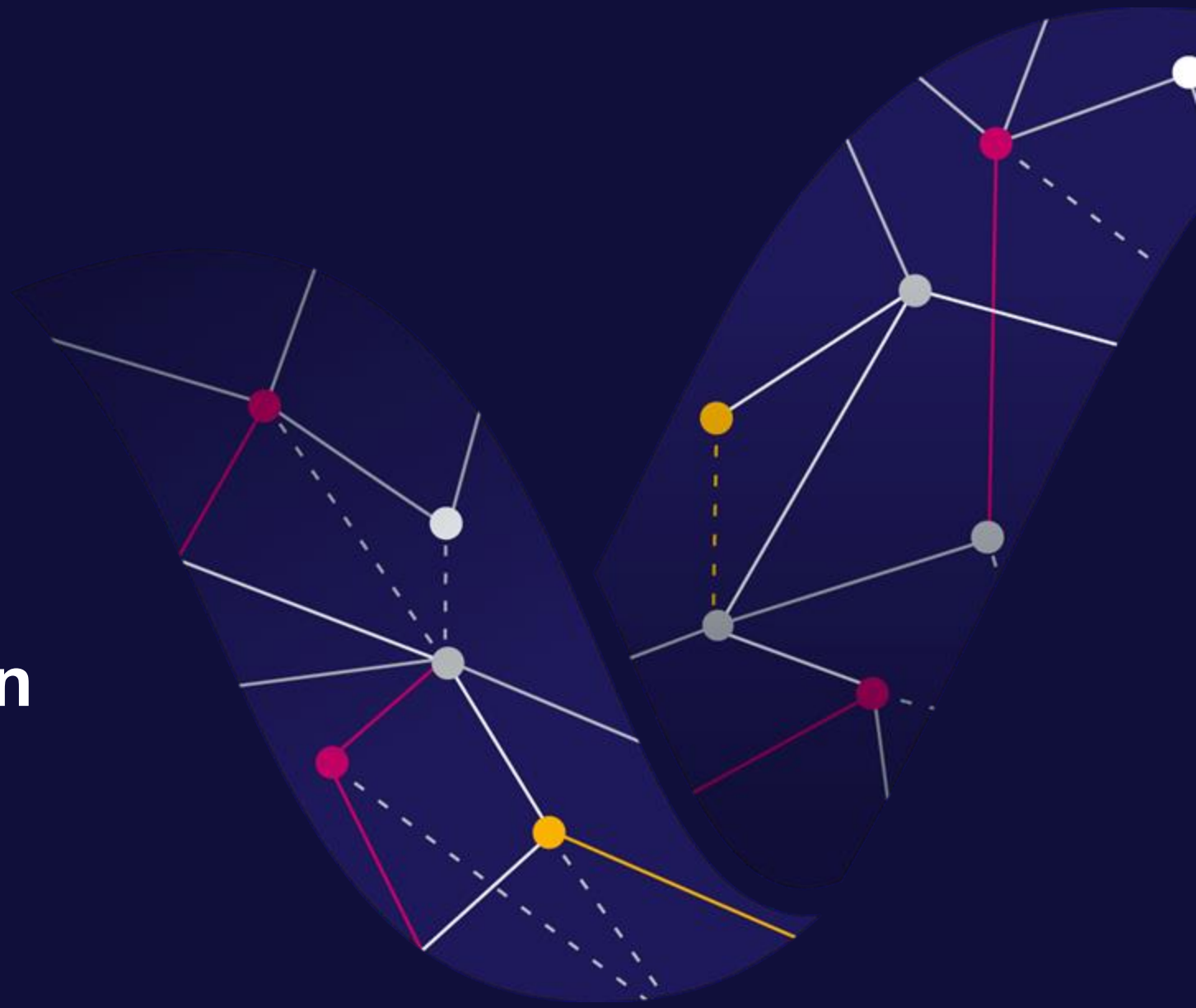


Uncertainty and valuation in the energy transition

20th May 2025

CONFIDENTIAL

Agenda

1. Energy transition efforts hit ‘peak uncertainty’ this decade, increasing stakeholder risks
   - Ofgem RIIO-T3 (SSMD) methodology, however, shows a stable **5.6% CoE** today
2. Vallorii’s AI model forecasts a 7-56% reduction in UK gas network demand by 2050
   - Flexibility in CapEx program can reduce energy transition costs in UK gas networks by **~£5.5bn** (present value, 16% of RAV), or **£256mn annually**
   - Investors would see 1.5x increase in CapEx volatility, driving **150-300bps CoE increase,** implying **£188mn increase in annual consumer bills**
3. Vallori forecasts 3x power outage risk from UK electricity system transformation, driving **230bps CoE increase** if not mitigated or passed through to consumers

POLL: How optimistic are you that the UK will reach net zero by 2050? (incl. decarbonised electricity by 2030)

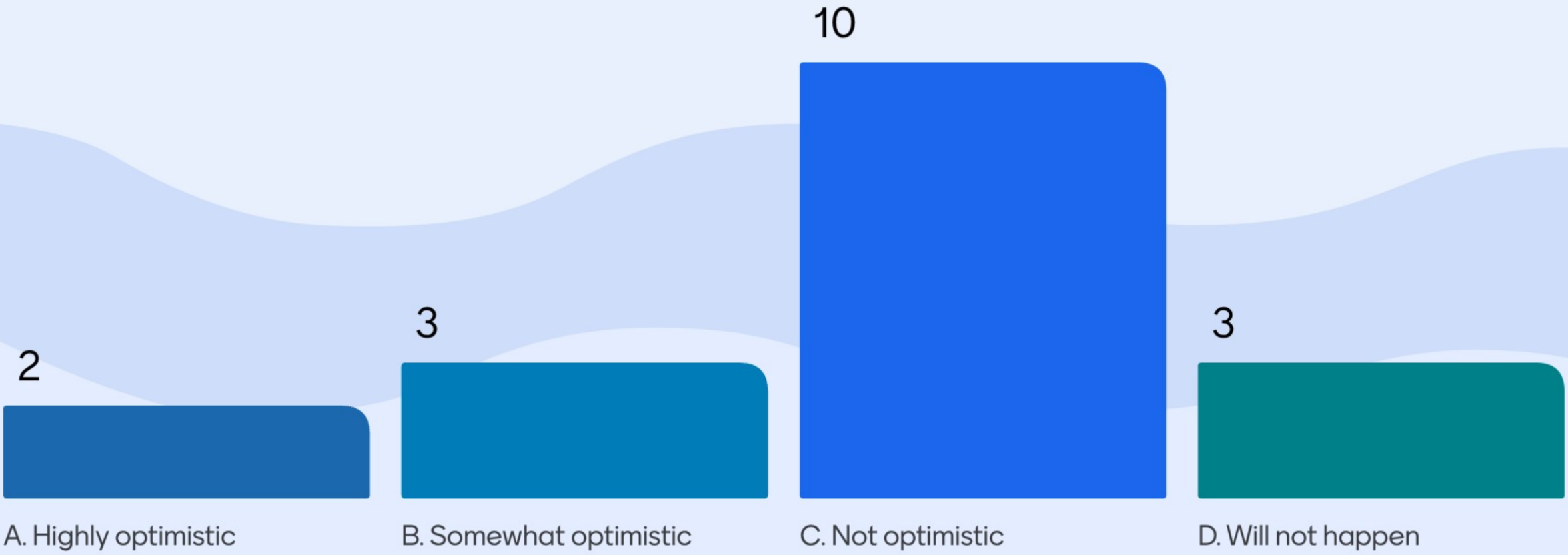
A. **Highly optimistic –** we're on track to achieve the government's commitment

B. **Somewhat optimistic** – we'll get there, but late

C. **Not optimistic** – we'll run out of steam

D. **Will not happen** – we'll never get started

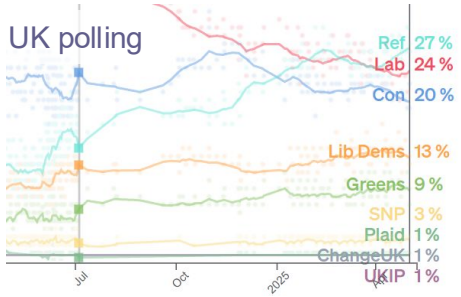
How optimistic are you that the UK will reach net-zero by 2050?



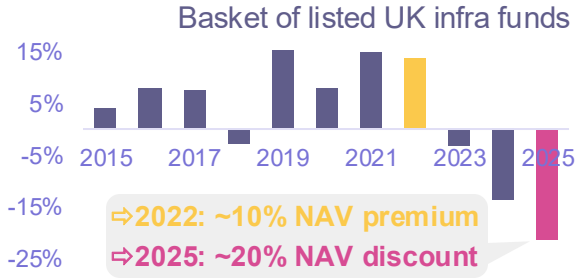
Uncertainty continues to grow on ‘when’ and ‘how’ the energy transition will unfold – with maximum outcome variability expected in the late-2030s

Today’s uncertainty in energy transition efforts…

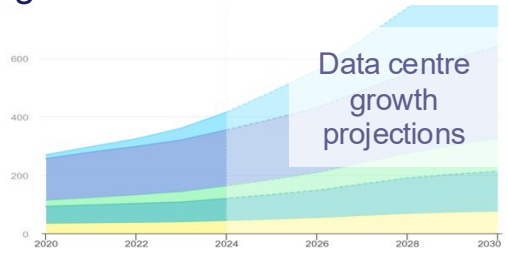
Growing political uncertainty in UK and abroad



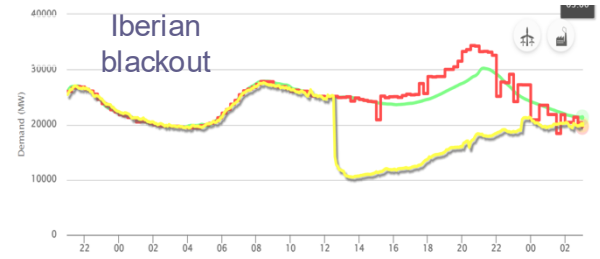
Market uncertainty and decreasing investor confidence



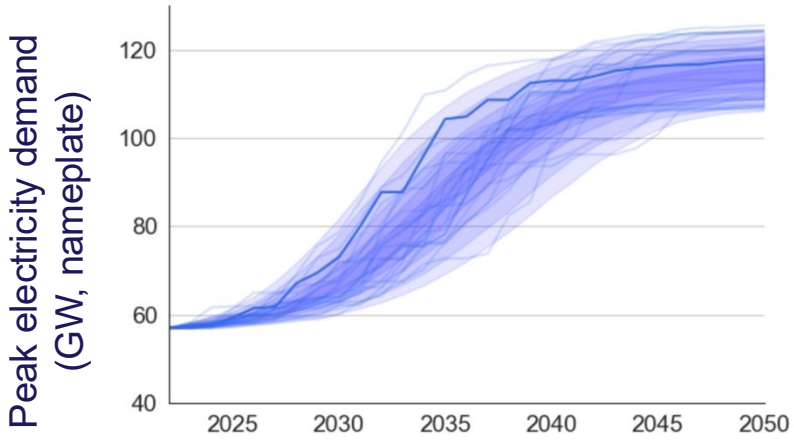
Technology adoption uncertainty driven by EV/heat pump sales & AI surge



System uncertainty driven by shift to renewable energy system



…drives tomorrow’s variability in energy transition outcomes



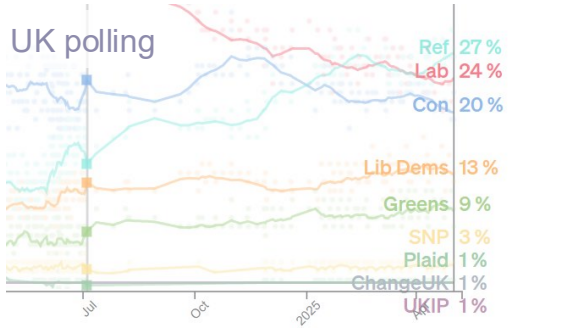
UK peak electricity demand in 2035-40 is highly uncertain today

Variability in transition pathways is highest around the mid-point

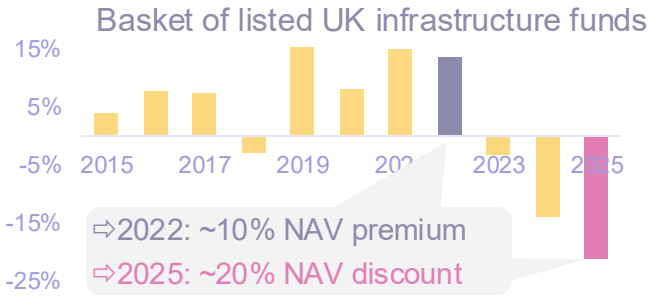
Source: IEA (2020–2030): Global data centre electricity use projections; Red Eléctrica (2025): Real-time electricity demand data (Spain); Hargreaves Lansdown: Infrastructure funds NAV data; Factset: Infrastructure funds price and market data; Politico: UK Poll of Polls; IEA (2023): Net Zero Roadmap – global clean energy investment needs and pathway to 1.5°C goal; Peak electricity demand from NESO-FES 2024 “Electric Engagement” scenario

POLL : Which driver creates the most uncertainty in the energy transition?

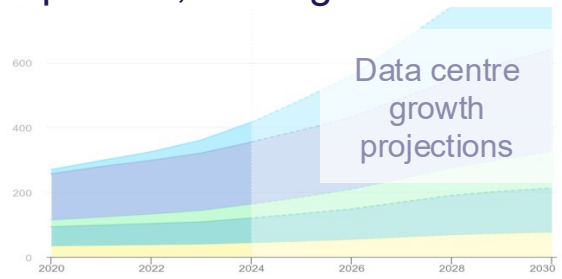
A. Growing political uncertainty in UK and abroad



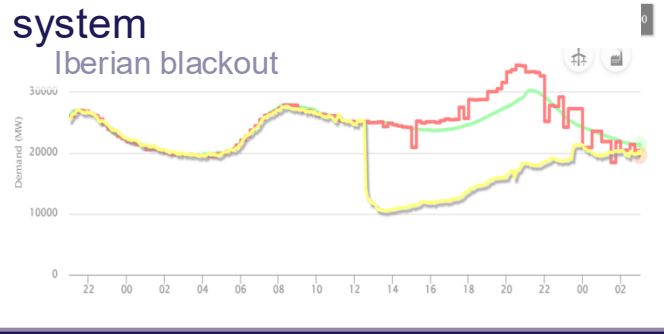
B. Market uncertainty and decreasing investor confidence



C. Technology adoption uncertainty driven by EV/heat pump sales, AI surge

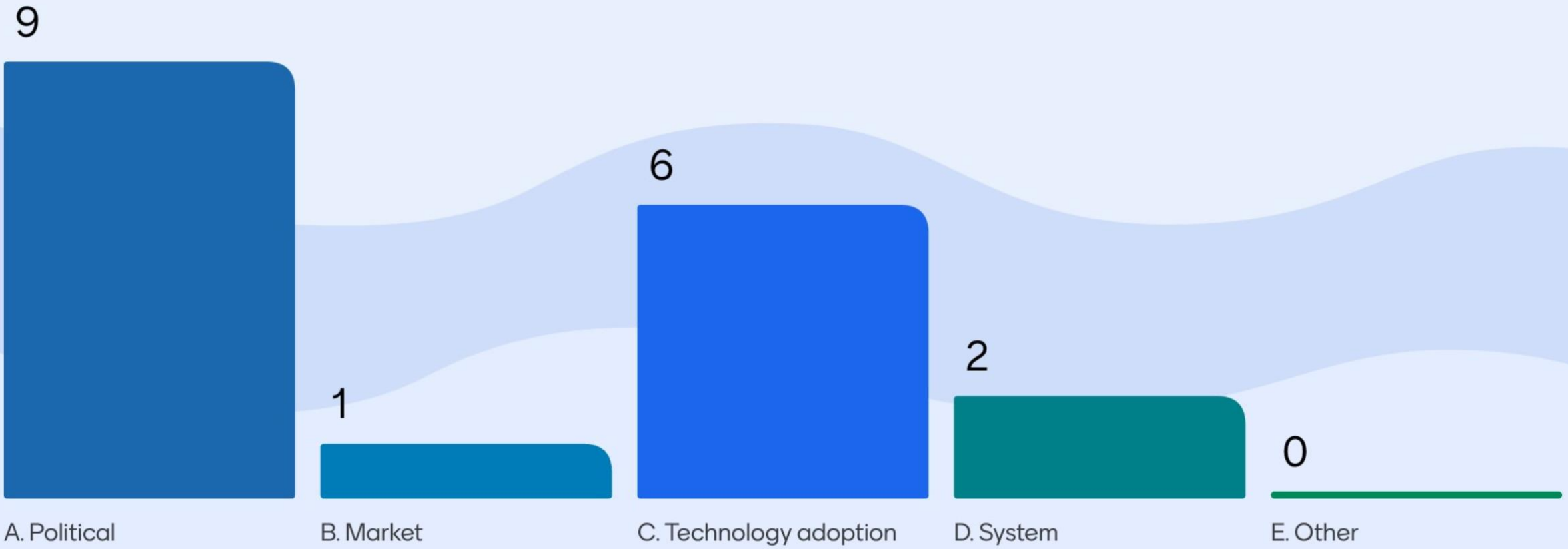


D. System uncertainty driven by shift to renewable energy system



E. Other

Which driver creates the most uncertainty in the energy transition?



CoE ››› *RIIO-T3 SSMD Methodology*

Cost of Capital Lab

Risk model selection

CAPM RIIO-T3

APT

Bottom-up

Results

CoE

CoE deep dive

CoD

CoD deep dive

What-if analysis

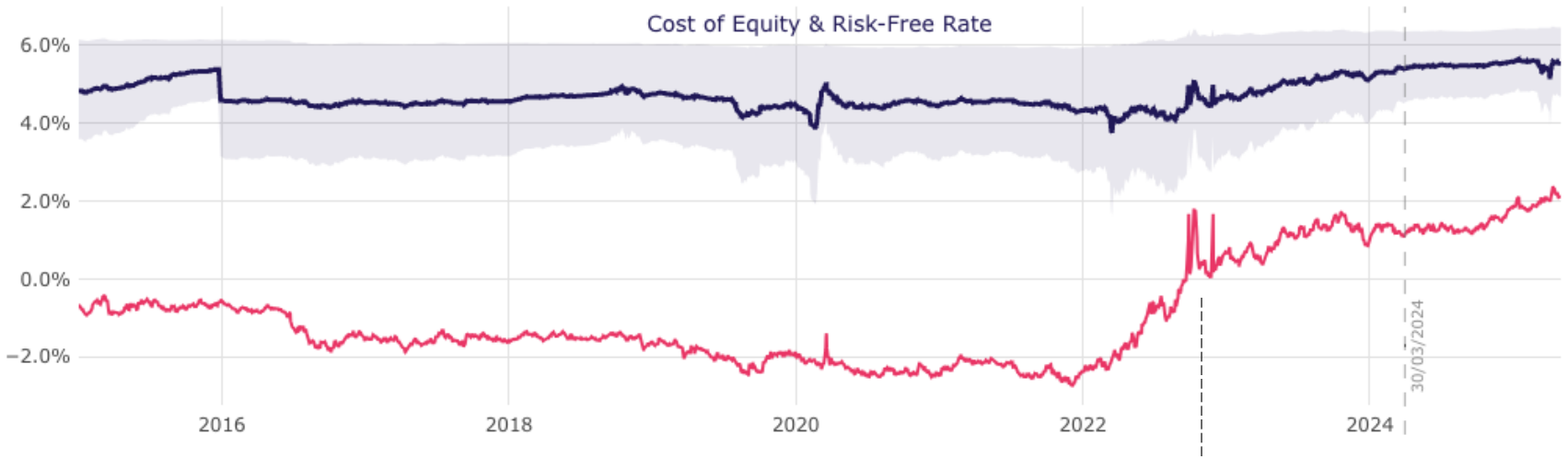
Forecasting

Reg. methodology documentation

Vallorii's CoC Lab shows that CoE under current RIIO-T3 methodology has remained flat around 5.6% despite rising uncertainties

Cost of equity and risk-free rate

real nominal



Apr 30 2025:

CoE 5.54%

RfR 2.22%

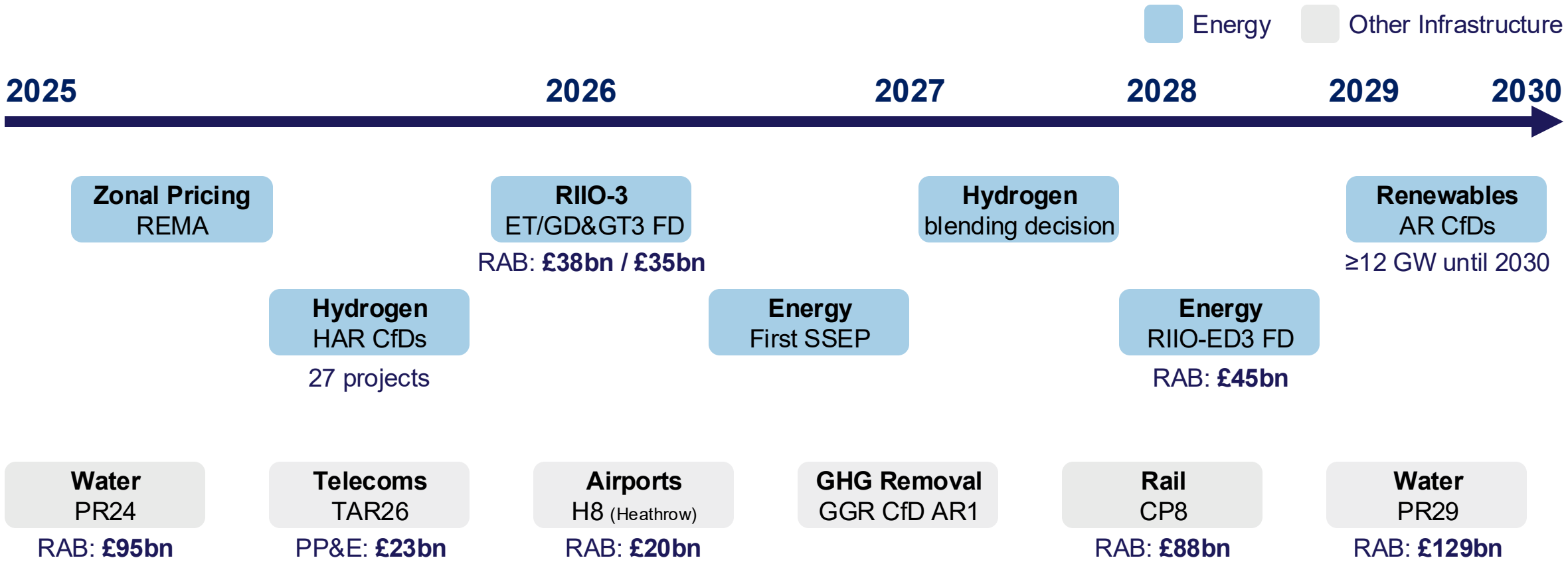
AI labelled events

Find out more ⓘ

SSMD decision date

UK political turmoil raised RfR, no effect on beta

2025 and 2026 bring critical policy and regulatory decisions in the UK that will set the path through the energy transition



Source: Water - Ofwat: PR24 Key Dataset 2, Annual RCV balances in 2022/23 prices; Airports - Heathrow: Regulatory Accounts 2024; Rail - Network Rail: 2024 RCV balance; Telecoms - BT: Annual Report 2024, PP&E; Renewables: DESNZ – AR7 reforms; Energy: RFPR (R7: RAV) - ET, GT, GD: 2026 Closing RAV - forecast, ED: 2028: Closing RAV; Hydrogen – DESNZ: HAR2 shortlisted projects

Vallorii uses AI to quantify impact of risks on valuation and CoE. Today we investigate CapEx volatility and system stability risks

Risks discussed at previous roundtables

- Outcome Delivery Incentives (ODI) risks
- Illiquidity risks
- Financial default risks
- **CapEx volatility**
- **System stability & Black Swans**

Risks to be discussed at future roundtables

- Construction risks
- Operational risks
- Natural disaster risks
- Currency risks
- …

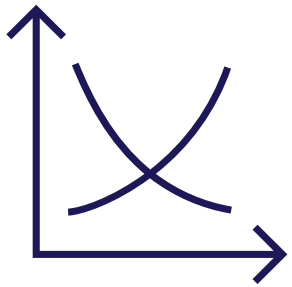
Case Study I

Future of **gas network** remains uncertain – leading to CapEx volatility

Case Study 2

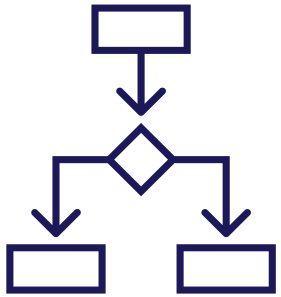
Transition uncertainty triples risk of black-swan disruption **to power grid**

Vallorii leverages AI to forecast infrastructure demand, evaluate the impact of optionality across stakeholders, and resulting impact on asset valuations



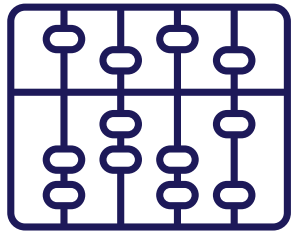
1 Forecast gas network demand

Using bottom-up AI analysis



2 Evaluate optionality of policy and investment

To aid **when** and **which** strategic decisions should be taken to maximise societal value

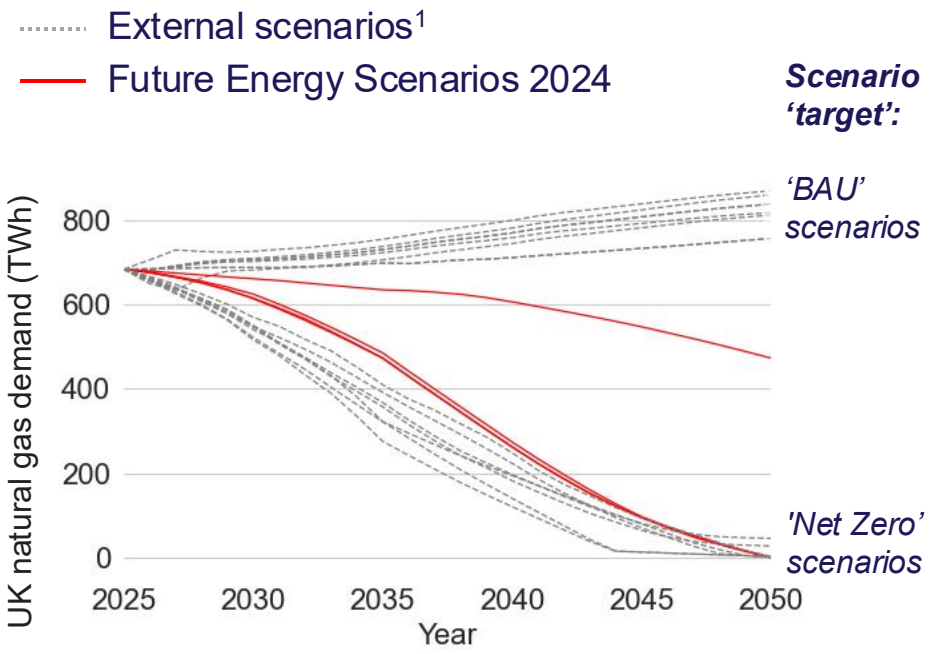


3 Assess CapEx volatility and impact on valuation

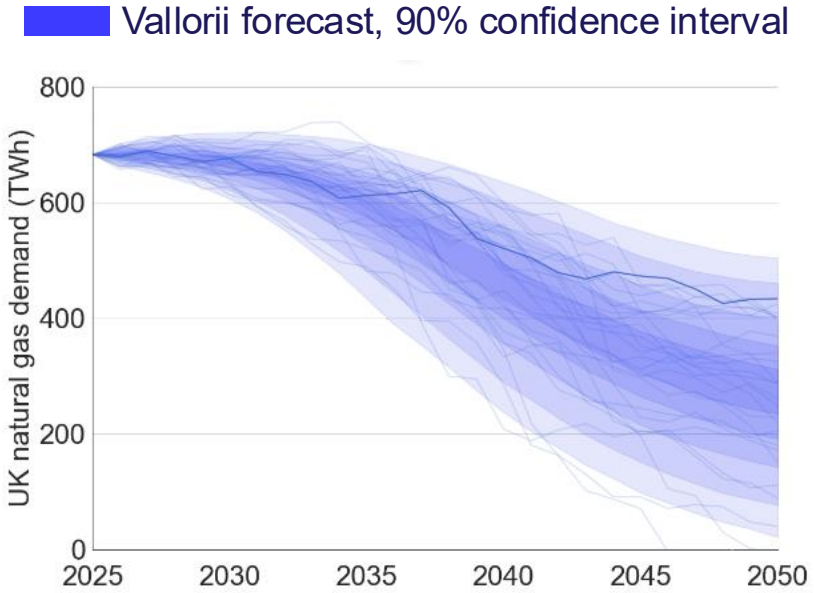
Based on stakeholder flexibility and risk allocation

(1) Vallorii ML model forecasts 28-93% decrease in UK *natural gas demand* by 2050 due to uncertainty in uptake of alternative technologies

Scenarios help assess sustainability targets but do not assign probabilities



Vallorii simulates thousands of possible pathways using AI, producing a probabilistic forecast that enables valuations



28-93% reduction in UK natural gas demand due to uncertain:

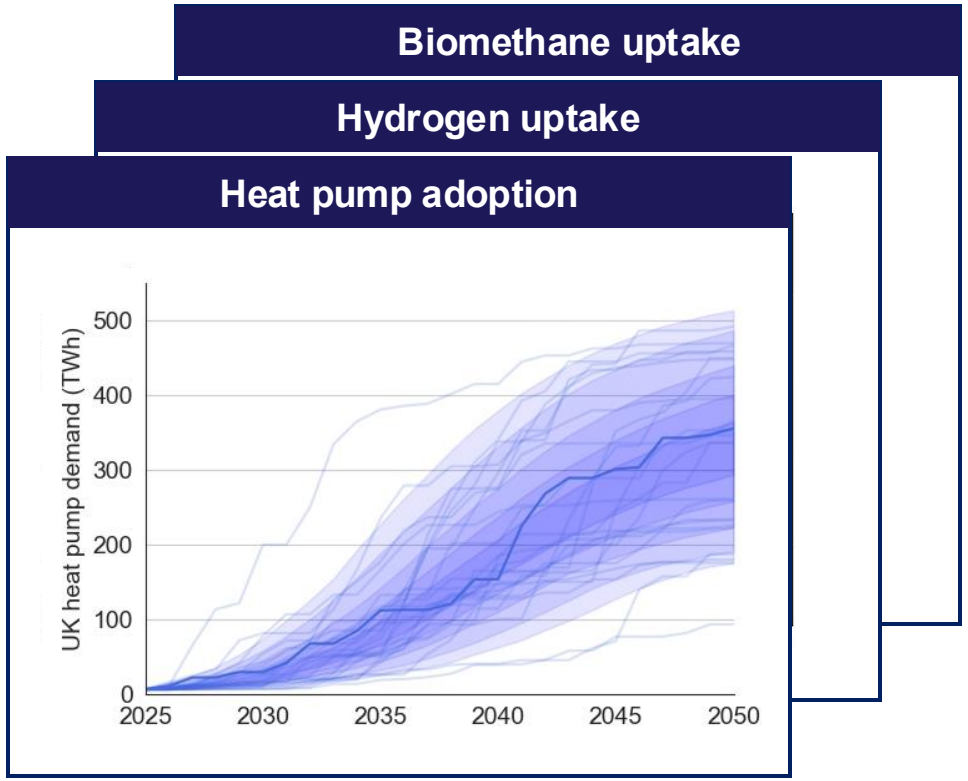
- Heat pump adoption
- H_2 and biomethane blending
- Electricity decarbonisation

Sources: Vallorii analysis, based on historical heat pump and biomethane uptake data, long-term heat pump penetration assumed to be 30-100%, FES-2024 projects long-term hydrogen demand to be 60-270 TWh, gov biomass strategy forecasts long-term biomethane demand at 35 TWh while gas company projects 120 TWh, long term gas for elec. demand projected at 130-570 TWh based on gov outlooks

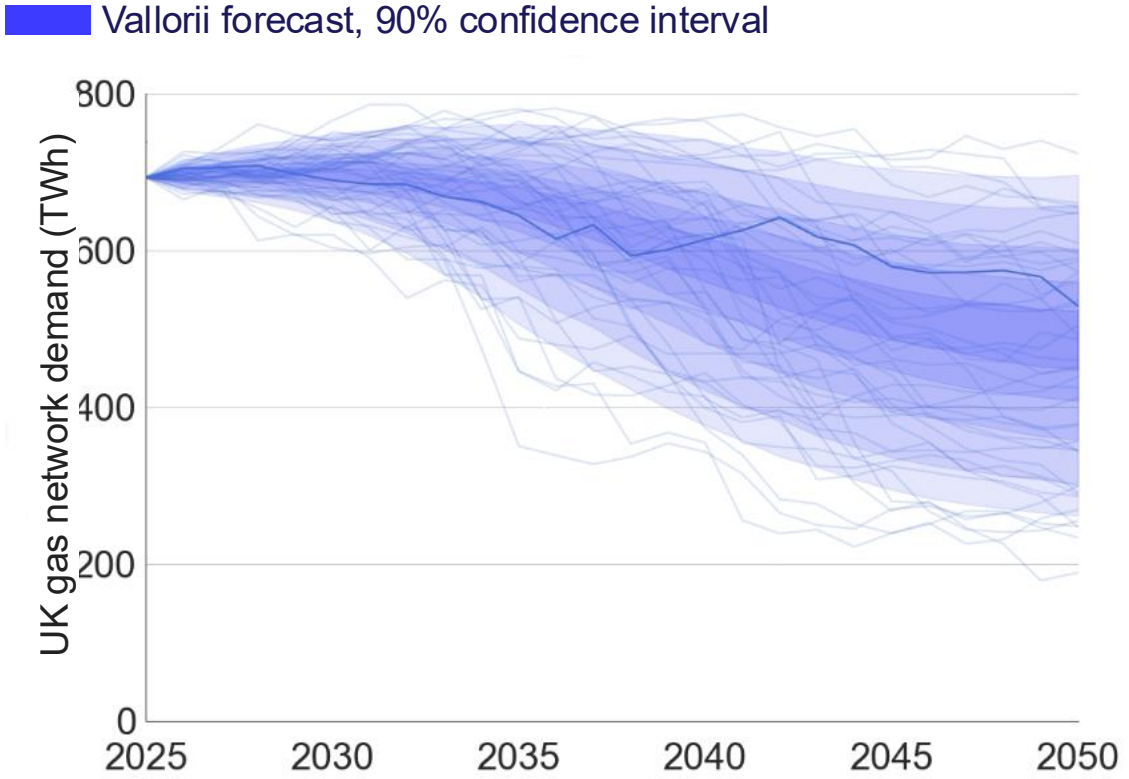
1. External scenarios consist of models from: AR6, AR7, NESO-FES 2024, DESNZ-EEP, CCC-6, CCC-7

(1) Demand for UK *gas network* projected to fall by 7-56%, as adoption of hydrogen and biomethane mitigates reduction in natural gas

Heat pump, Hydrogen, Biomethane adoption and blending can be forecast using Vallorii AI model

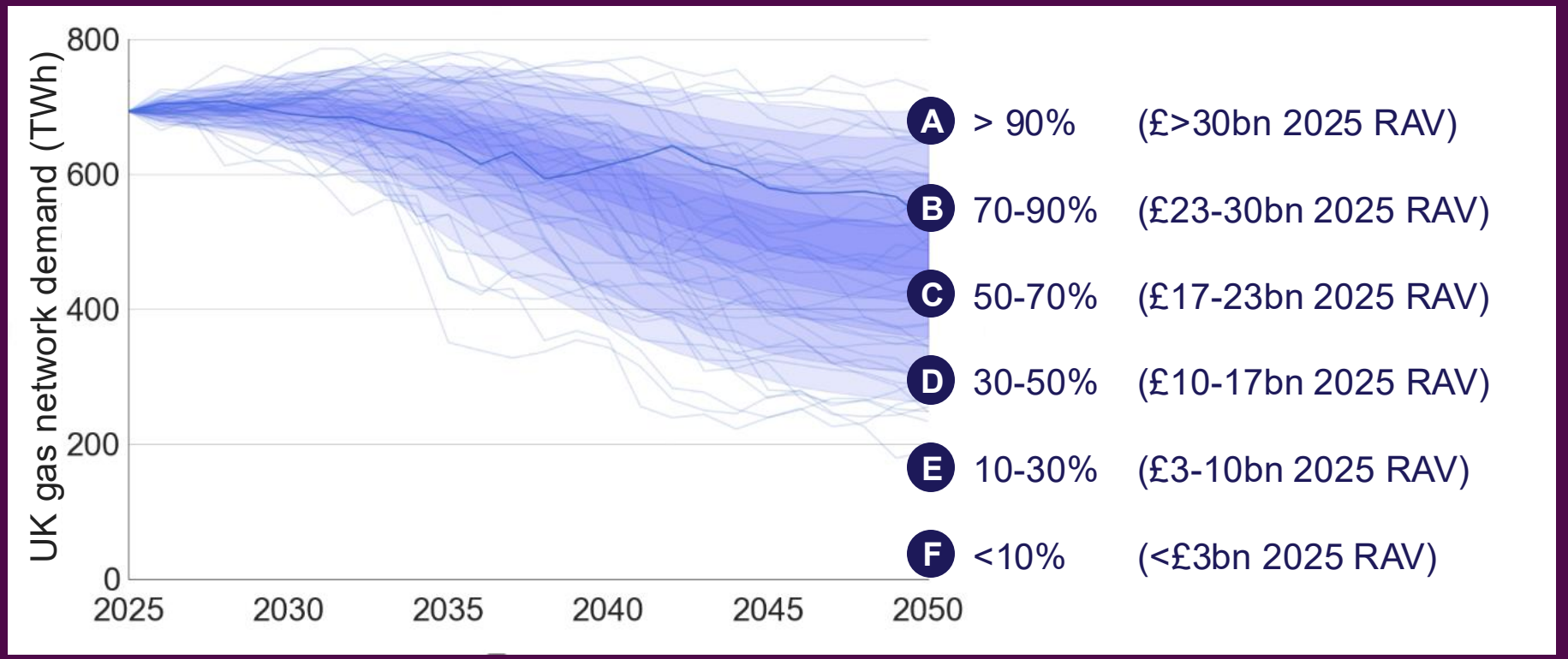


Current gas network size may continue to be required until 2050 due to growth in H_2 and biomethane

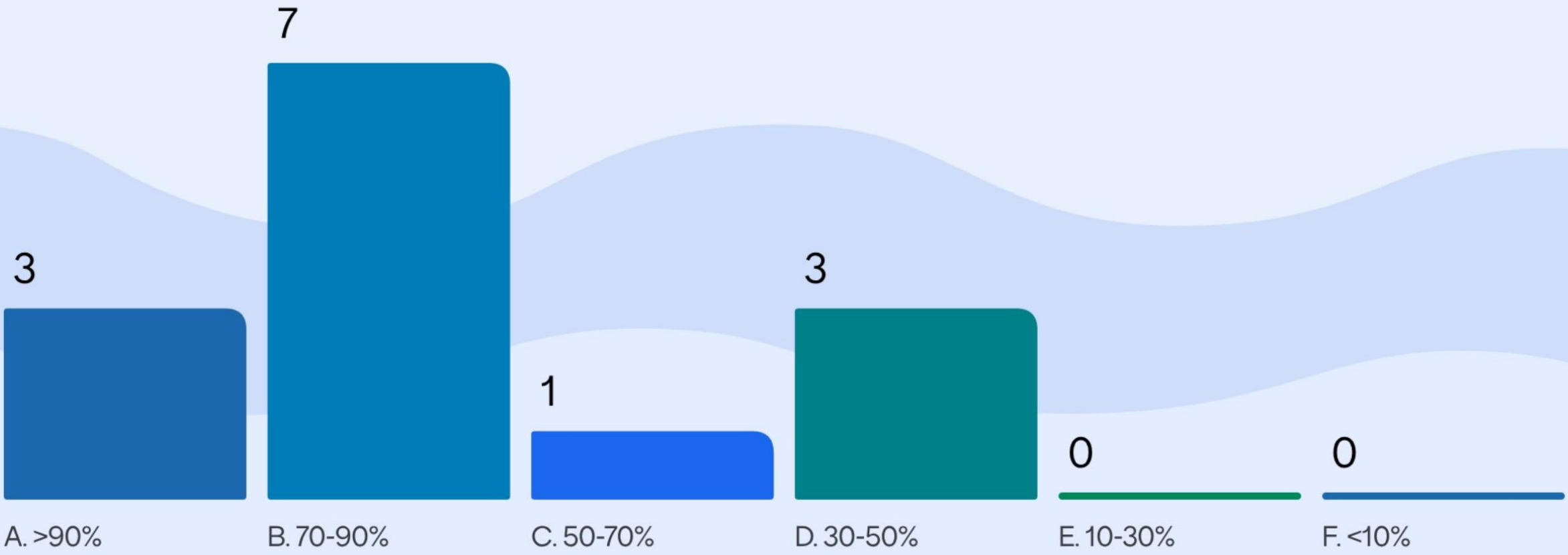


Sources: Vallorii analysis, based on data from heat pump and biomethane historical uptake data, long-term heat pump penetration assumed to be 30-100%, FES-2024 projects long-term hydrogen demand to be 60-270 TWh, gov biomass strategy forecasts long-term biomethane demand at 35 TWh while gas company projects 120 TWh, long term gas for elec. demand projected at 130-570 TWh based on gov outlooks

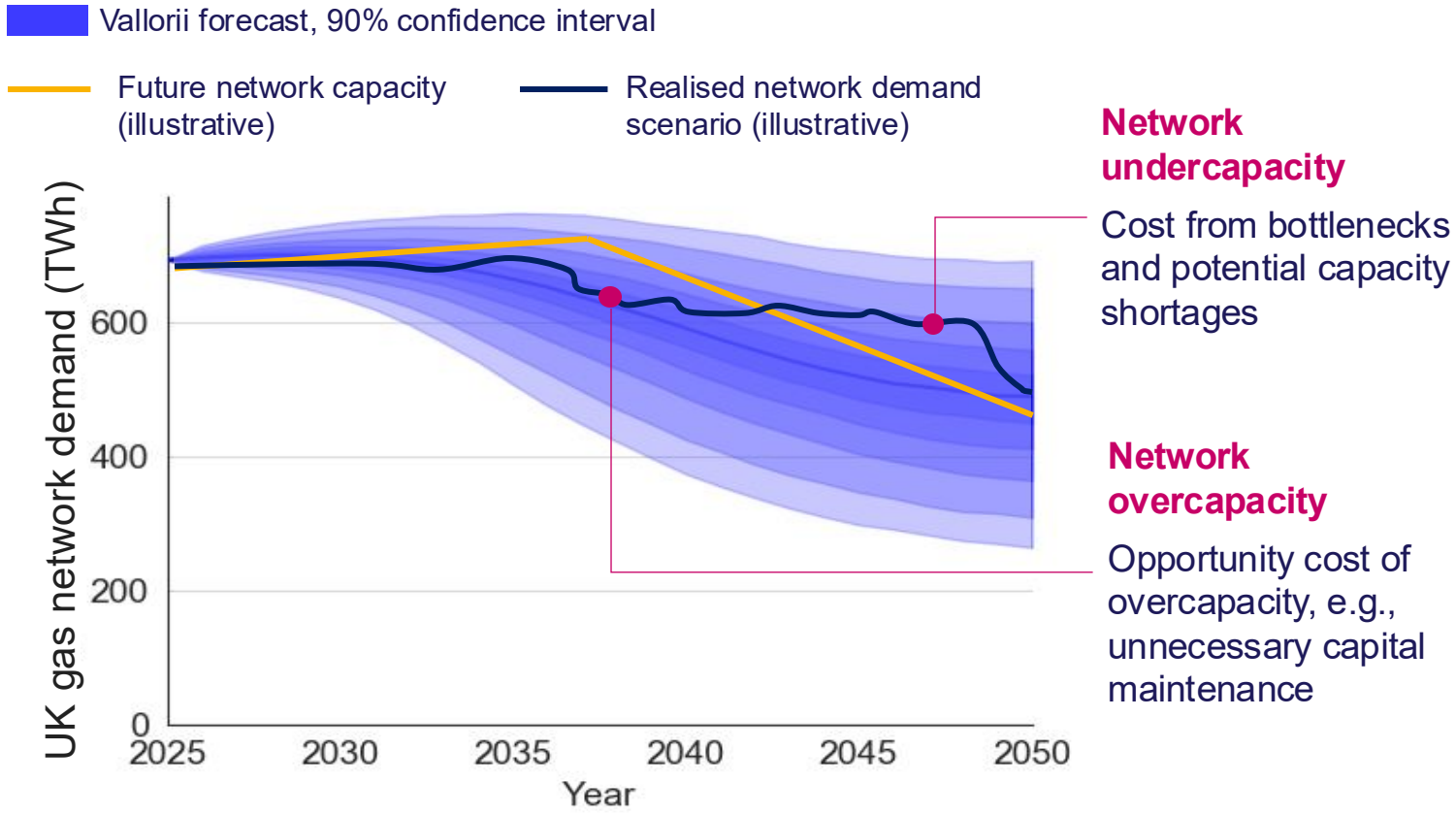
POLL: How much of today's UK gas network will be operating in 2050?



How much of today's gas network will be operating in 2050?



(2) Mismatches between network demand and network capacity are inevitable and will lead to societally costly bottlenecks or overbuild



Network undercapacity

Cost from bottlenecks and potential capacity shortages

Network overcapacity

Opportunity cost of overcapacity, e.g., unnecessary capital maintenance

Political & regulatory risk

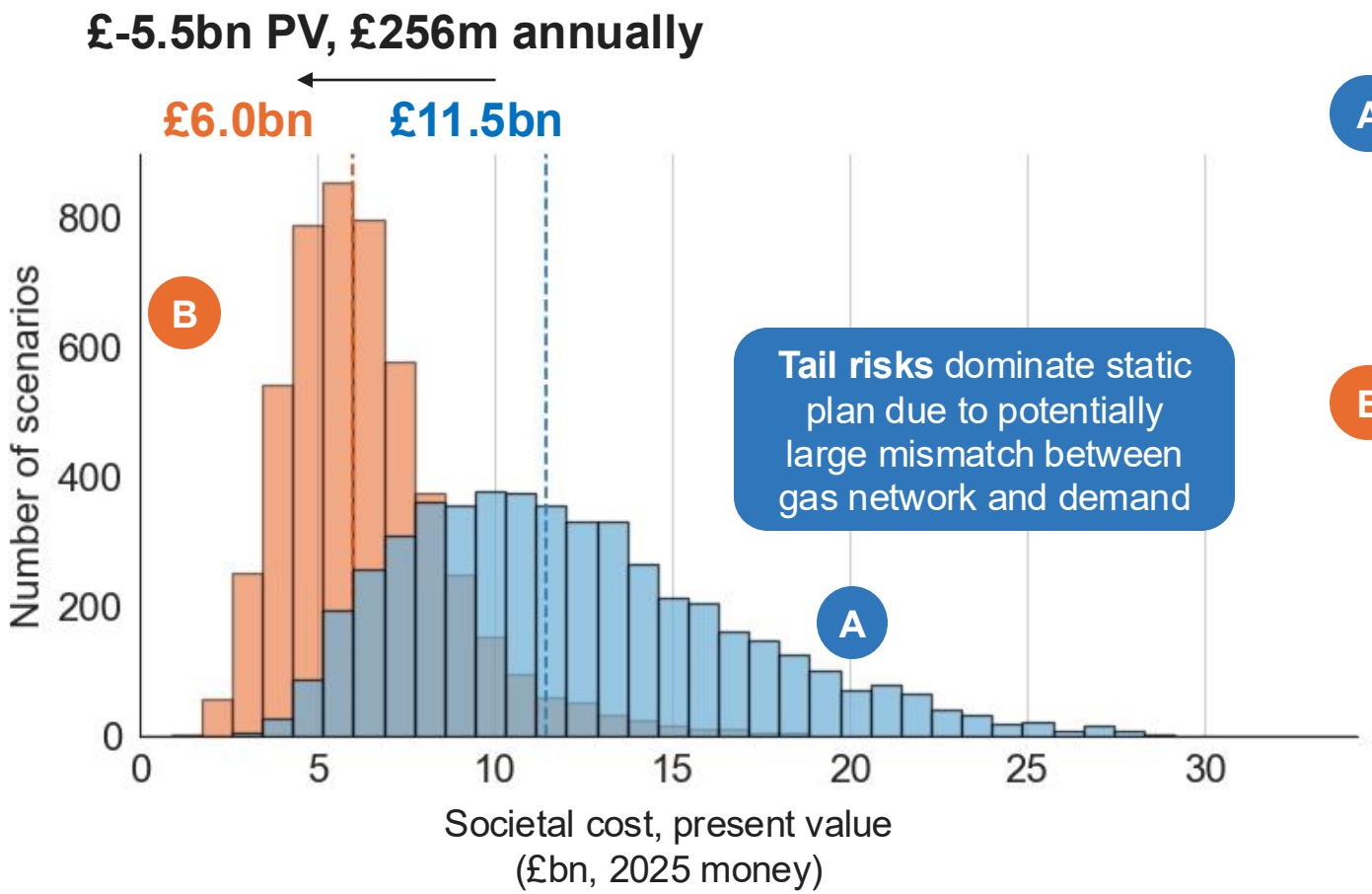
Who pays for over/undersupply?

- Supply/demand mismatch currently paid for by consumers
- This is not guaranteed until 2050 (e.g., drastic changes in prices, politics, volume)
- **Stranded asset risk** for investors

Sources: Vallorii analysis, based on data from heat pump and biomethane historical uptake data, long-term heat pump penetration assumed to be 30-100%, FES-2024 projects long-term hydrogen demand to be 60-270 TWh, gov biomass strategy forecasts long-term biomethane demand at 35 TWh while gas company projects 120 TWh, long term gas for elec. demand projected at 130-570 TWh based on gov outlooks

(2) Optionality reduces expected societal costs in the UK gas network by £5.5bn (16% RAV, £256m p.a.) by allowing network to adapt to demand

Distribution of societal cost over 5000 simulations



A **Static plan for the network (e.g., FE Scenario)**

- Decommission gas network and build out H_2 network on fixed timeline
- Large tail risks dominated by potential bottlenecks in gas supply

B **Flexible strategy that reacts to changes in molecule demand**

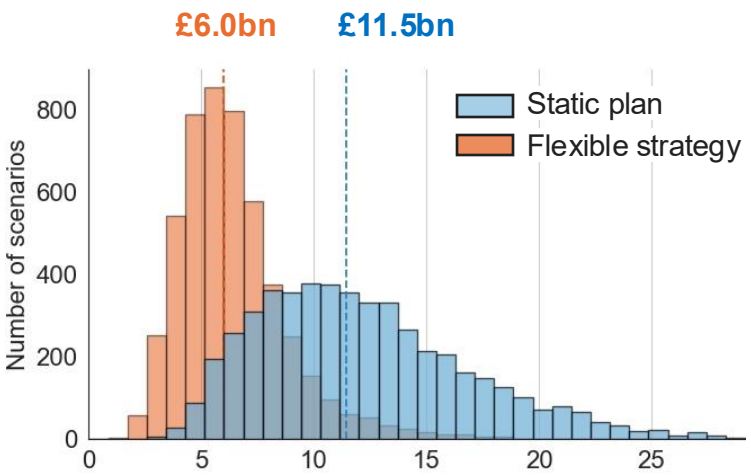
- Short-term growth in gas network
- Network is allowed to depreciate depending on actual gas demand
- £5.5bn societal value in gas network optionality today

Sources: Vallorii analysis, assumptions: 2% discount rate, hydrogen build-cost per unit of RAV is 1.3x that of gas (DeSantis et al, 2021), hydrogen assumed to have ~1/3 energy density compared to natural gas; demand based on data from heat pump and biomethane historical uptake data, long-term heat pump penetration assumed to be 30-100%, FES-2024 projects long-term hydrogen demand to be 60-270 TWh, gov biomass strategy forecasts long-term biomethane demand at 35 TWh while gas company projects 120 TWh, long term gas for elec. demand projected at 130-570 TWh based on gov outlooks

(3) However, planning flexibility also leads to 9% volatility in network capital value, driving up to 3% increase in CoE (£188m annual bill increase)

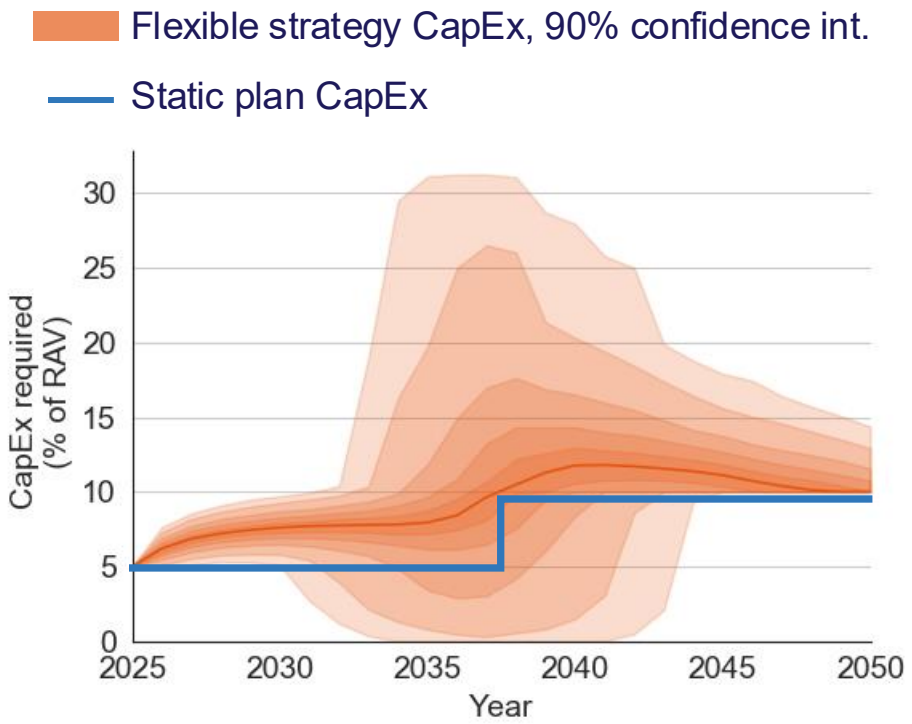
Optionality reduces expected costs of over/ under-supply by £5.5bn

Distribution of societal cost over 5000 simulations



Societal cost
(£ bn, 2025 money)

Optionality increases annual volatility in capital value to 9%



Plan	Capital Vol.	CoE
Static	5-7% historically	~6%
Flexible	9% 2033-2043	7.5-9%

Unknown CapEx schedule creates uncertain **timing & size of dividend schedule and RAV growth**

CAPM-consistent risk-aversion can be used to translate capital volatility to required equity returns

Sources: Vallorii analysis, assumptions: 2% discount rate, hydrogen build-cost per unit of RAV is 1.3x that of gas (DeSantis et al, 2021), hydrogen assumed to have ~1/3 energy density compared to natural gas; Demand based on data from heat pump and biomethane historical uptake data, long-term heat pump penetration assumed to be 30-100%, FES-2024 projects long-term hydrogen demand to be 60-270 TWh, gov biomass strategy forecasts long-term biomethane demand at 35 TWh while gas company projects 120 TWh, long term gas for elec. demand projected at 130-570 TWh based on gov outlooks

POLL: How do we best manage CapEx uncertainty throughout the energy transition?

Planning certainty

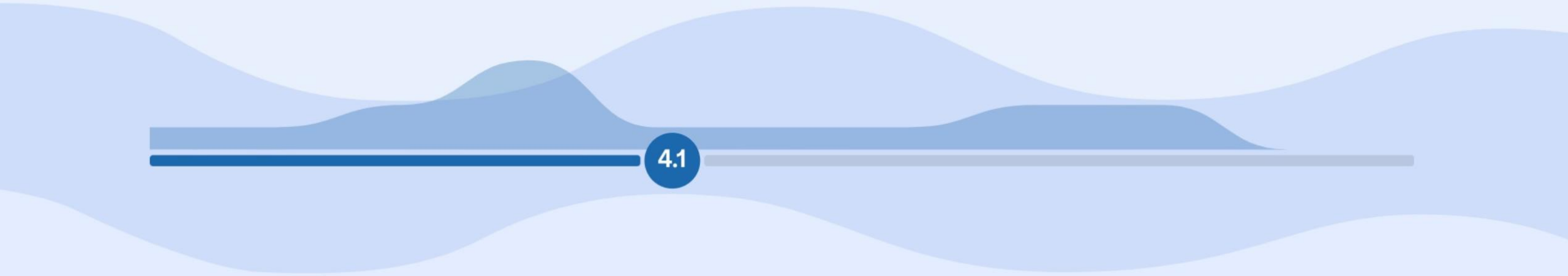
- Limited optionality
- High certainty in future CapEx
- Binding regulatory framework to provide long-term stability

Planning flexibility

- High optionality
- High uncertainty of future CapEx
- Flexible regulatory framework to react to changing market conditions

Further whole system design and collaboration between sectors could mitigate trade-offs and reduce peaks with e.g. hybrid heating, flexible storage, interconnectors

How do we best manage CapEx uncertainty throughout the energy transition?



Planning certainty

Planning flexibility

Vallorii uses AI to quantify impact of risks on valuation and CoE. Today we investigate CapEx volatility and system stability risks

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- Illiquidity risks
- Financial default risks
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- **System stability & Black Swans**

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- Operational risks
- Natural disaster risks
- Currency risks
- …

Case Study I

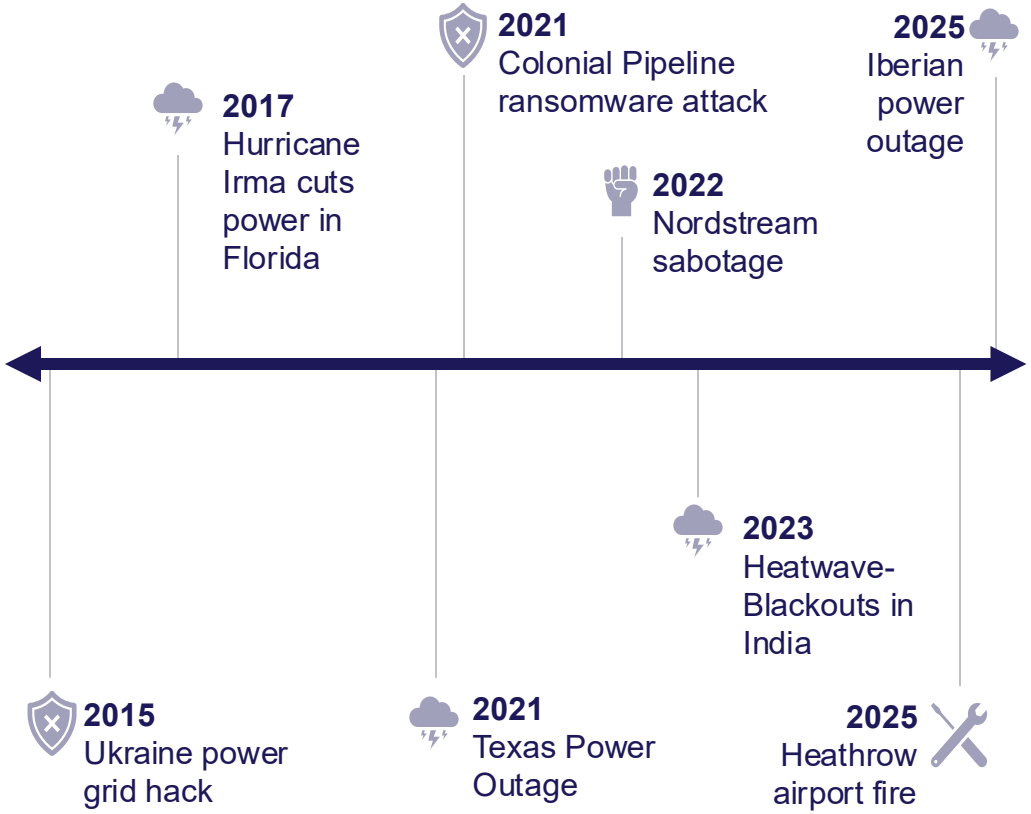
Future of **gas network** remains uncertain – leading to CapEx volatility

Case Study 2

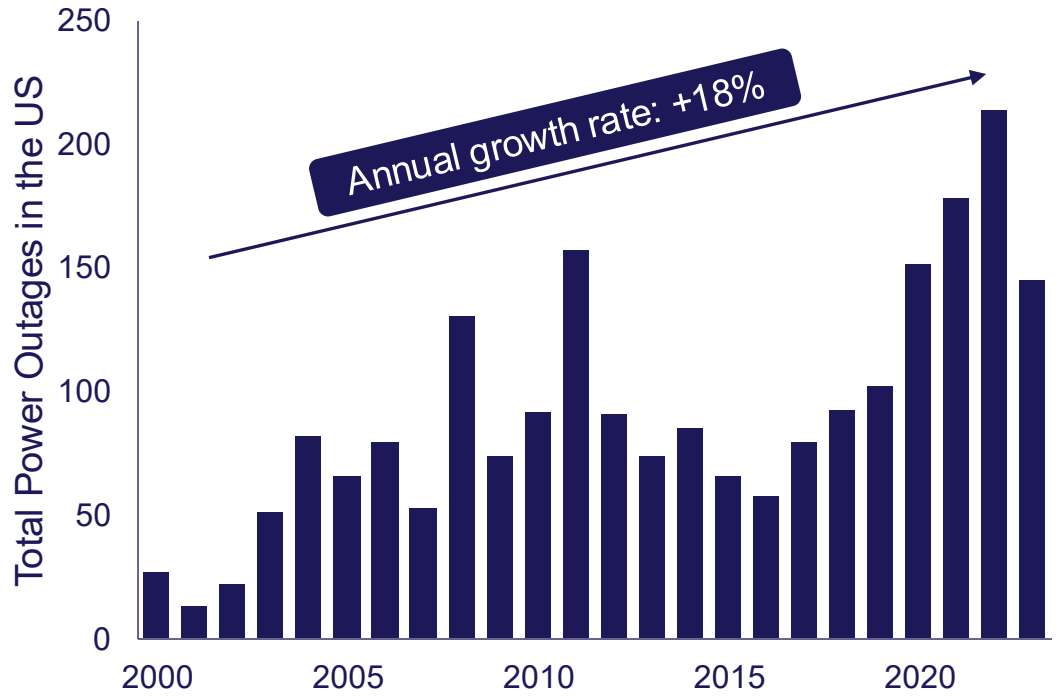
Transition uncertainty triples risk of black-swan disruption **to power grid**

Extreme disruptions to the electricity system have increased globally over the past 25 years

Extreme events make major disruptions more frequent



Power outages in US have grown by ~18% since 2000



Source: Weather-related Outages – Climate Central: Weather-related Power Outages Rising (2024), Financial Times: Iberian Power Outage, Texas Power Outage, Hurricane Irma, Gas Pipeline Sabotage; CISA: Cyber Attack Ukraine, Colonial Pipeline Attack ; Reuters: Heathrow Power Outage; Bloomberg: Long Blackouts Hit India as Heatwave Stokes Power Consumption

CoE ››› *Custom Iberian Comparators*

VALLORII

Cost of Capital Lab

Risk model selection

CAPM Custom

APT

Bottom-up

Results

CoE

CoE deep dive

CoD

CoD deep dive

What-if analysis

Forecasting

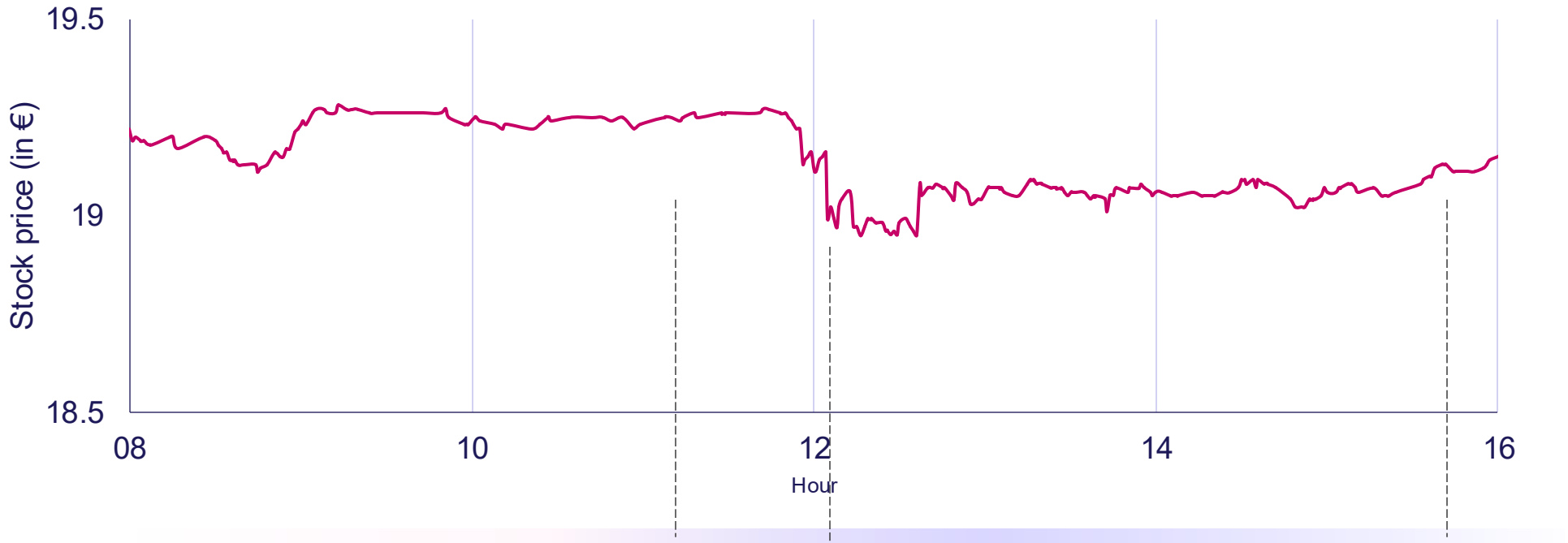
Reg. methodology documentation

Deep dive area Input data > ***Component*** Stock price

Vallorii's CoC Lab shows that Iberian stock prices show little volatility around blackout event

Red Eléctrica Stock Price

April 28, 2025



AI labelled events
Find out more ⓘ

11.33am: ***major power blackout*** *across Iberian peninsula*

Stock *of* ***Red Eléctrica drops by ~1.3%*** *as response to grid collapse*

Partial recovery *by end of trading day*

CoE ››› *Custom Iberian Comparators*

VALLORII

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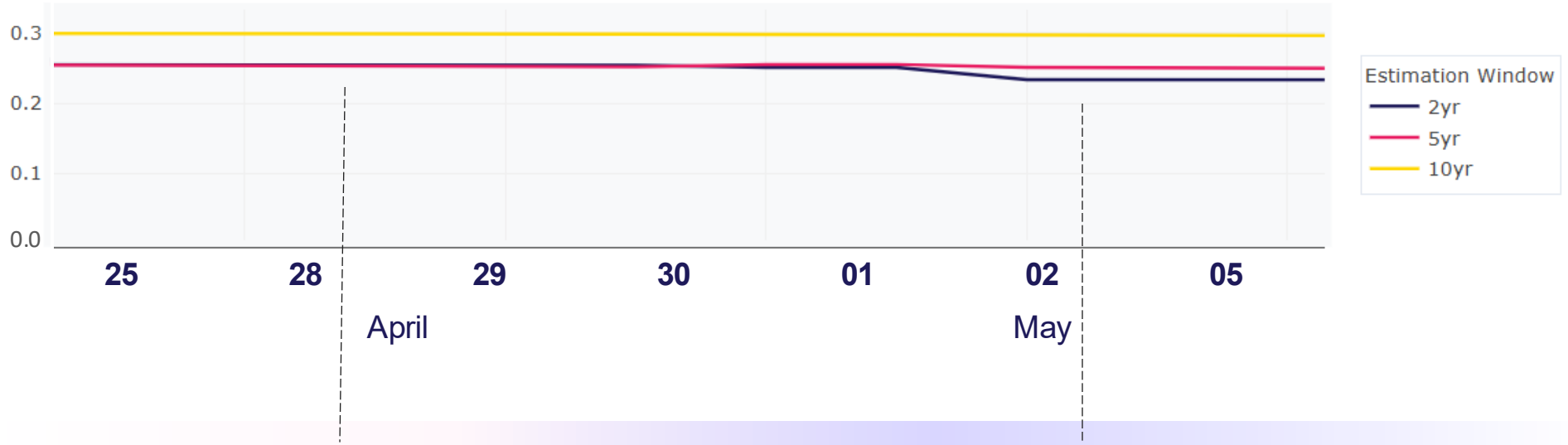
Deep dive area Beta › *Component* Unlevered

Vallorii's CoC Lab shows that Iberian comparator beta shows no significant change around blackout event

Red Eléctrica Unlevered Beta



AI labelled events
Find out more ⓘ

28 April: RED-ES unlevered beta, 2 year estimation window: ***0.255***

02 May: Correlation with market ***decreased,*** *RED-ES unlevered beta, 2 year estimation window:* ***0.233***

Vallorii leverages AI to forecast emerging risks of power outages that enable quantitative discussions on risk-sharing and resilience investments

1 Forecast energy transition risks

using top-down AI analysis and asymmetric risk profiles

2 Quantify risk and discuss allocation

among companies and consumers

3 Assess value-for-money of resilience investment

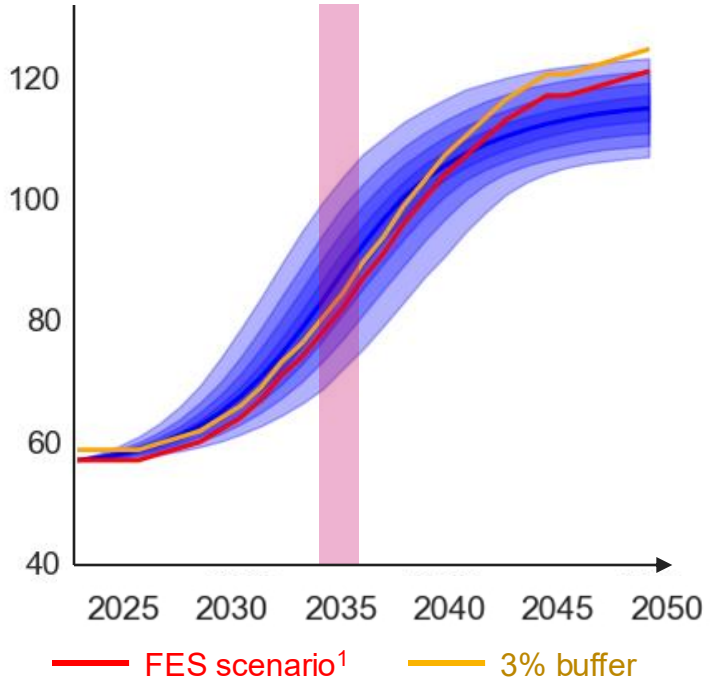
by determining cost and impact on resilience

(1) ML modelling shows that excess peak demand increases from 3% tail risk today to >9% in 2035 due to increasing stress on UK electricity systems

Future electricity demand most uncertain mid energy-transition

Vallorii forecast, 90% CI

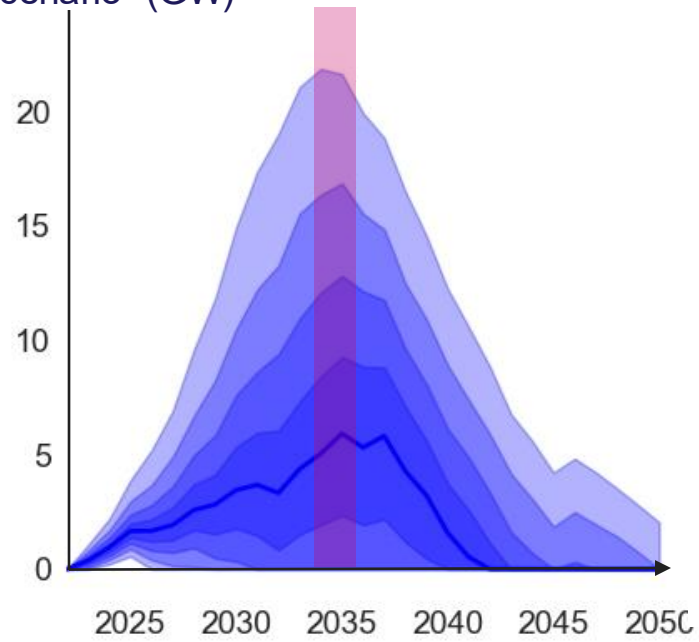
UK peak electricity demand forecast (GW, nameplate)



Excess demand risk peaks in 2035

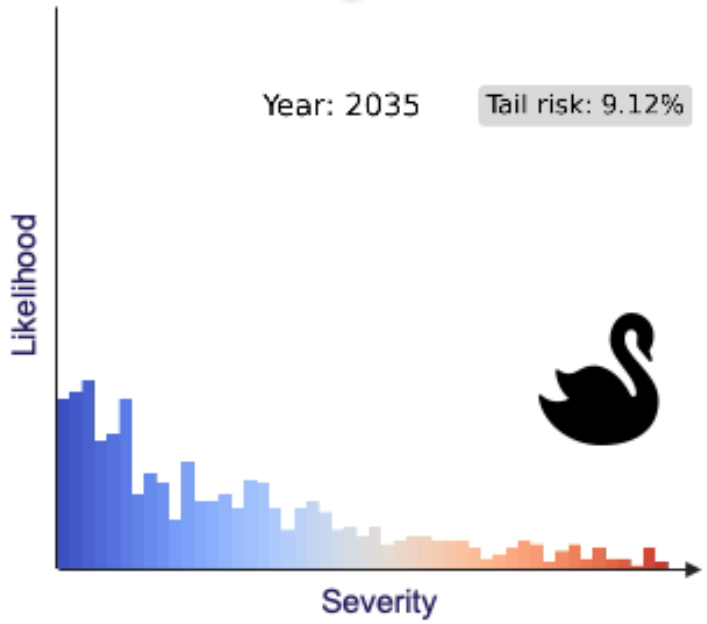
Vallorii forecast, 90% CI

Excess peak demand relative to FES scenario[1] (GW)



Excess demand increases likely-hood of black-swan events to >9%

Outage event severity over time



Sources: Vallorii analysis

1. FES 2024 Electric Engagement scenario

(2-3) Higher tail risk could add ~230bps to CoE for power-reliant infrastructure assets* if unmitigated

* Airports, datacentres, rail, EV charging, …

Risk-sharing mechanism

Consumers and industry bearing increasing risks (Higher losses)

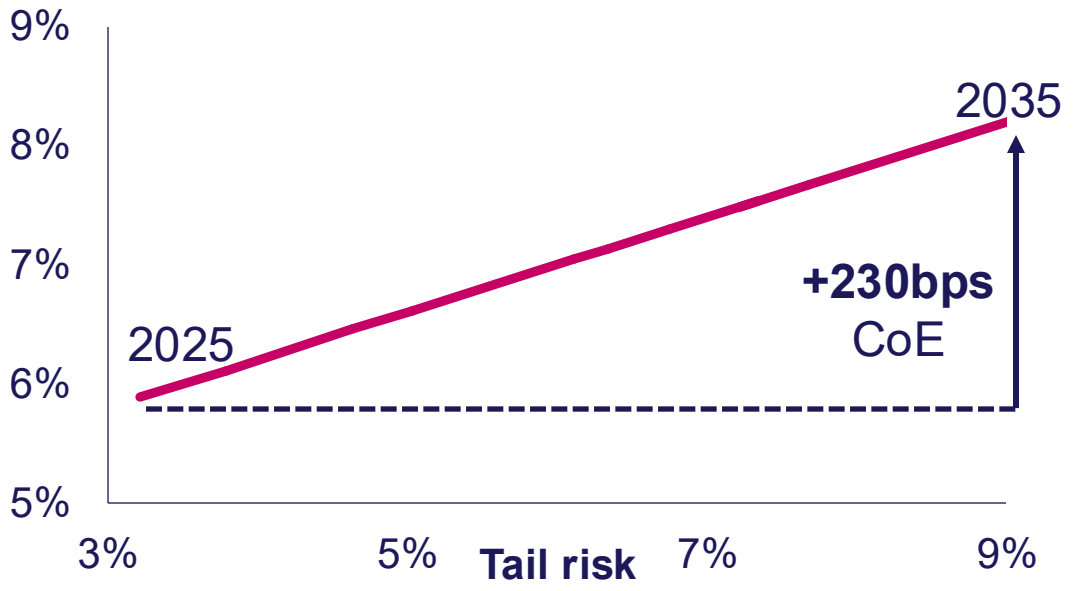
Current framework

Investors bearing increasing risks (Higher CoE & CoD)

More investments into resilience technologies (Higher CapEx)

Slower energy transition (Higher environmental damages and risks)

CoE as function of tail risk (% real)



$$CoE = C_0 + \lambda * \text{tail risk}$$

CoE impact of outage tail risk can be modelled as an additional risk-premium, λ is the coefficient of risk-aversion

Sources: Vallorii analysis

POLL: How do we manage potential system disruptions throughout the energy transition?

Risk-sharing mechanism

A **Consumers** and industry bearing increasing risks (Higher losses)

Current framework

B **Investors** bearing increasing risks (Higher CoE & CoD)

C **More investments** into resilience technologies (Higher CapEx)

D **Slower energy transition** (Higher environmental damages and risks)

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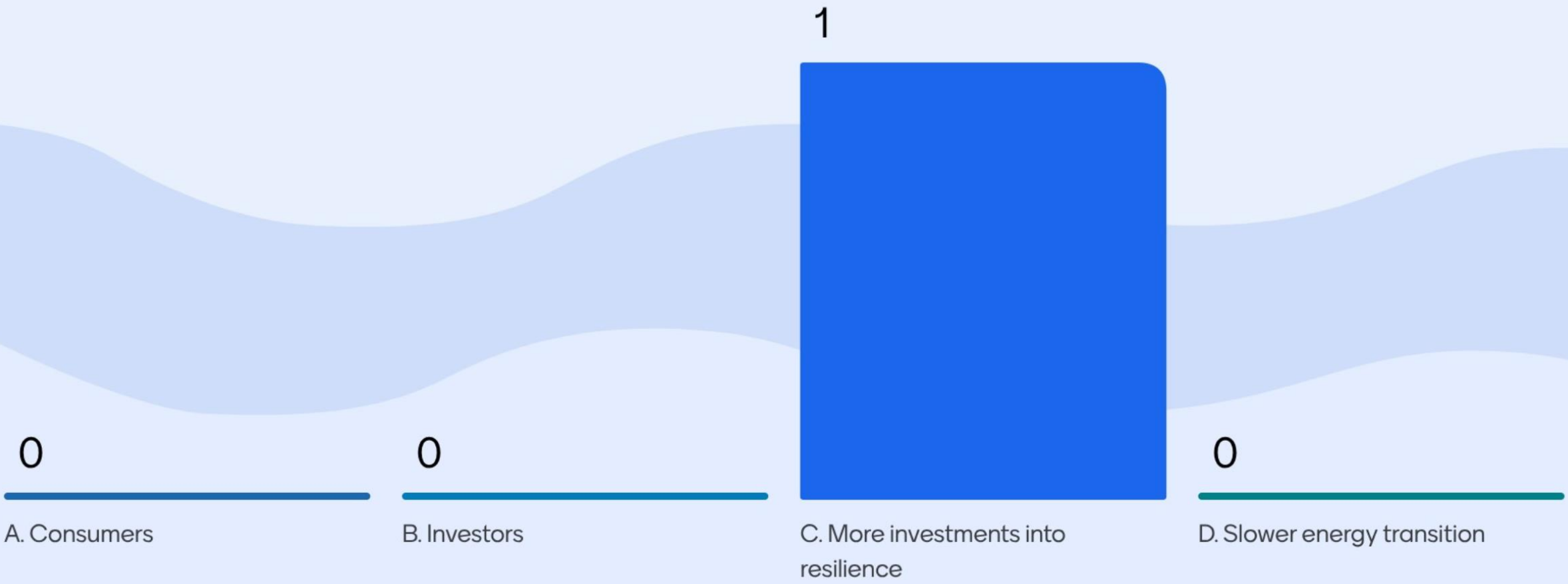
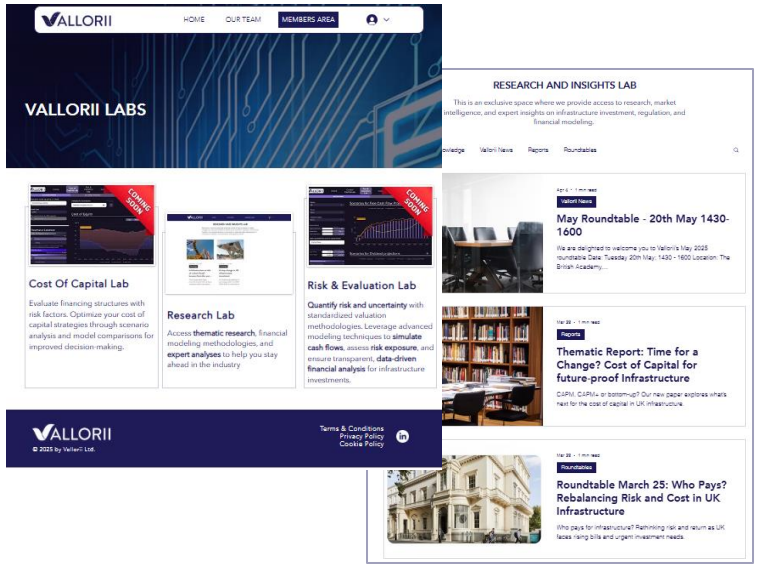
How do we manage potential system disruptions throughout the energy transition?



Progress since our last roundtable
Discussion with regulators, new publications, and live cost of equity tool

Membership and Events

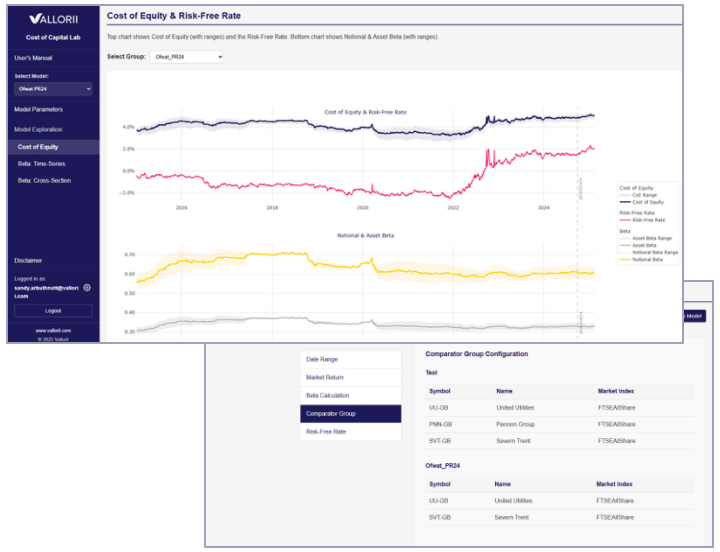


- More **Founder Members joined**
- **Cost of capital discussion** with UK government & regulators

Insights

- **CAPM thematic paper** circulated widely
- **Working papers** circulated for comments

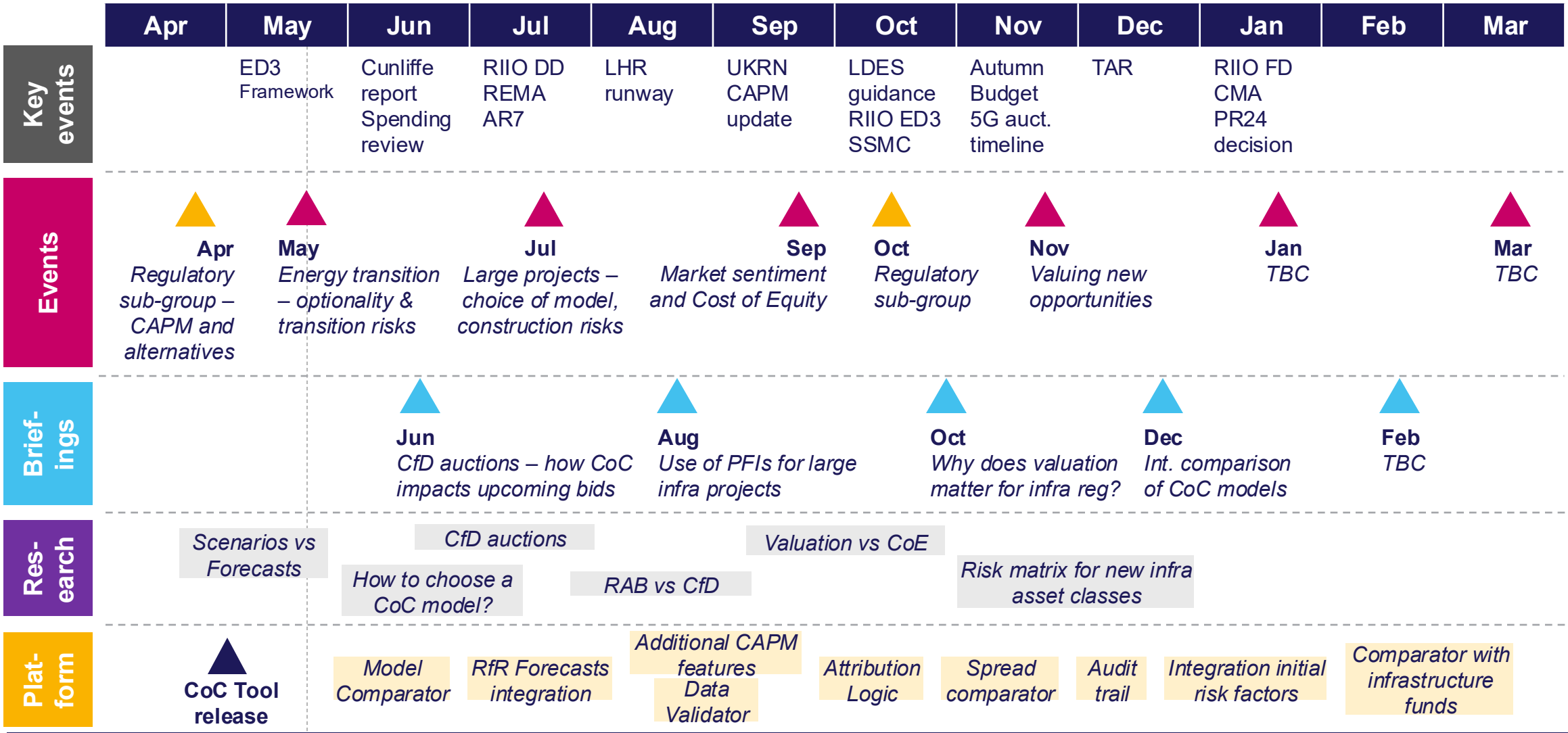
Analysis and tools



- **Fully interactive tool** on cost of equity launched (Ofgem, Ofwat)
- **Custom reports** available on demand

Source: Vallorii

Vallorii Membership – Outlook for 2025
Aligning risk and return; allocating risks to balance affordability/investability



Source: Vallorii

Upcoming Events

Dinner
12th June
7.00-9.00pm

CfD Workshop
TBC end of June

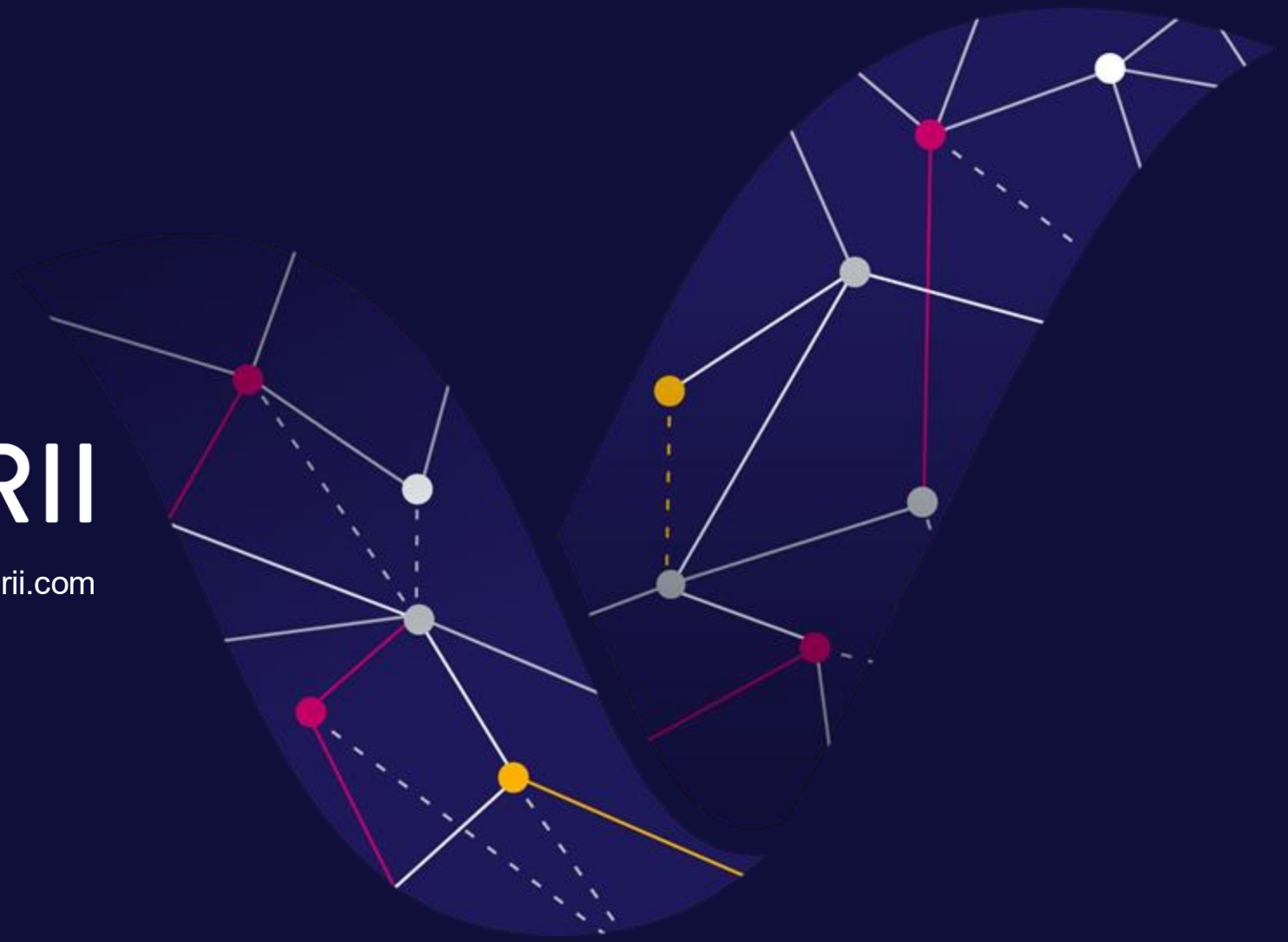
Roundtable
23rd July
3.00-4.30pm

Thanks for your participation today

We welcome your feedback

We'd greatly appreciate your feedback

Please take 30 seconds at the end of the discussion to let us know your thoughts



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