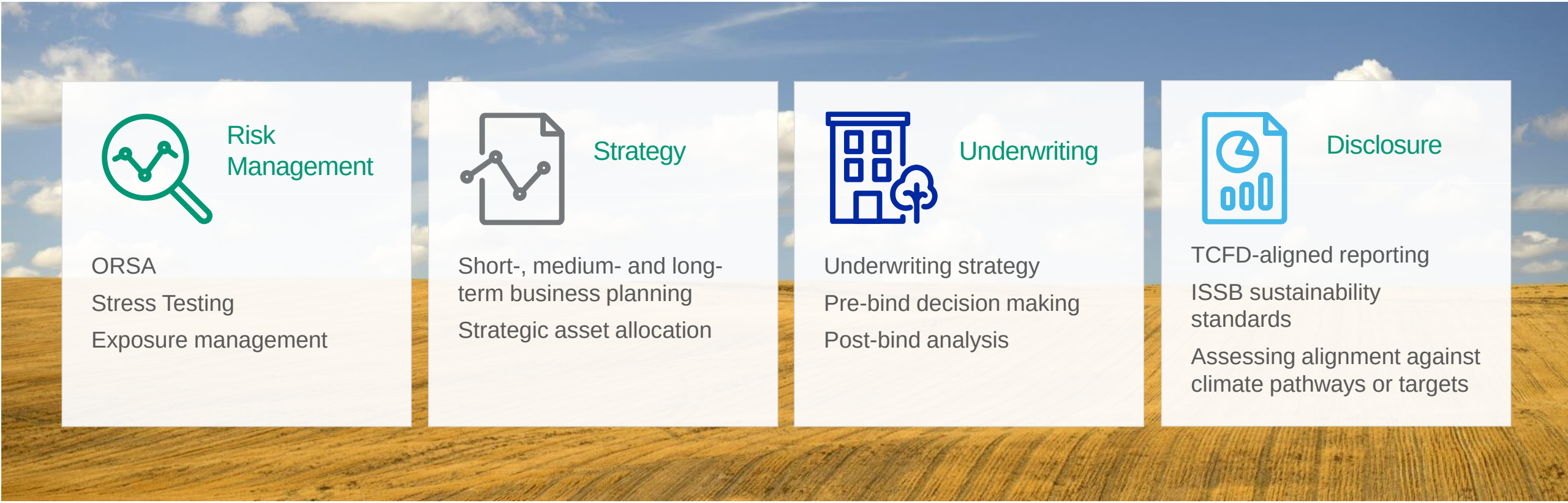
Key climate milestones affecting insurers are accelerating



On the back of these developments, an increasing number of insurers are exploring forward-looking transition analysis

Uses of forward-looking climate analysis

Transition scenarios are becoming relevant across business functions with varying levels of sophistication



Risk Management

ORSA

Stress Testing

Exposure management

Strategy

Short-, medium- and long-term business planning

Strategic asset allocation

Underwriting

Underwriting strategy

Pre-bind decision making

Post-bind analysis

Disclosure

TCFD-aligned reporting

ISSB sustainability standards

Assessing alignment against climate pathways or targets

2

Theory

Fundamentals and analytical principles of transition scenarios

a) Physical risk vs Transition Risk

b) Overview of different scenarios (IPCC,IEA, NGFS, PRI)

c) Analytical steps

Climate Change Risk

Climate Risk Terminology

Credit: kwest/Shutterstock.com

- There are two common types of risks:
  - **Transition risks –** permanent shifts driven by changes in policies, technology, carbon pricing, regulations and market behaviour.
  - **Physical risks**
    - **Acute physical risks** – shocks due to increased number of extreme weather events
    - **Chronic physical risks** – long term systemic (not diversifiable) shifts
- Underlying these two types of risks and the balance between them is ***scientific and socio-economic uncertainty***.
  - Future development of emissions driven by factors such as population and income growth
  - Degree of warming and climate disruption remains uncertain

? ***How can we help insurers address these risks?***

Sources of Transition Scenarios

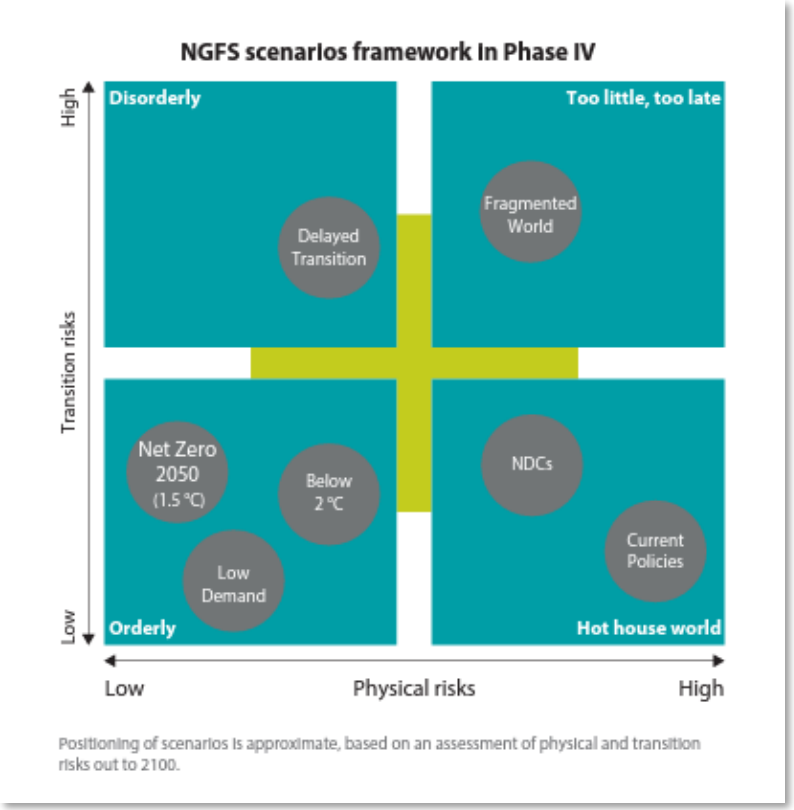
Standard Sources for Climate Scenarios

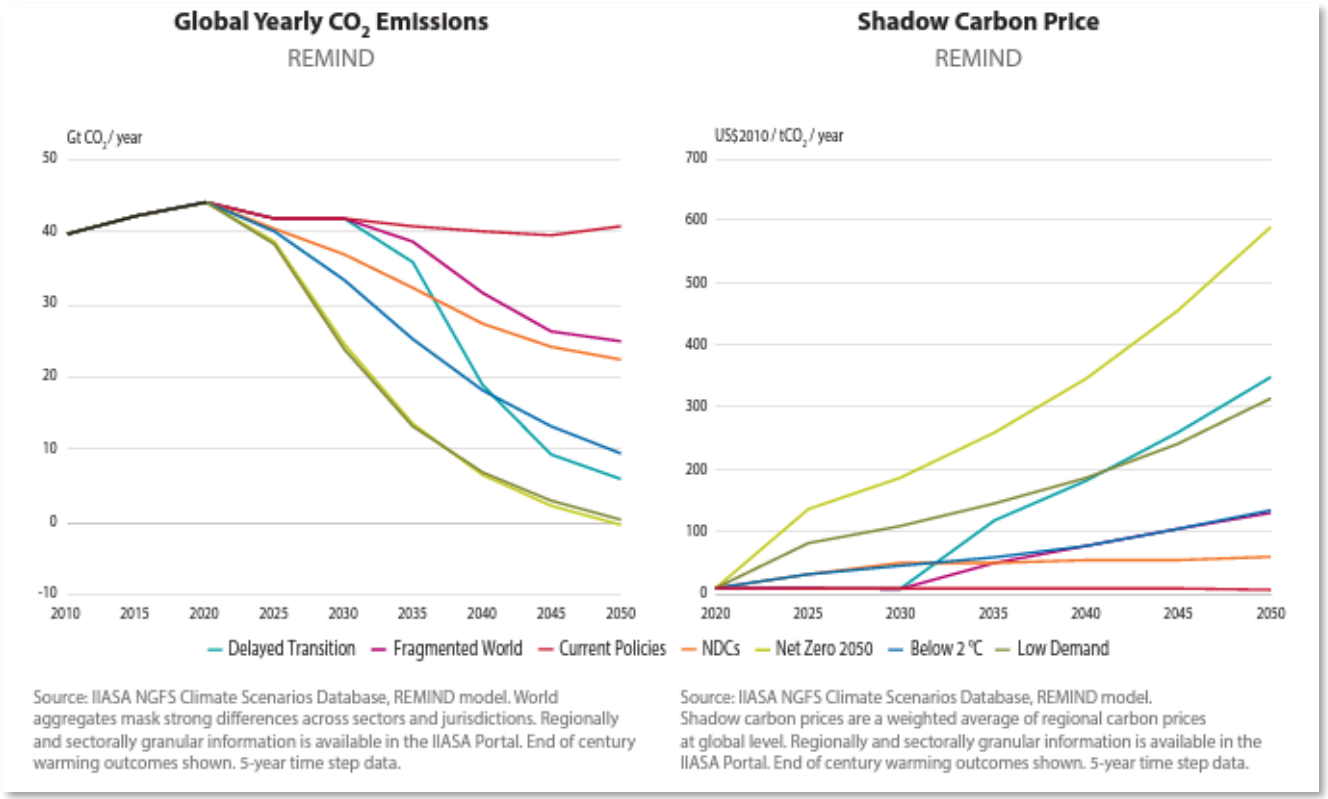
IPCC **Intergovernmental Panel on Climate Change**	**IEA** **International Energy Agency**	**NGFS** **Network for Greening the Financial System**	**UN PRI** **Principles for Responsible Investment**
UN body formed in 1988 for assessing the science related to climate change. Published the 2018 Special Report on Global Warming of 1.5ºC	Intergovernmental organisation with 31 member countries and remit includes recommendations on sustainability of energy	Set up in 2017. Group of central banks and supervisors. Scenarios primarily aimed at the financial sector.	Inevitable Policy Response (IPR) created in 2018 to support investors to incorporate transition risk into portfolio analysis
Assessment reports (AR) on climate change every 5-7 years.	Annual publication of the World Energy Outlook (WEO)	Phase 4 published November 2023	FPS first published in 2021 Update published 2023
SSP-RCP based pathways. e.g. SSP1-RCP2.6 1.8ºC SSP2-RCP4.5 2.7ºC SSP3-RCP7.0 3.6ºC SSP5-RCP8.5 4.4ºC	• Net Zero Emissions Scenario (NZE) • Announced Pledged Scenario (APS) • Stated Policies Scenario (STEPS)	• Net Zero 2050 • Below 2.0ºC • Low Demand • Delayed Transition • Fragmented World • Nationally Determined Contributions (NDCs) • Current Policies	Forecast Policy Scenario (FPS) Required Policy Scenario (RPS)

- » Sectoral outcomes can differ significantly across scenarios (particularly over medium term)
- » Considering differences between scenarios develops understanding of fundamental uncertainties

Modelling Physical and Transition Risk Scenarios

NGFS Phase IV Scenarios

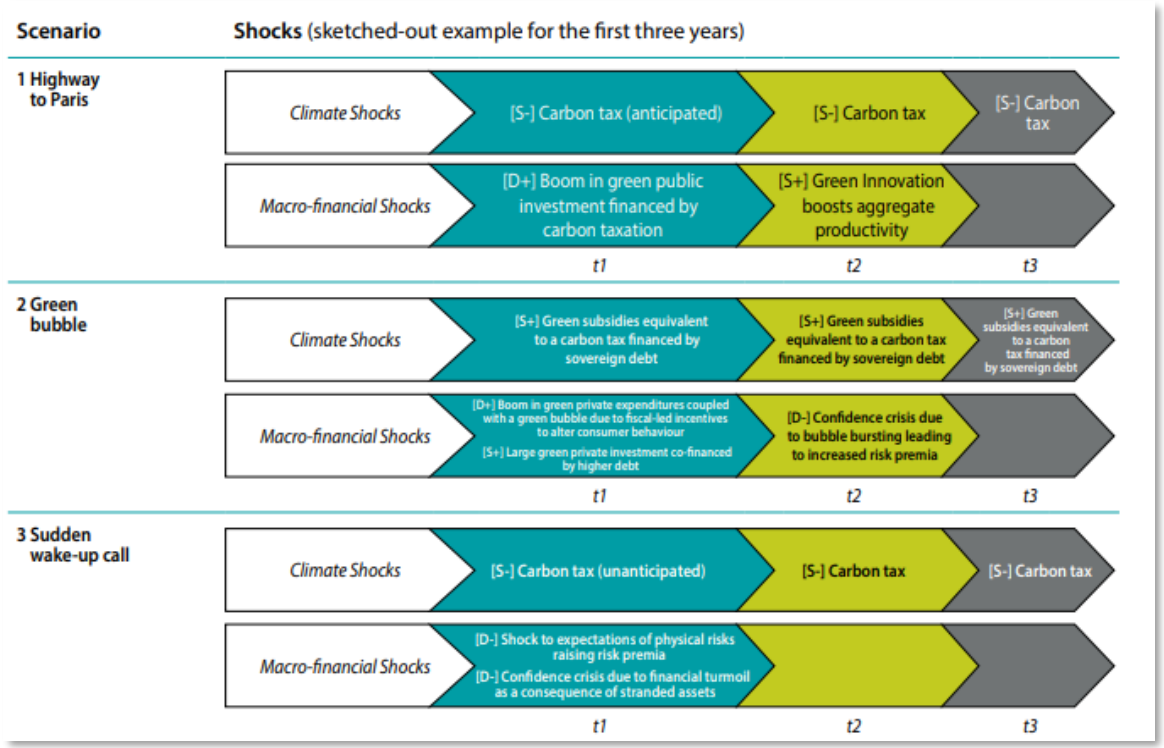




- Decreasing greenhouse gas emissions is a fundamental feature of transition
- Strong policies needed to ensure it happens quickly enough to limit worst impacts of climate change

NGFS Short Term Scenarios

Short Term Scenario Narratives



Source: Conceptual note on short-term climate scenarios, *NGFS technical document* (2023)

- Shorter term scenarios align more naturally with typical time horizons used by insurers
- NGFS short term narratives also start to explore potential upsides (e.g., opportunities, green growth)

Analytical Steps

Process for Going from Climate Scenarios to Financial Impacts

Climate

Temperature paths

Energy mix

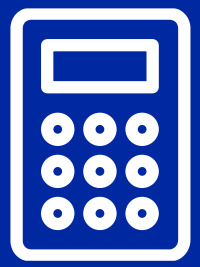
Carbon price

Macroeconomic

Abatement costs

Damages

Carbon tax revenue



Financial

Inflation

Nominal return

Real return

Risk premia

Credit spreads

Asset class returns

Government bonds

Corporate bonds

Equity

Property

Multi-asset portfolio

Sector output

Sector Output

GVA

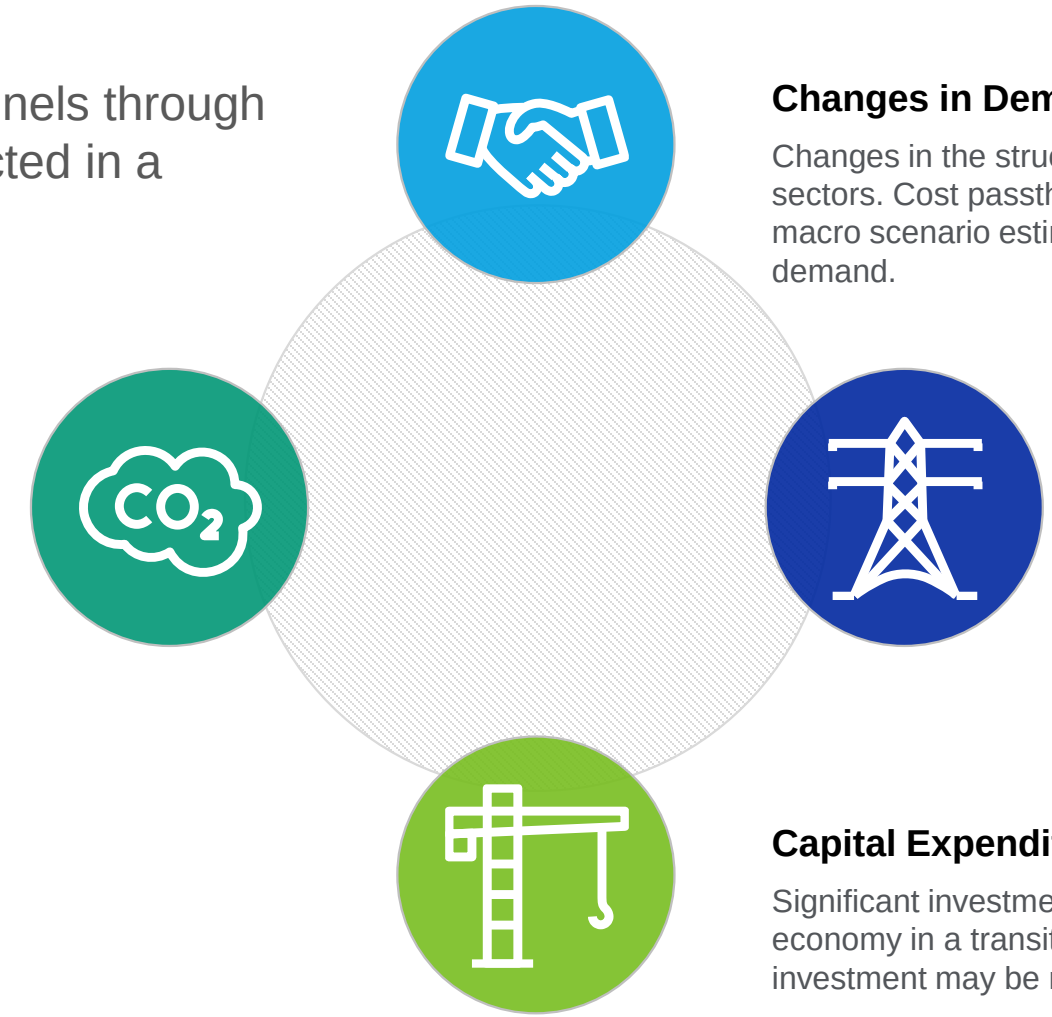
Sector Costs

Earnings and Valuation Impacts

Sector Cost Channels

Different Cost Impacts Across Sectors

There are four principal channels through which sector costs are impacted in a climate transition scenario.



Changes in Demand

Changes in the structure of the economy can alter demand across sectors. Cost passthrough can also impact overall demand. We use macro scenario estimates of sectoral value added as a basis for demand.

Carbon Taxes

Carbon taxes are projected in each scenario. Tax rates can vary by sector and region. Total costs are taxes times emissions.

Energy Costs

Final energy and energy prices are estimated in climate models. Energy costs can increase significantly in early years of a transition scenario.

Capital Expenditure

Significant investment will be required to restructure the economy in a transition scenario. In some sectors investment may be needed just to maintain current demand.

3

Practice

Creating a forward-looking view

a) Transition risk modeling

b) Asset class impacts

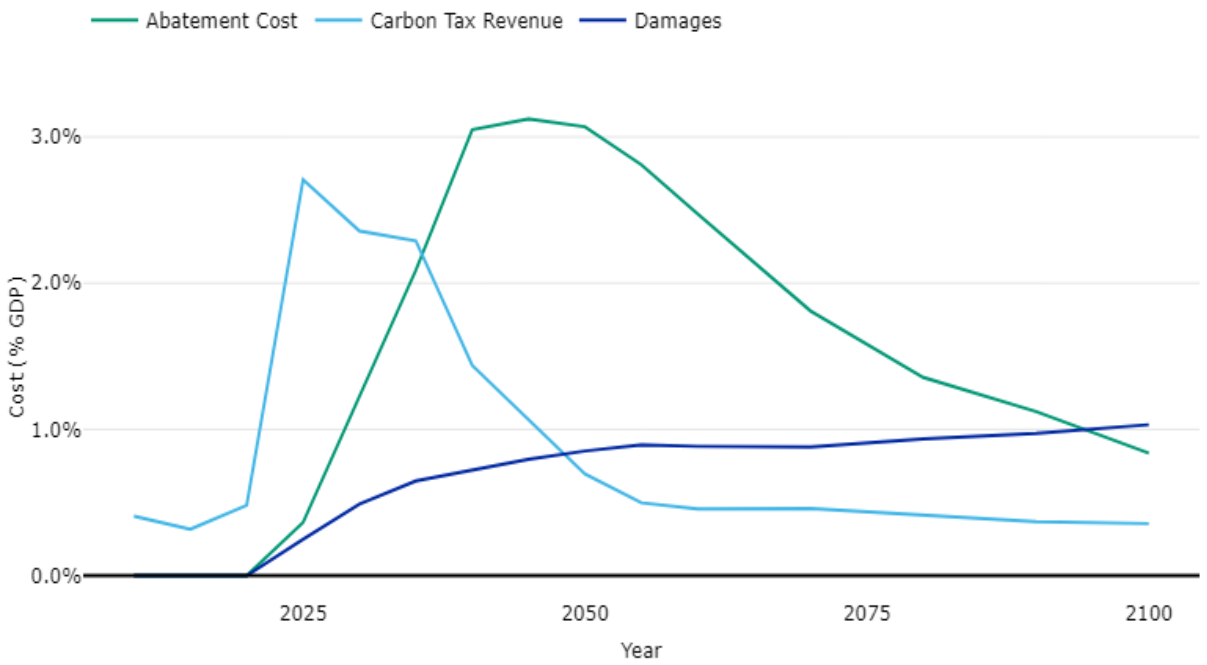
c) Alignment

Three waves of costs

Different profile of costs in a transition scenario compared to hot house scenario

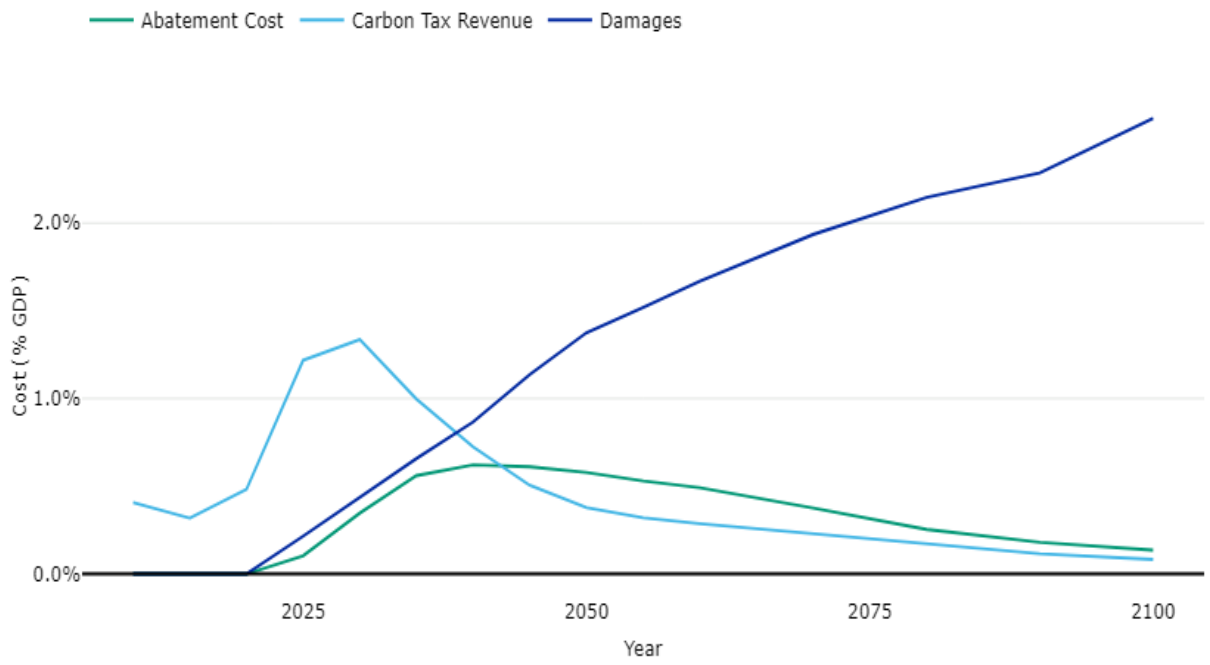
Orderly Transition

Net Zero 2050



Hot House Scenario

Nationally Determined Contributions



Carbon Tax Revenue

Abatement Cost

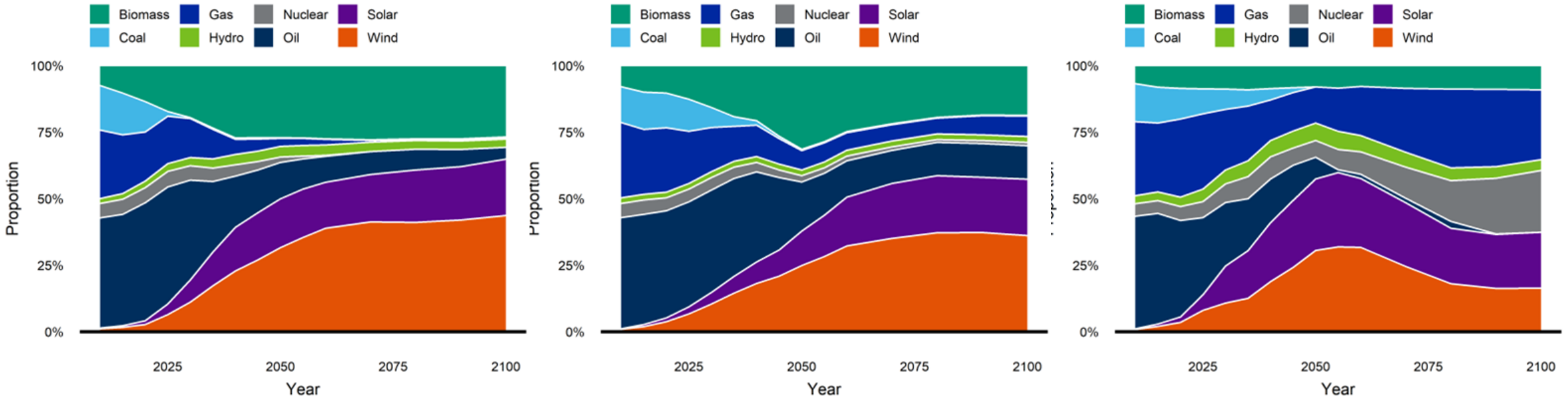
Physical damages

Energy System Modelling

Model Uncertainty

- Introduction of carbon taxes leads to higher energy prices and a growth in low carbon investments
- The projected energy mix can differ significantly between models
  - REMIND has almost zero gas in EU
  - MESSAGE has much significant gas CCS and nuclear for example

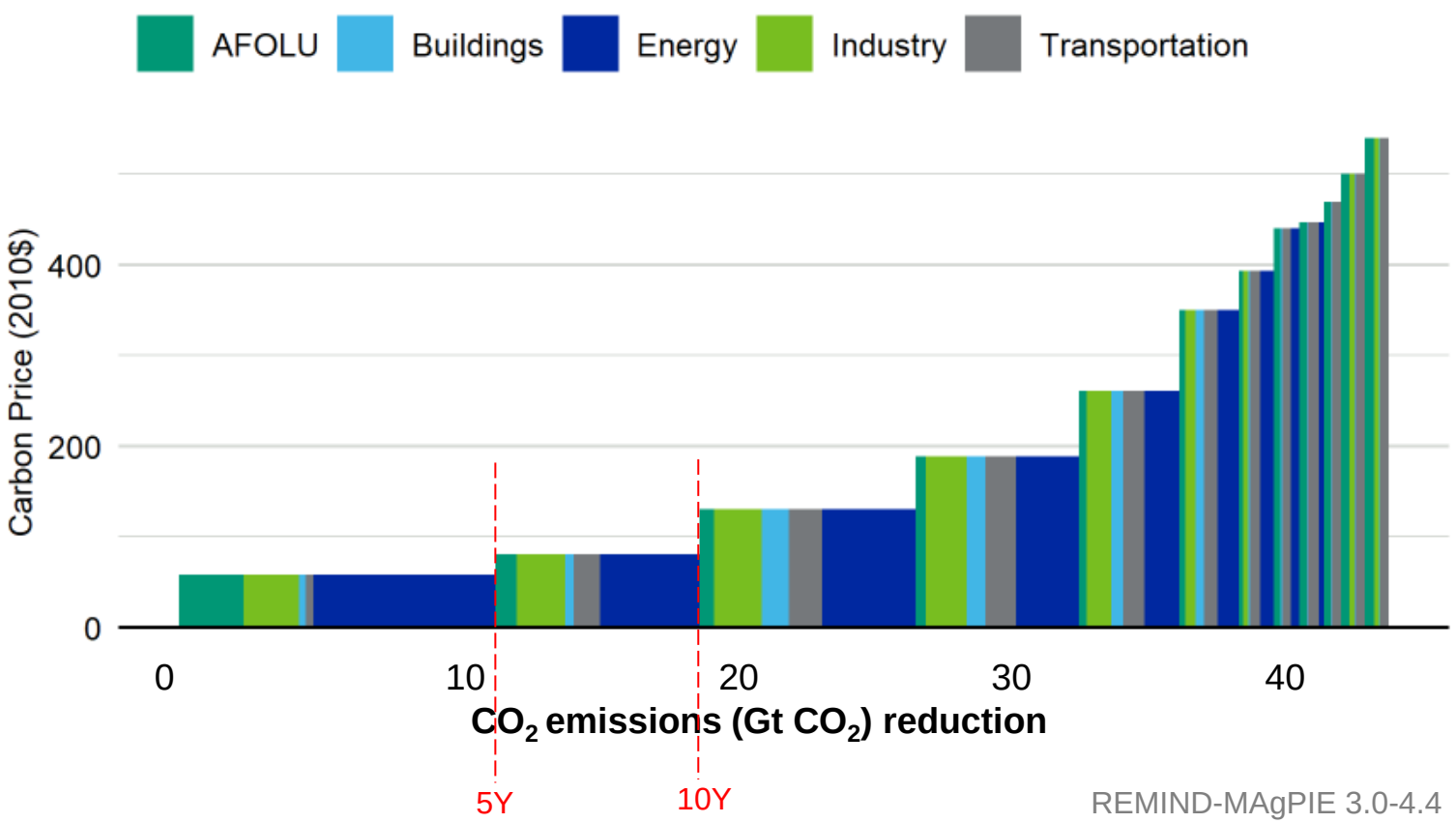
EU primary energy mix – Net Zero 2050



REMIND-MAgPIE 3.0-4.4 GCAM 5.3 MESSAGEix-GLOBIOM 1.1

The Stairway to Net Zero

Sector Abatement Costs



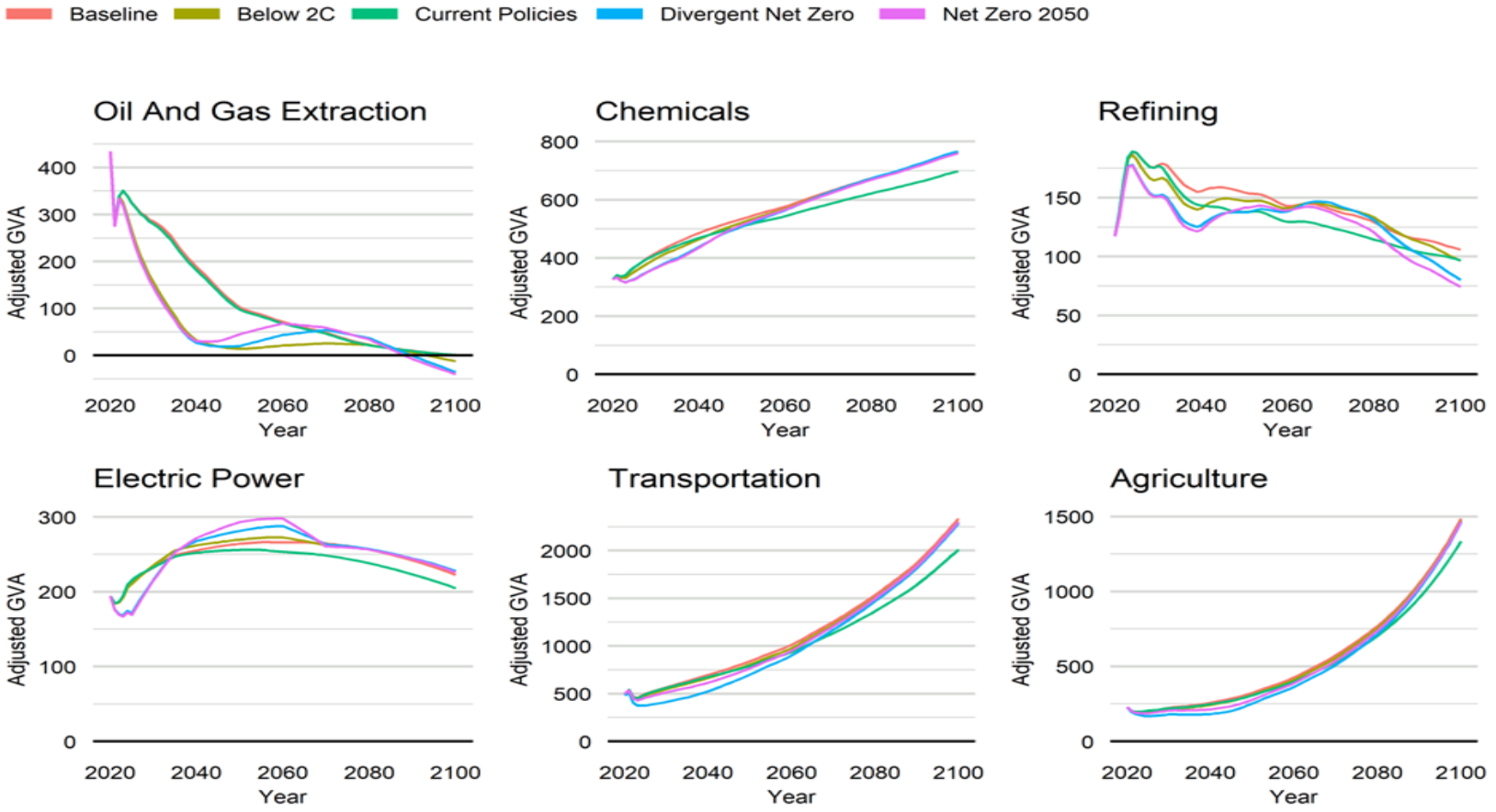
Marginal abatement costs can be represented as a stairway to Net Zero.

- The stairway to net zero is a series of 5-year timesteps. On the chart each block represents a 5-year step.
- The chart shows the annual mass of emissions which must be abated in each step to achieve Net Zero by 2050.
- Costs vary by sector. Some sectors can decarbonise earlier than others and the early steps have significant contributions from agriculture & forestry and energy.

Sector Output Modelling

Combination of Demand Changes and Investment

Adjusted Economic Output (Adjusted GVA)

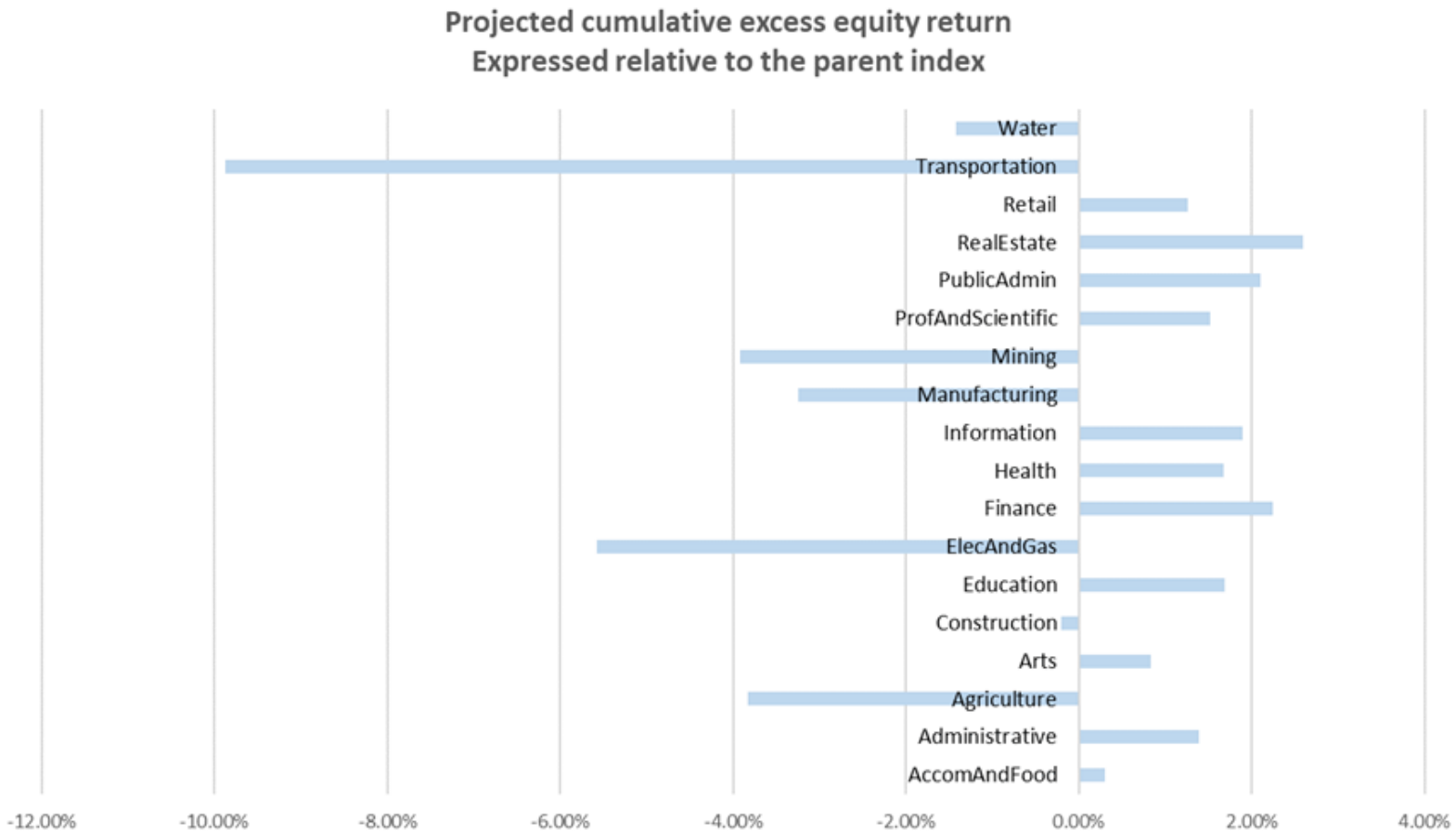


- GVA is the economic output per sector.
- Moody's macroeconomic team provide forecasts of GVA.
- Some sectors such as transportation and chemicals are predicted to grow, whereas others such as oil & gas are predicted to shrink.

Adjusted GVA = Gross Value Output post abatement costs & carbon taxes

Sector Analysis

Projected equity returns



- Using the output from the GVA analysis, we apply discounted cash flow model to assess impacts on equity risk premia for different industries.
- Chart shows projected cumulative equity return, relative to market index for orderly transition scenario, over a 10-year time horizon.

Calculating Asset Class Impacts

Framework for modelling financial variables

» In order to understand how economic impacts will affect financial markets its necessary to think carefully about how each impact will cascade through to asset valuations:

Financial Variables	Lower Consumption Growth	Climate Inflation	Higher Risk Aversion	Lower Earnings & Rental Growth
Real Yields	X			
Nominal Yields & Inflations	X	X		
Credit Yields & Spreads	X	X	X	
Equity & Real Estate	X	X	X	X

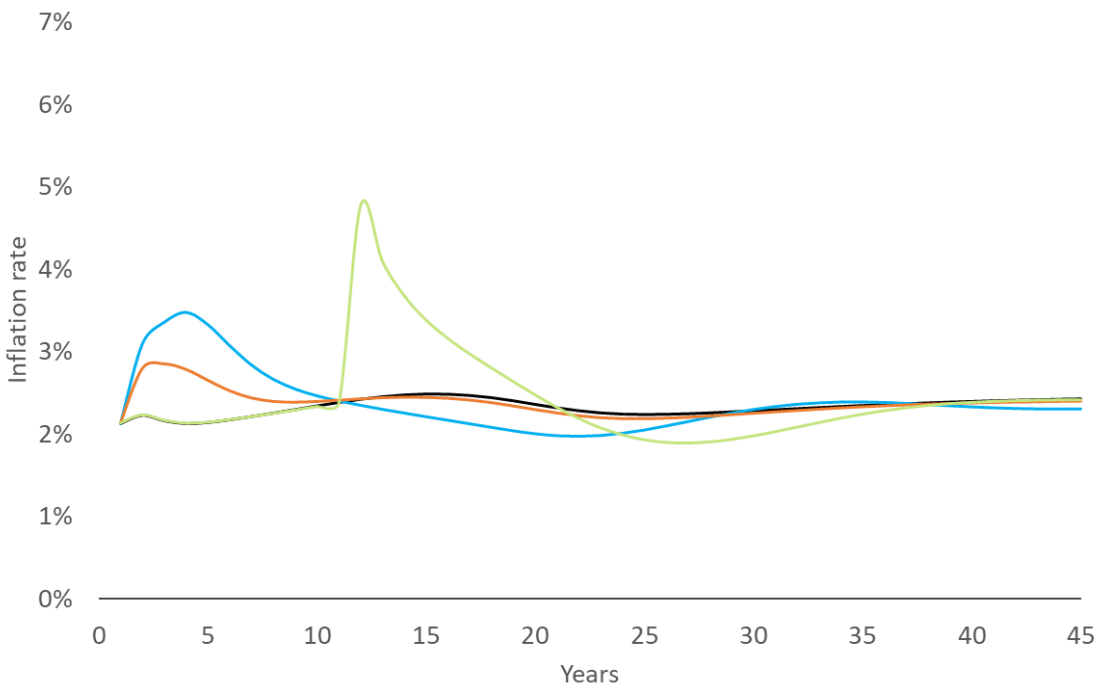
» Changes to cost of capital (real rate of interest, expected inflation levels and risk aversion/premia) are the critical drivers of valuation changes for all fixed income asset classes

Projecting financial variables

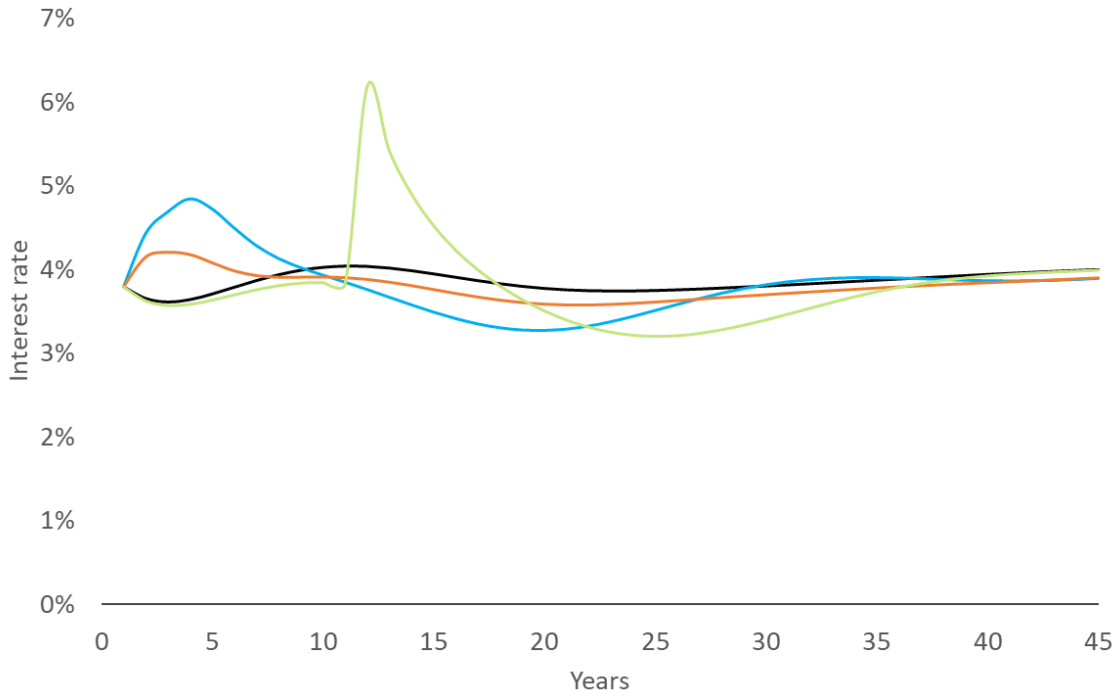
Inflation and interest rates

- Scenario analysis converts the emissions and carbon price impacts in to impact on financial market variables
- Higher energy prices mean nominal rates rise, introducing a wedge between real and nominal impacts

Projection of US Inflation



Projection of USD 10Y Treasury rate



Baseline **Orderly** – Net Zero **Disorderly** – Delayed Transition **Hot House** – NDCs

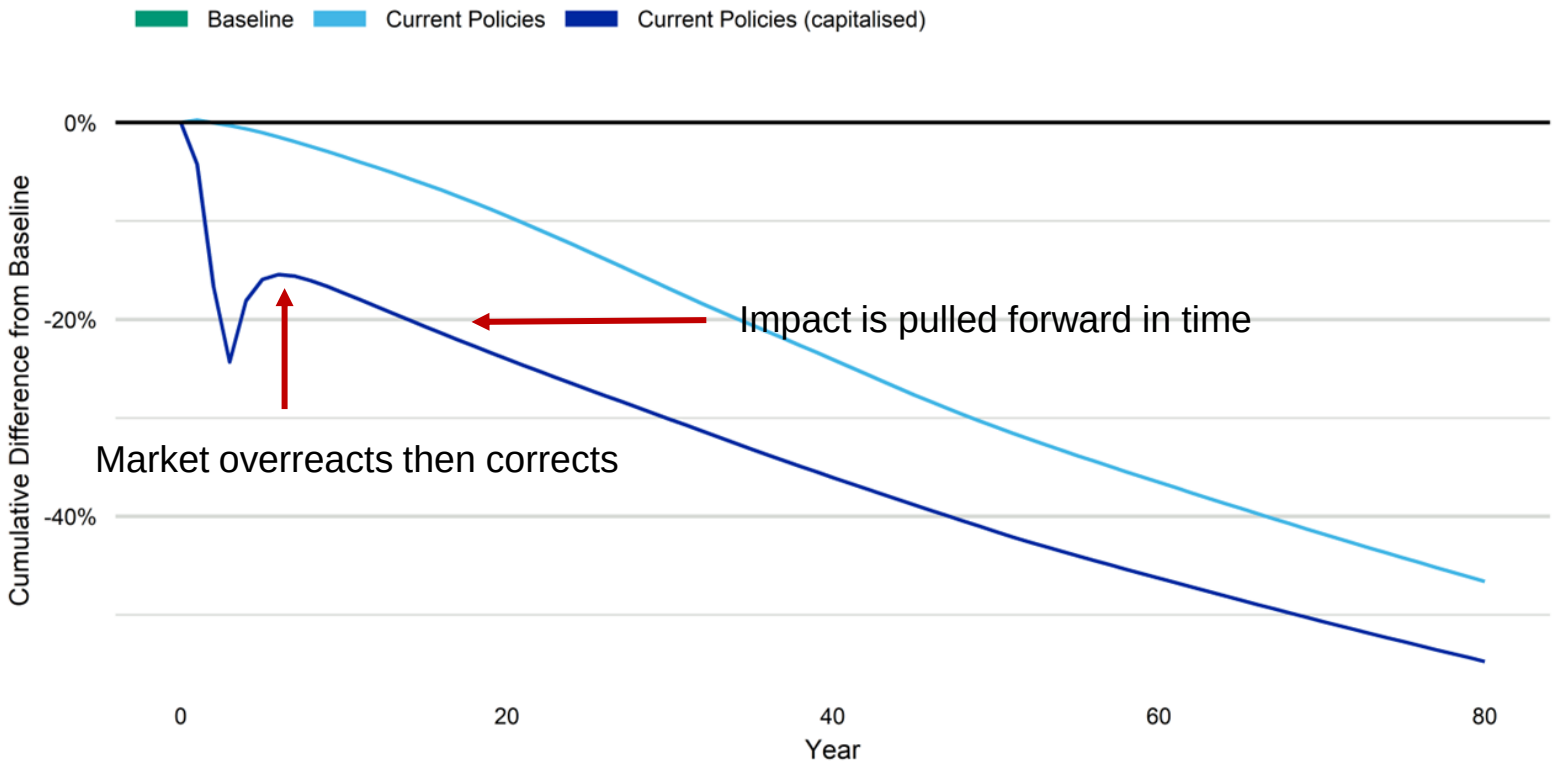
Short Term Impacts

Capitalising changes in expectations

Long term drag on returns can be brought forward by capitalization.

Climate scenarios are often considered as slow-onset, long-term effects, which exert a drag on growth and returns over decades, but these can be converted into short-term scenarios.

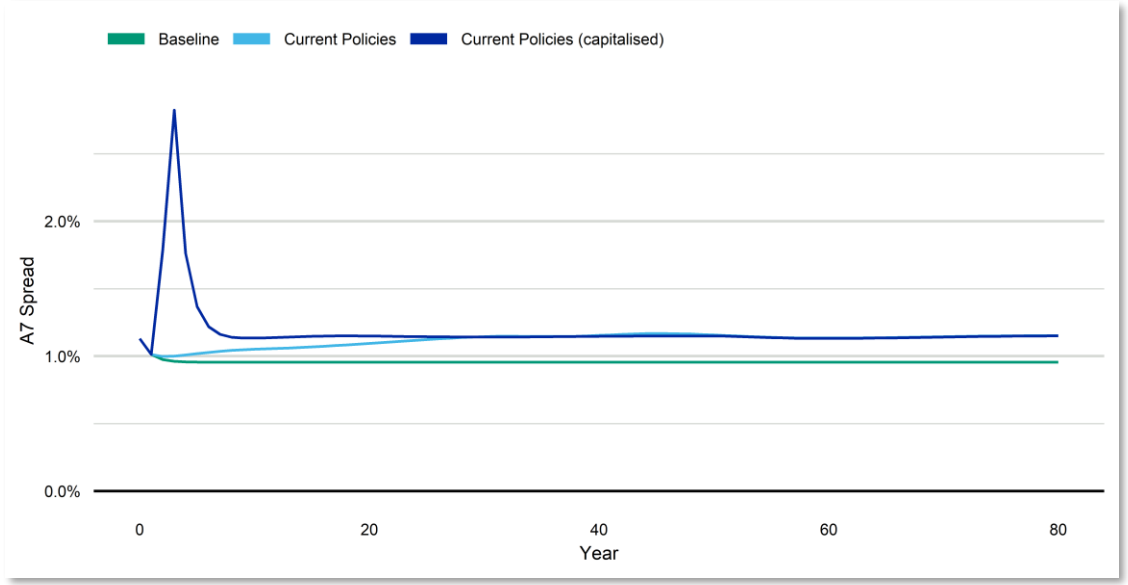
- Simulate a “Minsky moment” via a change in expectations and pricing in future losses.
- This is particularly relevant for physical risk and hot house scenarios where direct effects take time to impact on the economy.

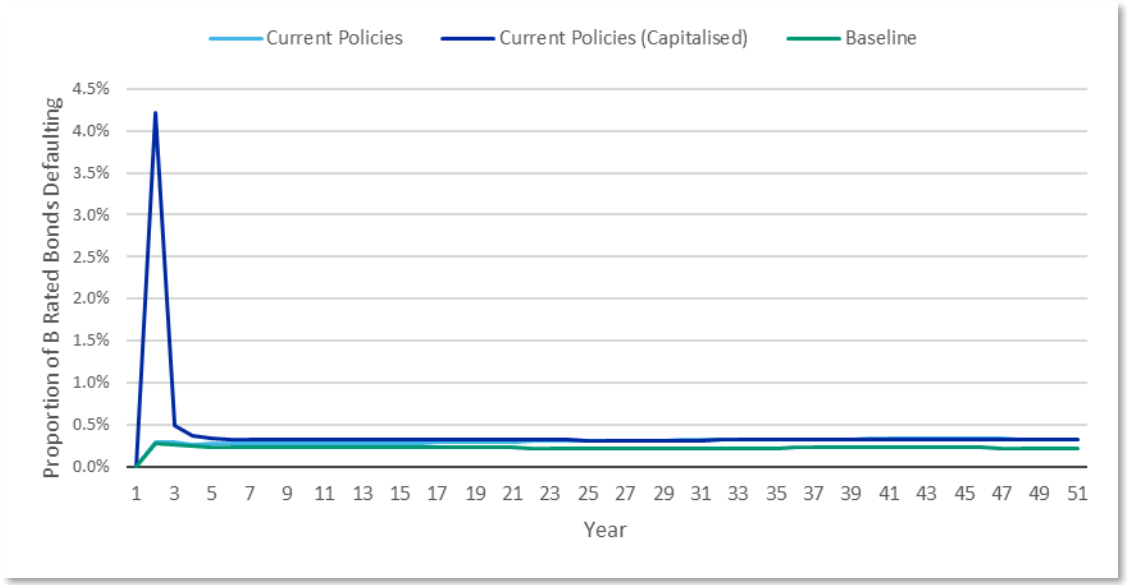


Credit Impacts of Capitalisation

Capitalising changes in expectations

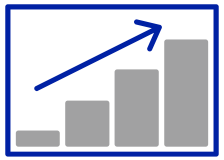
- Short term equity shocks are accompanied by a rise in risk aversion and spikes in credit spreads
- Realized defaults also increase significantly due to equity correlation
- Note a full stochastic run would have even higher defaults





Balance Sheet Impact

Climate risk modelling needs to quantify risk across both sides of balance sheet



Assets	Liabilities
Climate Pathway Scenarios Quantify losses of financial investments given climate change scenarios	**Climate Change Physical Risk Modelling** Assess risks on country territory leveraging NAT CAT risk models covering acute physical risks such as flooding, storms, earthquakes

Model requirements

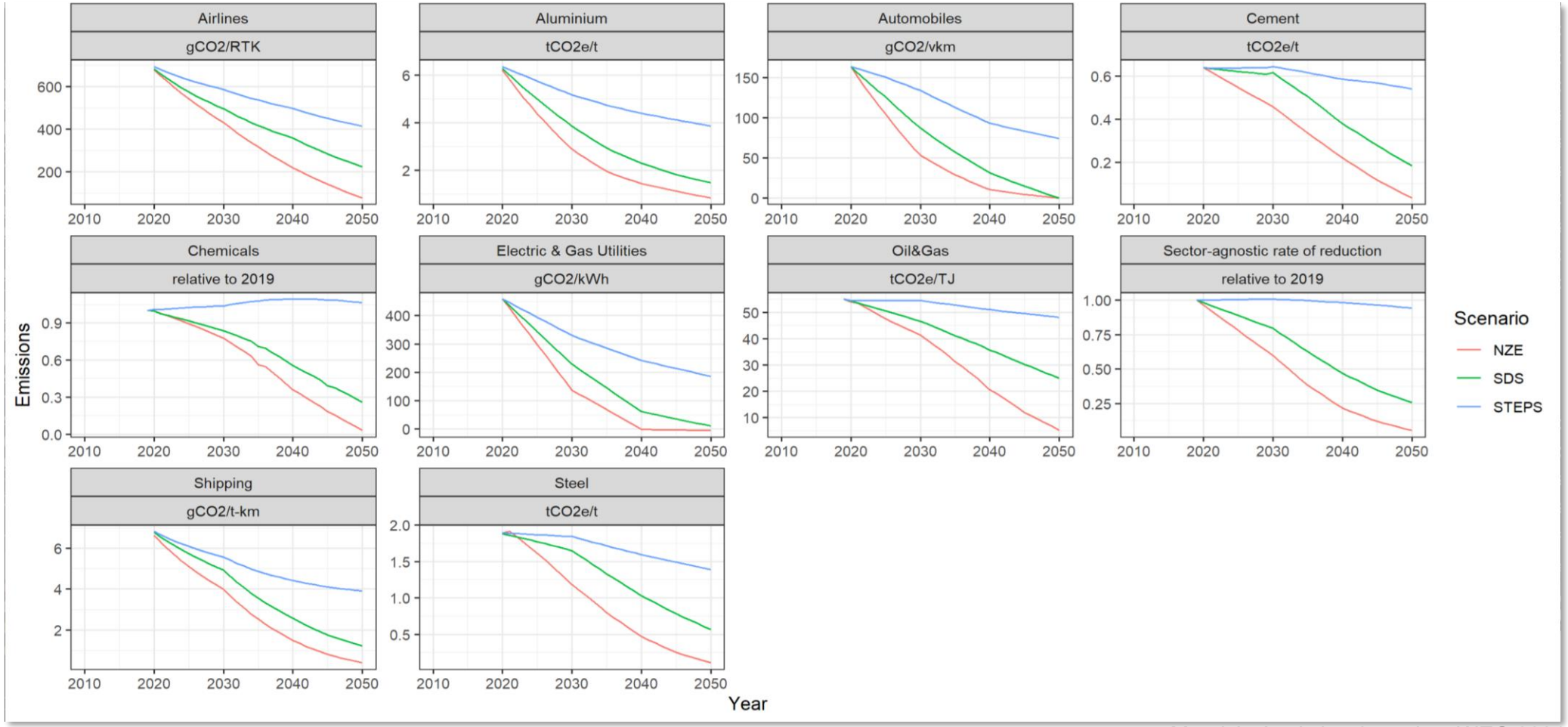
- Models must have comprehensive coverage of the balance sheet for both physical & transition risk
- Capability to translate physical risk into loss distributions for the liabilities
- Capability to translate climate temperature paths into financial variables, covering wide range of asset classes
- Consistent assumptions across balance sheet => align climate scenarios with any existing physical risk models and assumptions

Challenges

- Meeting reporting timelines for ORSA and TCFD
- Expertise to make informed choice of the climate change scenarios
- Climate scenarios involve long term projections whereas insurers projection horizon is typically much shorter at 3-5 years

Emissions Pathways

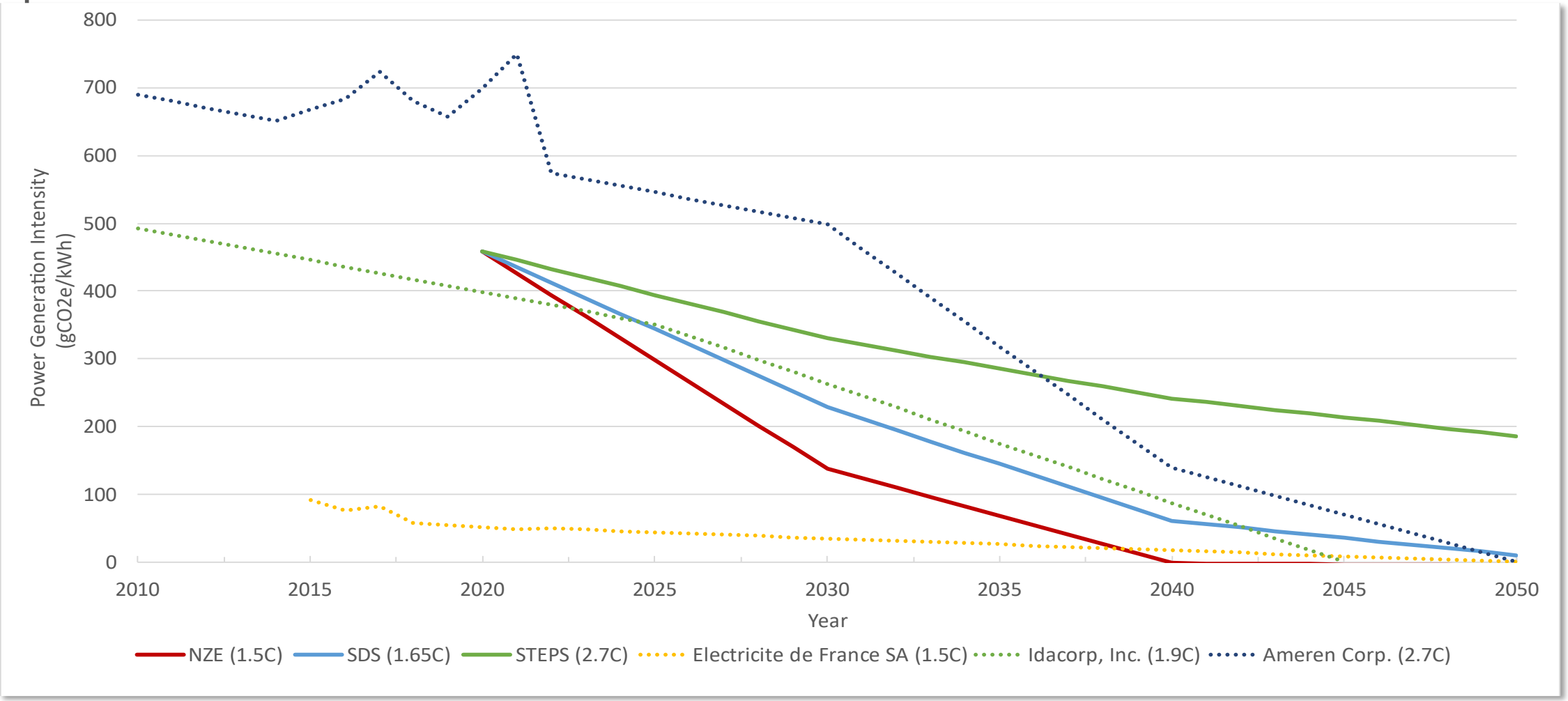
Sector emissions benchmarks can be derived from scenario outputs feeding into portfolio and entity analysis



Moody's Analytics, based on WEO 2021

Scenario Alignment: look at a sector

Companies' respective trajectories can be compared with sector or company-specific scenario benchmarks



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Summary & Q&A

Summary

1

Introduction

- On the back of industry initiatives and regulations accelerating, an increasing number of insurers are exploring forward-looking transition analysis
- Whilst use cases and respective requirements may differ between insurer's business functions, transition scenario analysis can inform and support decision making and planning across

2

Theory: Fundamentals and analytical principles of transition scenarios

- Wide range of possible scenarios based on the assumptions we select for these drivers of uncertainty
- More insights gained looking across a range of scenarios than digging too deeply into individual scenarios
- Climate change has the potential to significantly impact financial markets over both the short and long term

3

Practice: Creating a forward-looking view

- Translating climate change impacts into financial impacts is non-trivial and requires careful methodological decisions
- Scenario analysis is a key technique for both transition and physical risk modelling and can be applied to both sides of the balance sheet
- Sector emissions benchmarks can be derived from scenario outputs feeding into portfolio and entity analysis

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Questions and Answers

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Thank You

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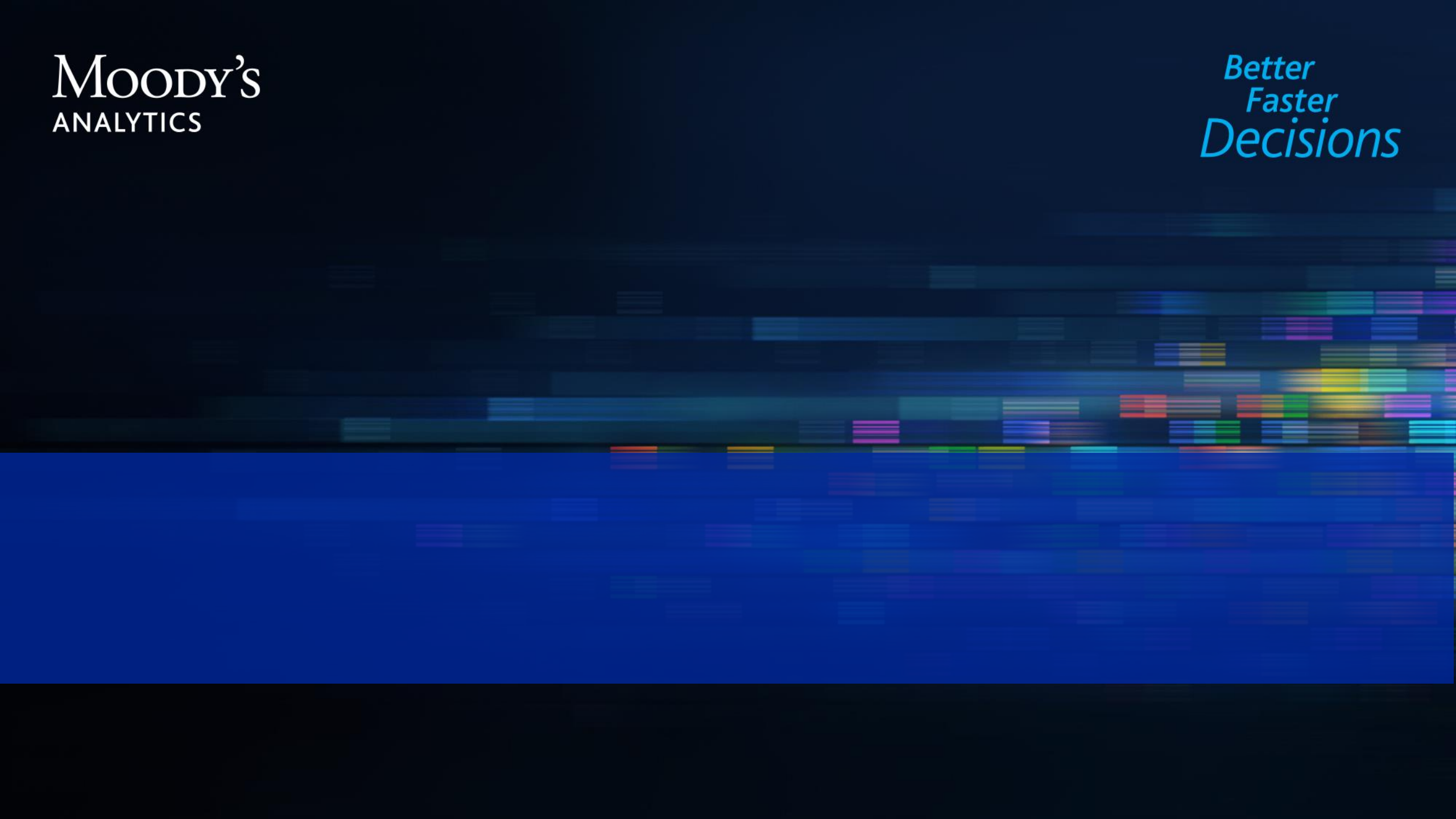
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