

Cambridge Centre for Risk Studies

2022 ANNUAL RISK SUMMIT

SYSTEMIC RISKS AND INTERLINKED GLOBAL CHALLENGES

Plenary Session 4: McKinsey Risk Prize and Parallel
Sessions

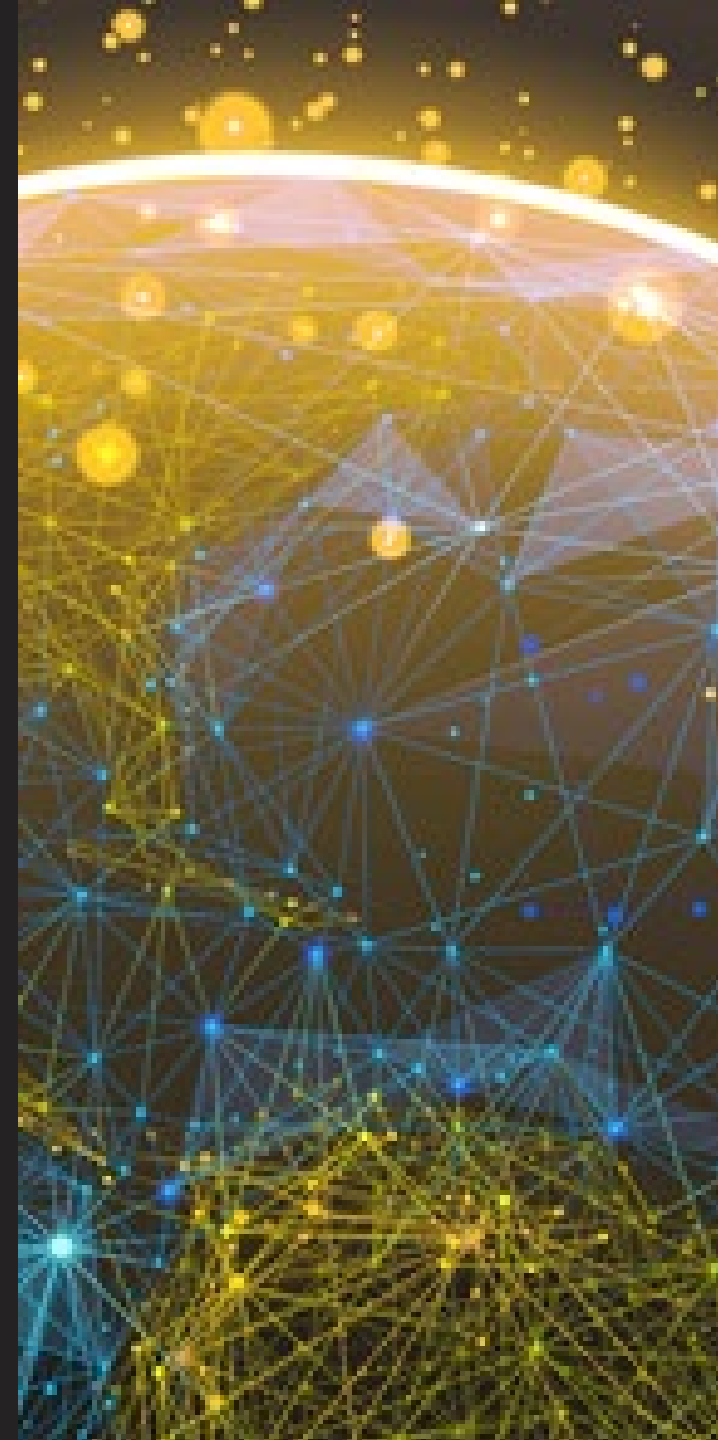
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Energy and Power Risk

Fransje van der Marel

Partner, McKinsey

Centre for
Risk Studies



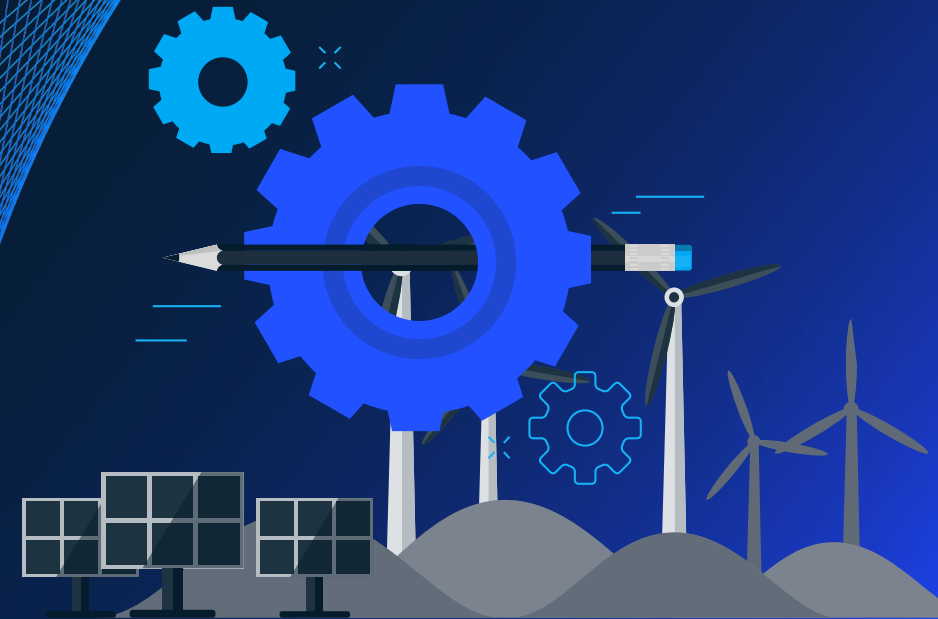
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Antifragile and the energy transition

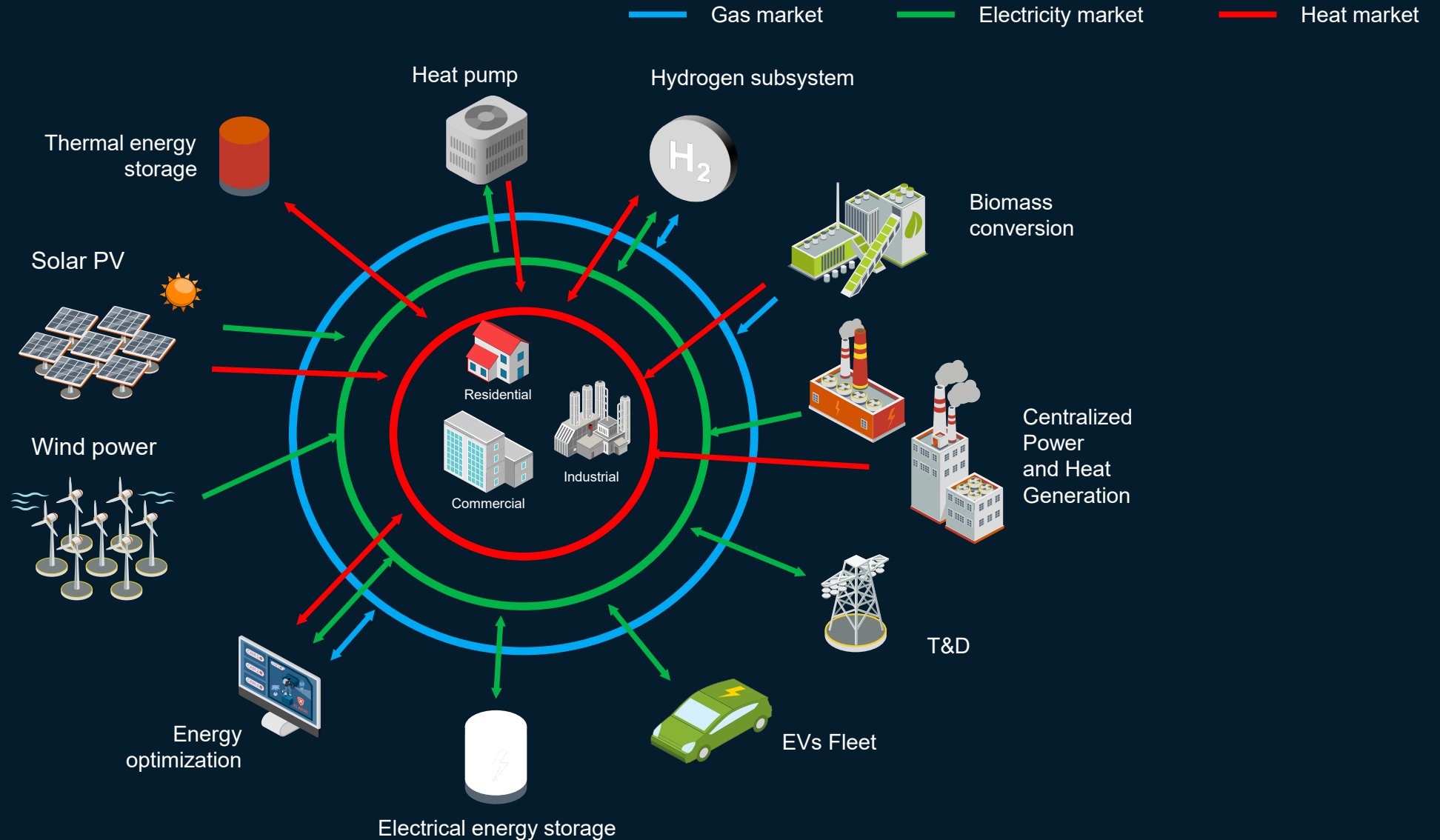
Cambridge Risk Summit

Fransje van der Marel | June 2022

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Energy companies face an increasingly complex energy ecosystem to reach net-zero

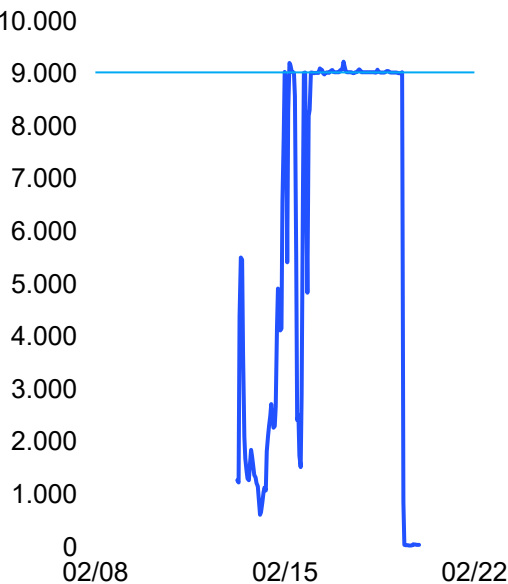


Volatility only to increase going forward



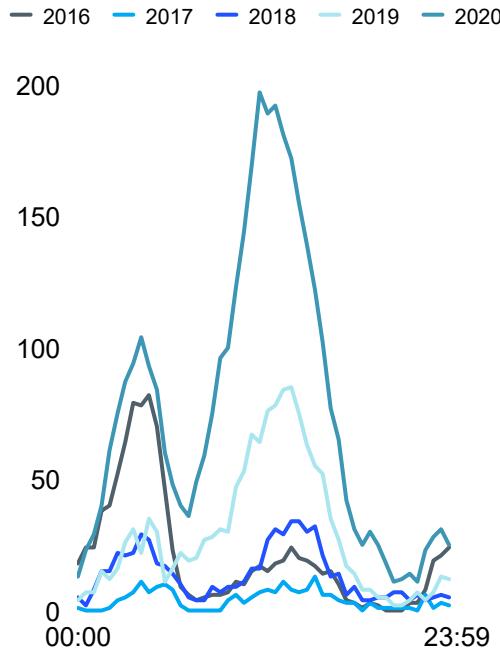
Texas freeze with power prices up to 9'000 USD/MWh in Feb. '21

Power prices and administrative price cap



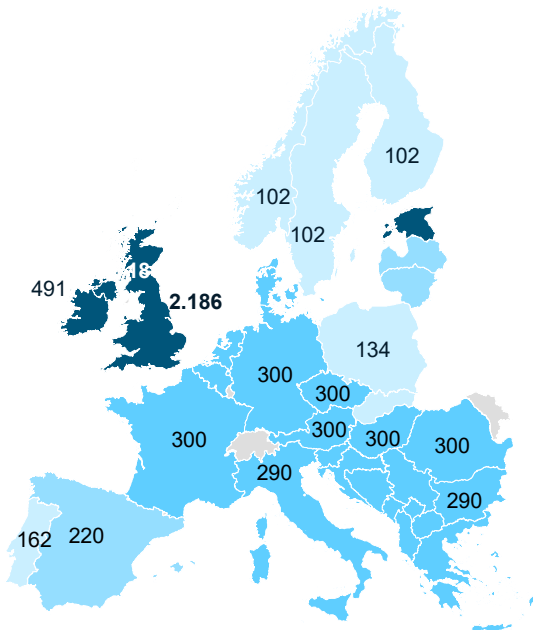
Massive increase of negative price events driven by distributed solar

Count of trading intervals with negative prices



UK record power prices of >2'000 GBP/MWh

Power prices on 15.11.2021, 18:00



Price volatility only expected to increase further due to higher penetration of intermittent renewables

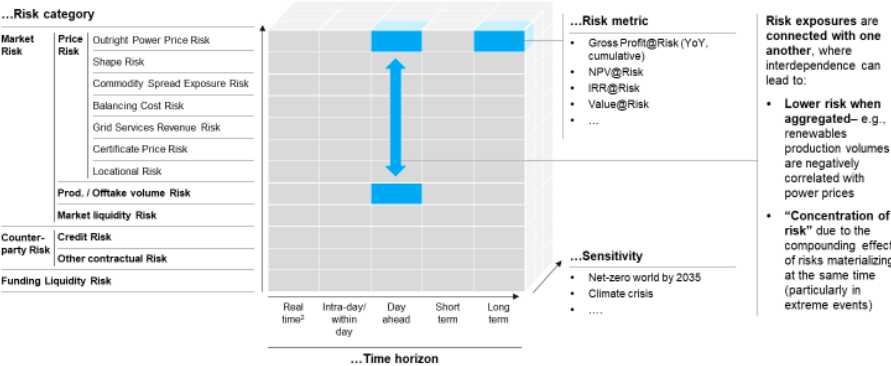
4 steps towards becoming antifragile

Step 1

Risk taxonomy definition to align an understanding of “portfolio” and “positions”

1. Risk taxonomy: Critical starting point is to define risks and align on metrics to measure

Risk exposure is expressed granularly at the level of a...



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Step 2

Mapping risks along dimensions of risk factor and positions type by market

2. Risk heatmaps: Building Risk Heatmaps helps to understand portfolio and where to focus modelling effort

High level of risk expected Medium level of risk expected Low level of risk expected/hedged N/A Not applicable

Illustrative	As-produced PPA for RES asset	Fully merchant RES asset	CCGT asset exposures	Battery storage asset exposures	Prop. trading	As-produced PPA offtake for RES asset	Retail positions exposures
Market Risk							
Price Risk							
1 Outright Power Price Risk	Power price fixed – except potentially for contractual exceptions for negative prices	Exposure to avg. prices and potential price spikes (e.g., gas, CO ₂ prices)	N/A (exposure to clean spark spread, not power prices)	N/A	Trading based on patterns around volatility of forward price curves	Exposure to price risk of price differentials (e.g., forward vs. spot)	Possible exposure but typically hedged
2 Shape Risk		Exposure to hourly differences in power prices (e.g., day-ahead vs. real-time)	Shape risk may present for flexible assets – relevant to determine peak power price	Battery economics based on price variation between time periods	Ability to trade around shape of production / consumption	Exposure to price risk of price differentials (e.g., forward vs. spot)	Profitability highly dependent on consumption profile over time
3 Locational Risk	N/A	Exposure to basis risk in the U.S. (e.g., power hubs)	Exposure to basis risk in the U.S. (e.g., power hubs)	Ability to trade around commodity supply	Exposure to basis risk in the U.S. (e.g., power hubs)	Exposure to basis risk in the U.S. (e.g., power hubs)	Exposure to basis risk in the U.S. (e.g., power hubs)
4 Commodity Spread Exposure Risk	N/A	N/A	Exposure to clean spark spread (MS and CO ₂ prices vs. power prices)	N/A	Ability to trade around commodity supply	N/A	N/A
5 Balancing Cost Risk	Balancing risk present but not in most cases	Balancing risk present but not in most cases	Limited balancing needs for flexible dispatchable sources	N/A	N/A	N/A	Balancing risk for accuracy predicting consumer demand over time
6 Grid Services Revenue Risk	Limited ability to offer Grid Services	Exposure if CCGT used in a high-volatility market	High revenue for services (e.g., grid services)	N/A	Limited ability to offer Grid Services	N/A	N/A
7 Certificate Price Risk	Limited value for voluntary certificates (e.g., 1 EUR/MWh for QUKs)	Exposure if CCGT is used in a high-volatility market	N/A	N/A	Limited value for voluntary certificates (e.g., 1 EUR/MWh for QUKs)	N/A	Potential exposure as purchaser of QUKs (e.g., for green power contracts)
8 Production / Otfake volume Risk	Production can vary substantially over time	Limited volume risk for flexible dispatchable sources	N/A	N/A	Production can vary substantially over time	Production can vary substantially over time	Risk arising from shift in planned vs. actual vol. where only planned vol. is hedged
9 Market liquidity Risk							
10 Counter Credit Risk	M&M exposure can be high if power drops depending on creditworthiness of counterparty	Standard risk – can become significant if hedging done for the asset	Credit risk (not fully relevant (e.g., if used for grid services, etc.))	Credit risk (not fully relevant (e.g., if used for grid services, etc.))	Risk e.g. for collateral in OTC transactions	Credit risk (not fully relevant (e.g., if used for grid services, etc.))	High credit risk exp. for all
Other contractual Risk							
11 Funding Liquidity Risk							

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Assess materiality in detailed model (step 3)

A Contract parametrization

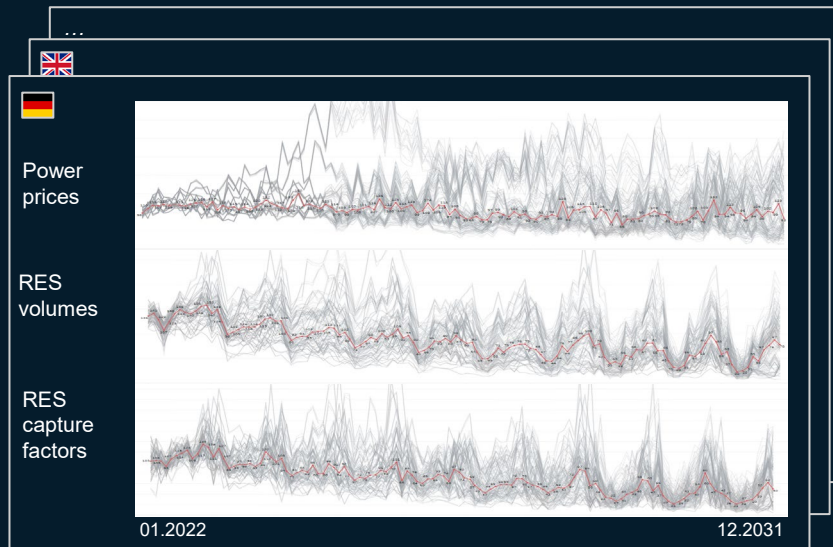
```

name: Offshore Wind CfD
name: Battery
name: Solar Merchant
name: PAP PPA Offshore Wind
asset_type: Generation
asset_subtype: Offshore Wind
business: RES
currency: "eur"
currency_exchange_rate: 1.16
region: Europe
subregion: nl
price_area: nl
installed_capacity: 250
load_factor: 0.495
rf_baseload_price_monthly: dam_price_nl_nl
ref_asset_ind: nl_offw
date_online: 2024-01-01
ppa:
  type: pay-as-produced
  volume_pc: 1
  volume_yr: 0
  price: 39
  inflation: 0.01
  start_date: 2025-01-01
  end_date: 2121-01-01
    
```

Each asset/position characteristic is **parametrized** in a configuration dictionary including; e.g.:

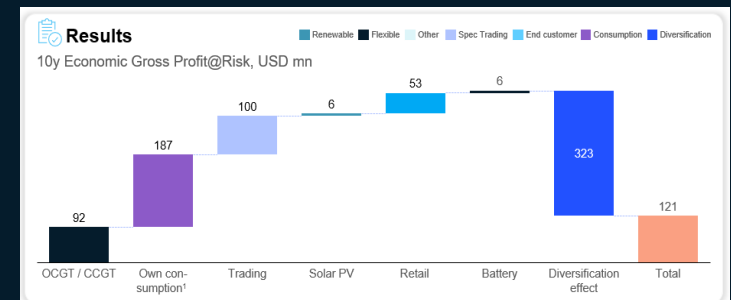
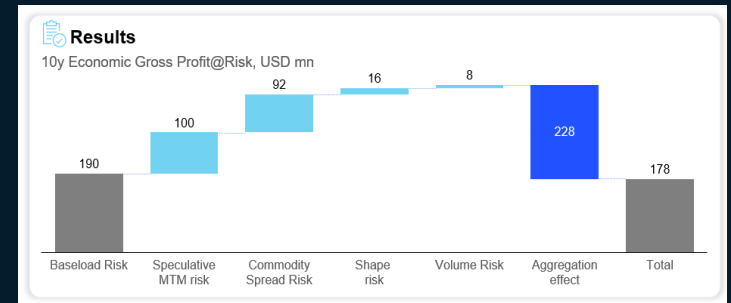
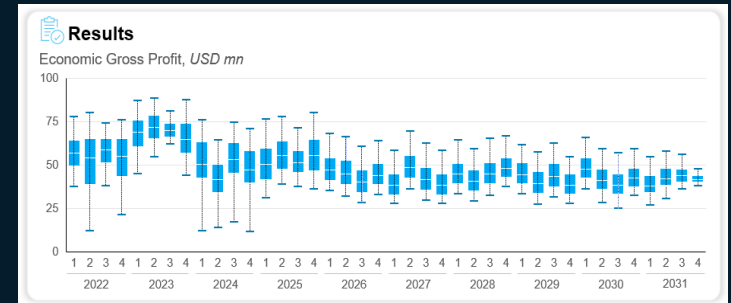
- **Asset parameters:** e.g. market, installed capacity, load factor, COD dates, etc.
- **PPA parameters:** e.g. PPA type, PPA price, volume, start & end date, etc.
- **CfD parameters:** e.g. type, CfD price, % of volume applicable

B Risk factor simulation



Risk factors simulations are used to **compute merchant revenues** in each simulation for the whole portfolio

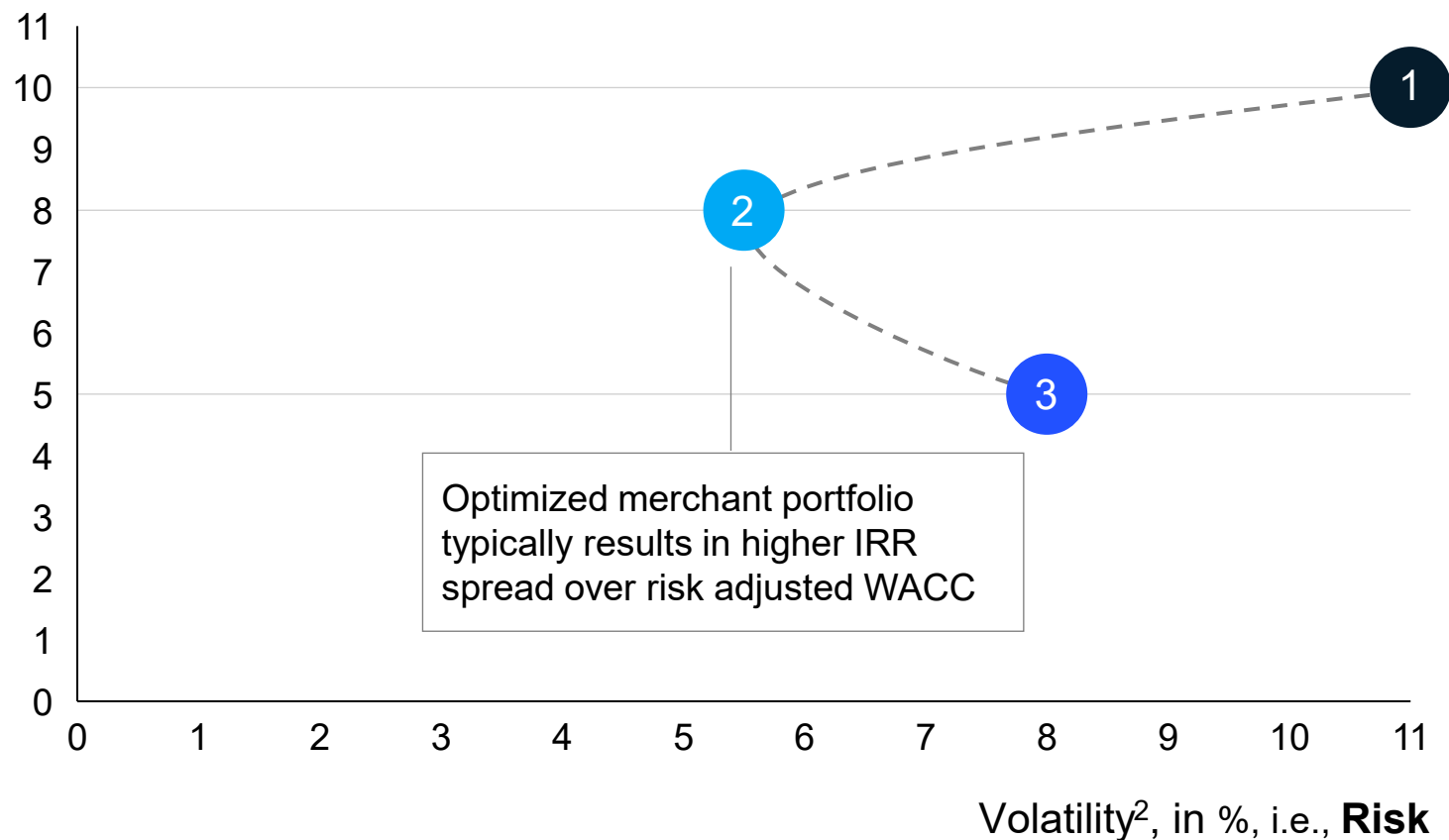
C Gross profit computation



Making the right portfolio choices to enhance value (step 4)

Illustrative - Each investment opportunity with unique risk-return profiles

Expected Return¹, %



1 Internal rate of return (IRR) of base-case scenario

2 Expected IRR vs P5 IRR (IRR@Risk)

Source: McKinsey CapEx/OpEx assumptions & market scenarios; PexaPark PPA benchmarks

① Fully merchant asset



Unhedged wind asset Assuming no global risk diversification

② Merchant portfolio of different technologies and in different geographies



Wind
PV
Storage
Power-to-X

③ De-risked asset with merchant tail



As-produced PPA + merchant tail

2022 Cambridge-McKinsey Risk Prize Announcement of Finalists and Winner



Rob Glew

Risk Management in
Development Aid: A
Modular Approach



Shan Liu

De-risking for Huimin
Bao Insurance



Aditya Panse

'MAP'ping the
uncharted: proposal to
make international tax
dispute resolution more
efficient

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