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Developing a market to deliver reliable cost-effective decarbonised electricity

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Westminster Energy & Environment Forum
Virtual
28th February 2022

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Messages

- Net zero requires massive investment
- Low-C is capital intensive
  - **the key to lowering cost is lowering cost of capital**
- Renewables – support needs reform
  - Need **better hedge** against uncertain future prices
- Nuclear – RAB model
- Flexible gas: capacity auction + ancillary services

=> **Hybrid markets**:

- competition **for** the market (auction LT contracts)
- then competition **in** the market

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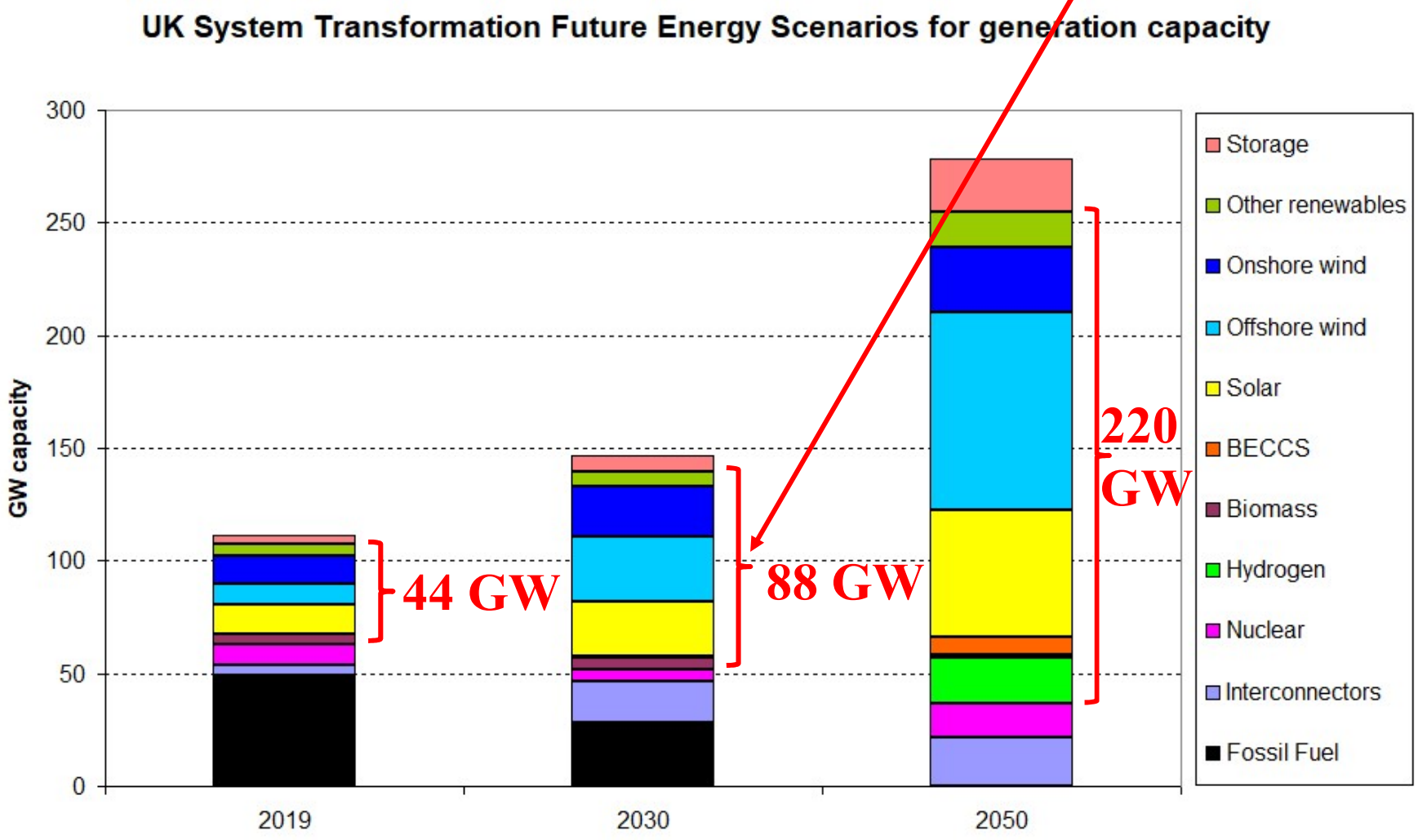
UK renewable electricity capacity to *double* by 2030



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Long-term contracts to replace missing futures markets

Variable Renewable Electricity (VRE- wind, PV):

- Avoid distorting location decisions
- Encourage short-term response to market
- Offer assured revenue to deliver **low WACC**
  - hedge against **uncertain future prices** set by fossil fuels
- VRE contract instead of CRM payment

Flexible controllable fossil

- Efficient flexibility/ancillary service payments
- Procure sufficient firm capacity in Capacity Auction

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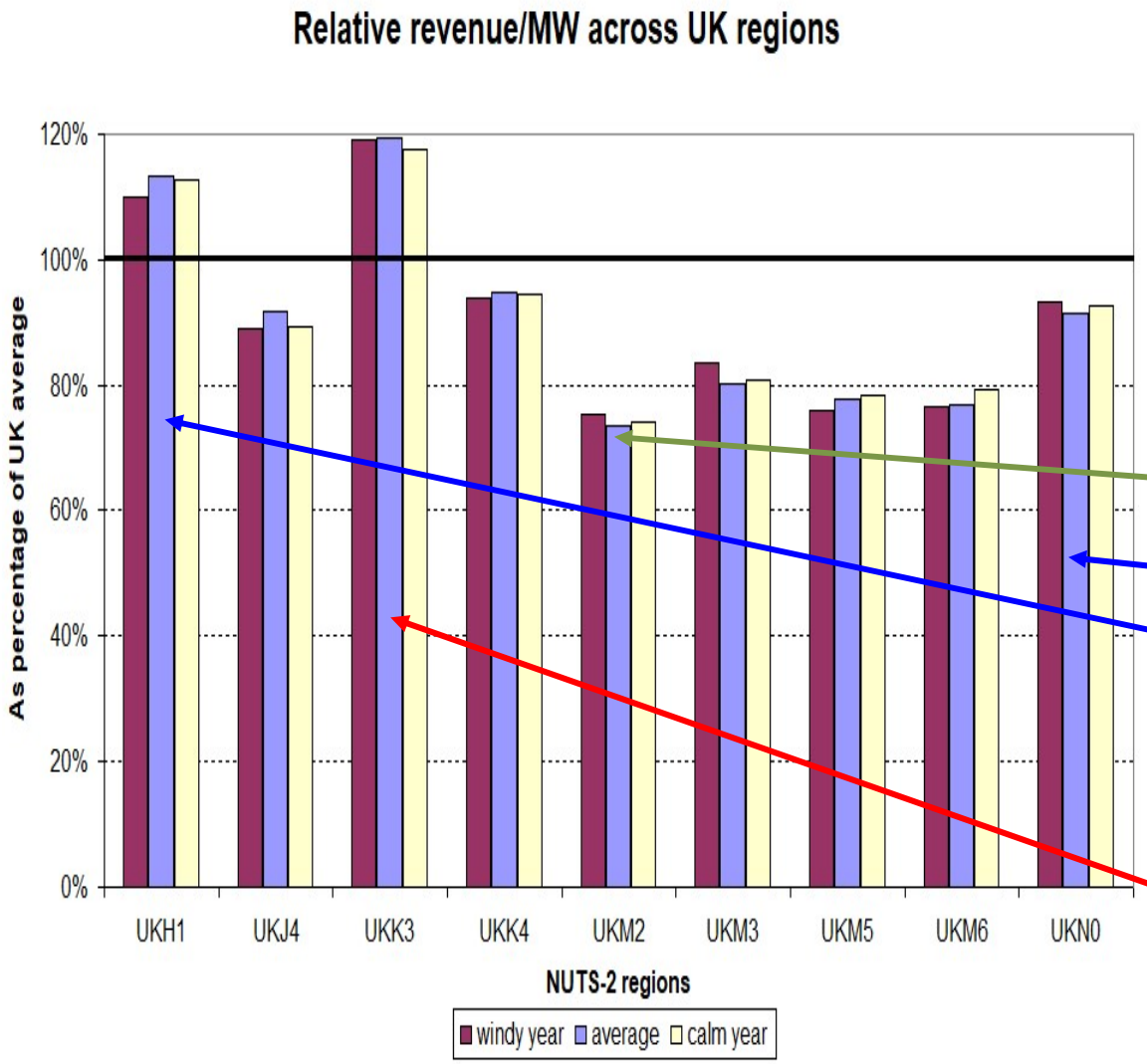
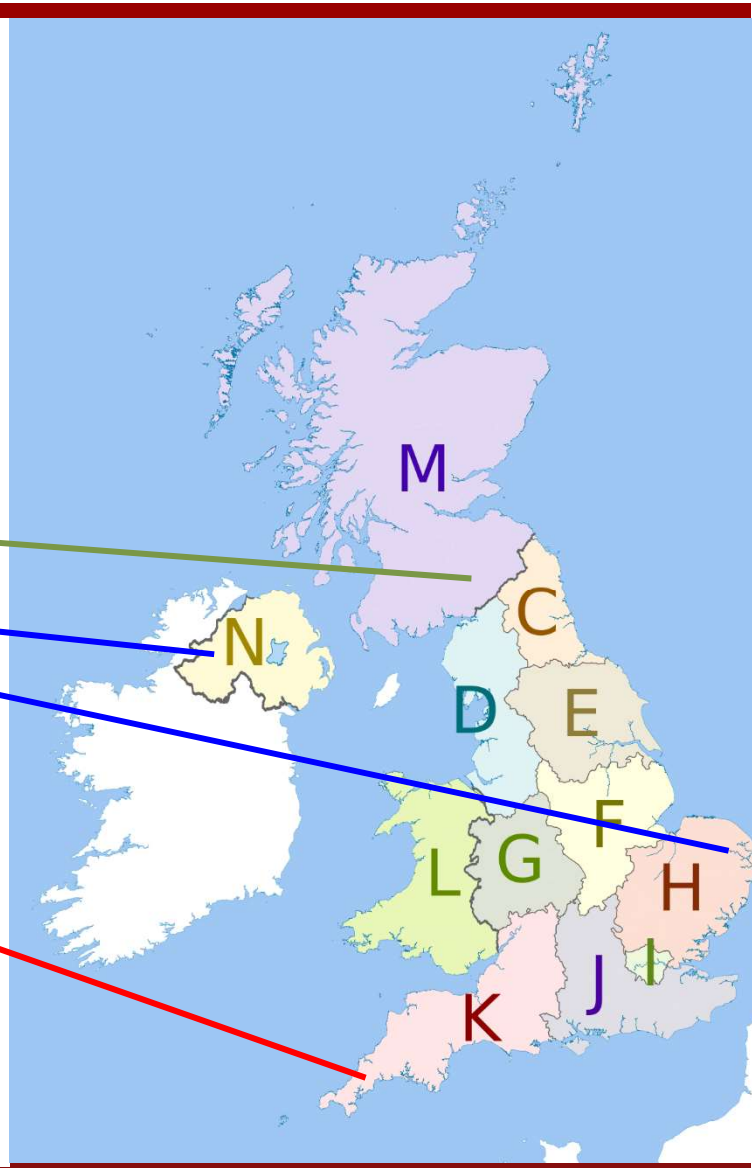
Output and value/MW vary with location





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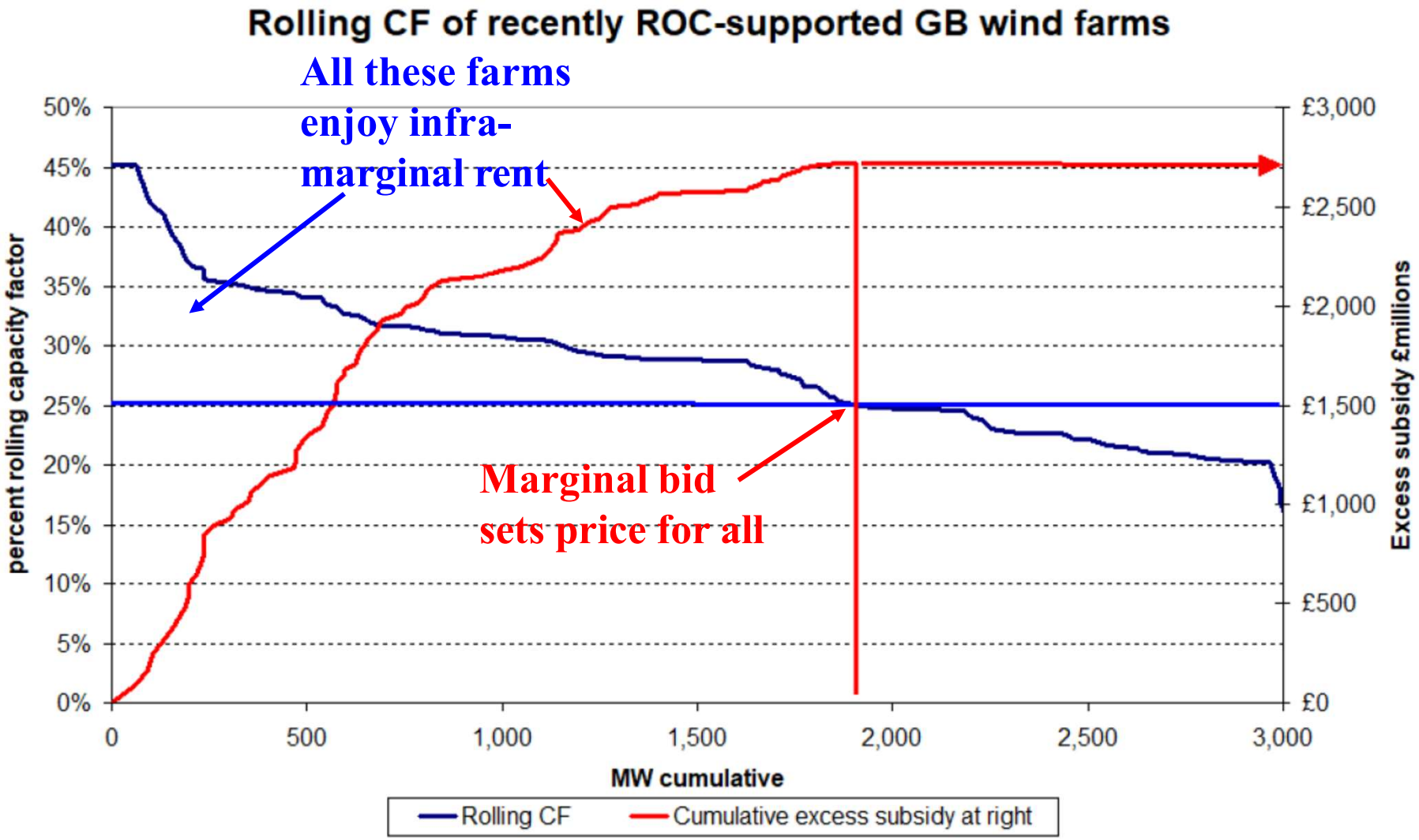
Cumulative excess subsidy from a time-based contract



Reforming VRE support

- Aim: minimise cost of finance while ensuring market responsiveness
- Pay for **capacity** not output for efficient technology choice
  - ⇒ Costs are up-front, running costs independent of market prices

⇒ **Efficient** market prices guide efficient investment, location and output

Designing long-term low-risk VRE contract

- Current VRE contracts pay fixed price ***s*** for metered output
- Standard CfD requires specifying contract independent of output
  - => Generate if **price>variable cost**, not if not (buy cheaper from the market)

=> Make contracted amount = **forecast output**/MW of **regional** wind/PV

- Limit number of full operating hours to remove location distortion
  - E.g. 30,000 MWh/MW
- **Auction** to determine strike price ***s*** for new contracts
- **Grandfather** existing contracts as location decision has been made

Security of supply – the world is changing

- System operator holds reserves for N-1 events
  - loss of single largest critical element, generator or line etc.
  - Assumes losses are statistically independent
- Wind, PV strongly correlated – almost like a single plant

  => Capacity auctions must account for risk of widespread fall in supply
- Climate change => extreme events (fire, flood, freeze)
  - Need system thinking: gas failed in Texas
- Wind, PV, smart demand, batteries,.. with own electronic controls interact in unexpected ways

Conclusions: market design

- Zero carbon electricity: high capital cost, low variable cost
  - ⇒ Long-term hedges to lower finance cost (missing futures markets)
  - – Hedges: cover independent of actual output => respond to market

=> **CfD with FiT** for VRE needs change

–capacity ***not output*** support to hedge up-front costs for low WACC

– need better location and dispatch price signals guided by market, not support prices => needs adequate CO_2 price for efficient market price

– hedge set not by metered output but forecast output (***yardstick pricing***)

– contract specified for *full operating* ***hours, not years***

– de-rating capacity to take account of high correlations

- wind, solar act more like a single large generator

References

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- Newbery, D., 2021. Designing efficient Renewable Electricity Support Schemes, at https://www.eprg.group.cam.ac.uk/eprg-working-paper-2107/
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Acronyms

CfD: Contract for Difference
FiT: Feed-in Tariff
RAB: Regulatory asset base
RO(C): Renewable obligation (certificate)
VRE: variable renewable electricity
WACC: weighted average cost of capital