

A vision for 2050 and implications for today

Benjamin Collie
Aurora Energy Research

@AuroraER_Oxford #AuroraSummit



Achieving a net zero emissions target has risen up the international policy agenda

Targets from Paris Agreement at COP21 (2015)

Agreement to keep global temperature rise well below **2°C** above pre-industrial levels

Agreement to pursue efforts to limit temperature increase to **1.5°C**

Global requirements from IPCC special report (2018)

Net zero emissions by 2075

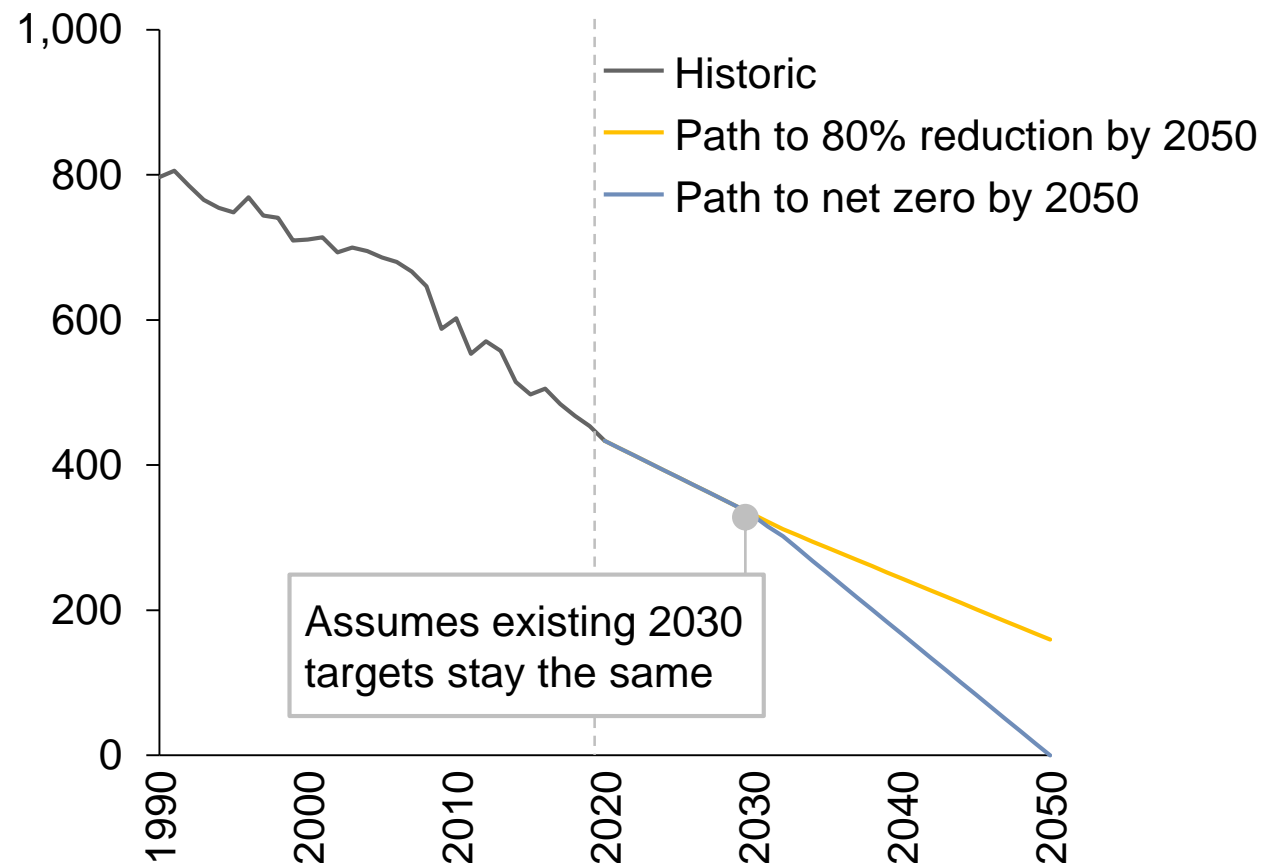
Net zero emissions by 2050

Leadership by the UK could raise ambition elsewhere by:

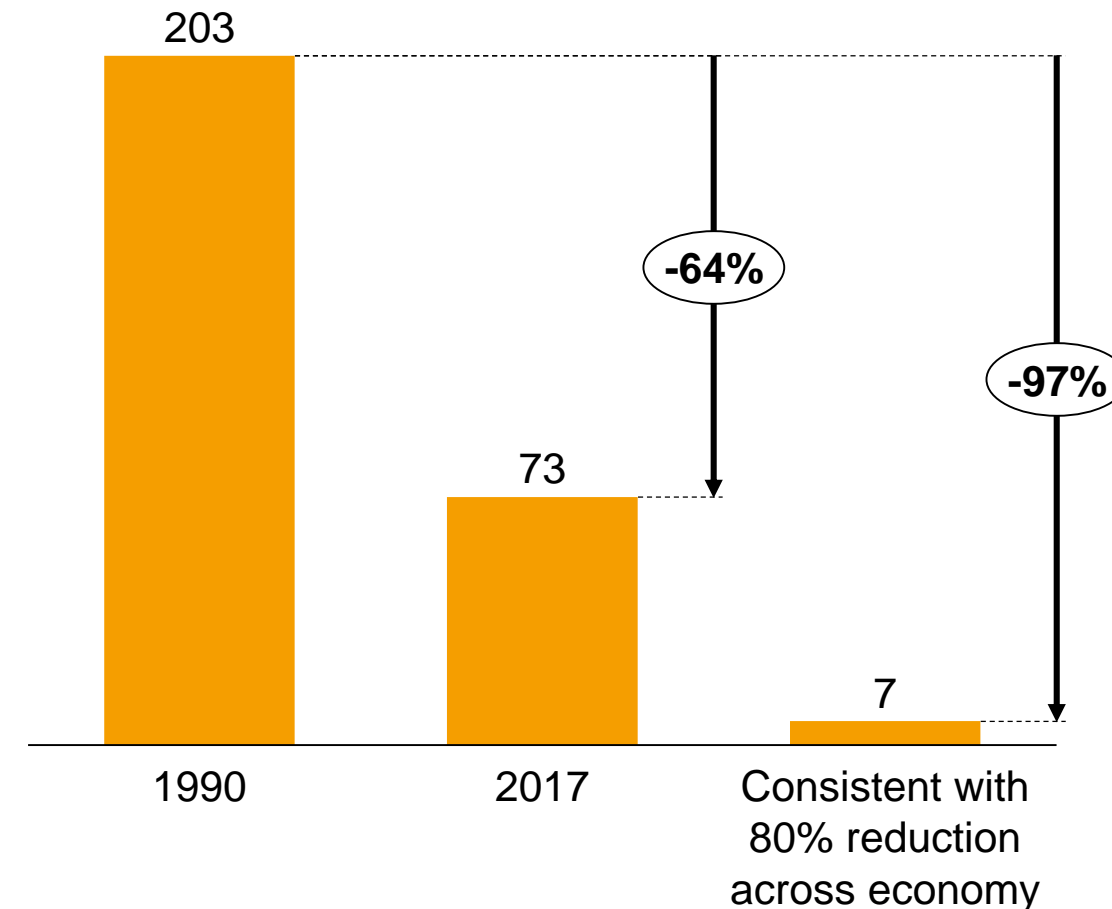
- Developing technology and bringing costs down
- Identifying barriers and solutions in the design of networks, markets and policies
- Demonstrating benefits

The Committee on Climate change has proposed that the UK aims for net zero greenhouse gas emissions by 2050

UK annual CO₂ emissions, Mt

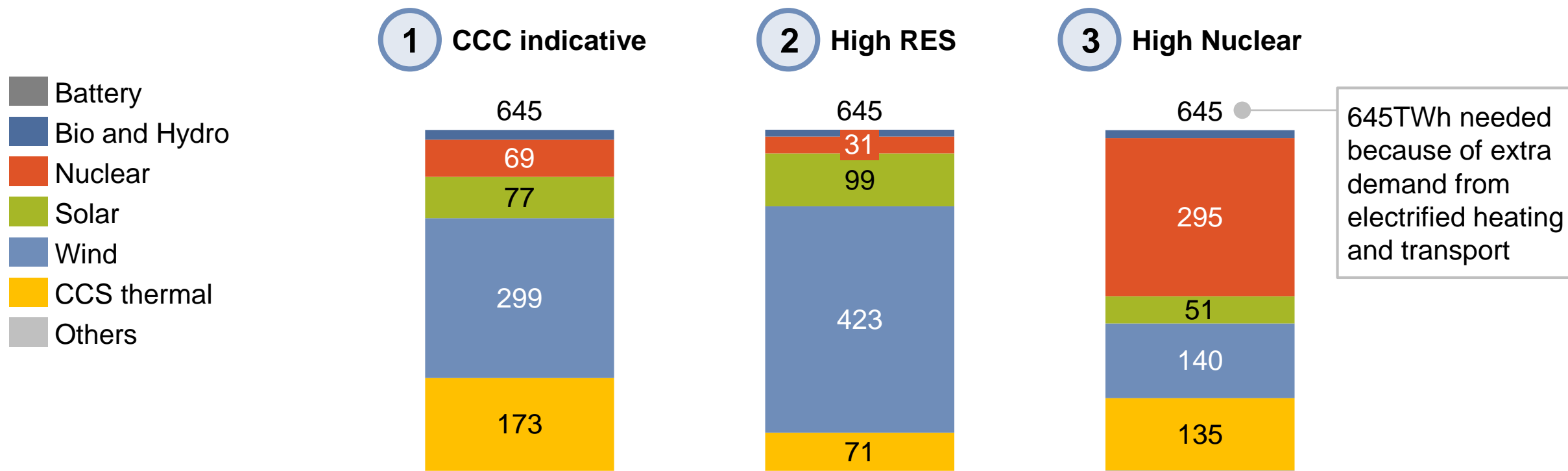


UK power sector annual CO₂ emissions, Mt



Net zero is achievable if CCS can be deployed fast enough to provide the required low-carbon flexibility

Net zero scenarios for 2050 generation mix,
TWh



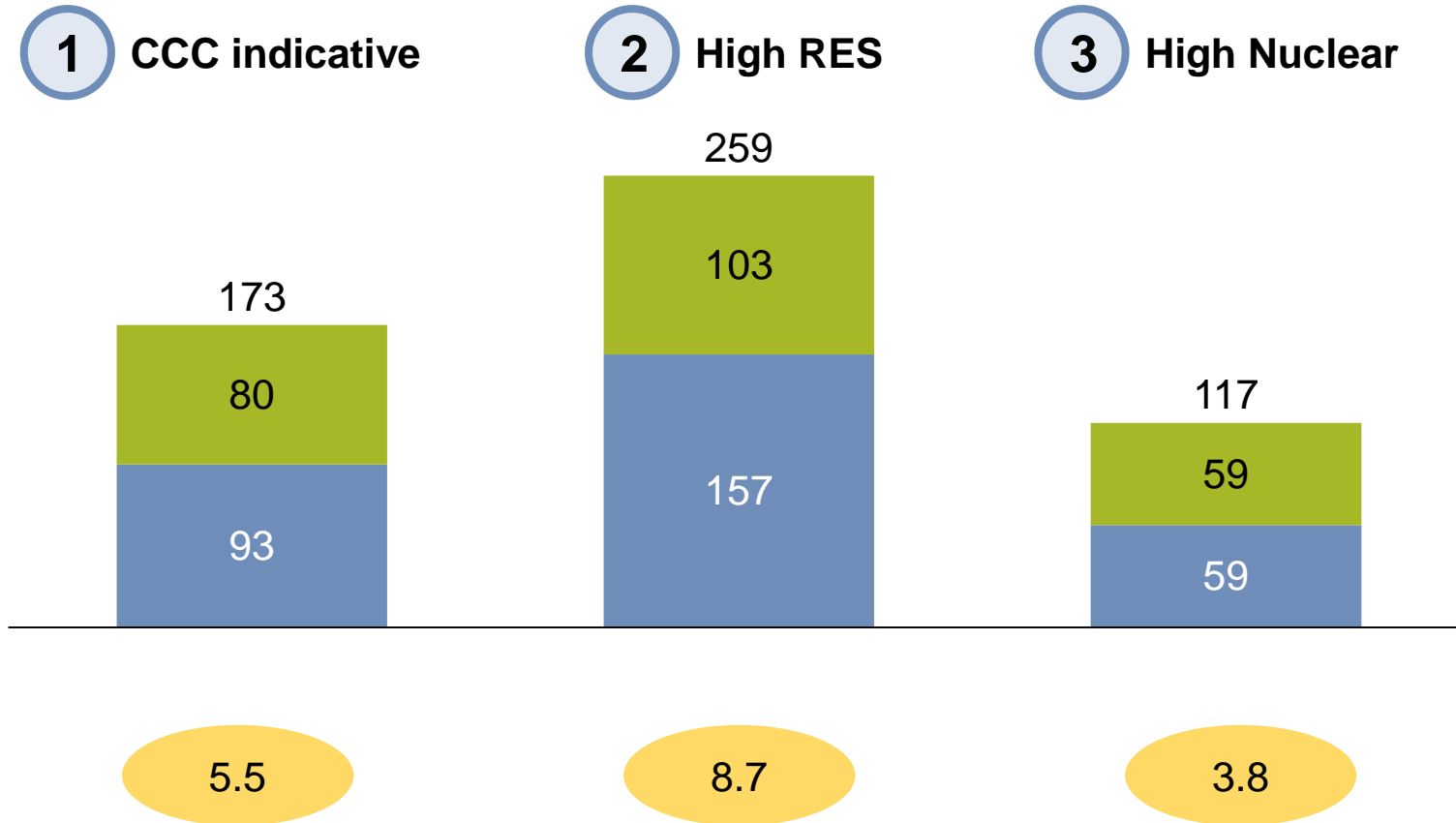
Sources: Aurora Energy Research, "Net Zero Technical Report", Committee on Climate Change, May 2019

Note: "CCC indicative" scenario is designed to give roughly the generation mix indicated in the CCC report, but is not based on precisely the same capacity mix

Achieving net zero would require an average of £4bn - £9bn of capital investment in renewables per year until 2050

2050 renewable capacity,
GW

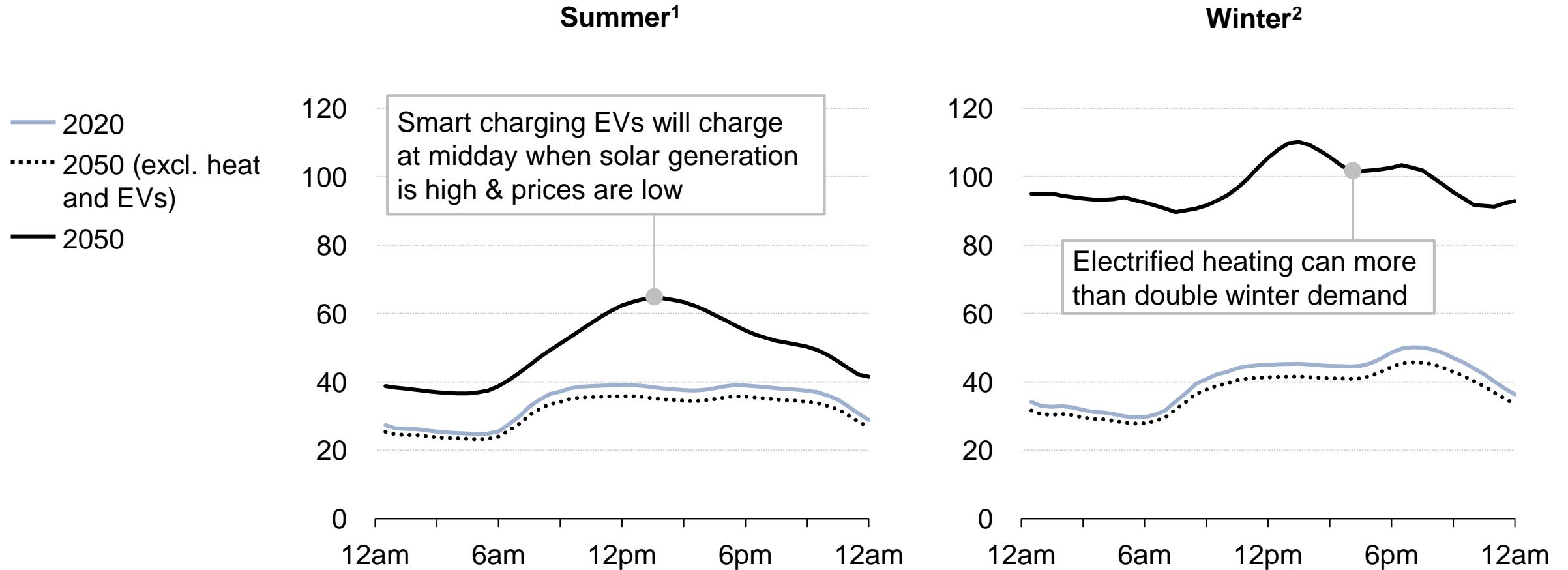
Solar
Wind



Average annual capital investment 2018 - 2050, £bn, real 2018

Renewables' economics will depend on the profile of demand, which will change over time as heat and transport electrify

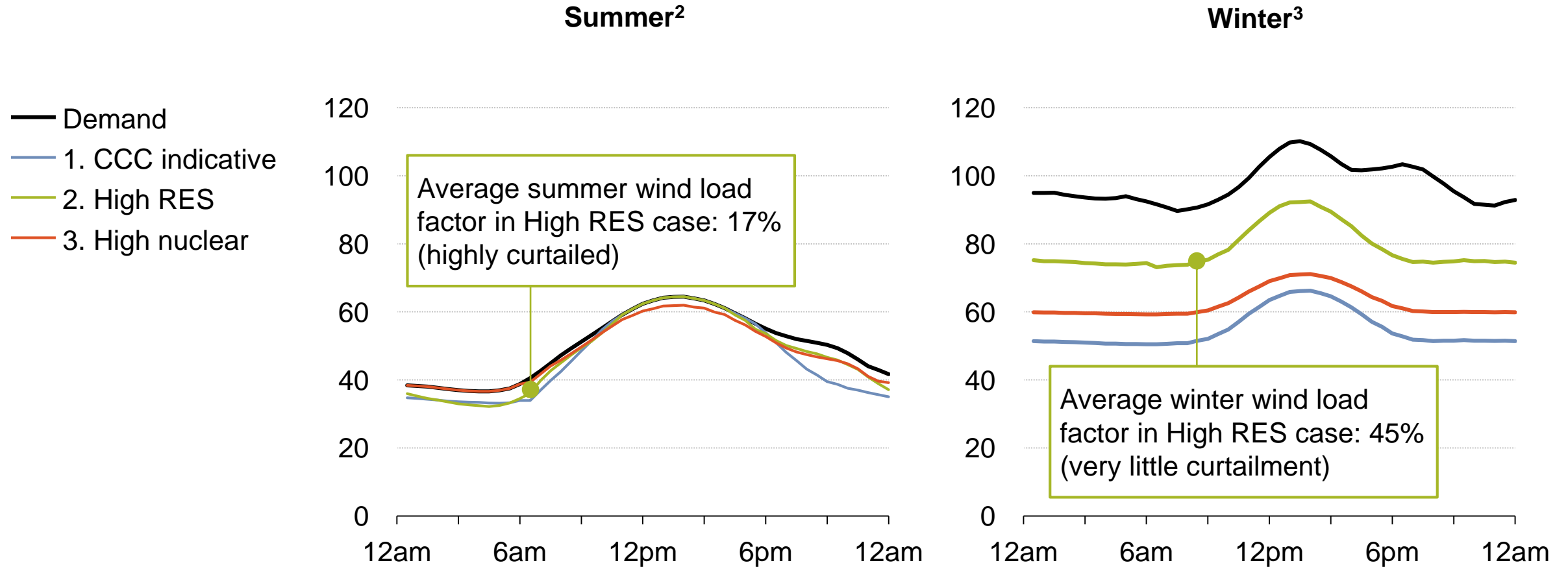
Half hourly demand profile, GW, average day



1. Average between April and September. 2. Average between October and March
Source: Aurora Energy Research

Renewables will typically profit in winter when CCS sets the price, but summer will see lower prices and more curtailment

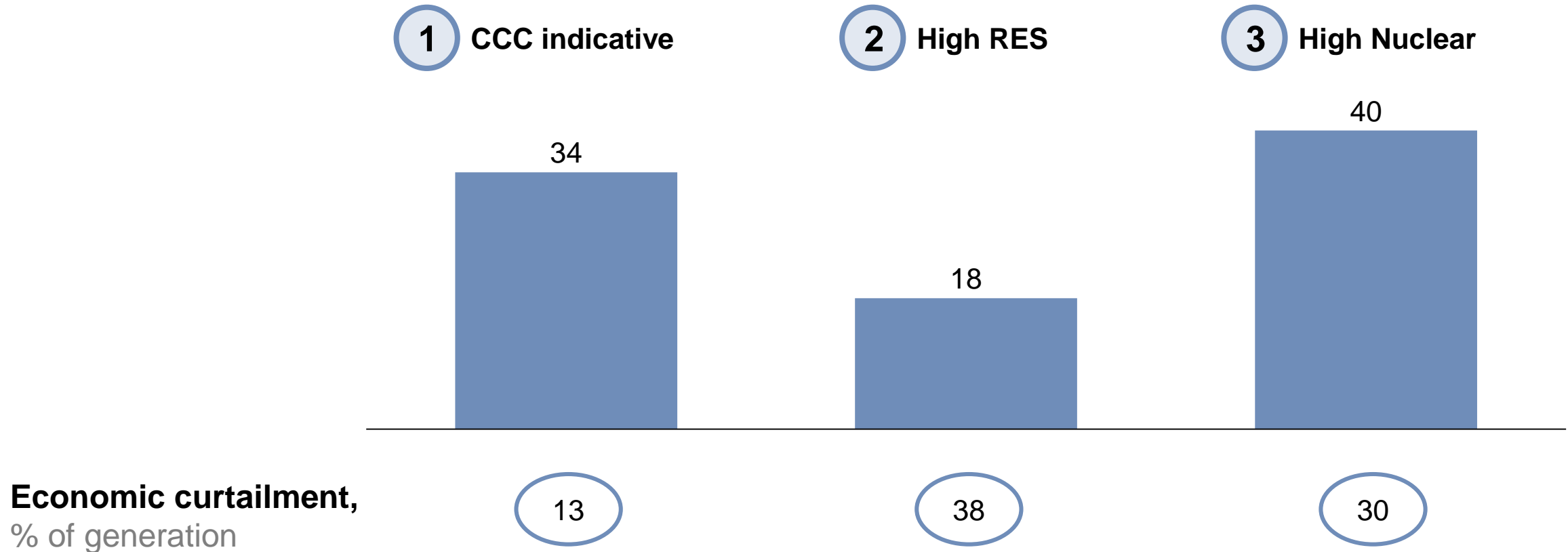
Portion of half hourly demand met by low marginal cost supply¹ in 2050,
GW, average day



1. Total average generation from onshore wind, offshore wind, solar and nuclear, after curtailment 2. Average April - September. 3. Average October - March
Source: Aurora Energy Research

A high renewables scenario implies material cannibalisation; this is mitigated in scenarios with more CCS and nuclear

Wind power capture price in 2050,
£/MWh, real 2018



Technology will narrow the gap between costs and revenues for renewables, but policy measures will be needed to close it

Technology improvements could narrow the gap, but are highly uncertain

Could lower costs of renewables

- Faster than expected CAPEX or OPEX declines

Could raise capture prices for renewables

- Faster than expected load factor improvements
- Cheaper storage to reduce curtailment and cannibalisation
- DSR, smarter networks, aggregators

Policy support for renewables revenues would carry different levels of exposure to market forces

More market exposure for RES

- Higher carbon prices
- Equivalent Firm Capacity auctions
- Renewable Obligation Certificates
- Floor prices
- Contracts for Difference

More transfer of risk to government

Policy decisions in the next couple of years could provide clues to the pathway we will follow towards net zero

Potential key future decisions

1 Renewables



- Increase in CfD budget to support offshore wind sector deal (30GW by 2030)
- Access to CfD auctions or price floor support for onshore wind and solar

2 Nuclear



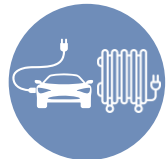
- Direct government investment in projects (as considered for Wylfa)
- Introduction of Regulated Asset Base model for future projects

3 CCUS



- Increase in ambition of CCUS deployment: multiple facilities commissioned in 2020s
- Design of adapted CfD or alternative funding mechanism for CCUS

4 Transport and heat



- Earlier date for all new cars to be zero emission: e.g. 2030 or 2035 instead of 2040
- Support for electrification of heating in existing building stock

5 Carbon pricing



- Guidance for steeper pathway for UK carbon prices
- Concerted diplomatic programme to allow the introduction of border adjustment taxes

Investors and industry should position themselves in readiness for the likely scale of future change

What successful market participants will do to prepare for the future



Investors

- Build portfolio across renewable and flexible technologies
- Adjust strategy based on potential policy change
- Plan to track and adjust as costs develop
- Assess merchant renewables rigorously



Developers and Utilities

- Co-locate with storage, peaking plant or demand
- Seek scale through alliances or mergers
- Integrate generation and trading vertically
- Form R&D alliances with academia and start-ups
- Gain early experience in deploying new technologies

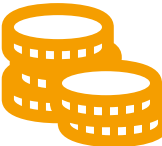
Renewables are key to decarbonising the UK; their future success depends on today's policy and business decisions



- The UK can help limit global warming through a target to reach net zero emissions by 2050



- This could create an average annual investment opportunity of £4bn - £9bn in UK renewables



- Deployment on this scale will push down capture prices, making the economics of renewables challenging



- This challenge can be resolved: the government will face a choice of policies involving different levels of risk transfer

A vision for 2050 and implications for today

Benjamin Collie
Aurora Energy Research

@AuroraER_Oxford #AuroraSummit

