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The Microeconomic Problem with Renewable Energy

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- I’m going to start with a paradox

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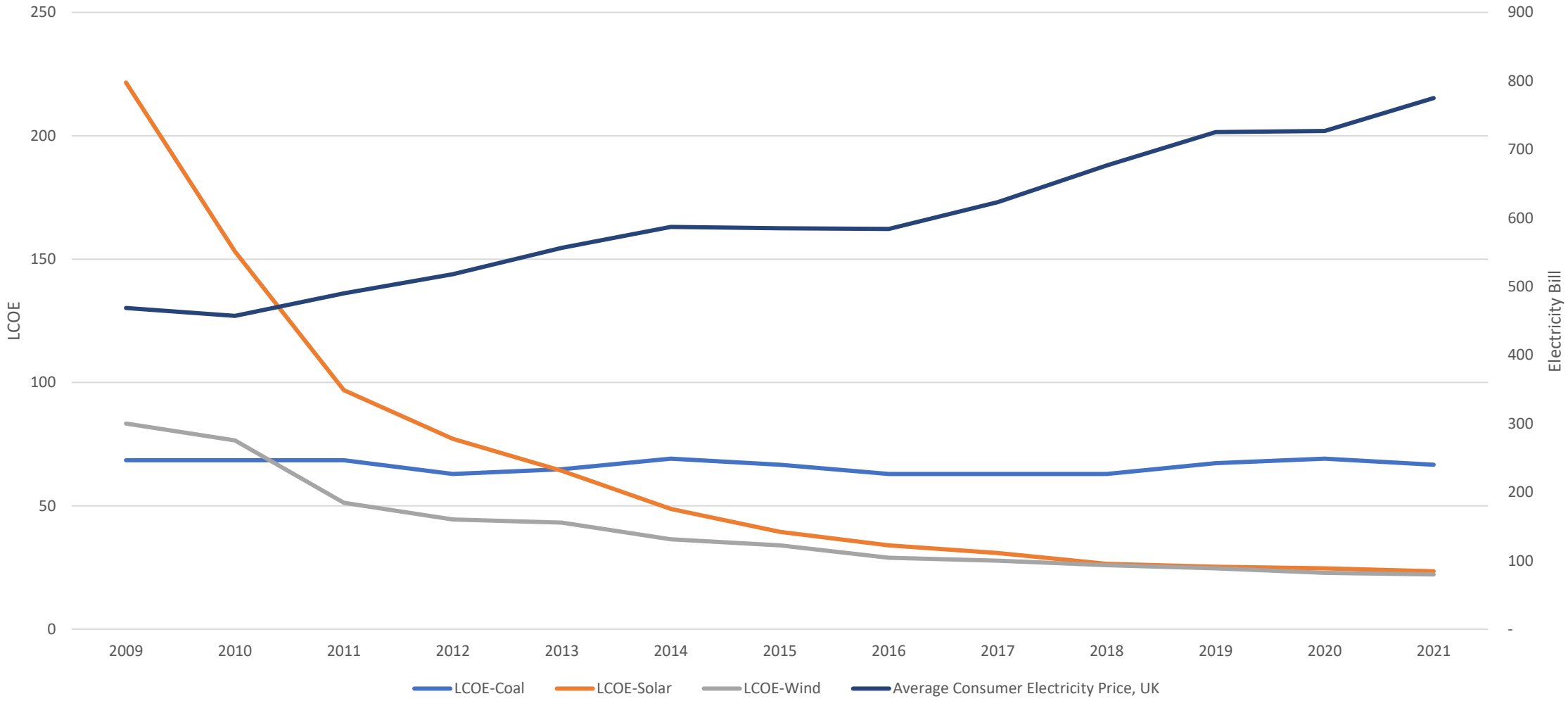
LCOE vs consumer electricity bills



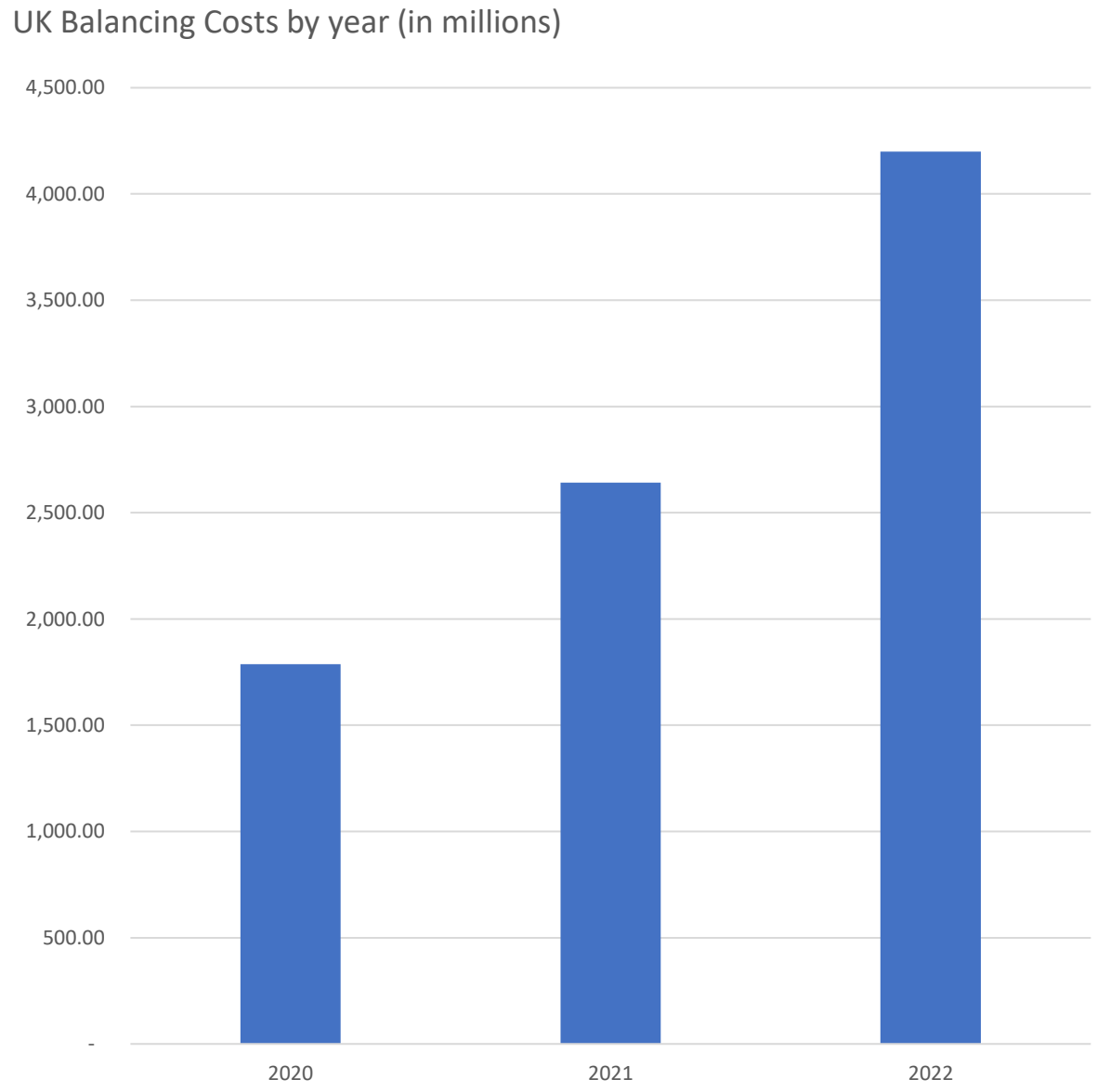
- What is going on here?

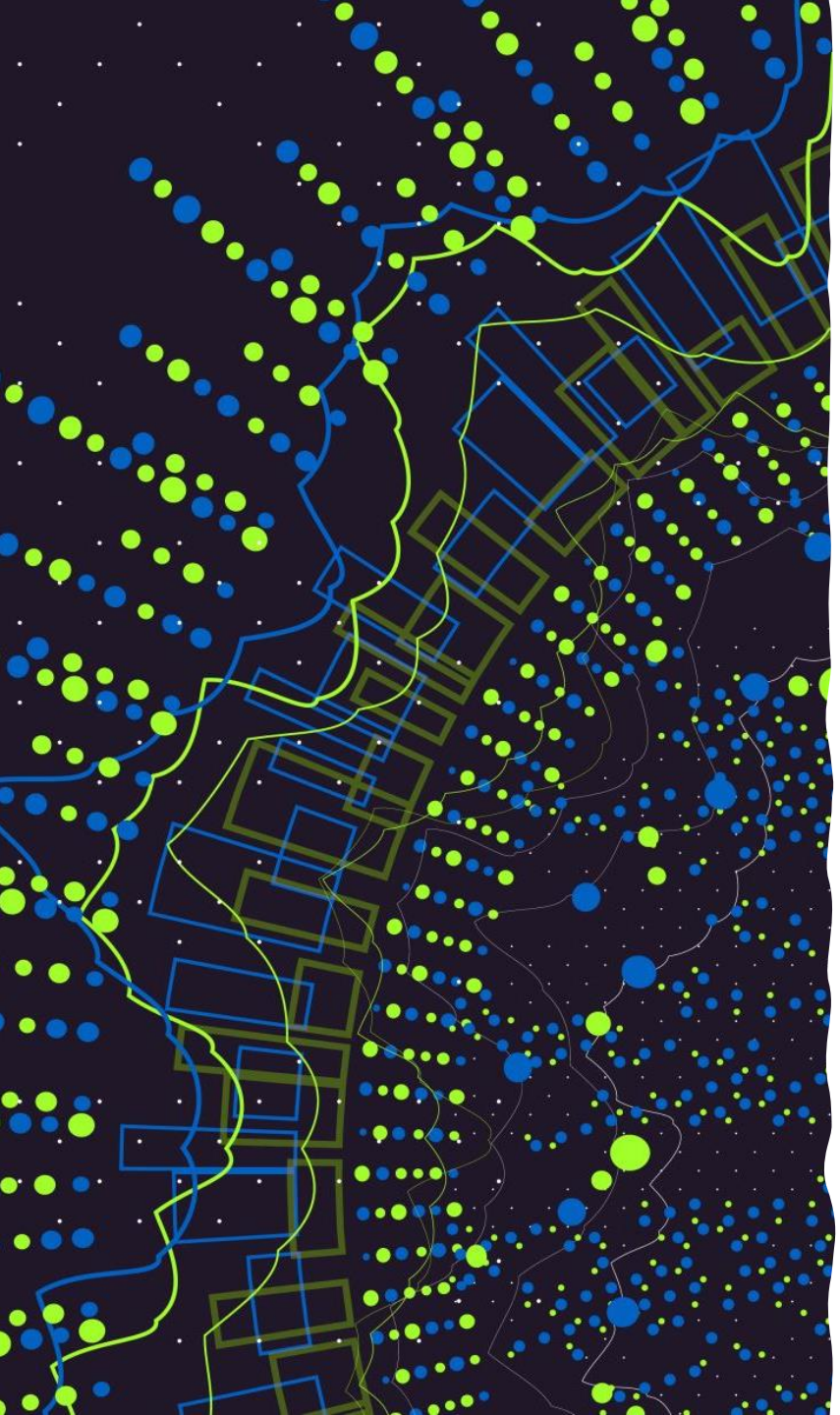
- Guesses?

The fundamental problem is that the costs to balance generation and load (supply and demand) skyrocket once renewables cross about 30% penetration.

This presentation will focus on the economics of this problem (without assigning blame).

How much are costs increasing?





Now let’s explore why this is happening

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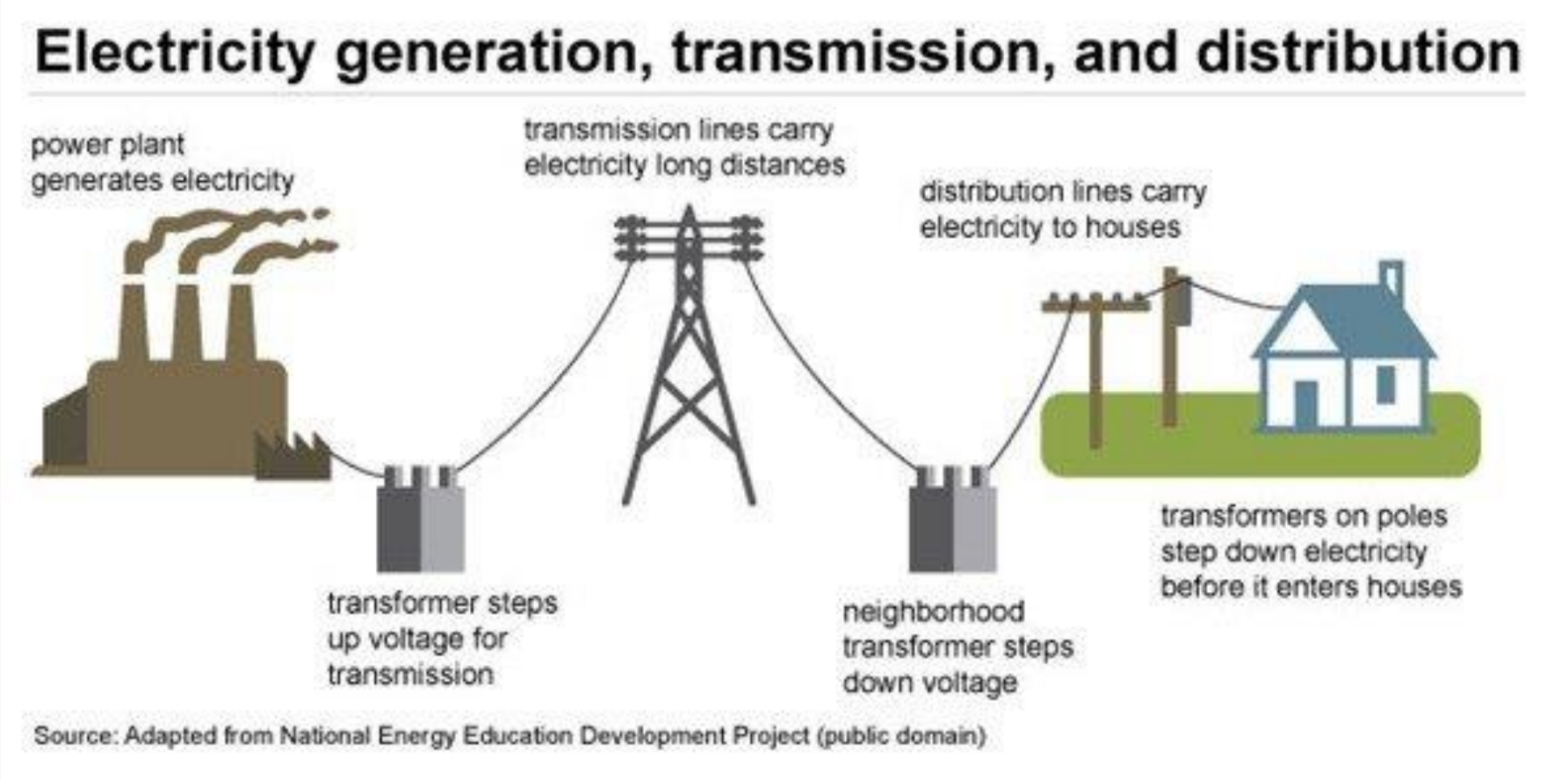
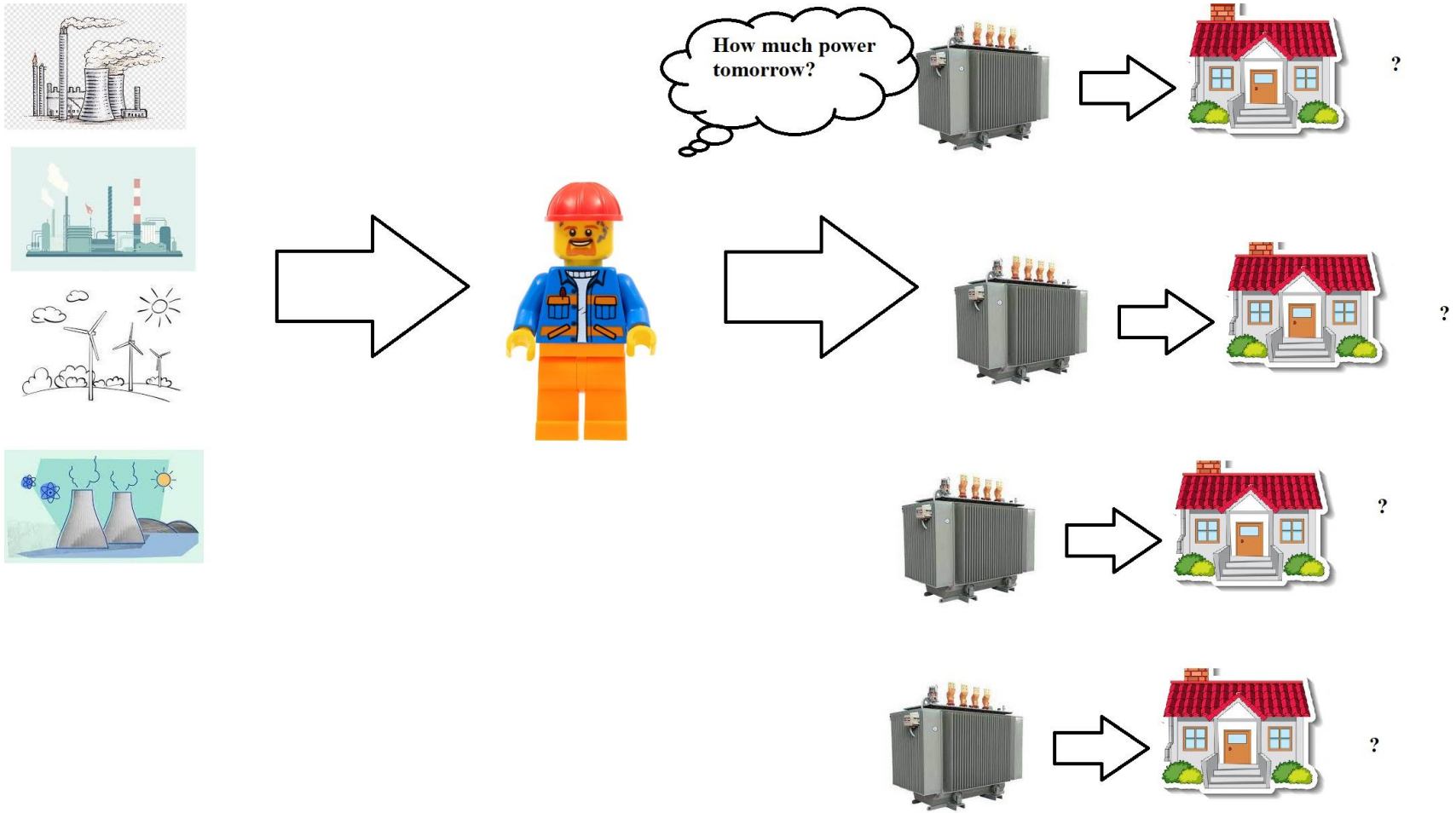
Typical energy grid



The energy system today



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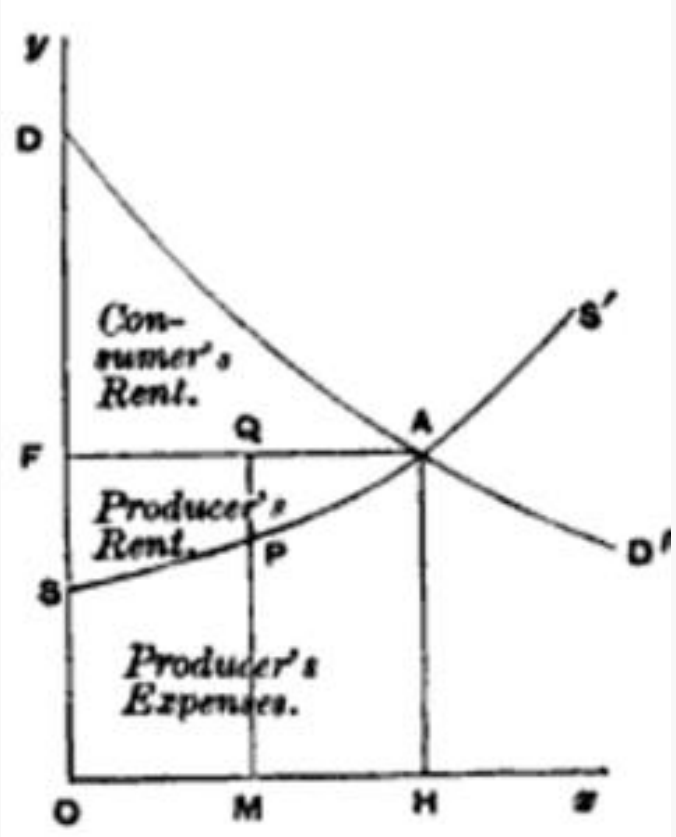
How to keep grid balanced?



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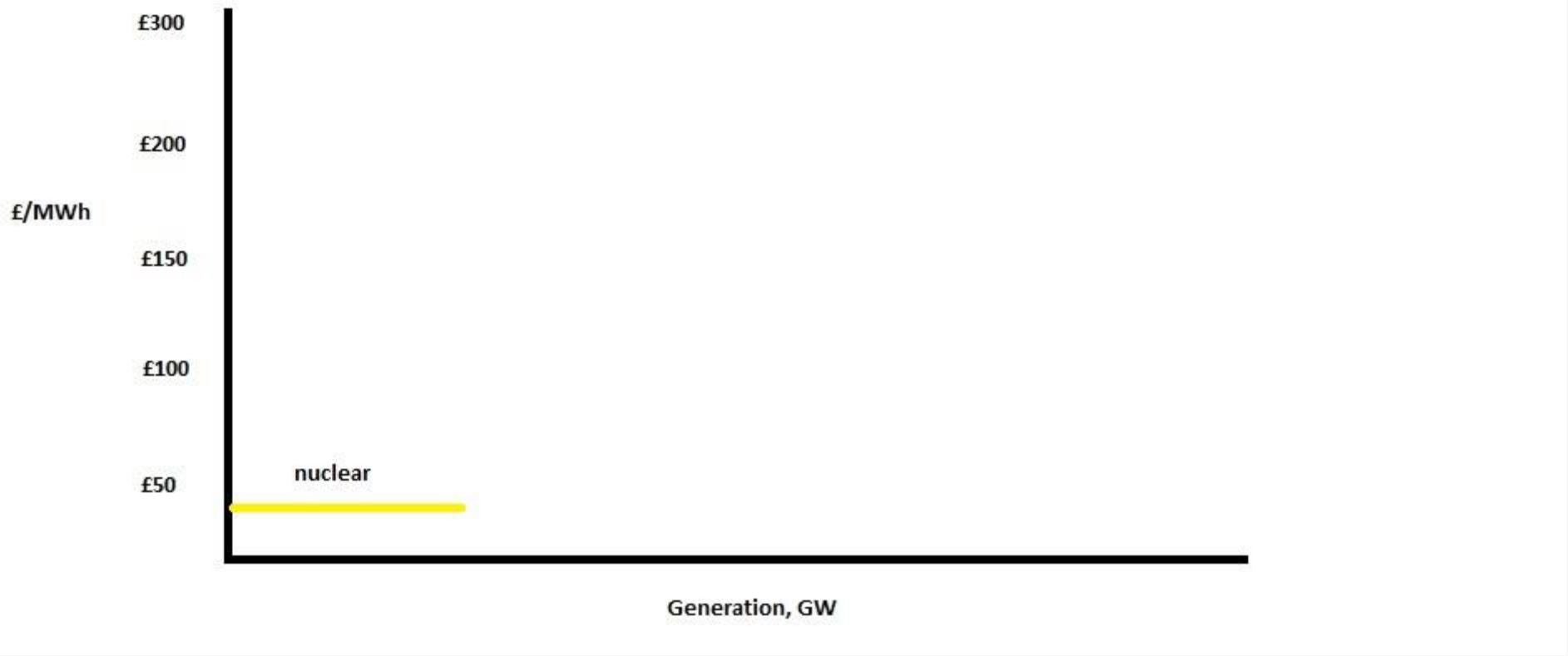
Generation stack



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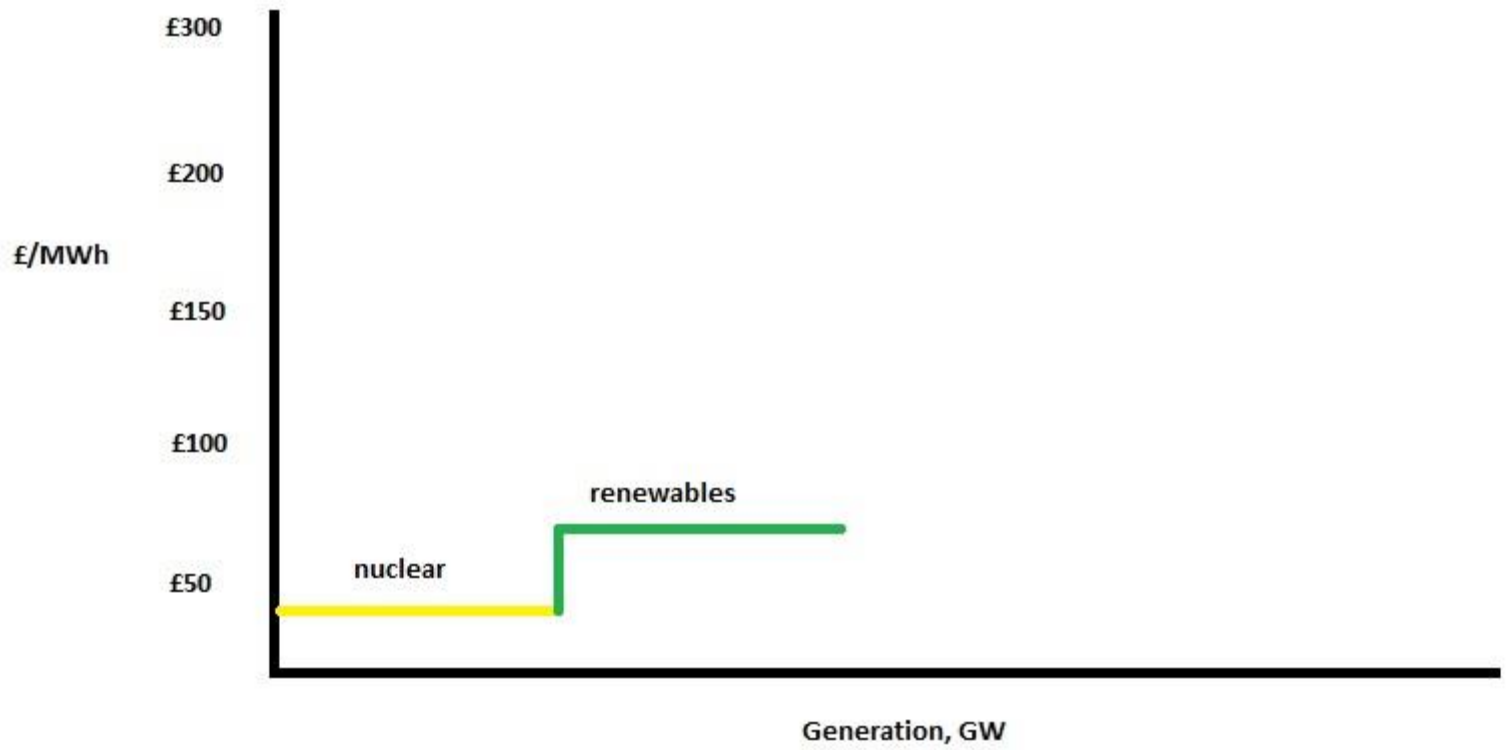
Generation stack



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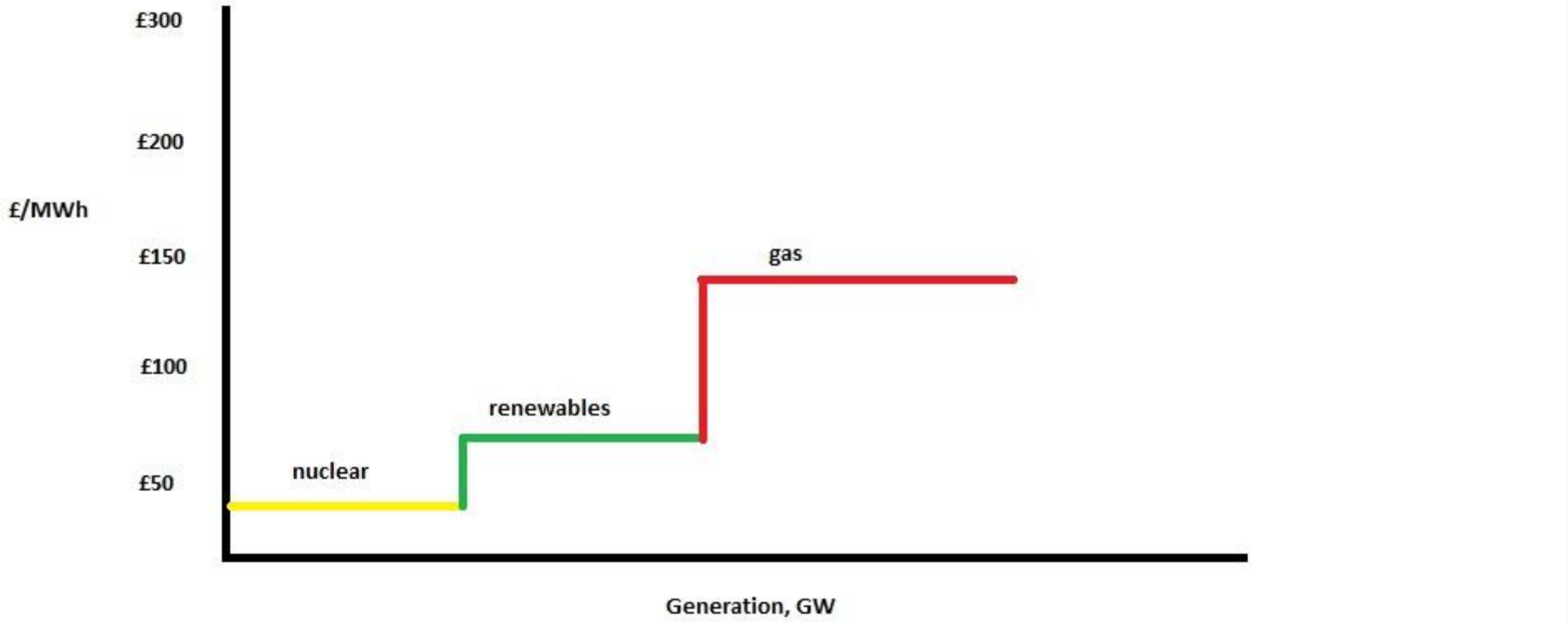
Generation stack



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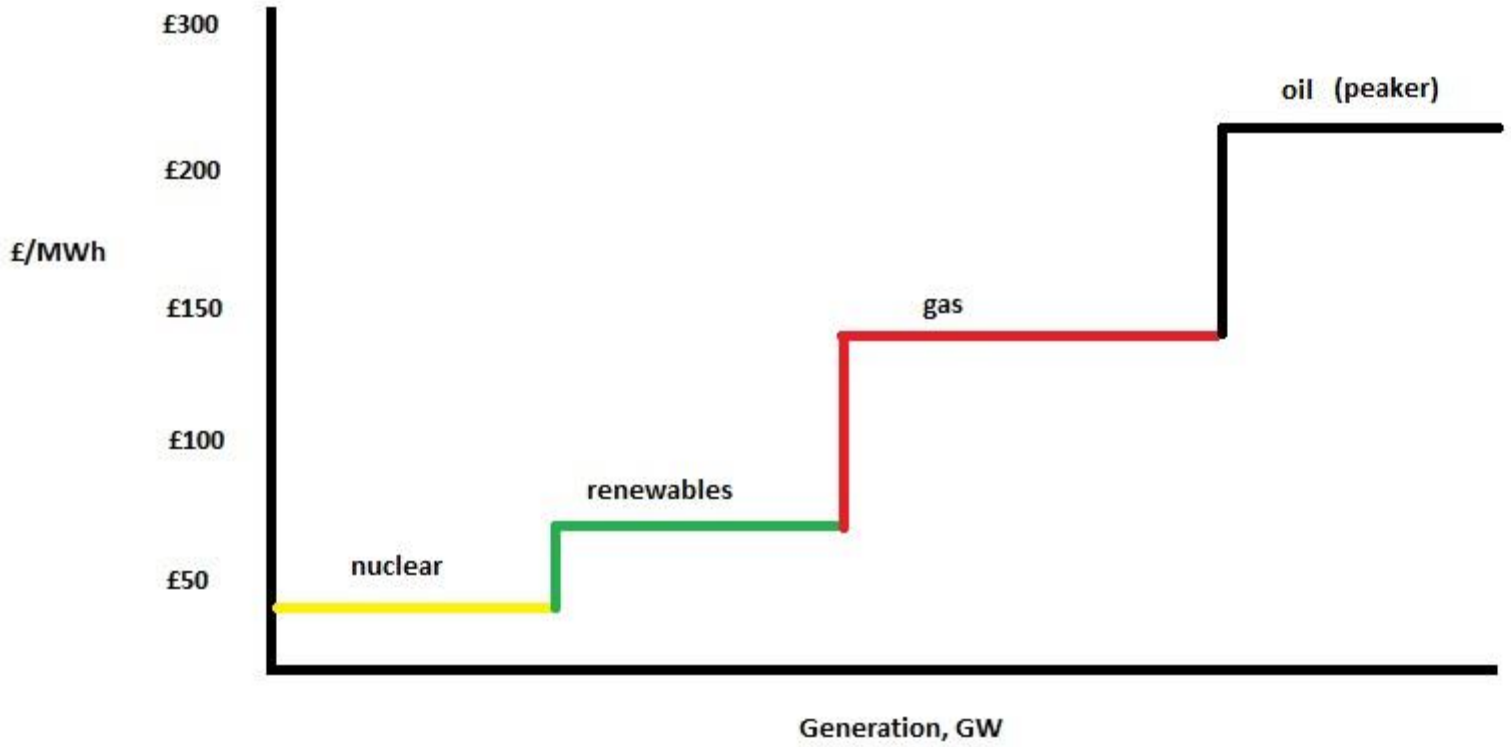
Generation stack



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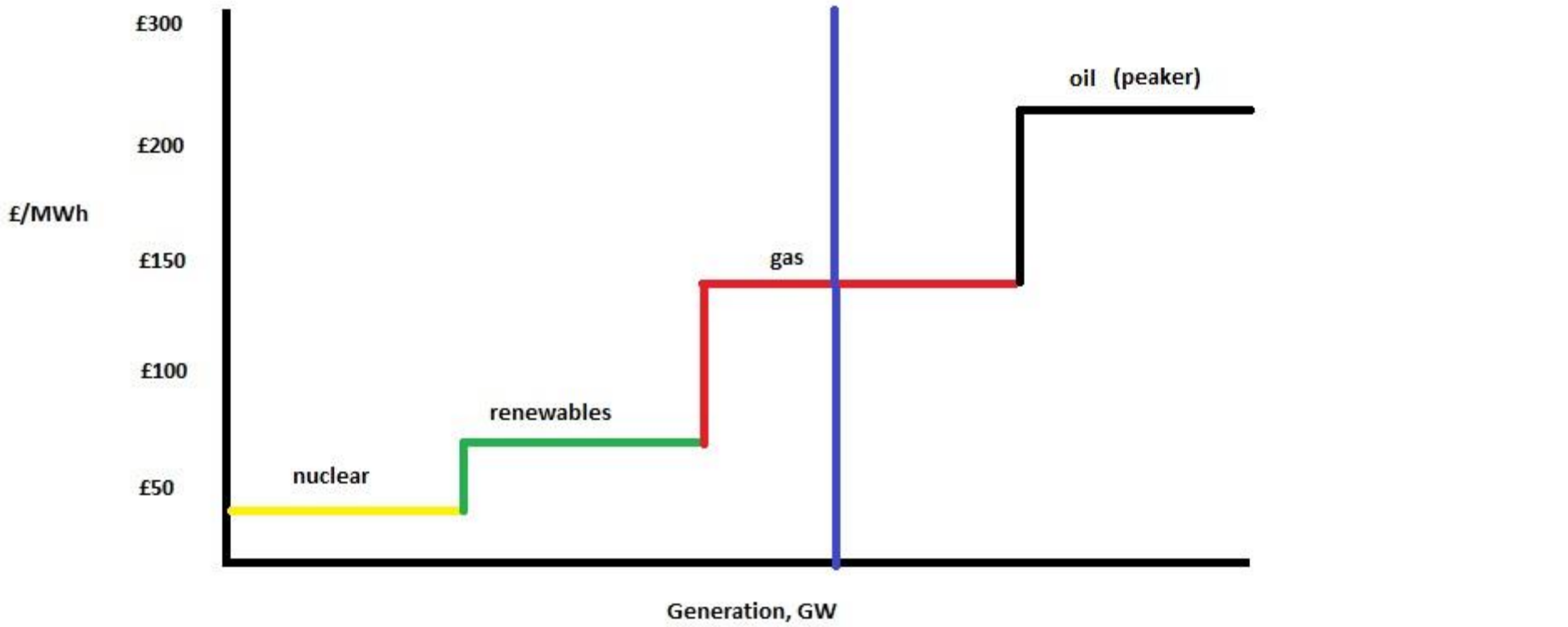
Day ahead price – inelastic demand



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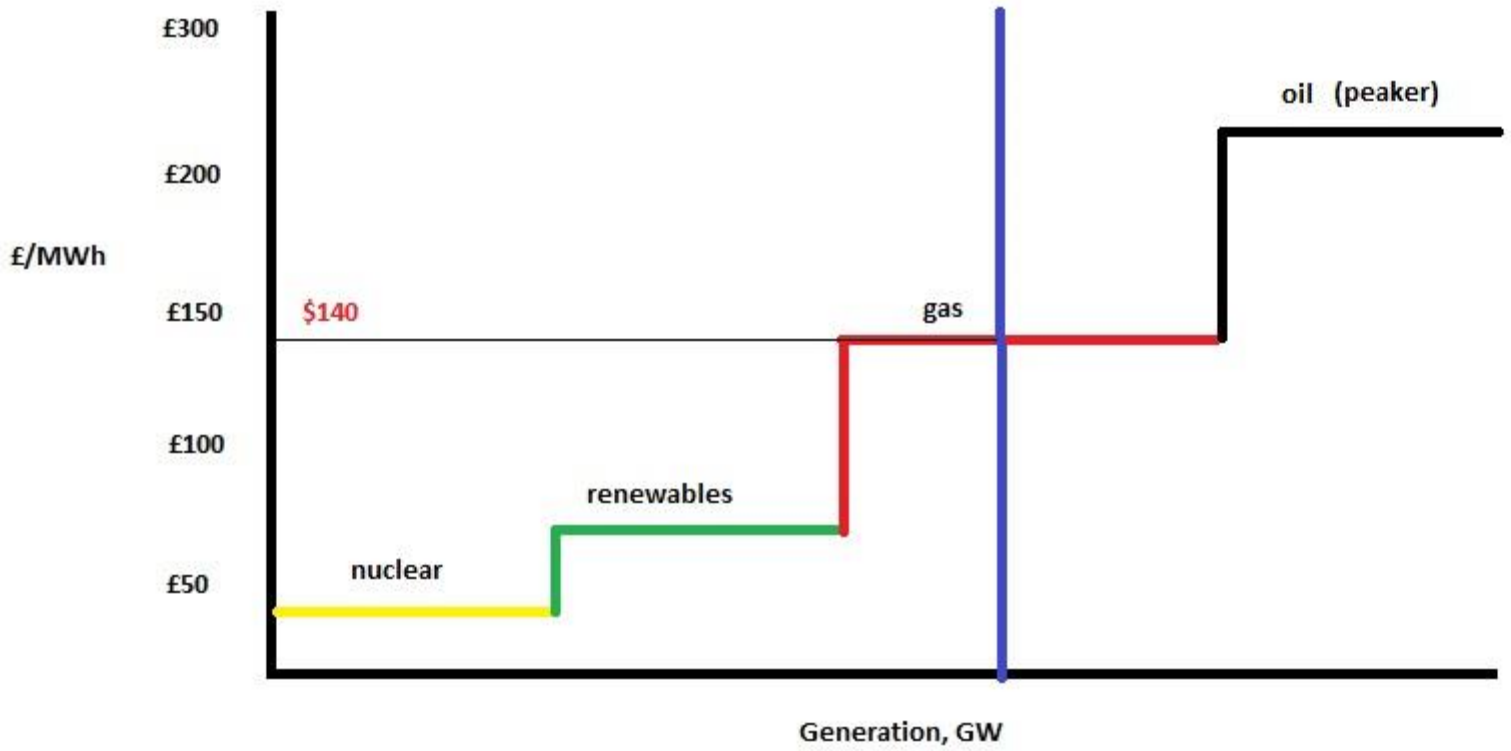
Day-ahead price



Case study 1

Incorrect load forecast

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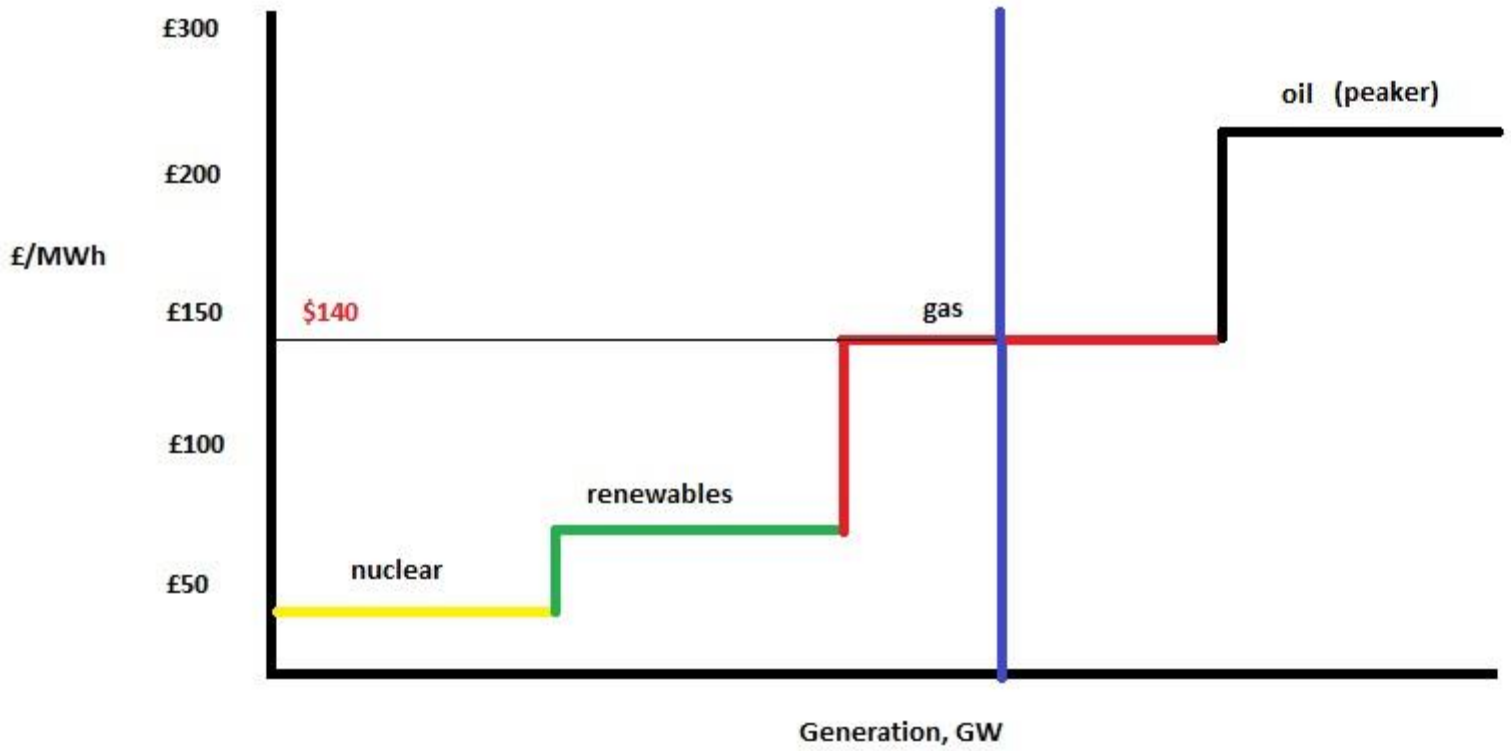
Day-ahead price



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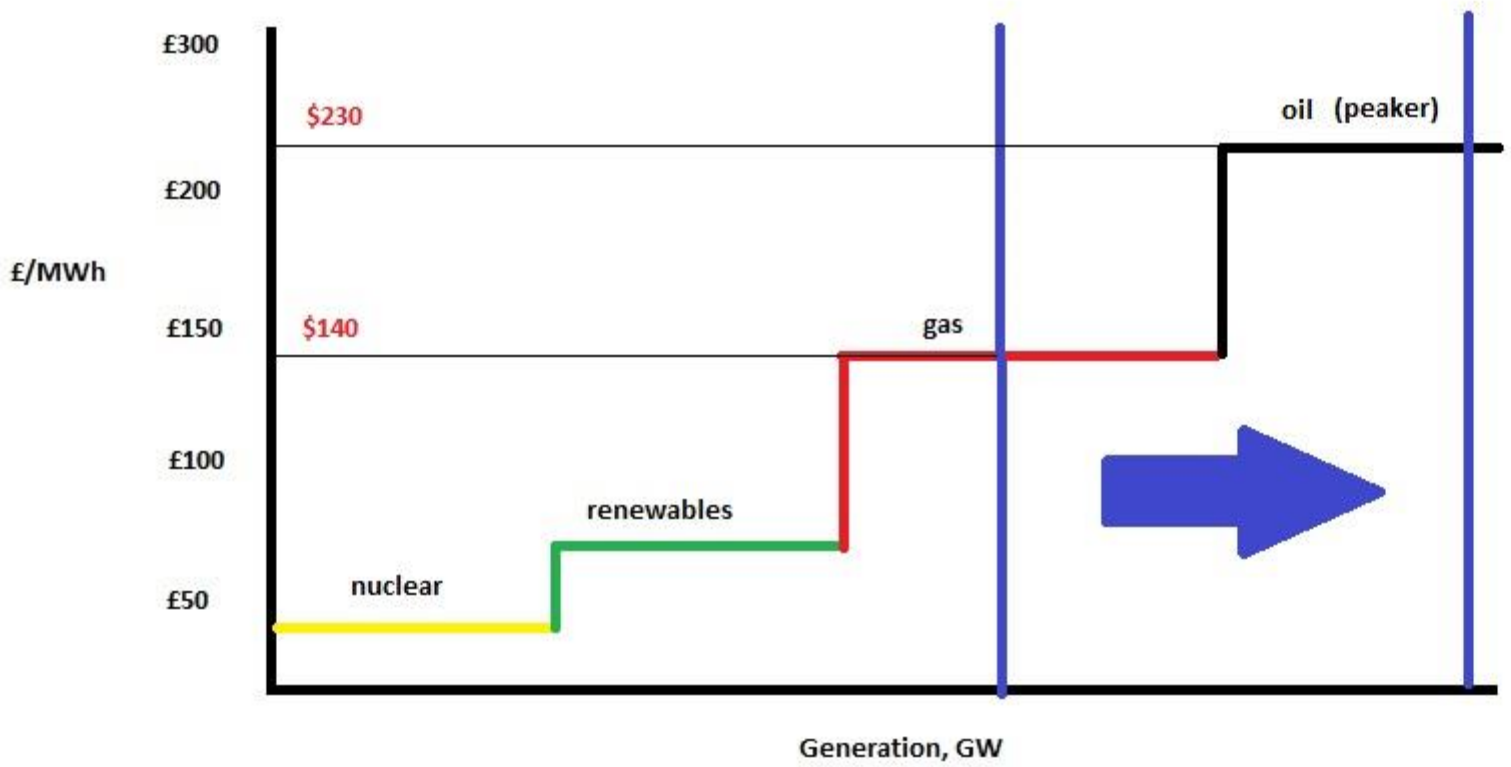
Balancing costs 1



Case study 2

Incorrect generation forecast

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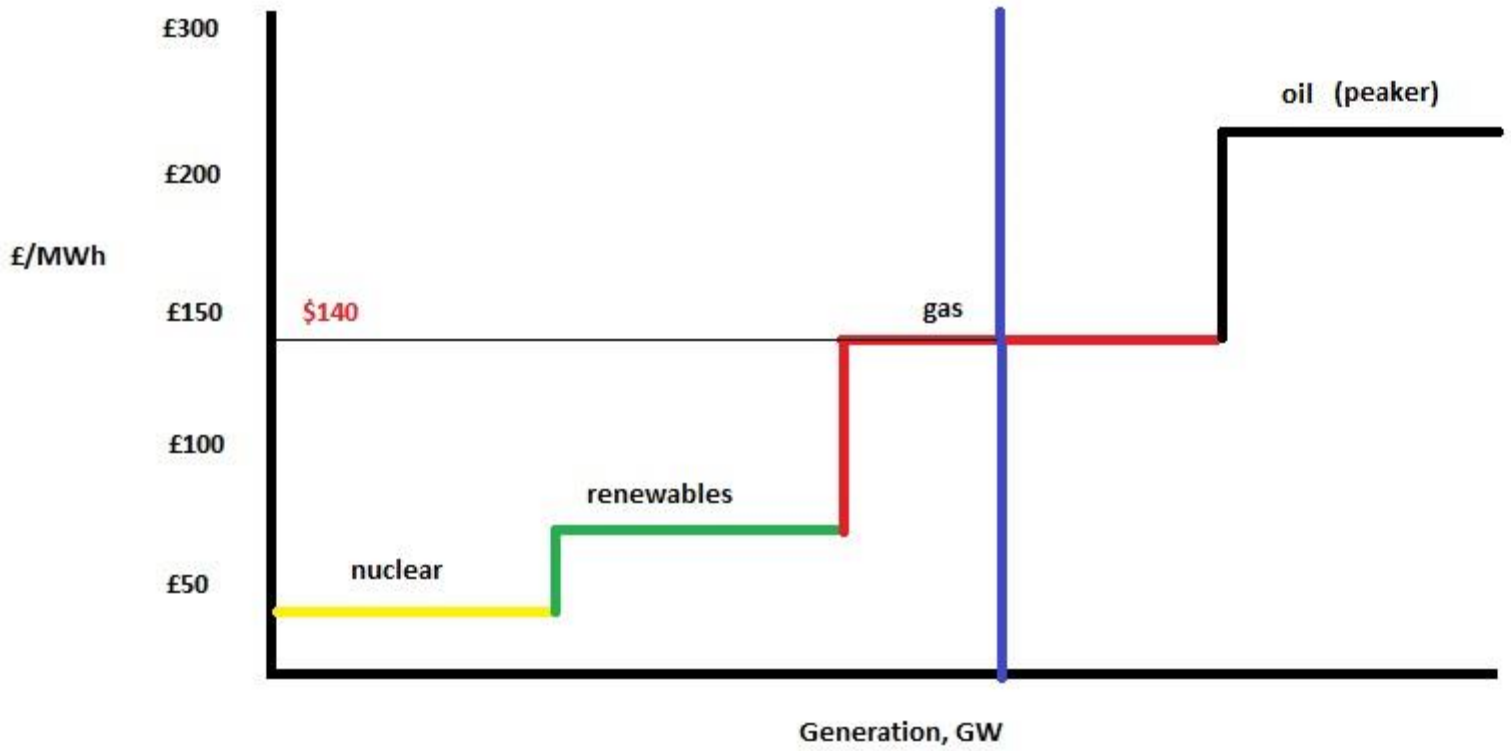
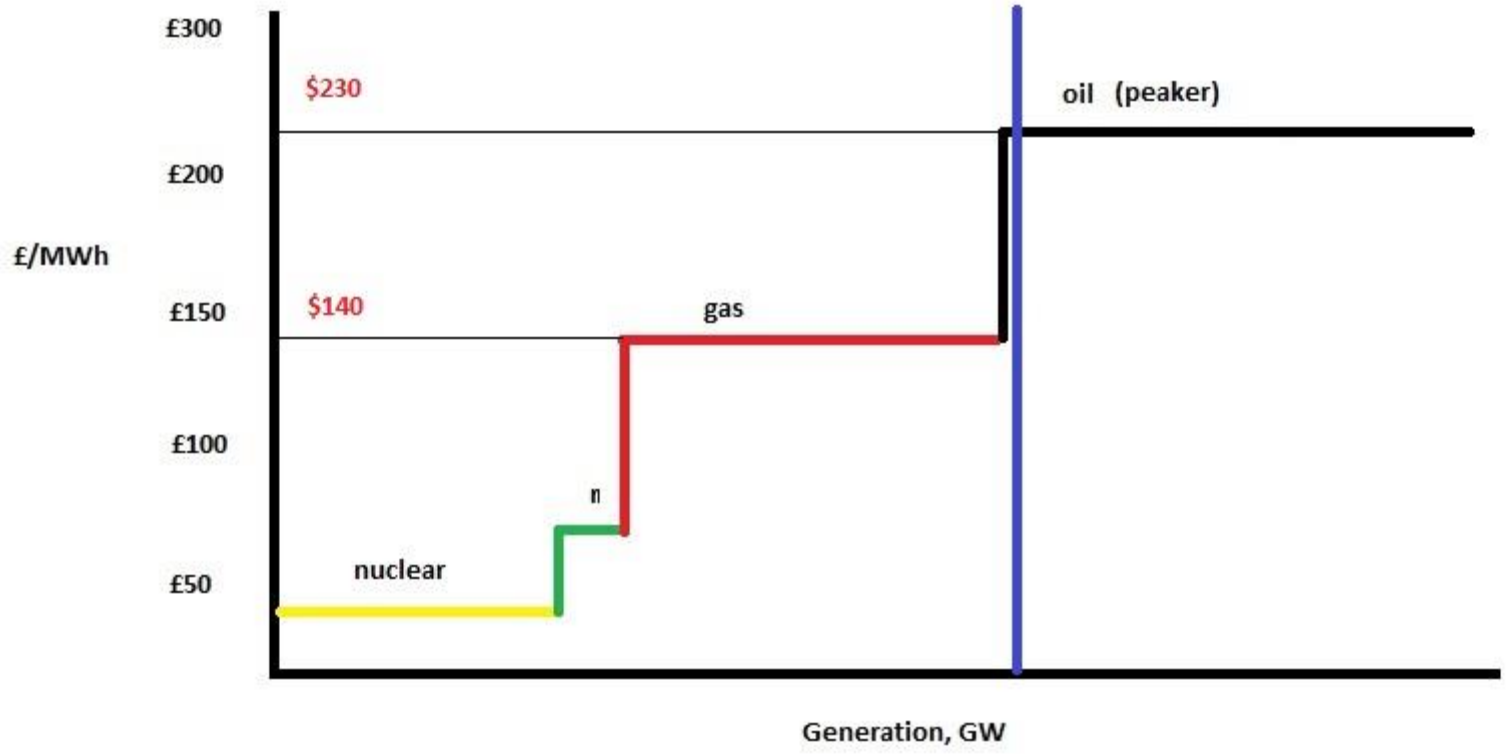
Day-ahead price



Balancing costs 2



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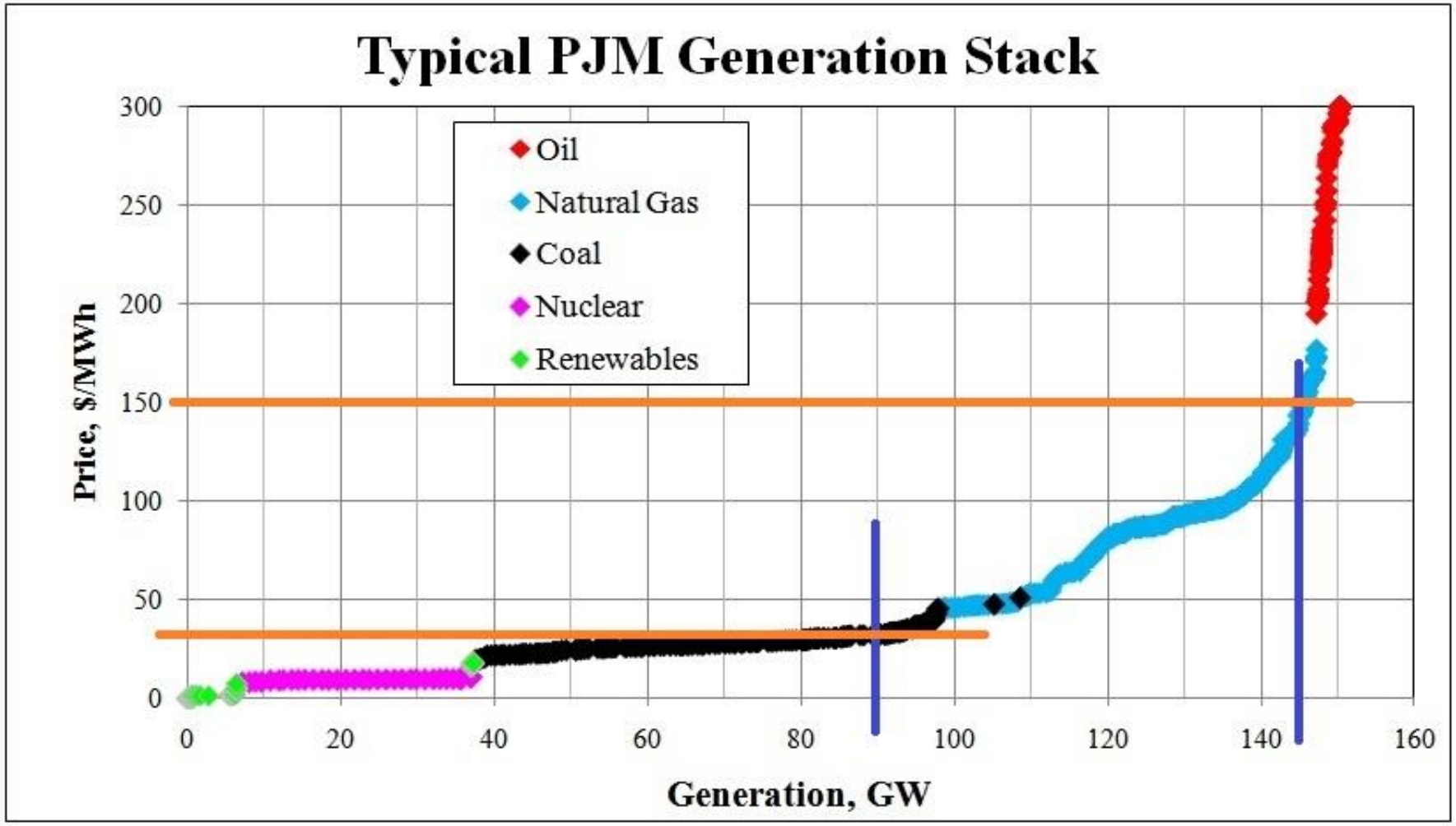
Real data from Pennsylvania
Source: Penn State University



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UK Balancing Costs
Source: National Grid ESO

2021: £1.2 billion
2022: £2.2 billion
2023: £4 billion (projected based on Jan-Apr)

What are we going to do about this?

IEA Solution

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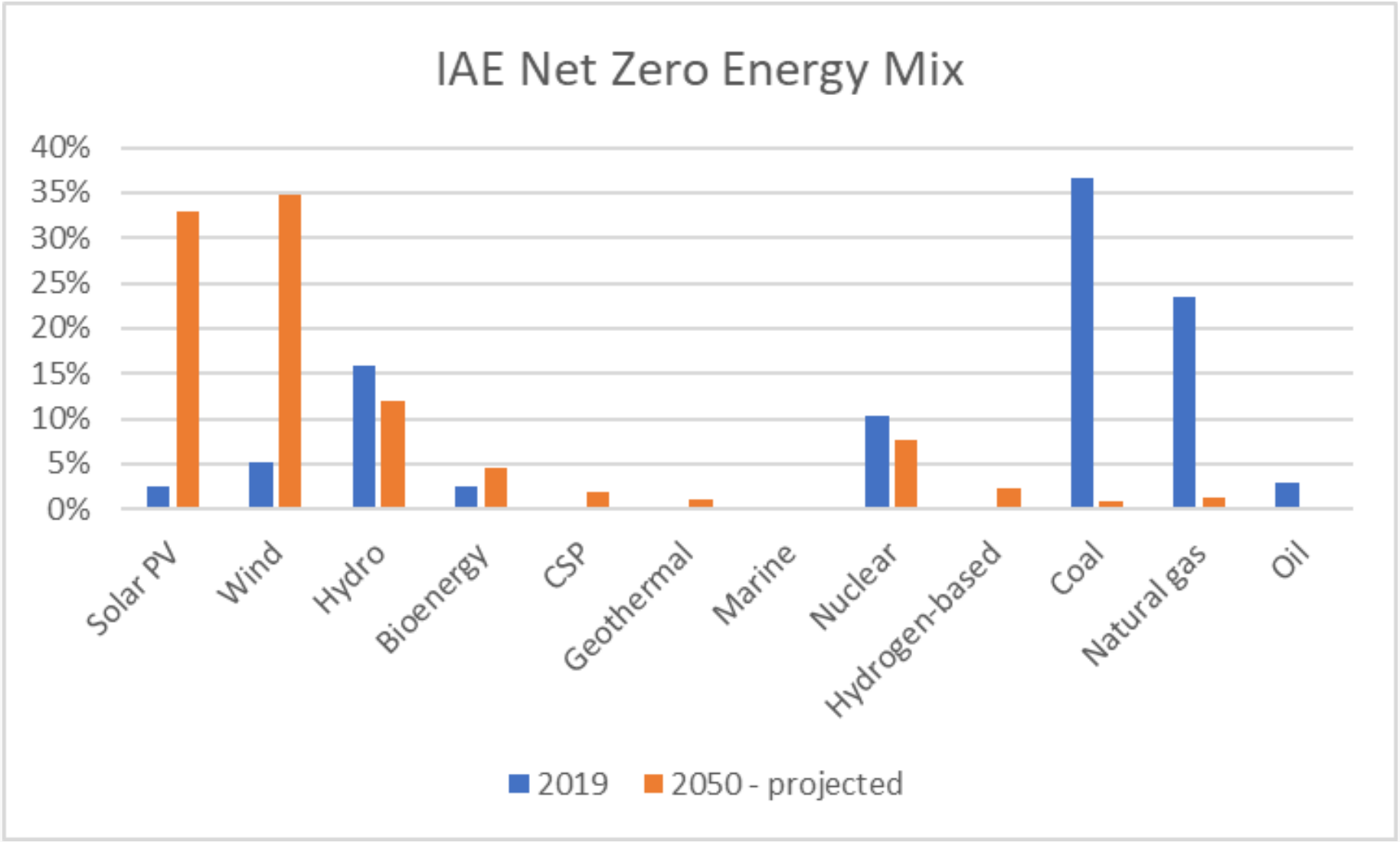
Source: IEA roadmap to 2050



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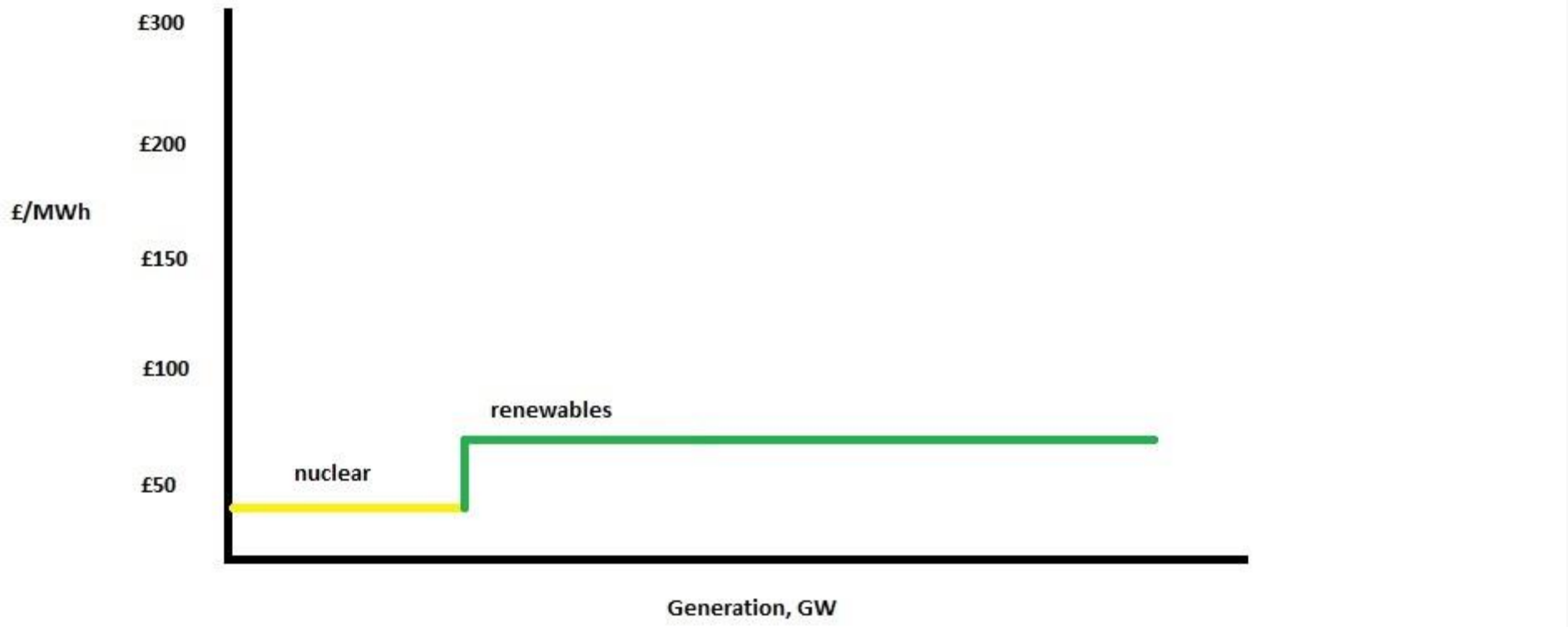
Future of renewables?



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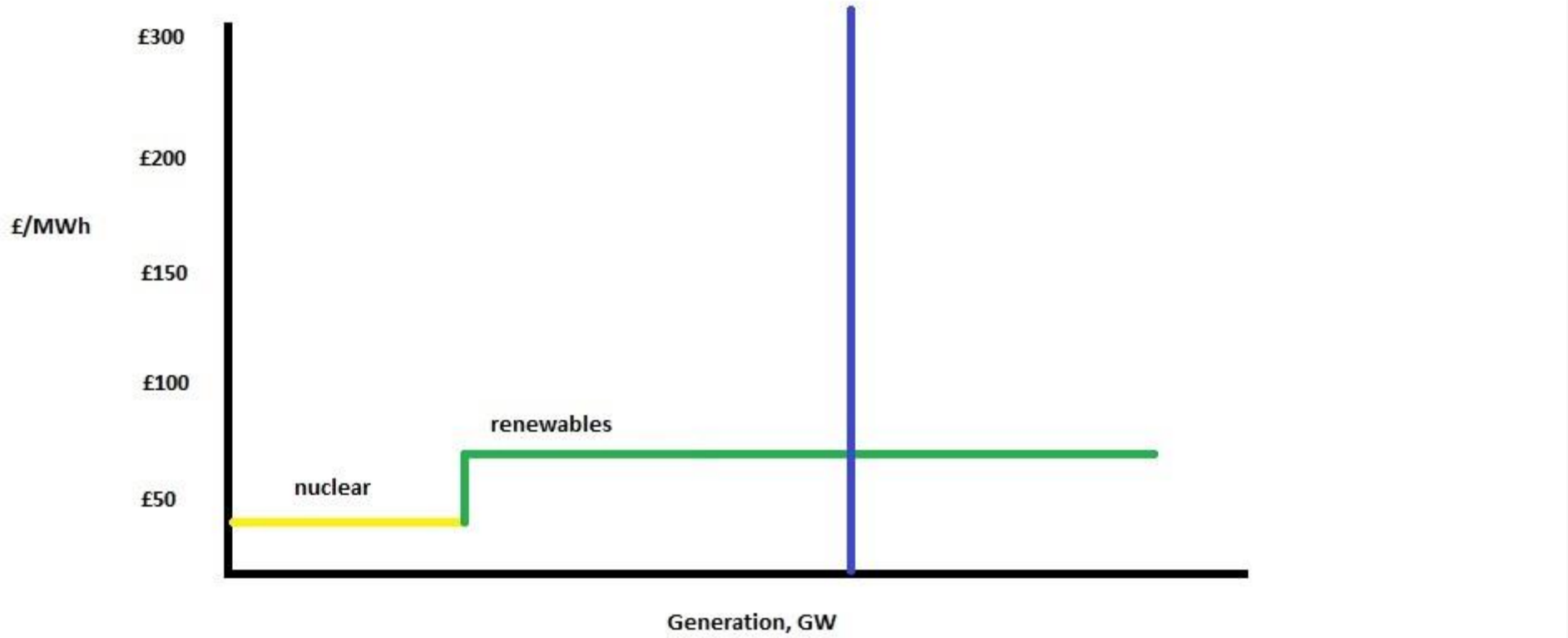
Future of renewables?



But this just increases volatility…

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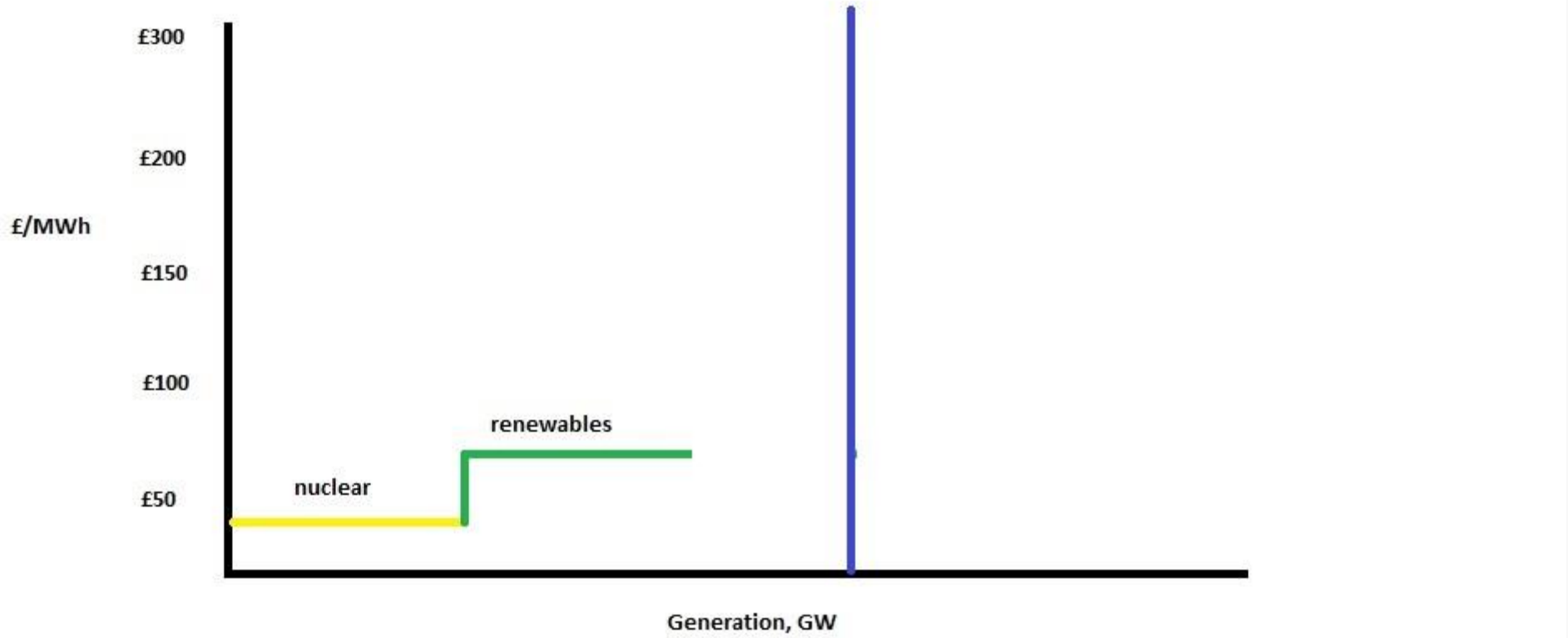
Future of renewables?



Well, Ryan, just make batteries (or hydrogen) your new peaker…

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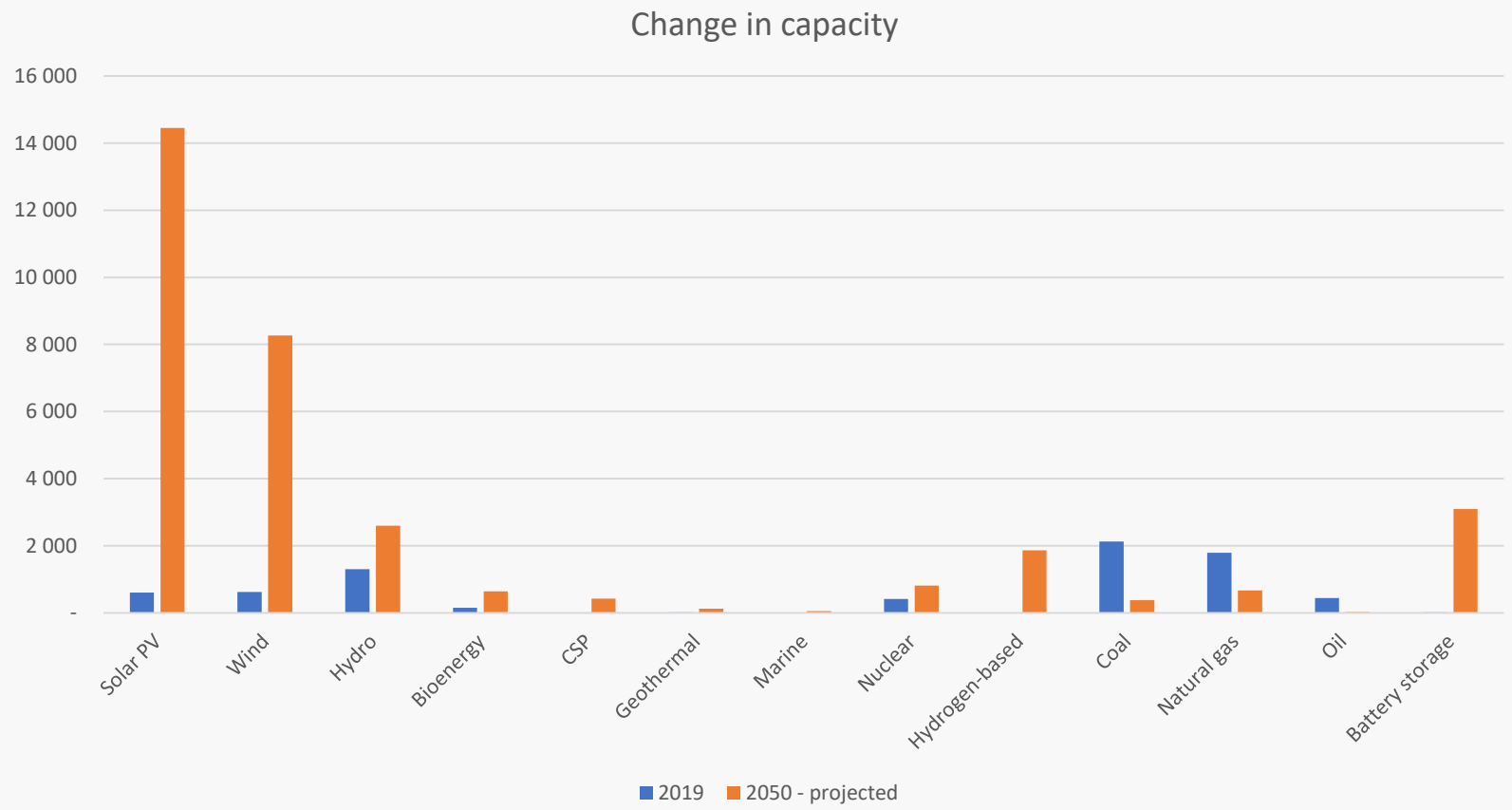
Source: IEA roadmap to 2050



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UK Balancing Costs
Source: National Grid ESO

3500 GW new battery capacity in 27 years

Currently 1GW installed in UK

25 GW newly-installed globally in 2022.

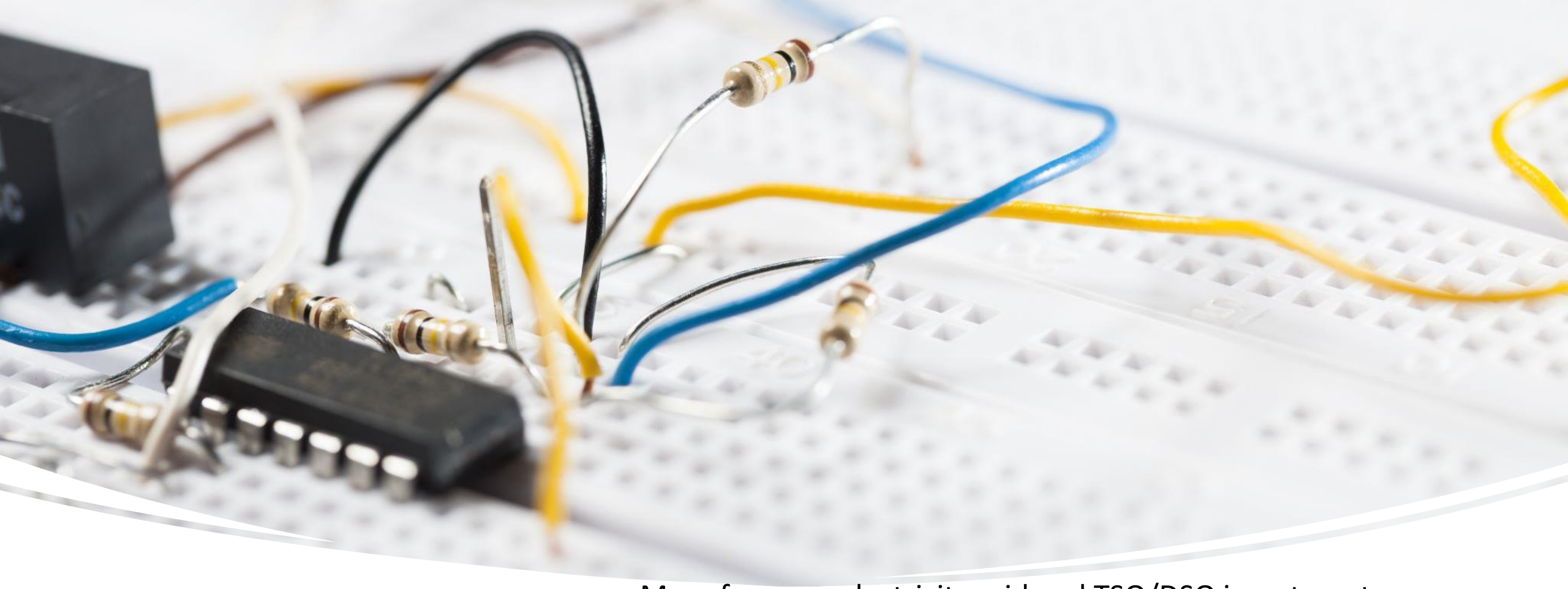
Currently about 10 acres per MW

LCOE of batteries (including disposal costs) is very high

IEA plan will cost somewhere between $5 – $15 trillion

Only gets us halfway there

Assumes massive behavioural changes – everyone will consume less and have fewer cars and smaller homes and no more air travel and crappier boilers…….



Solution?

- More focus on electricity grid and TSO/DSO investment incentives.
- Reconsider unbundling rules set by competition law /DGCOMP
- LMP combined with new tech?

Question?
Comments?
Angry mobs?