

# Business Game

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Green Innovation Team

# AGENDA

WHAT WE INCLUDED IN OUR  
WORK

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PACTA report on initial portfolio

Risk evaluation

Green Bonds

Portfolio rebalancing

PACTA report on rebalanced portfolio

IORP stress test (rebalanced portfolio)

Time series analysis

# PACTA REPORT ON INITIAL PORTFOLIO

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Exposure to  
climate relevant  
sectors



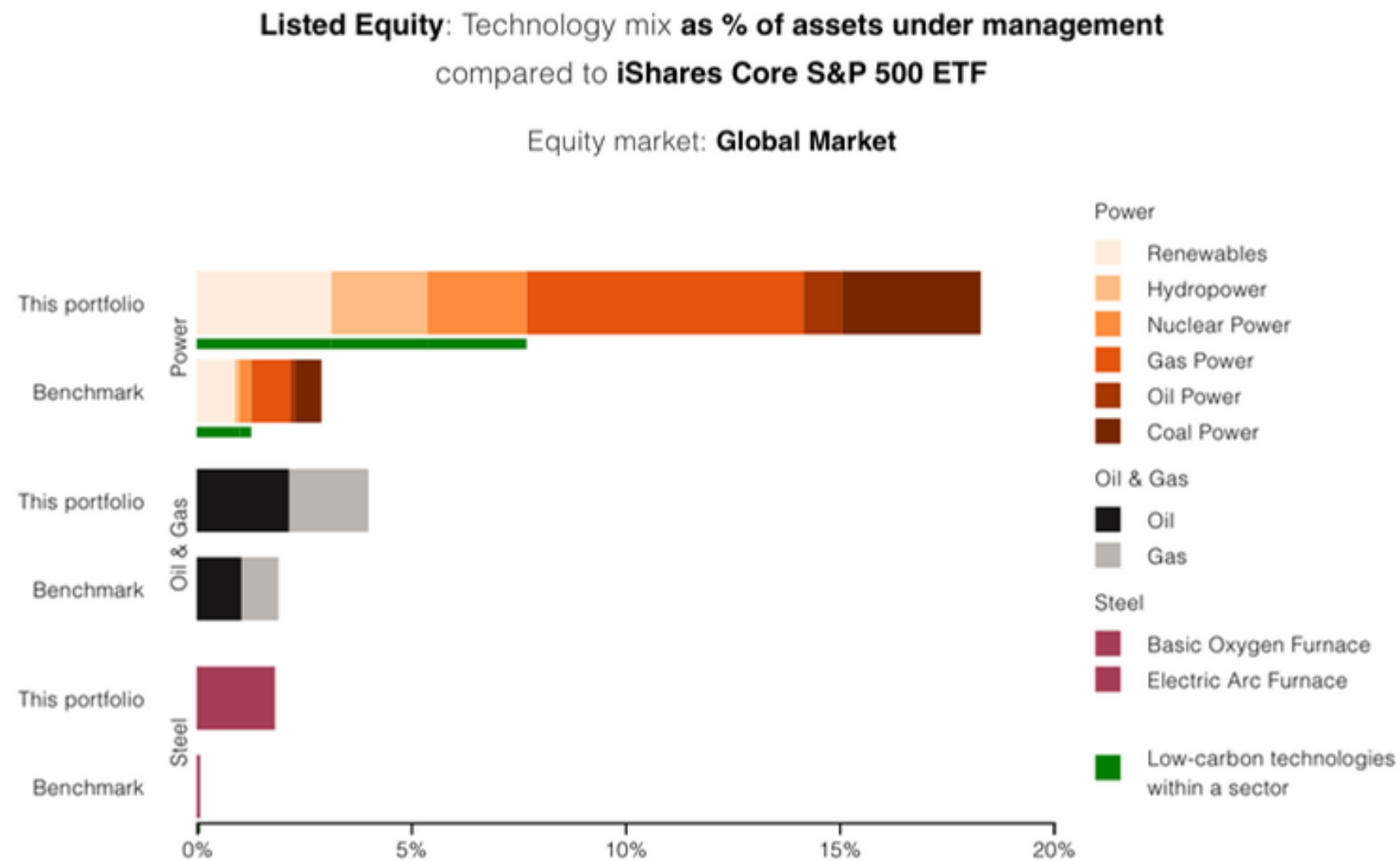
Alignment with  
climate  
scenarios



Company-level  
results

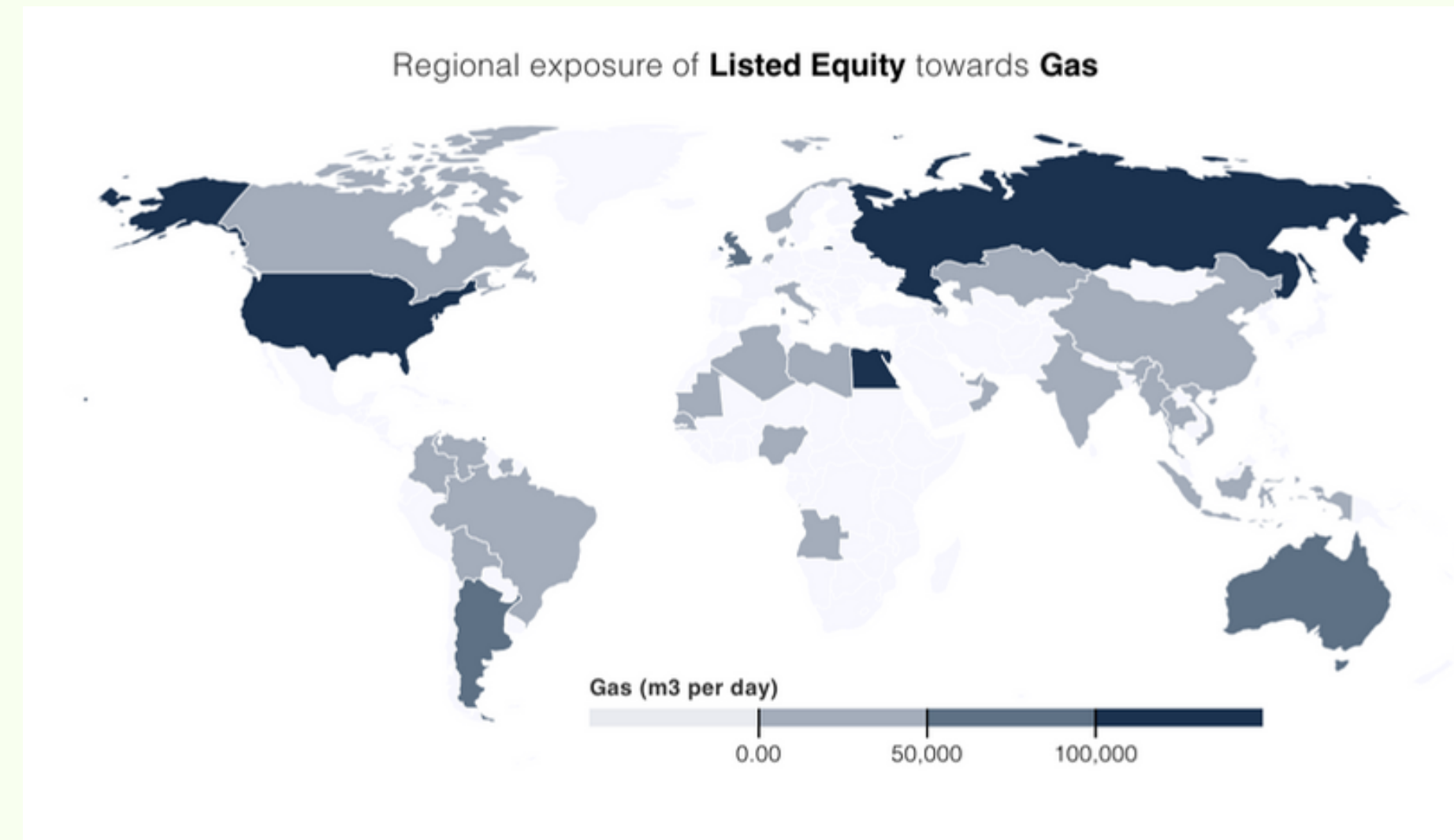
# EXPOSURE TO CLIMATE RELEVANT SECTORS

## Sectorial current exposure



Current exposure of the portfolio compared with the benchmark provided by the PACTA tool, divided in the key climate relevant sectors. The portfolio is out-performing compared with the benchmark.

## Geographic exposure



Need to reduce exposure in sectors such as the gas and oil sector, since it is the most exposed sector, in order to be aligned with the Paris Agreement.

The reduction of gas exposure is important also when considering the geopolitical issues concerning Russia, the biggest provider of the portfolio.

# ALIGNMENT WITH CLIMATE SCENARIOS

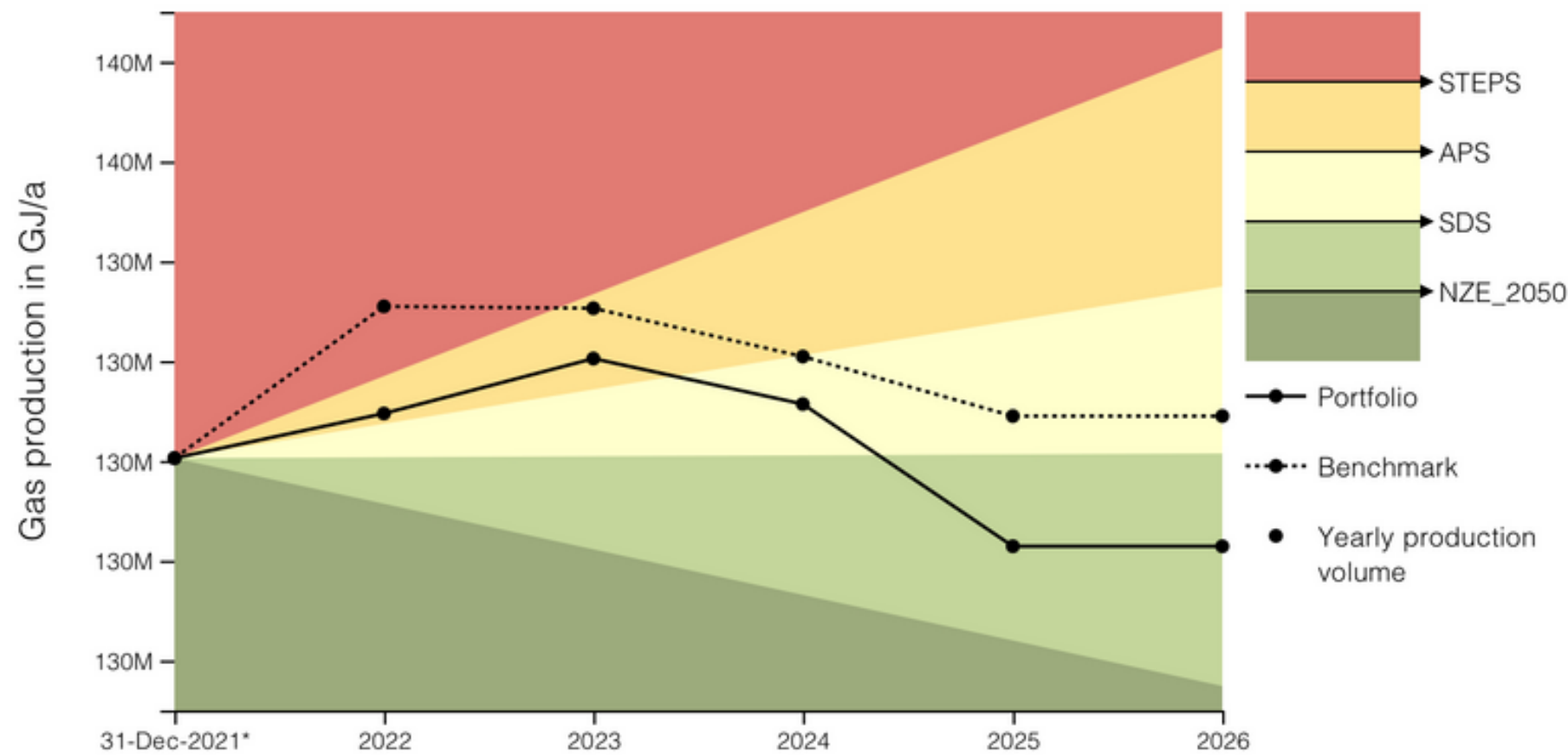
## Alignment of production trajectories

## Future technology breakdown

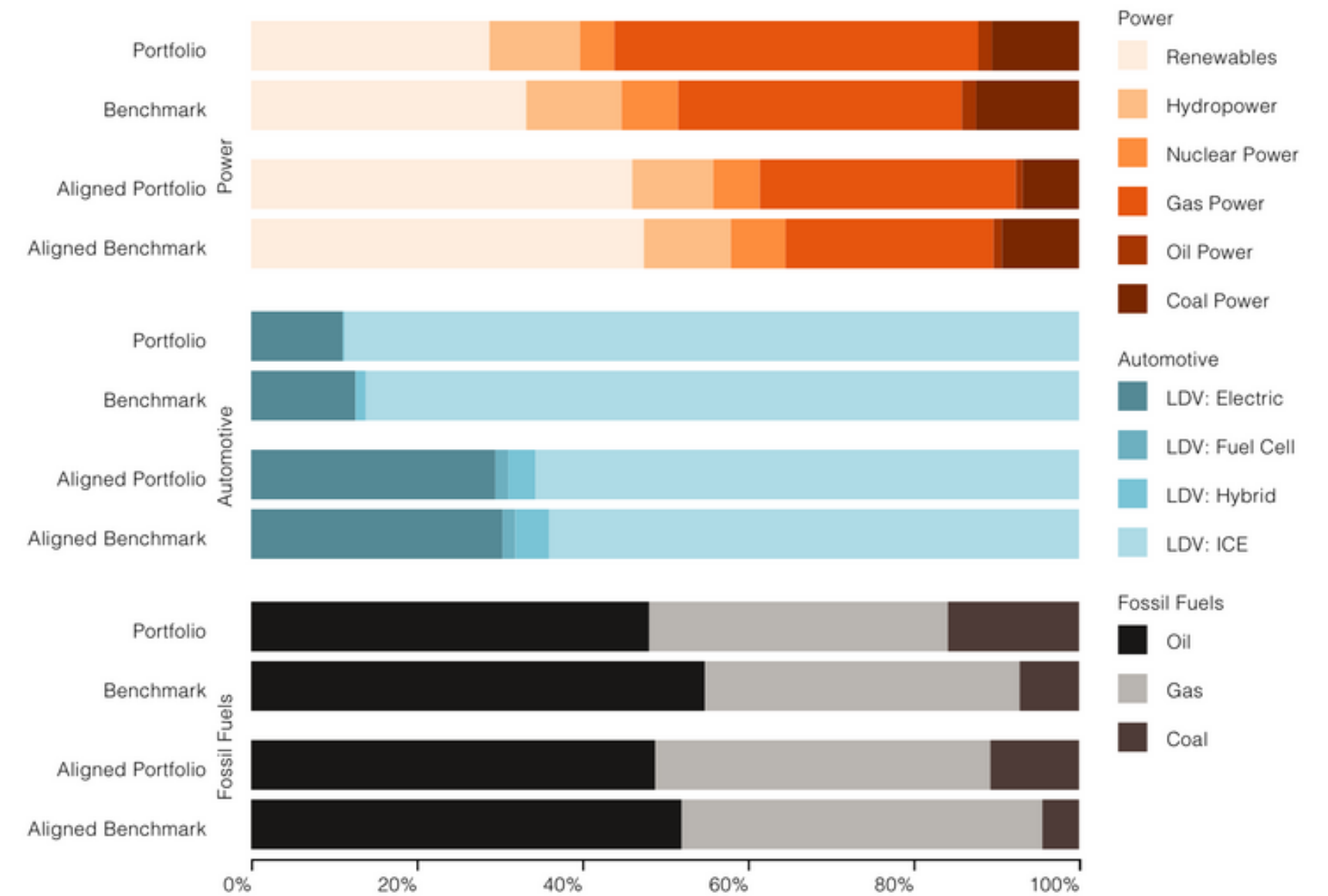
**Listed Equity:** Production trajectory of Gas compared to **iShares Core S&P 500 ETF**

Allocation method: **Portfolio Weight** Equity market: **Global Market**

Scenario geography: **Global** Scenario source: **WEO2021**



**Corporate Bonds:** Future technology mix as % of sector based on **NZE: 2050** scenario compared to **iShares Global Corp Bond UCITS ETF** as a subset of **Global Market**

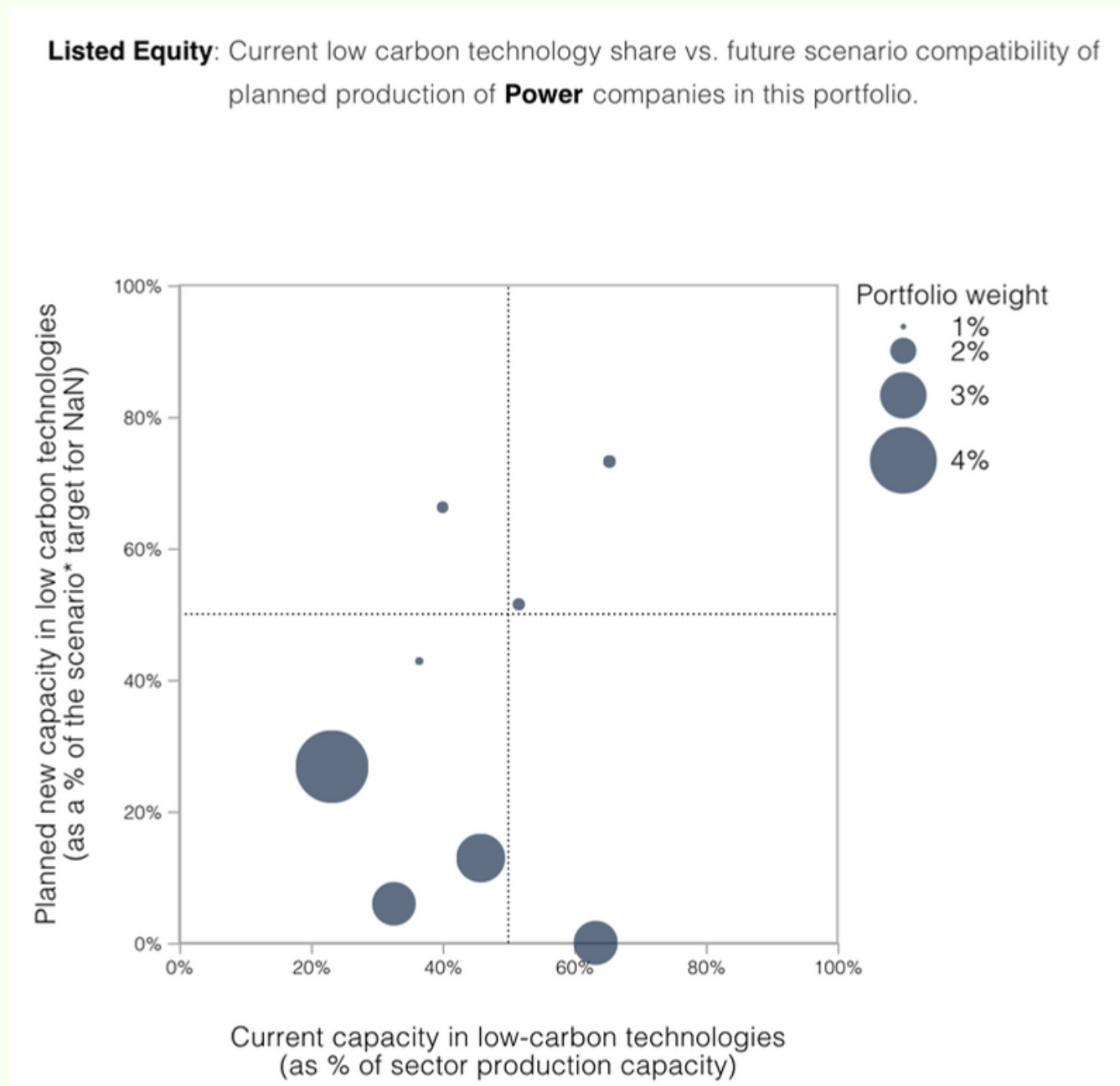


The production trajectory of Gas of our portfolio shows an outperformance against the benchmark, but it is not enough to reach the Net zero emissions by 2050 scenario.

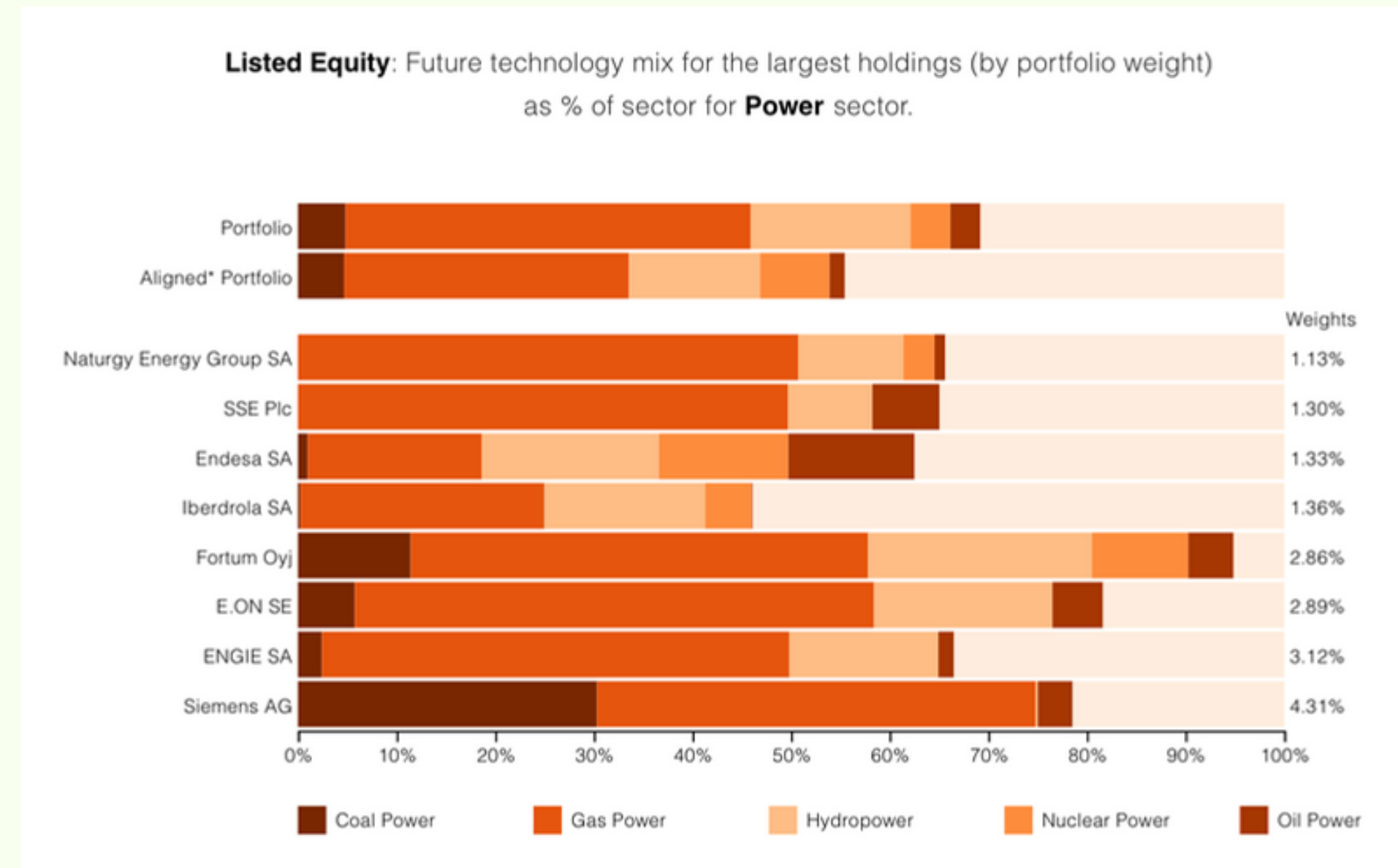
The transition from high-carbon technologies to renewable technologies is the most viable option to achieve Net Zero emissions by 2050.

# COMPANY-LEVEL RESULTS

## Low- and high-carbon split



## Technology exposure



In the left, companies such as Siemens AG, ENGIE SA, and Fortum Oyj, own more high-carbon technologies, while in the right, companies such as E.ON SE, own more low-carbon technologies.

List of the most relevant companies in power and automotive sectors according to their weight in the portfolio.

## ADDITIONAL CONSIDERATION ON THE PACTA TOOL

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**1**

No consideration of trajectories of real estate assets

**2**

Implementation of the new European Commission directive "Energy performance of buildings" (2018/844/EU)

**3**

Italian's perspective



# GREEN BONDS

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Overview



## What is a green bond

Green bonds are debt instruments where the proceeds will be exclusively applied to finance or re-finance, and eligible green projects

## Why inclusion of green bonds improves climate performance of the portfolio

They can finance assets such as green buildings that could bear a lower credit risk over time, and they can help mitigate climate change-related risks in portfolios resulting from policy changes such as carbon taxation

## Three principles

- Green Bond Principles
- Climate Bond Initiative criteria
- EU (voluntary) Green Bond Standard

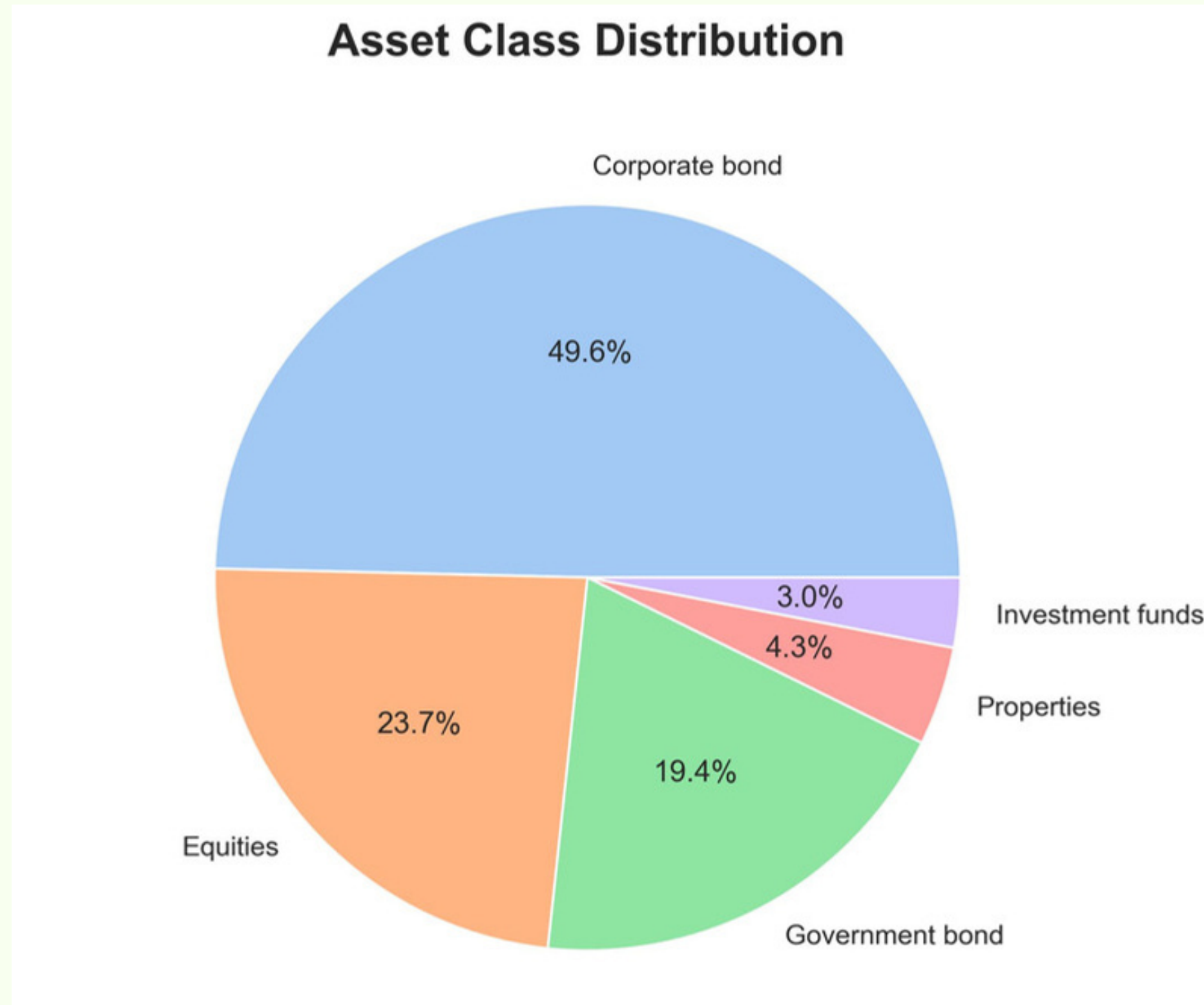
# PORTFOLIO REBALANCING

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# ASSET CLASS DISTRIBUTION

MAIN COMPOSITION OF THE INITIAL PORTFOLIO



# PORTFOLIO ALIGNMENT

## SELECTION OF THE ASSETS

### Green bonds

We tried to substitute where possible the conventional corporate and government bonds with the green ones, maintaining the same company or sector.

### Equities

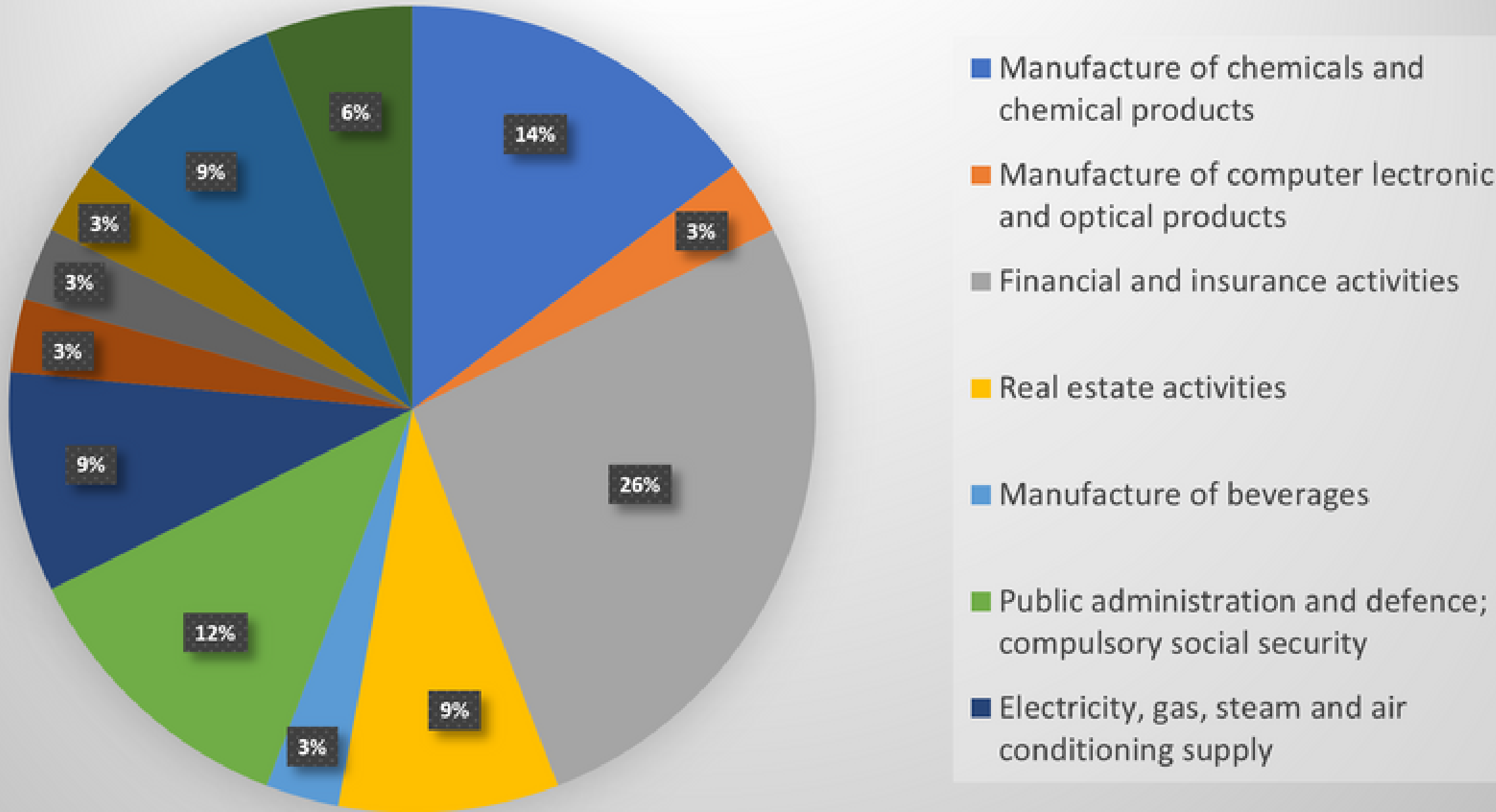
- Emission score: we substituted the two best-in-class ESG company for each industry.
- Also, we excluded from the screening oil, gas, uranium and coal companies.

### Investment funds and properties

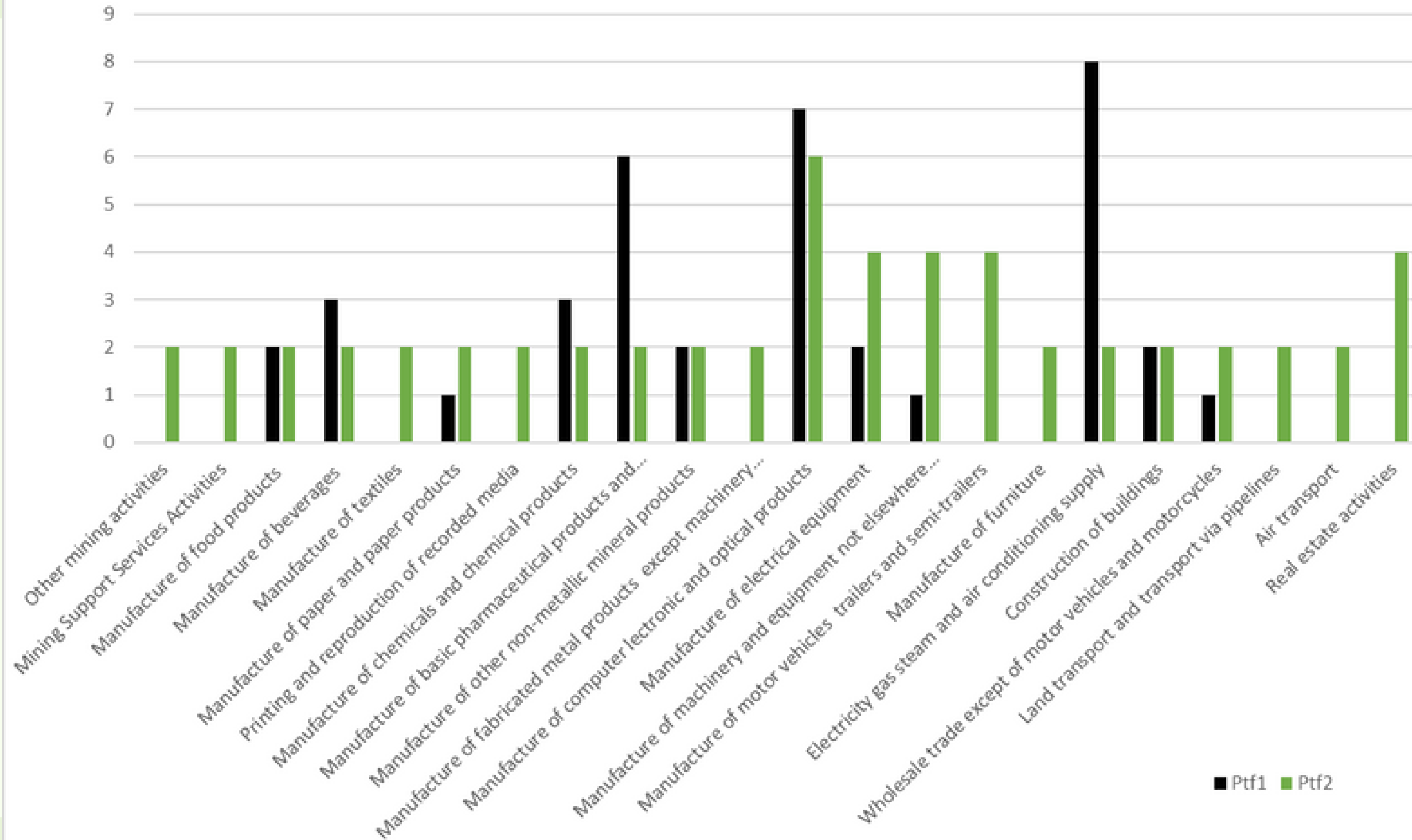
We didn't change the allocation

# COMPOSITION BY SECTOR OF THE NEW GREEN BONDS

Composition by sector for the new green bonds

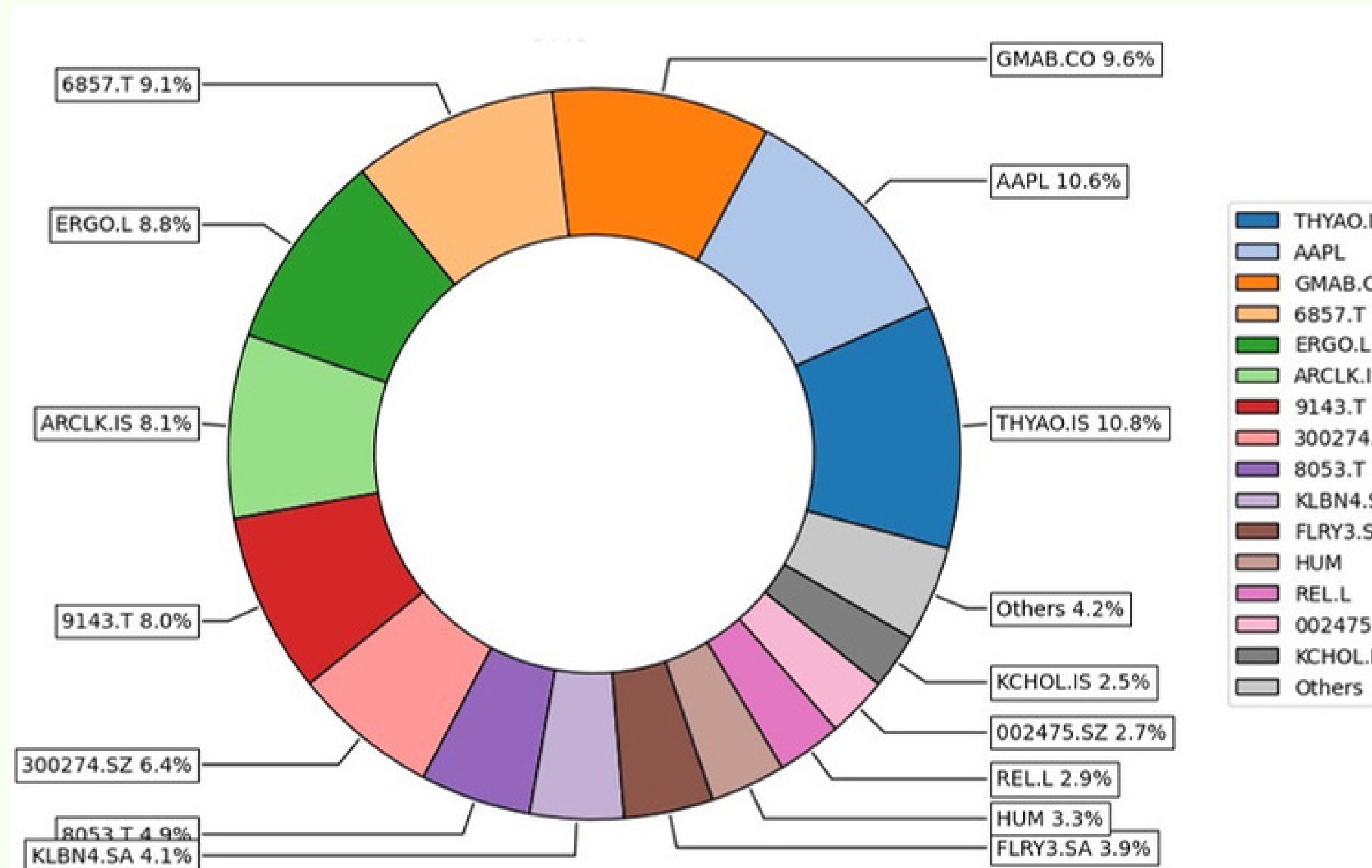


### Sector repartition\*



\*Stats based on 50% of Pt1 and 60% of Pt2 as the rest is categorised "Activities not captured by the list of NACE sectors above. Specifically this refers to NACE sectors I,J,K,M,N,O,P,Q,R, and S"

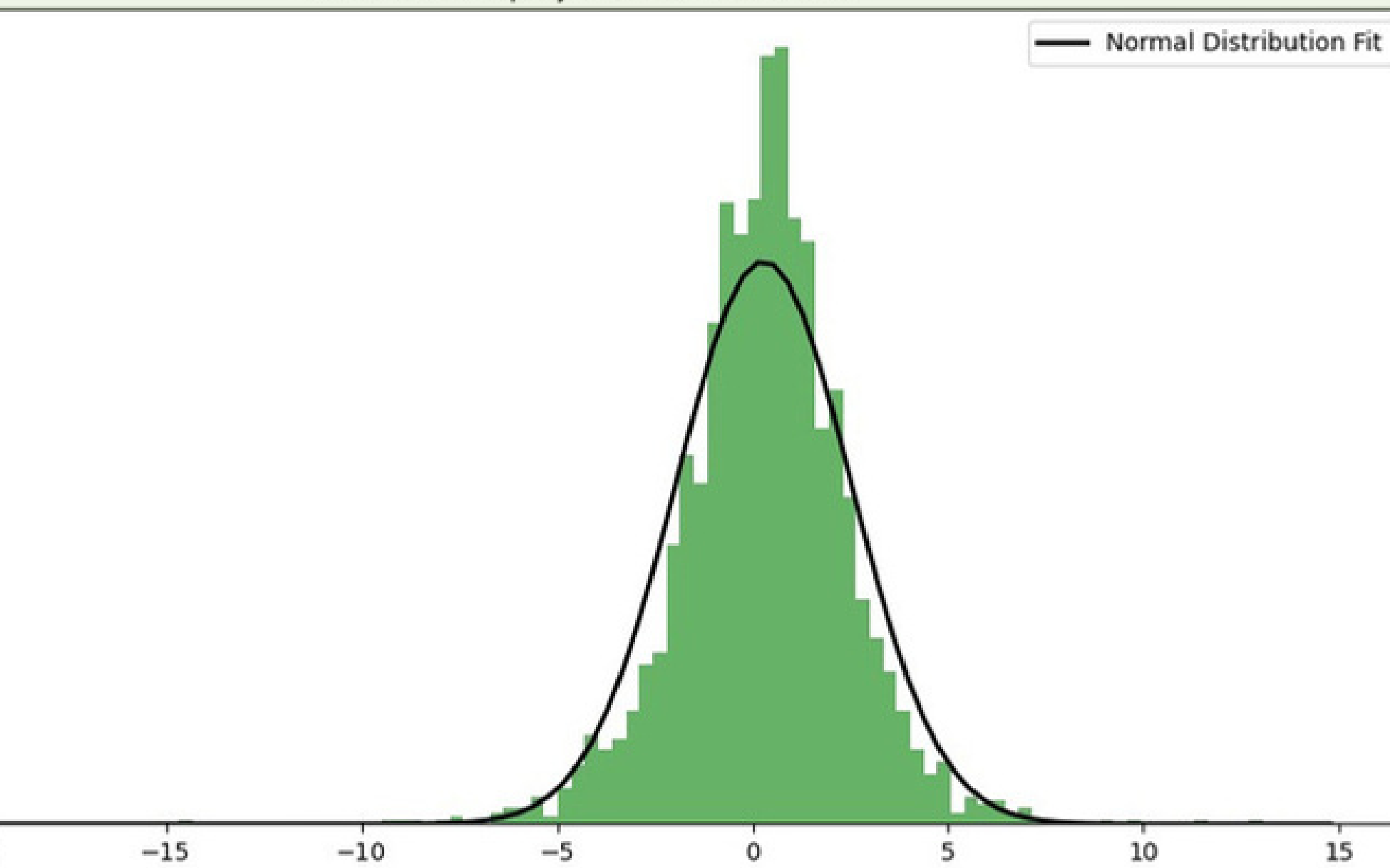
# MEAN-VARIANCE OPTIMIZATION



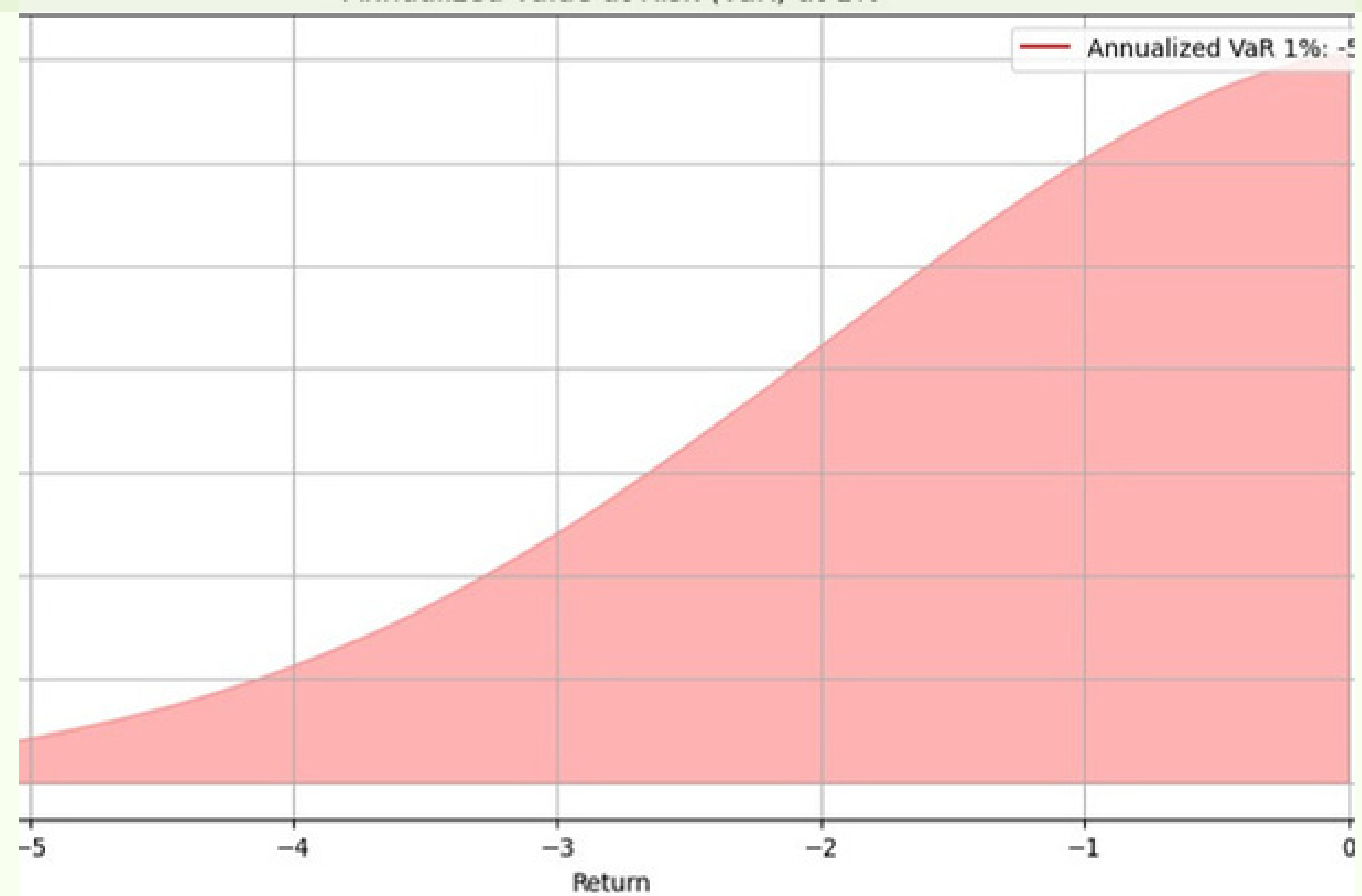


# GAUSSIAN DISTRIBUTION

Annualized Equity returns - Normal fit



Annualized Value at Risk (VaR) at 1%



# RISK EVALUATION

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# DATA CLEANING

→ Dropping properties

→ Selecting time range

→ Matching shapes



# INITIAL PORTFOLIO



Weights and stock prices



Portfolio value



Cumulative return

# GREEN PORTFOLIO



Weights and stock prices



Portfolio value



Cumulative return

# RISK MEASURE ASSESTMENT

	Initial	Green
Final cumulative return	1.70%	1.96%
Standard deviation	0.010	0.009
Downside risk	0.418%	0.189%



# PACTA REPORT ON REBALANCED PORTFOLIO

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Exposure to  
climate relevant  
sectors



Alignment with  
climate  
scenarios

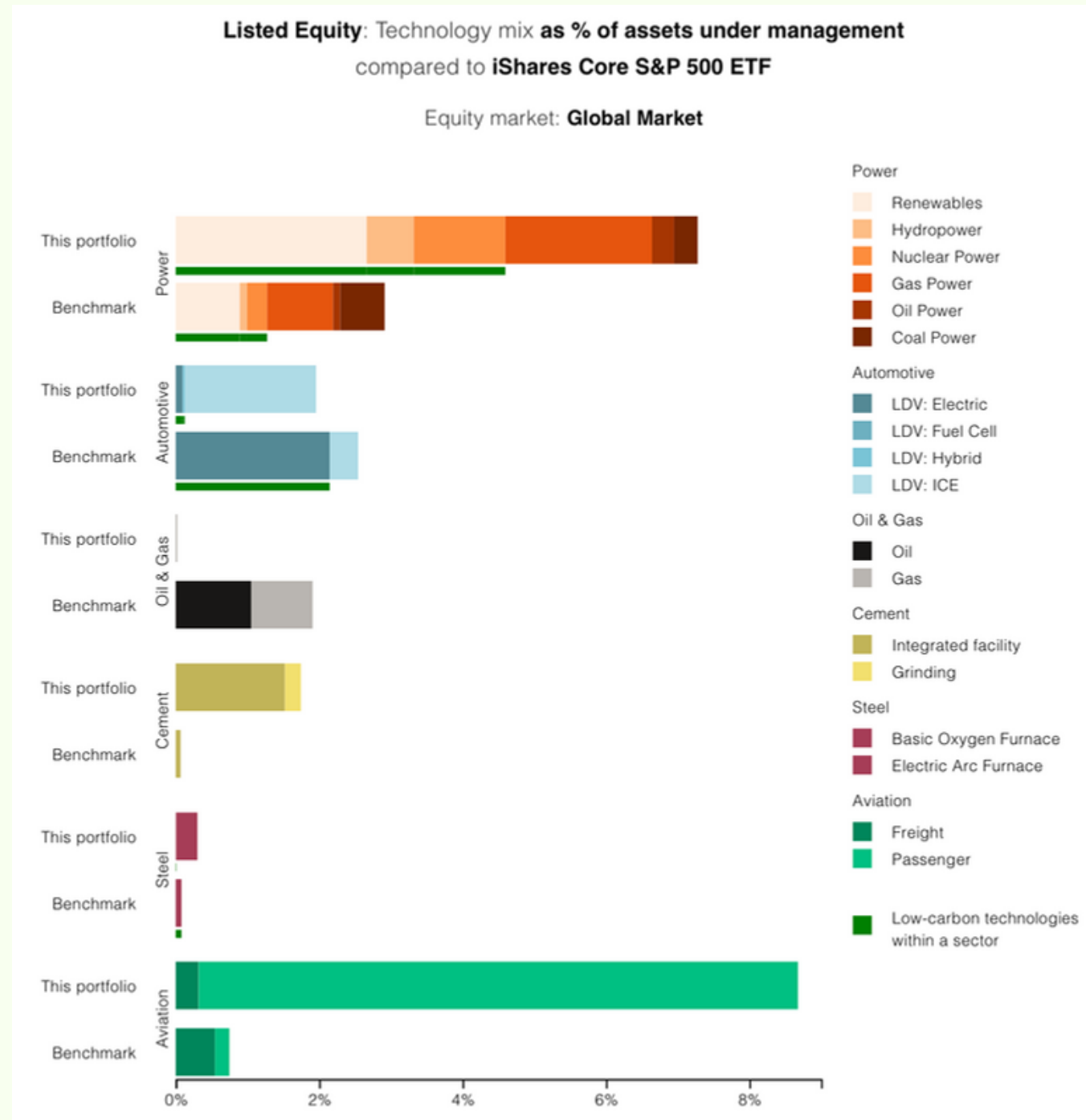


Company-level  
results

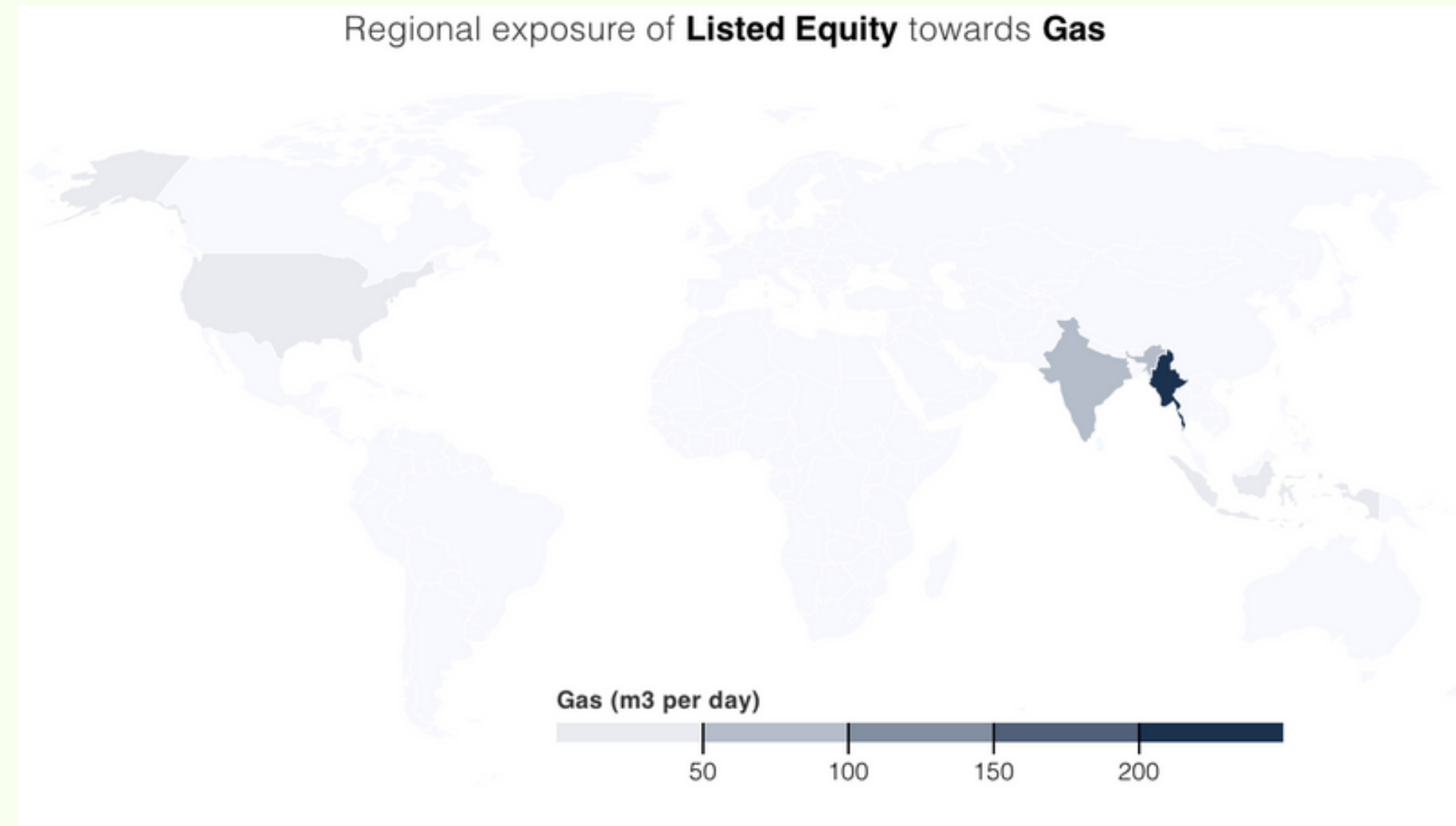


# EXPOSURE TO CLIMATE RELEVANT SECTORS

## Sectorial current exposure



## Geographic exposure



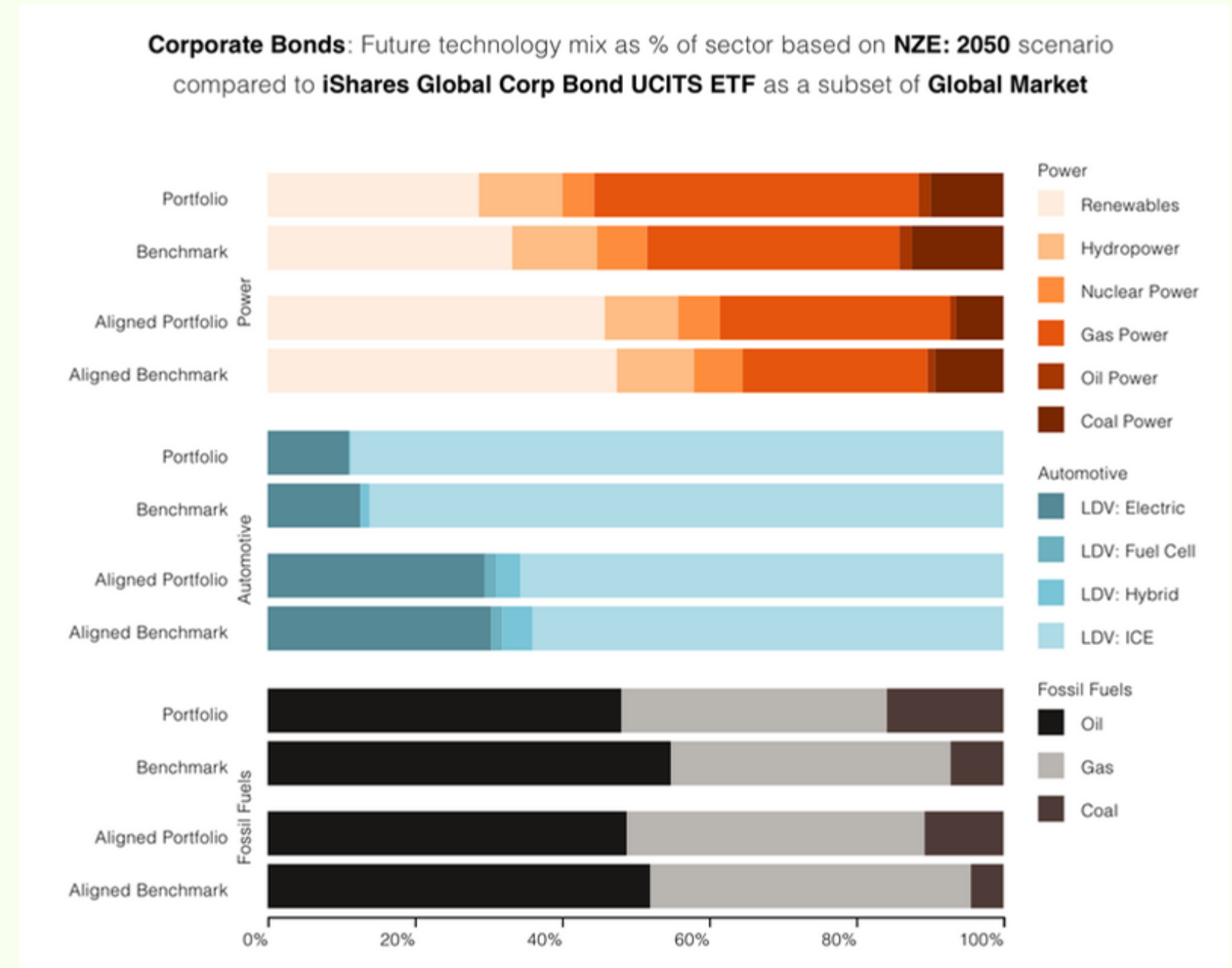
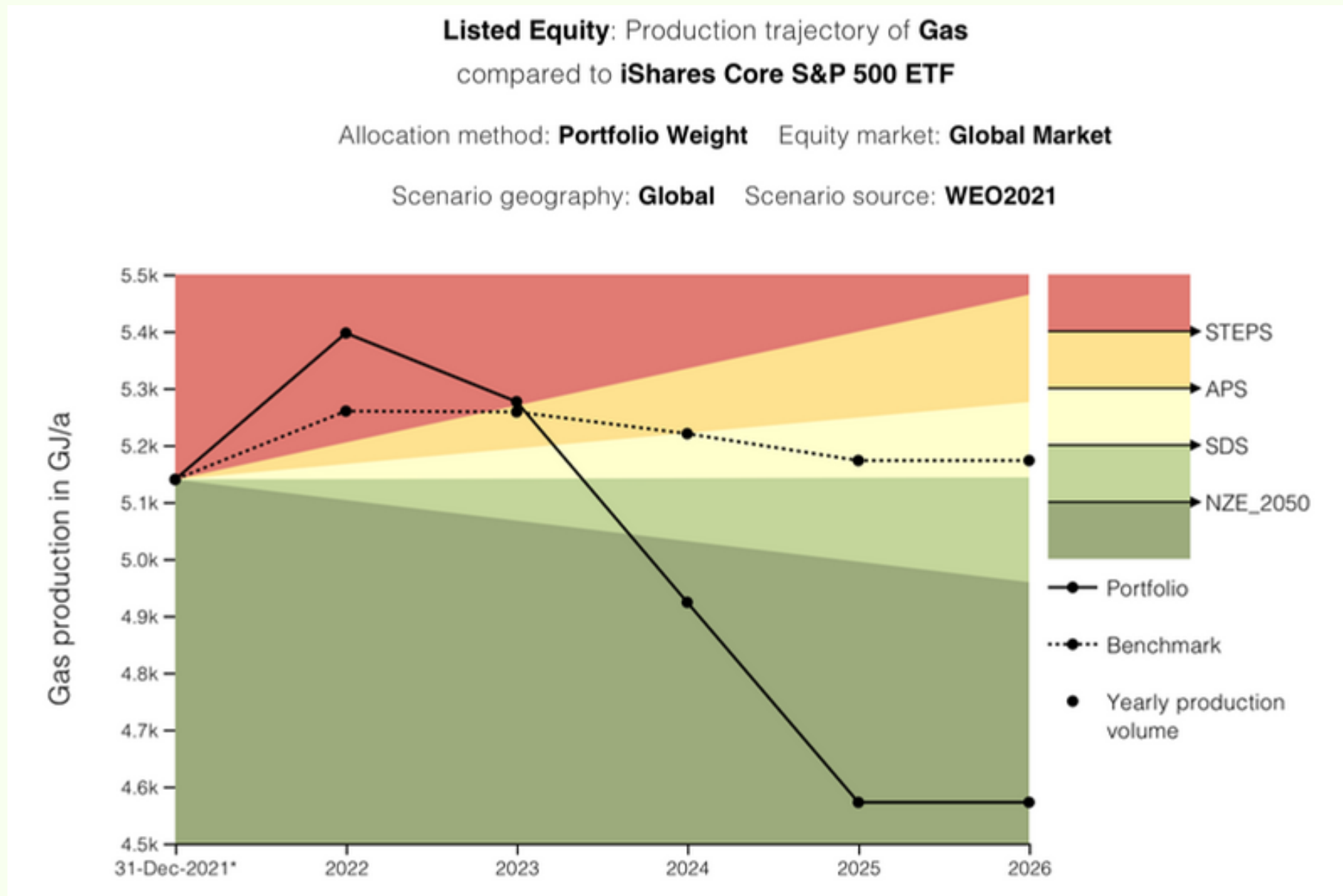
Current exposure of the portfolio compared with the benchmark provided by the PACTA tool, divided in the key climate relevant sectors. The portfolio is out-performing compared with the benchmark.

Thanks to our rebalanced portfolio, we reduced our exposure to the geopolitical risks related to the actual Ukraine-Russia war.

# ALIGNMENT WITH CLIMATE SCENARIOS

Alignment of production trajectories

Future technology breakdown



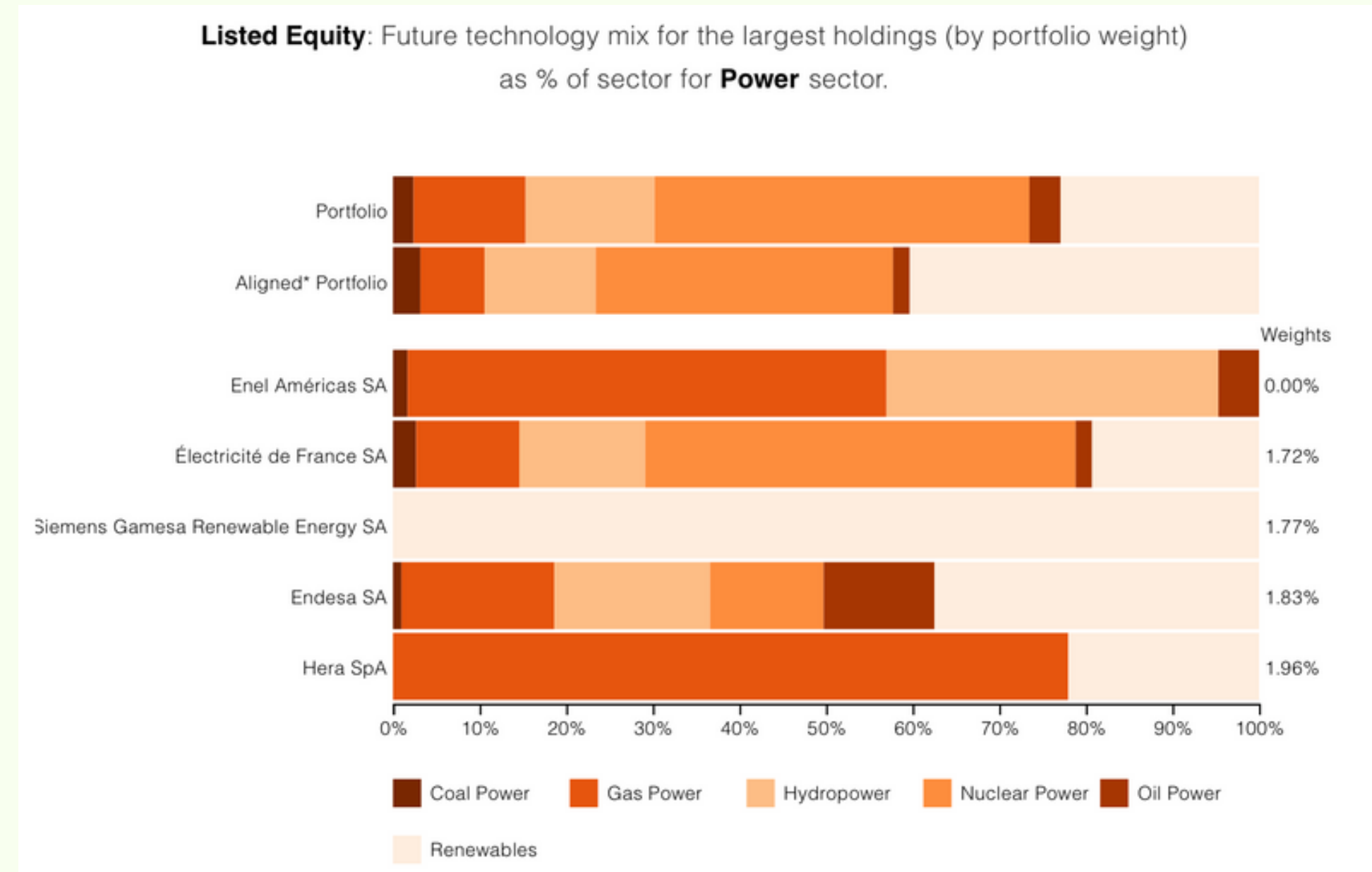
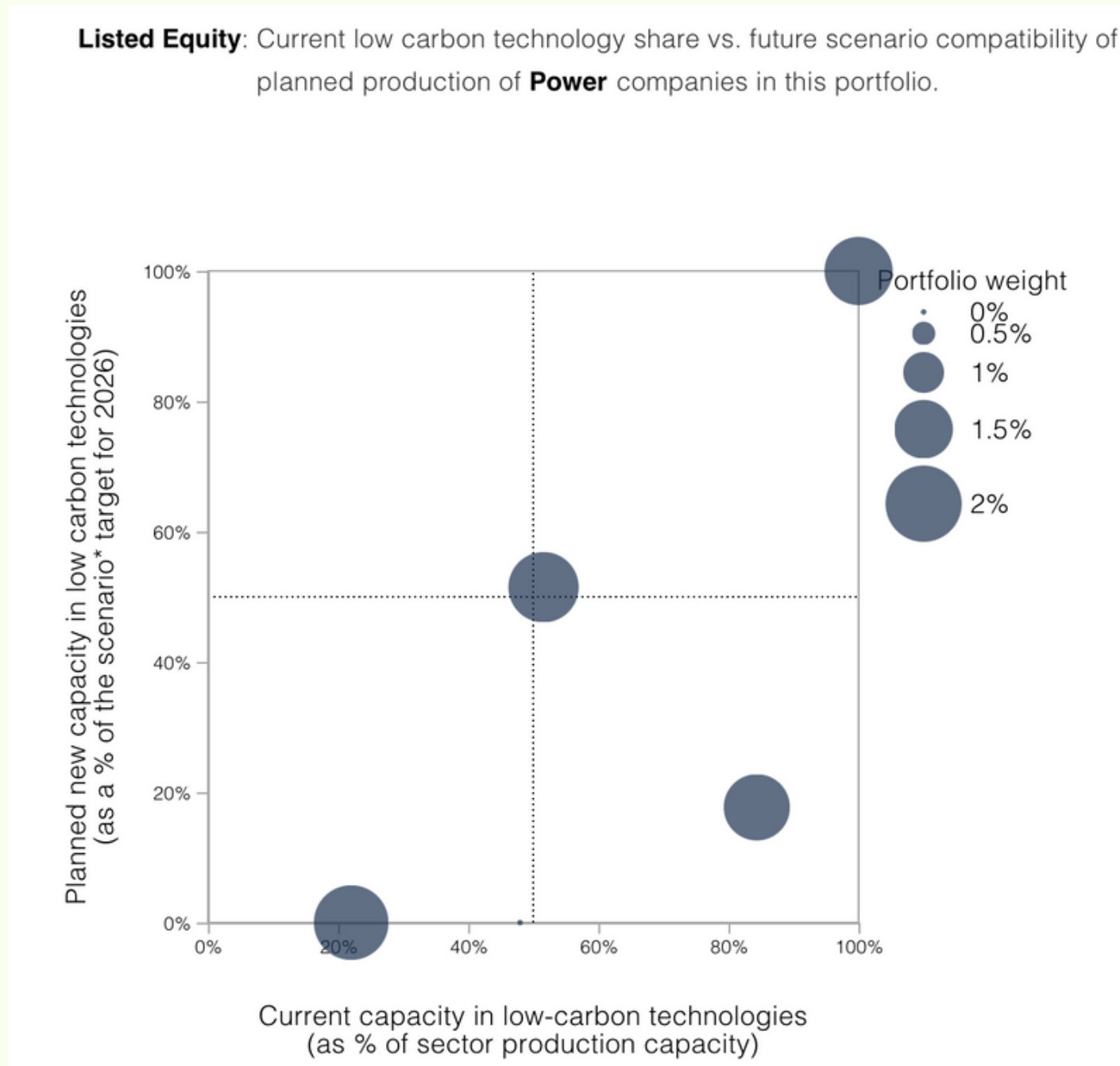
The rebalanced portfolio drastically exceeds the benchmark, reaching the Net Zero emissions by 2050 scenario.

The transition from high-carbon technologies to renewable technologies is still the most viable option to achieve Net Zero emissions by 2050

# COMPANY-LEVEL RESULTS

## Low- and high-carbon split

## Technology exposure



New composition of current capacity in low- and high-carbon technologies.

List of the most relevant companies in power and automotive sectors according to their weight in the portfolio.

# BIGGEST IMPROVEMENTS

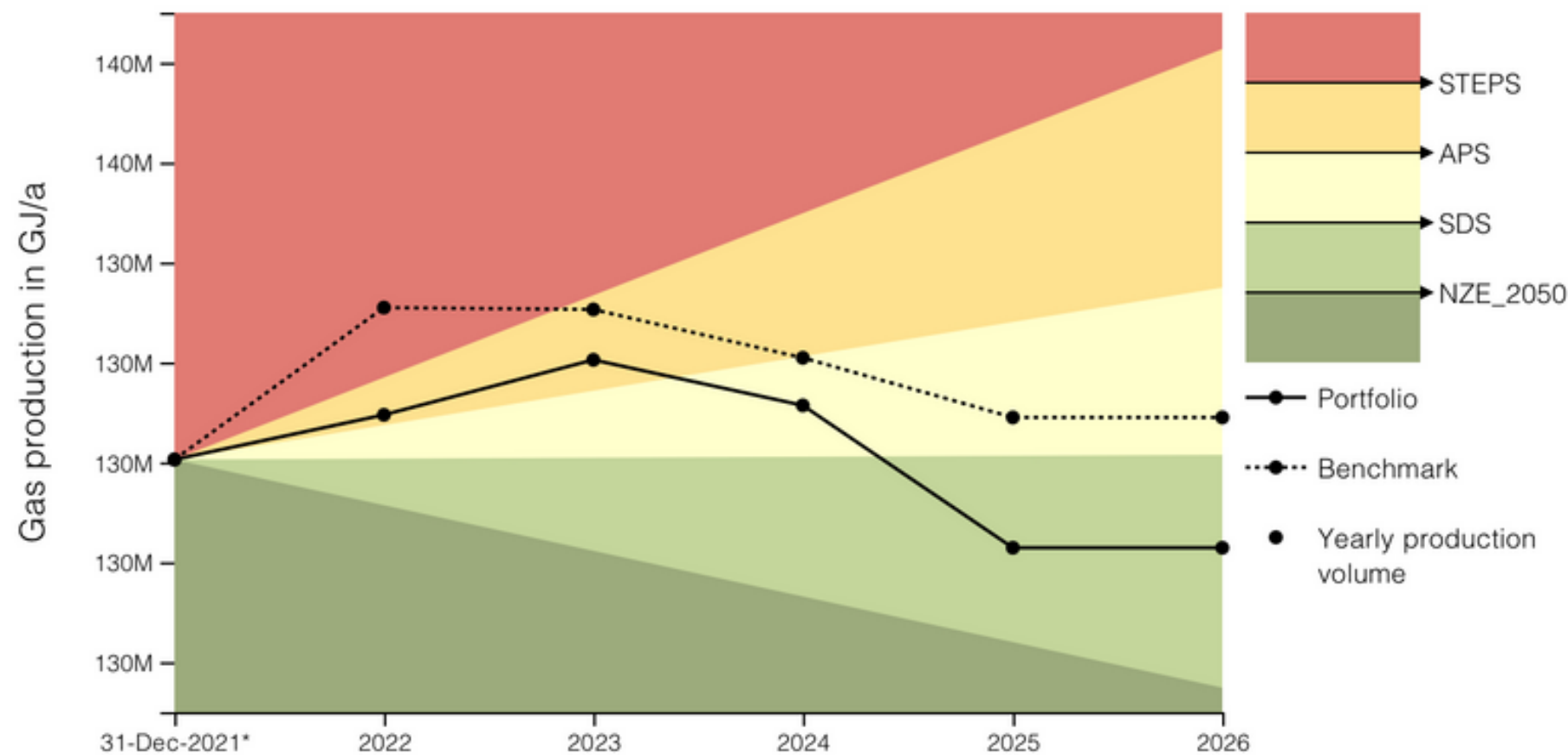
Initial portfolio

Rebalanced portfolio

**Listed Equity: Production trajectory of Gas**  
compared to **iShares Core S&P 500 ETF**

Allocation method: **Portfolio Weight** Equity market: **Global Market**

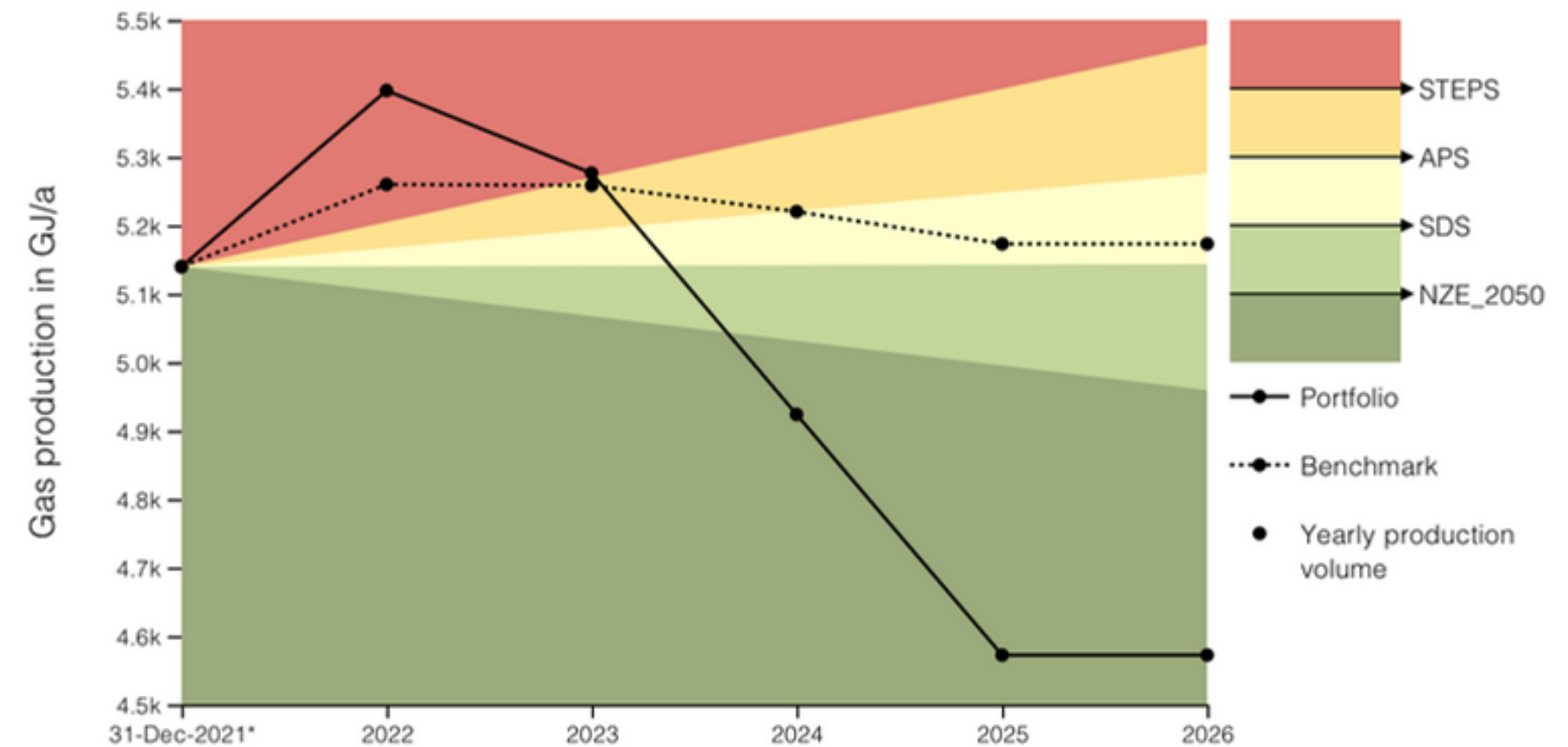
Scenario geography: **Global** Scenario source: **WEO2021**



**Listed Equity: Production trajectory of Gas**  
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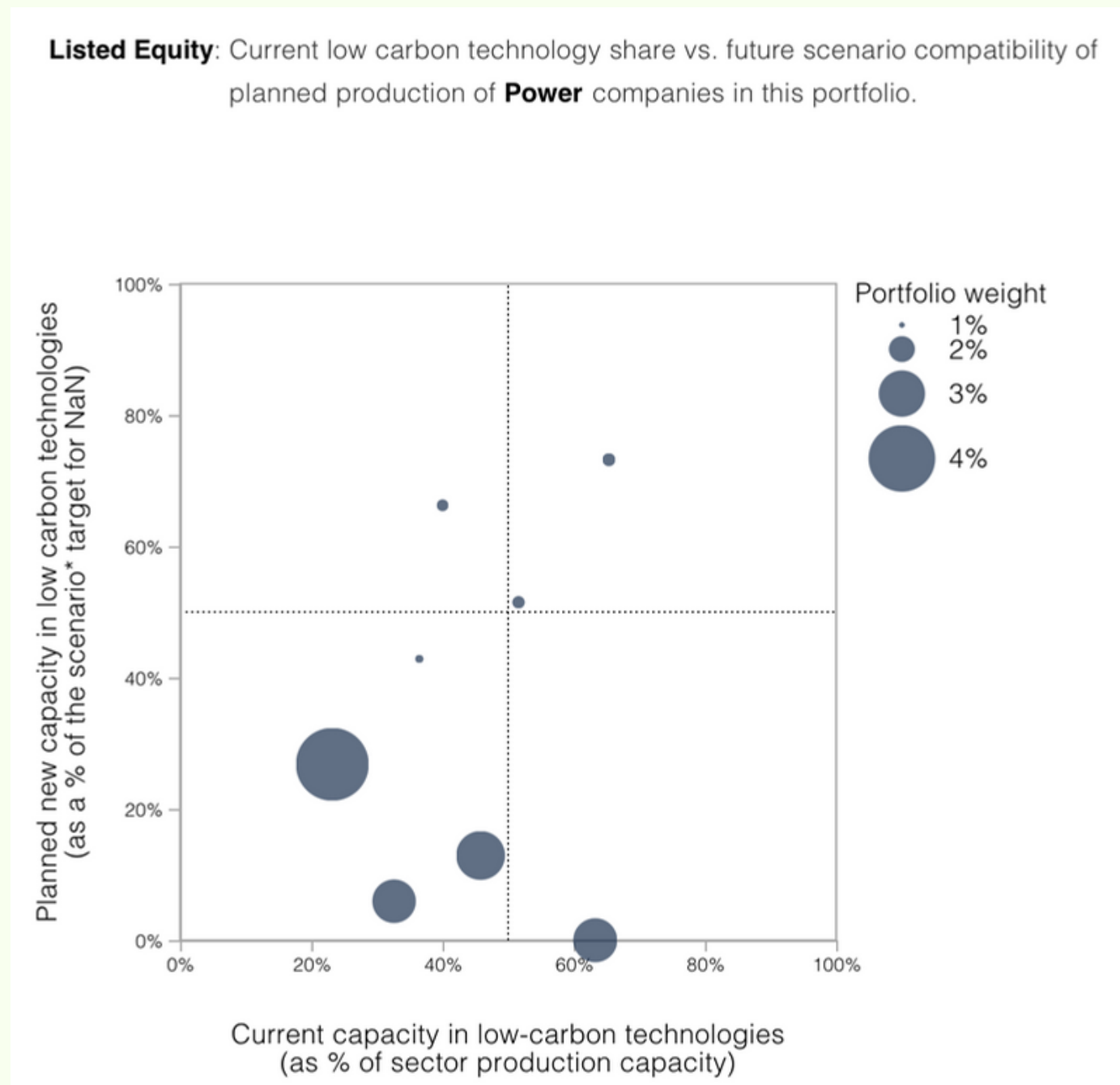


The biggest improvements resulting from the rebalanced portfolio are reduction of exposure to high-carbon energy such as gas, reaching the Net Zero emission by 2050 scenario, and the composition of low- and high-carbon technologies.

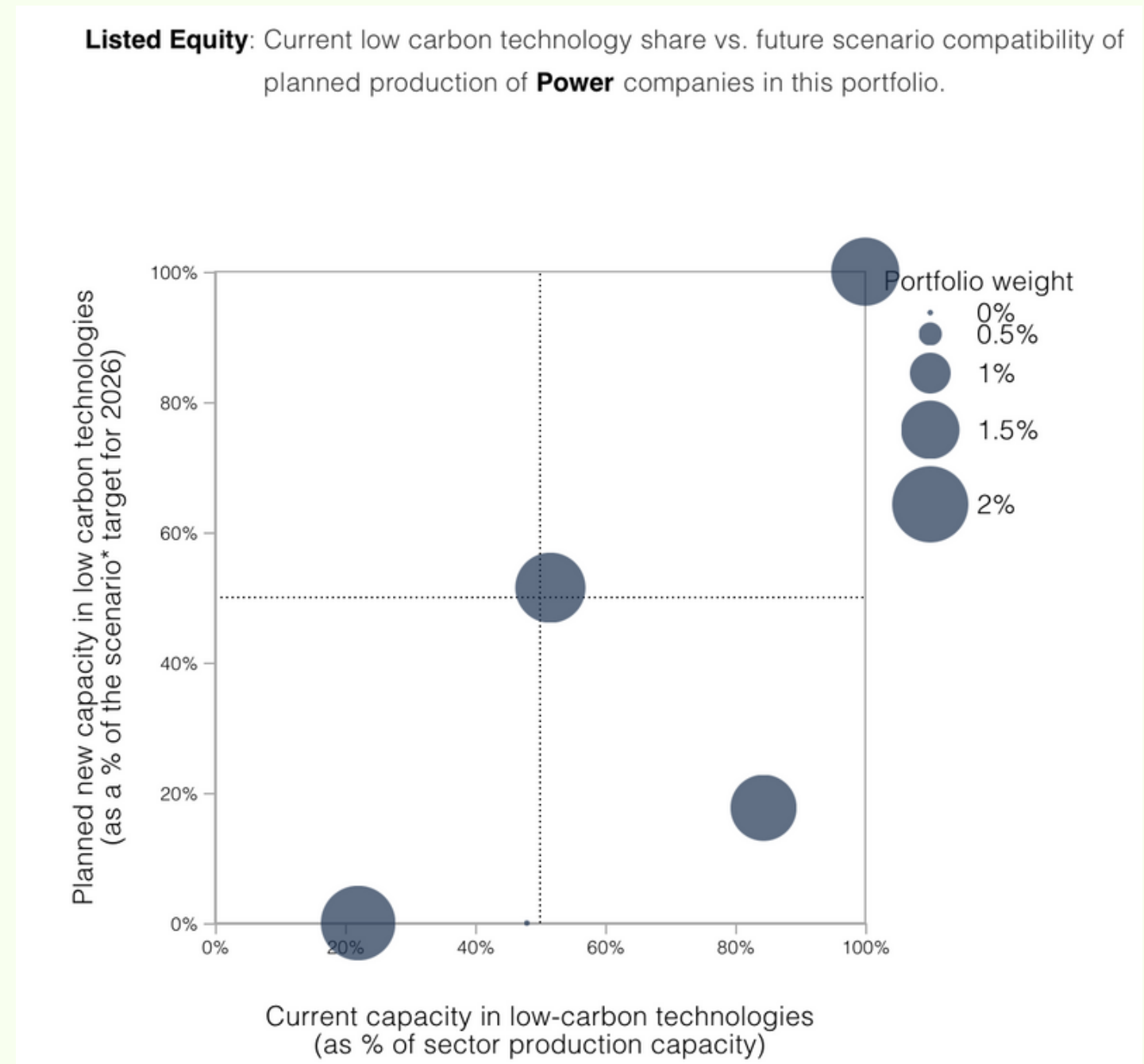


# BIGGEST IMPROVEMENTS

## Initial portfolio



## Rebalanced portfolio



The biggest improvements resulting from the rebalanced portfolio are reduction of exposure to high-carbon energy such as gas, reaching the Net Zero emission by 2050 scenario, and the composition of low- and high-carbon technologies.

# IORP STRESS TEST

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Analysis of initialed &  
rebalanced portfolio

# IORP STRESS TEST

## IORP Explained

**EIOPA** has carried out its first climate stress test for the Institutions for Occupational Retirement Provisions (IORPs) sector in the European Economic Area (EEA) to gain insights into the effects of environmental risks on the occupational pension sector

**AIM:** Assess exposure to environmental risks

## Shocks' assumptions

**EQUITIES:**  
NACE code

**PROPERTIES:**  
country

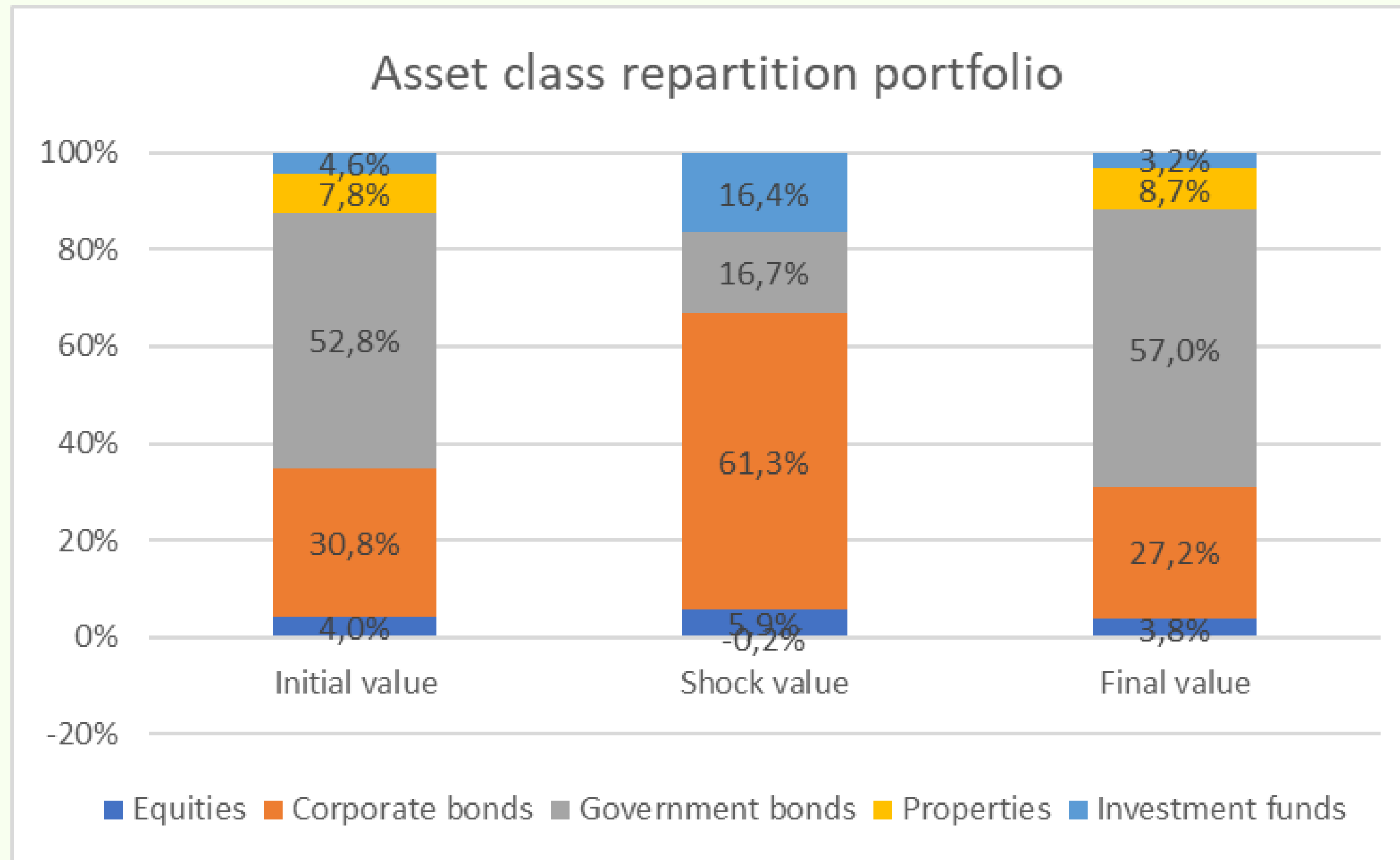
**INVESTMENT FUNDS:**  
highest shock equities -37.8%

**CORPORATE BONDS:**  
corporate yield shock = sum of risk free shock and another based on NACE code

**GOVERNMENT BONDS:**  
-(modified duration\* sovereign yield shock)



# ASSET CLASSES EVOLUTION



# PORTFOLIO COMPARISON

## Portfolio Overview



- ± **Same** repartition and contribution
- **Initial market value** ± 850M,
- **Shock value** ± 100M
- **Final value** after shock ± 750m

## New Portfolio

- **Less sensitive** for the Equities (318k) and Corporate Bonds (81k)
- New green government bonds are **more sensitive** (-230k)
- Overall **less sensitive** portfolio (168k)

# TIME SERIES ANALYSIS

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# TIME SERIES ANALYSIS OF WEATHER AND PORTFOLIO ASSET PRICES



Portfolio asset prices



**CORRELATION?**

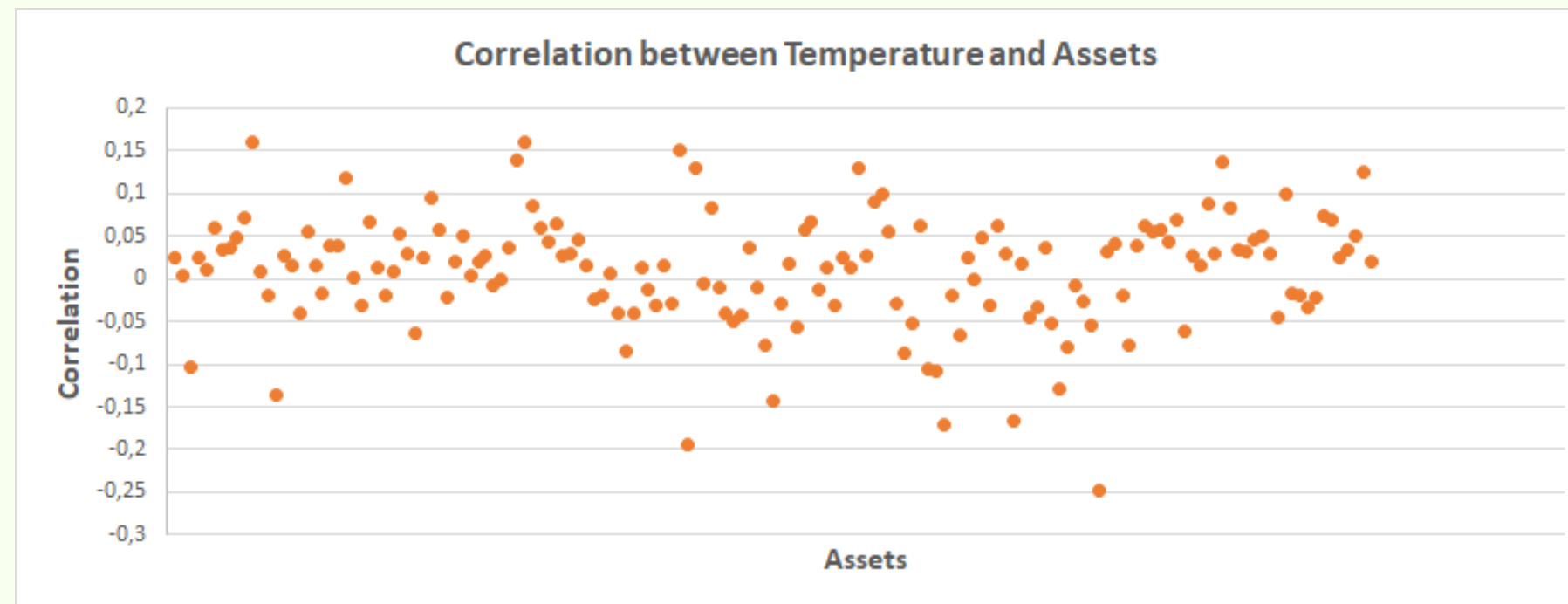
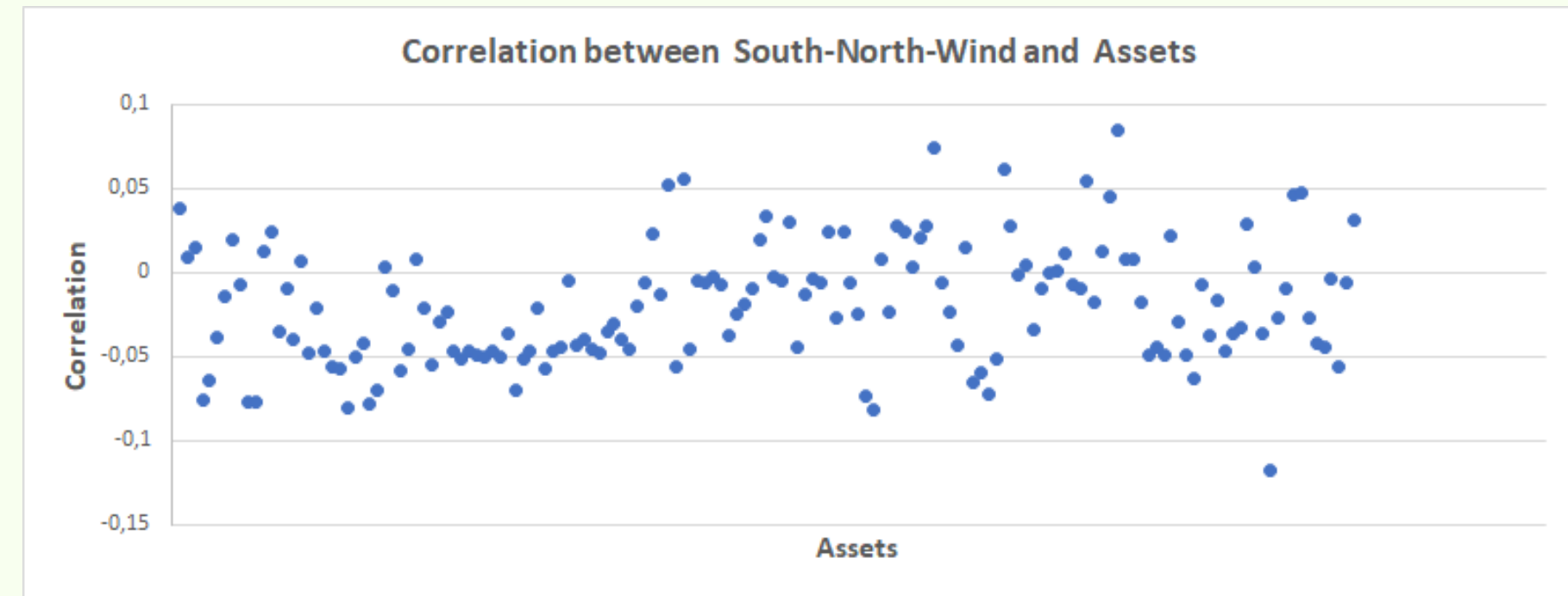
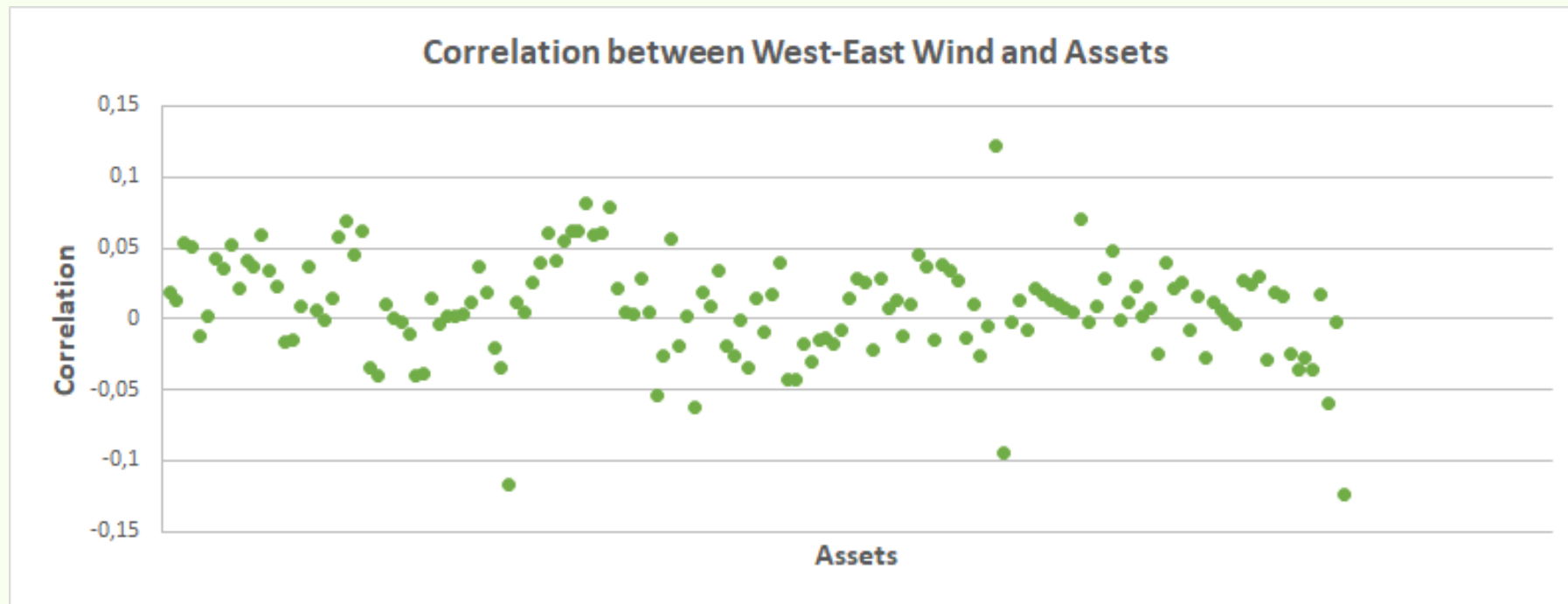
Weather variables:

- wind from West to East
- wind from South to North
- Temperature



# CORRELATION

PLOTS OF CORRELATION BETWEEN WEATHER COMPONENTS AND ASSETS



# INTERPRETATION

## RESULTS OF OUR CALCULATIONS



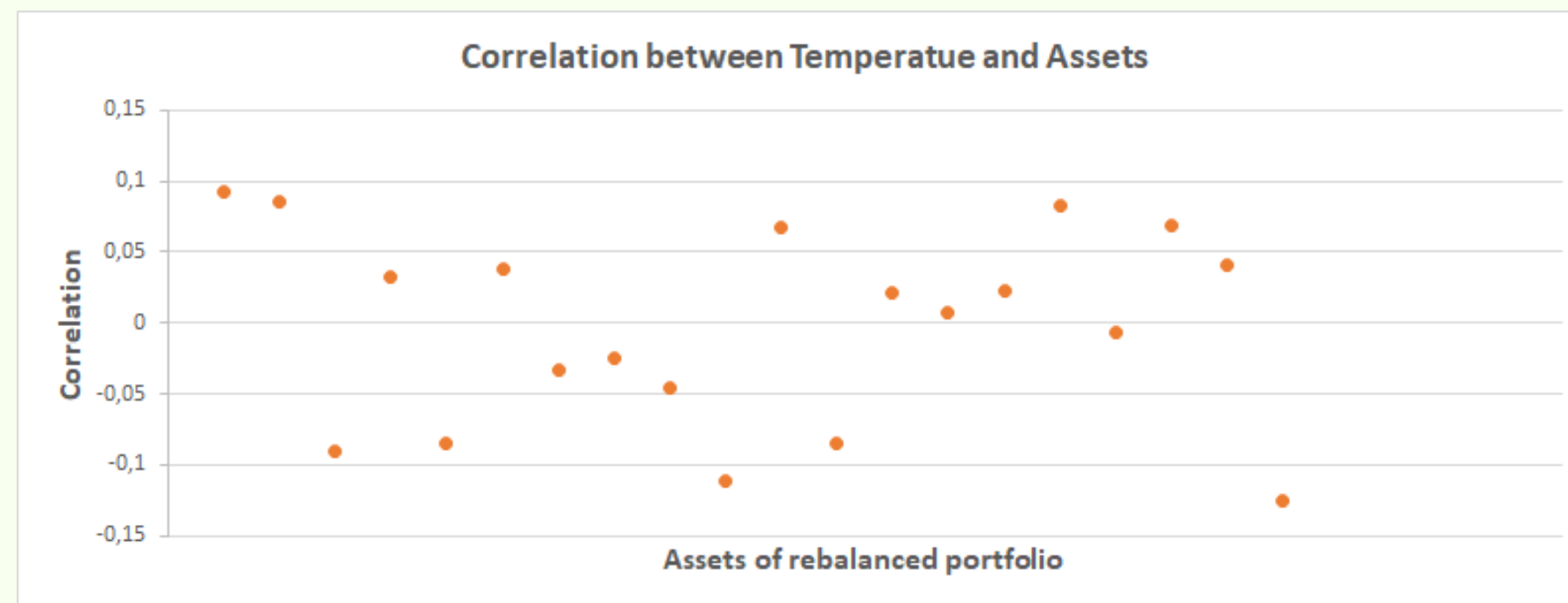
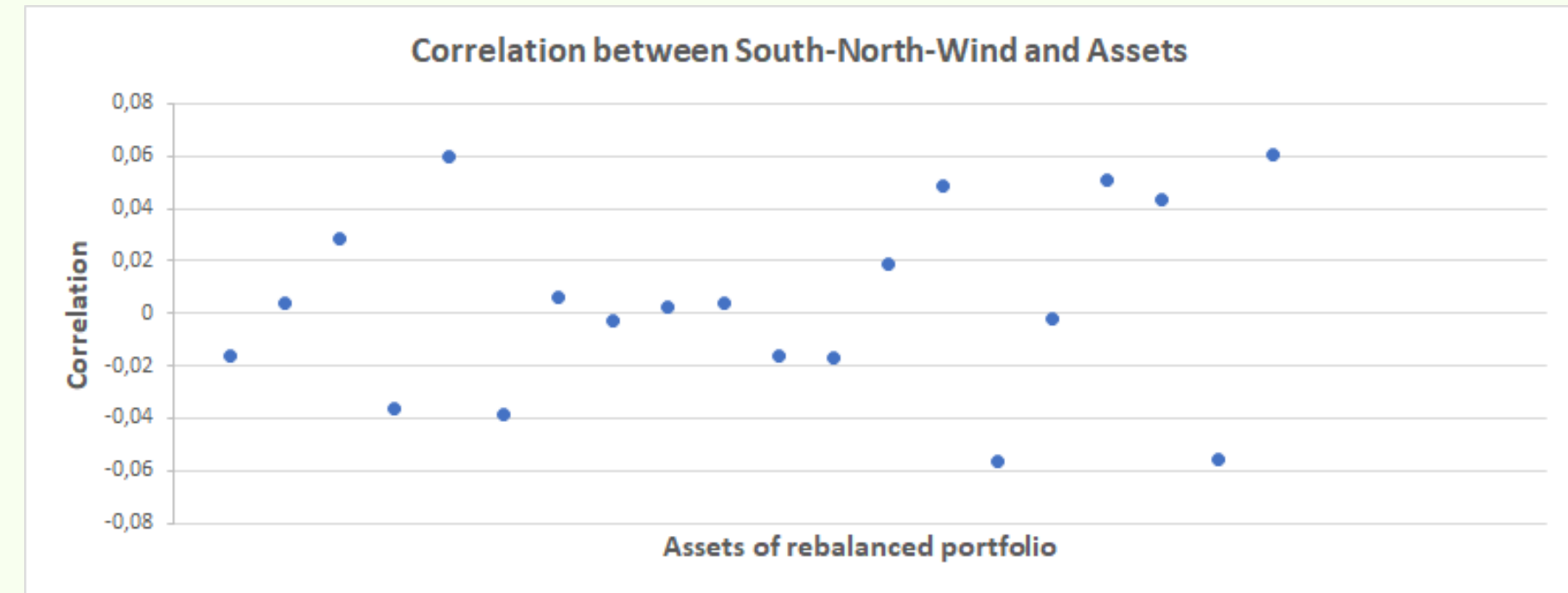
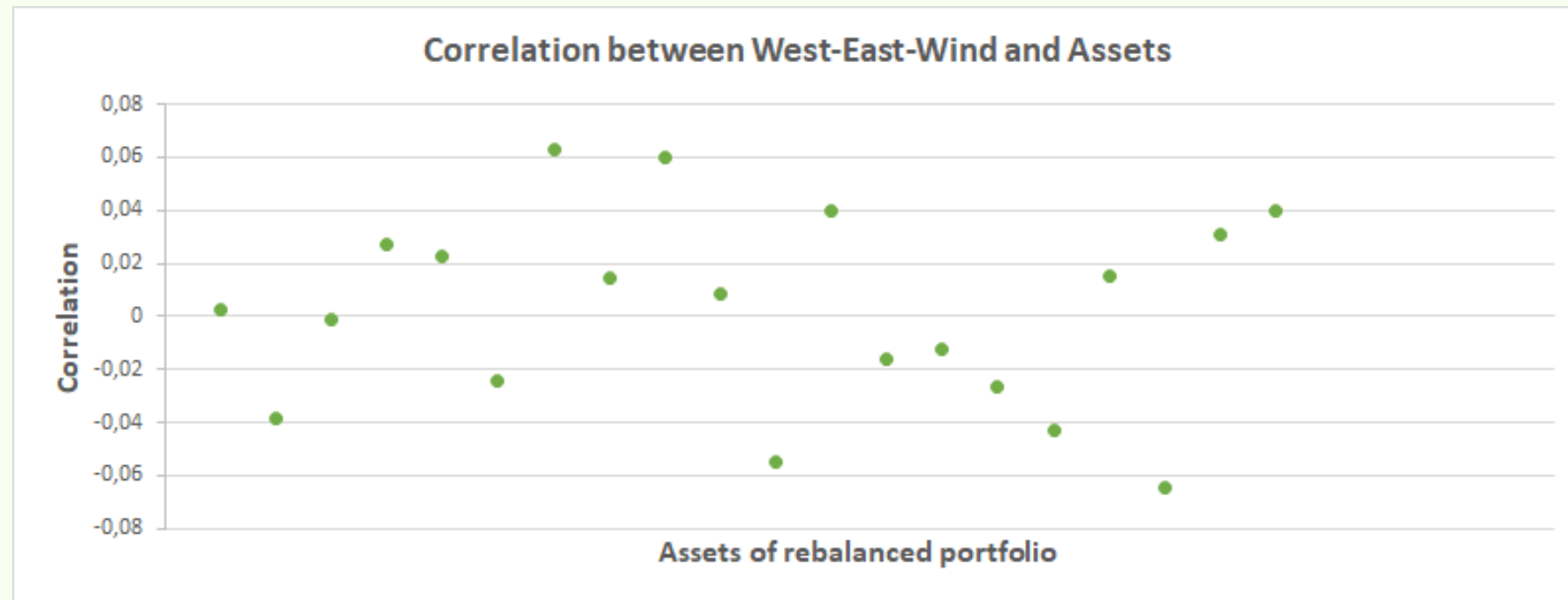
- Rather small correlations
- Weather might have some influence but not the only factor at play
- Use weighted correlation as a measure of portfolio exposure to weather:



No hedging necessary

# REBALANCED PORTFOLIO

## CORRELATION FOR REBALANCE PORTFOLIO





# INTERPRETATION

## RESULTS OF OUR CALCULATIONS

Slightly higher absolute correlations due to higher influence of renewable energy (e.g. wind energy)



# MATHEMATICAL APPROACH TO HEDGING PHYSICAL RISK

## WEATHER COMPONENTS AS ORNSTEIN-UHLENBECK-PROCESS

Let  $S_t$  be the deterministic seasonality component and  $X_t$  the trend variable.

$$W_t = S_t + X_t$$

where

$$dX_t = k(\theta - X_t)dt + \sigma dW_t$$

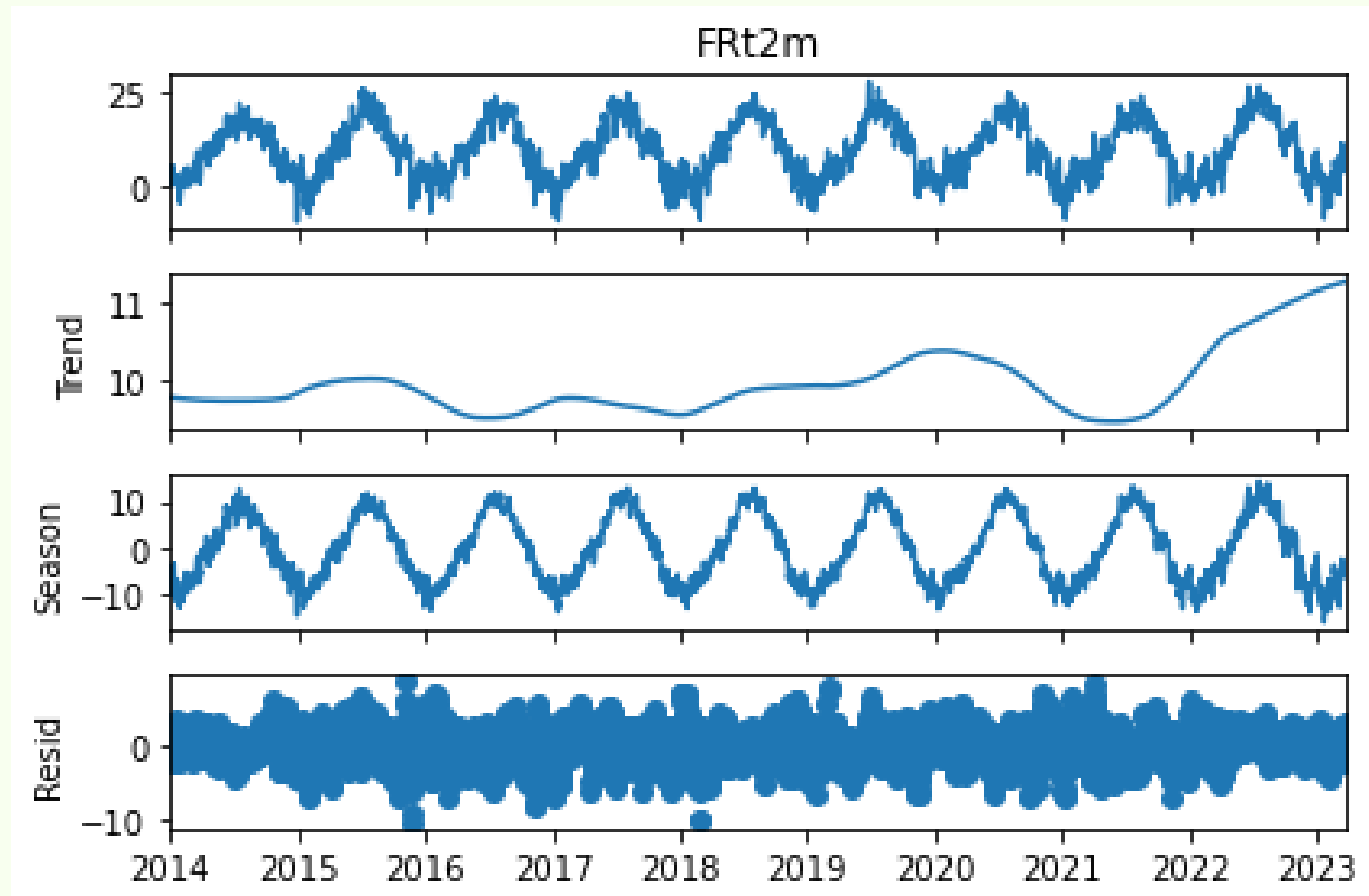
and

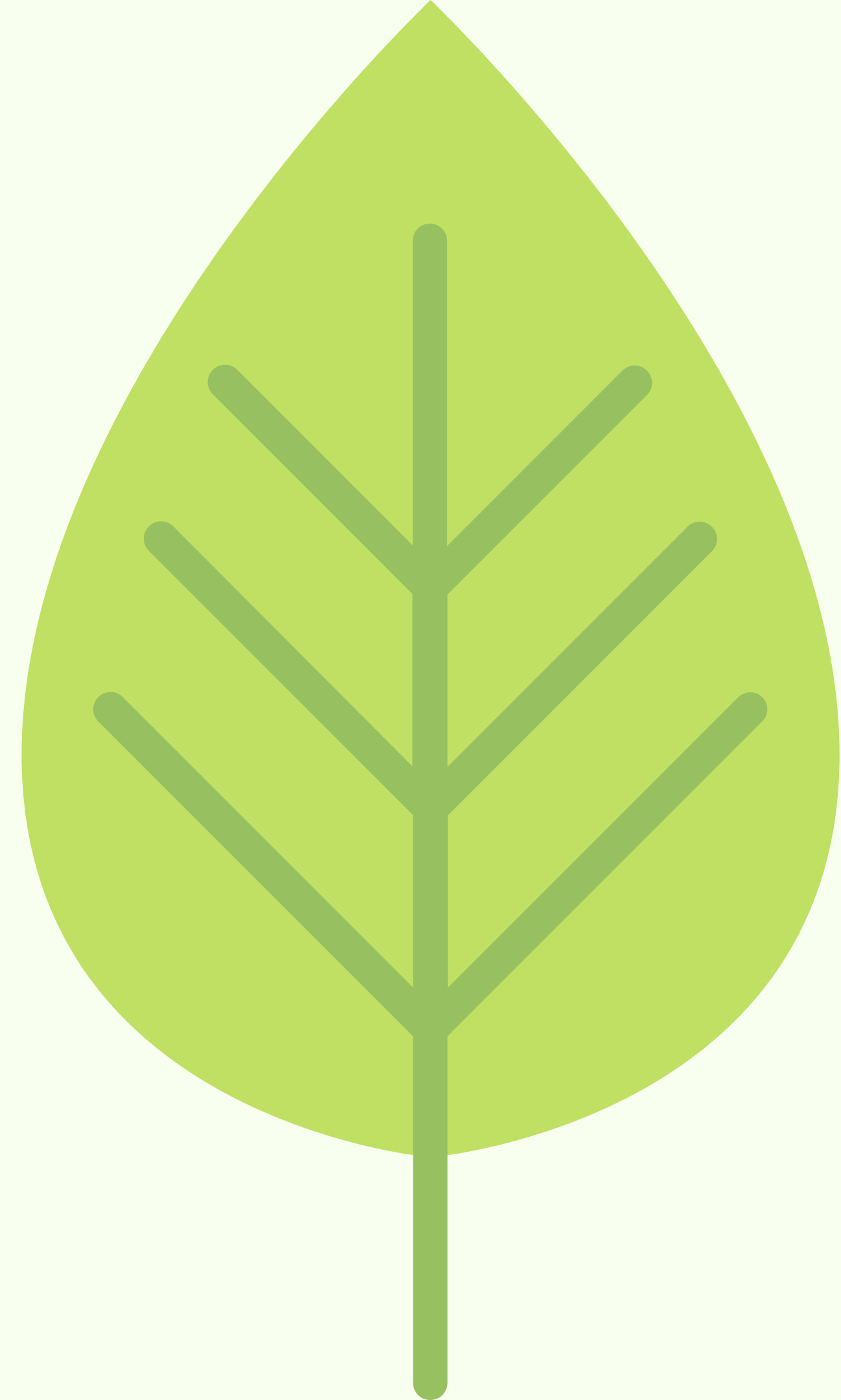
$$X_t = X_0 e^{-kt} + \theta(1 - e^{-kt}) + \sigma \int_0^t e^{-k(t-r)} dW_s$$

$$F_W(t, \tau) = \mathbb{E}_t^{\mathbb{Q}}[W(\tau)]$$

# EXAMPLE

FRANCE TEMPERATURE FROM 2014 TO 2023





# Thank you

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Green Innovation Team