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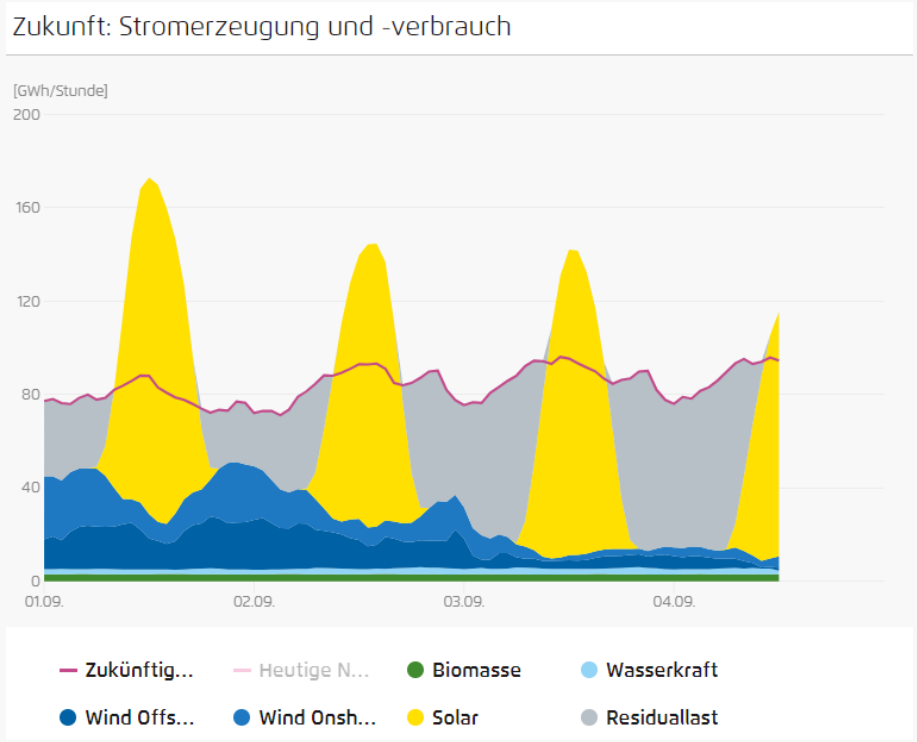
The German Capacity Market – Risk and Opportunity for BESS

Rapid renewables expansion in Germany brings several challenges to the energy system of the future

Energy transition in Germany[1)]



Requirements of energy system of the future

Flexibility

- Bulk of renewable generation requires demand-side flexibility to avoid tremendous curtailment costs
- Shifting of energy to times of few renewable generation

Dispatchable generation

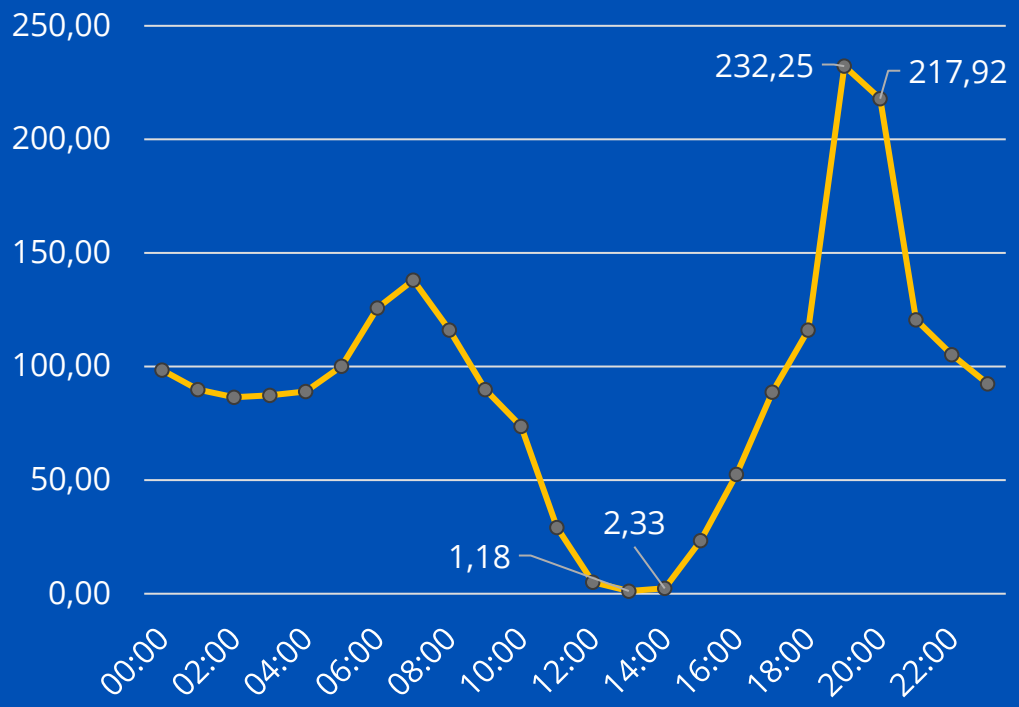
- Residual load to be covered with dispatchable capacity
- Capacity market measure to incentivize capacity buildout, other countries show that BESS can play crucial role

BESS supports supply- and demand-side flexibility as well as grid utilization challenges

1) Source: Agora Energiewende

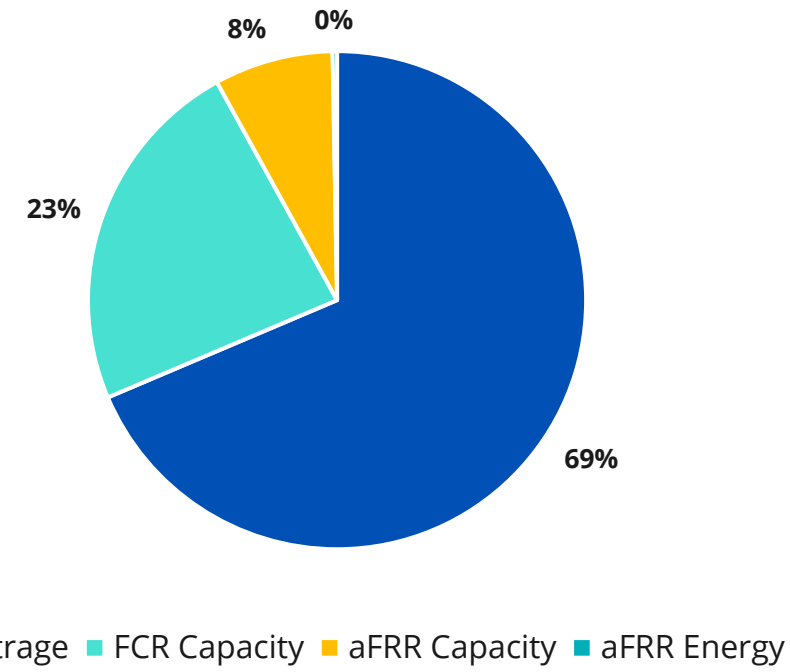
Wholesale market volatility drives BESS revenue stack towards arbitrage

Auction > Day-Ahead > DE-LU > 27 August 2024 (€/MWh)[1)]



Illustrative

Revenue breakdown for 50 MW / 100 MWh asset in 2025



1) Source: EPEX

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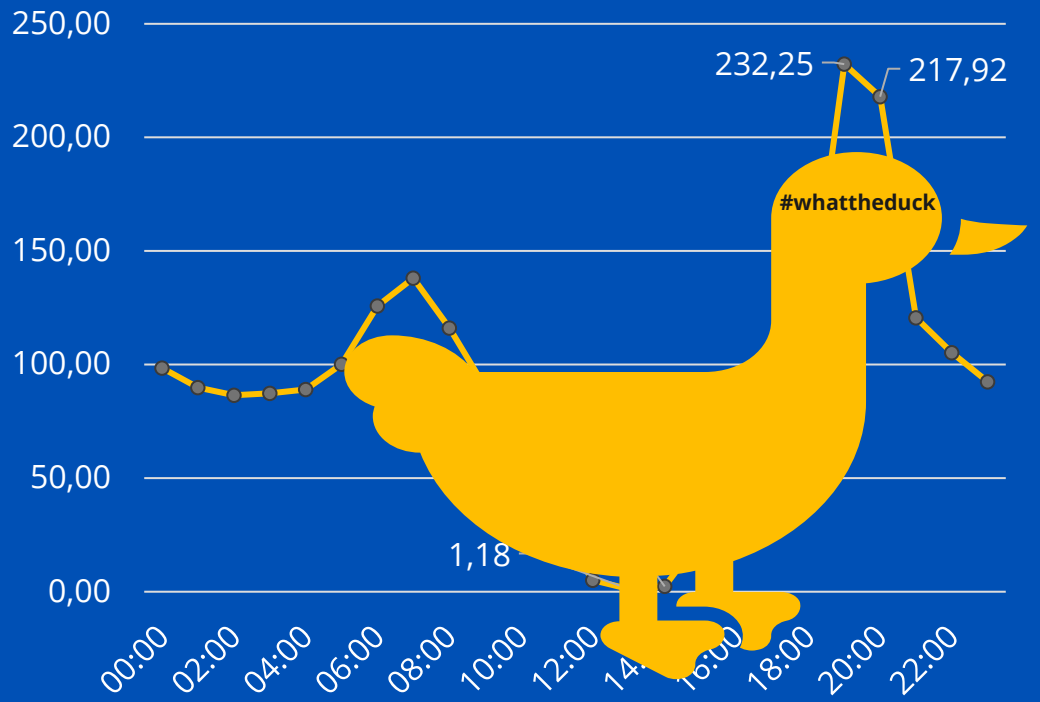

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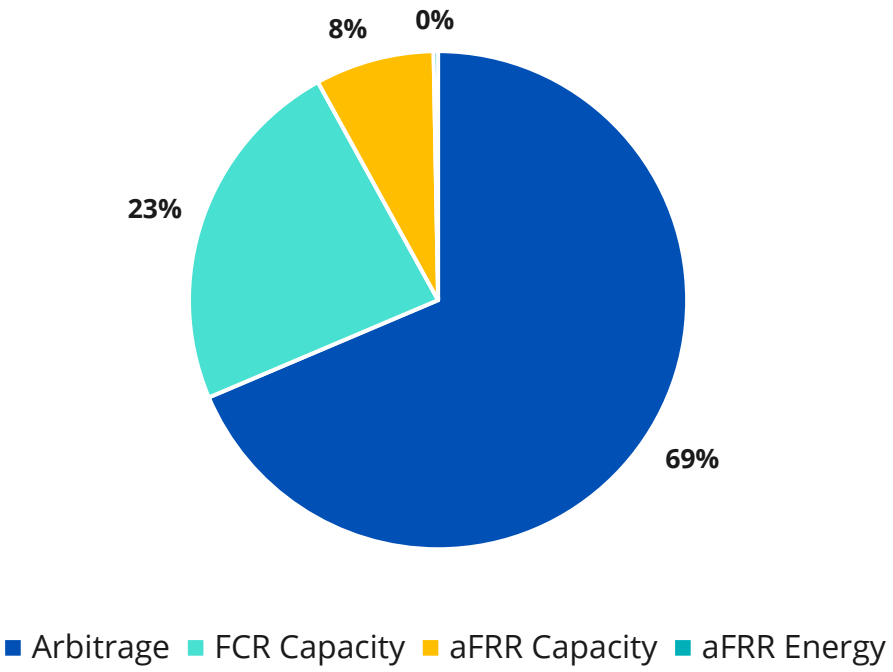
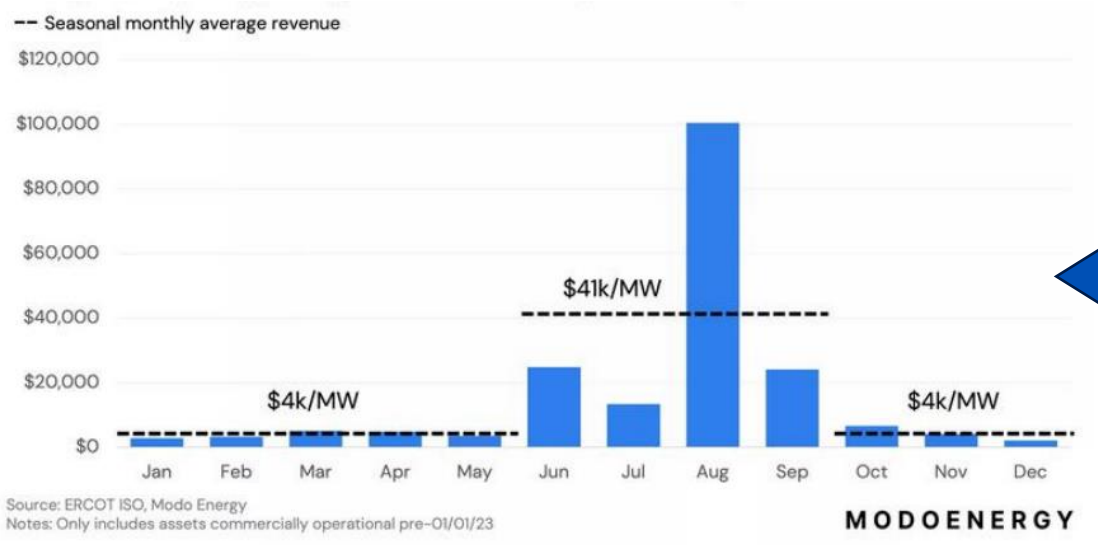


1) Source: EPEX

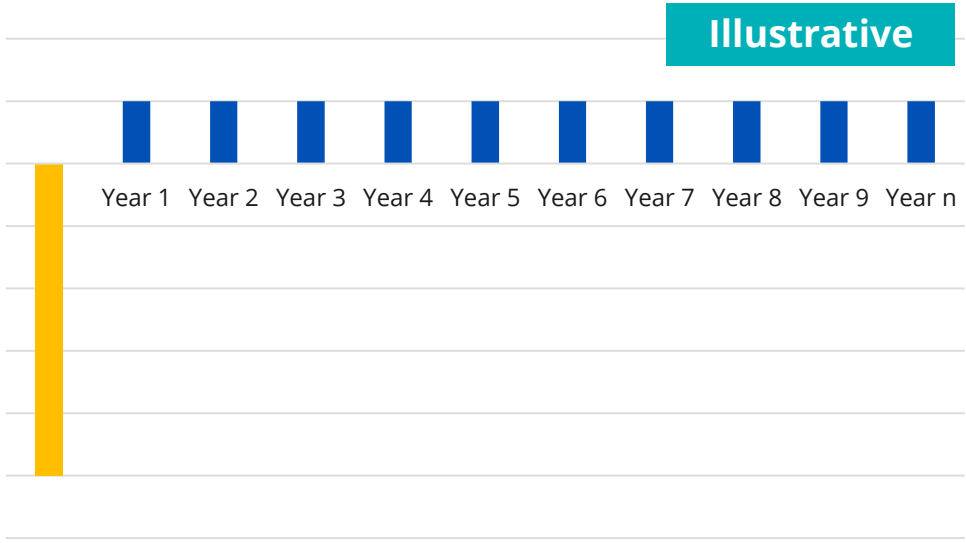
BESS business case is highly attractive in Germany but does not offer long-term contracted revenues

BESS revenues: highly volatile & unpredictable[1)]



VS

PV or wind PPA revenues: flat & long-term contracted

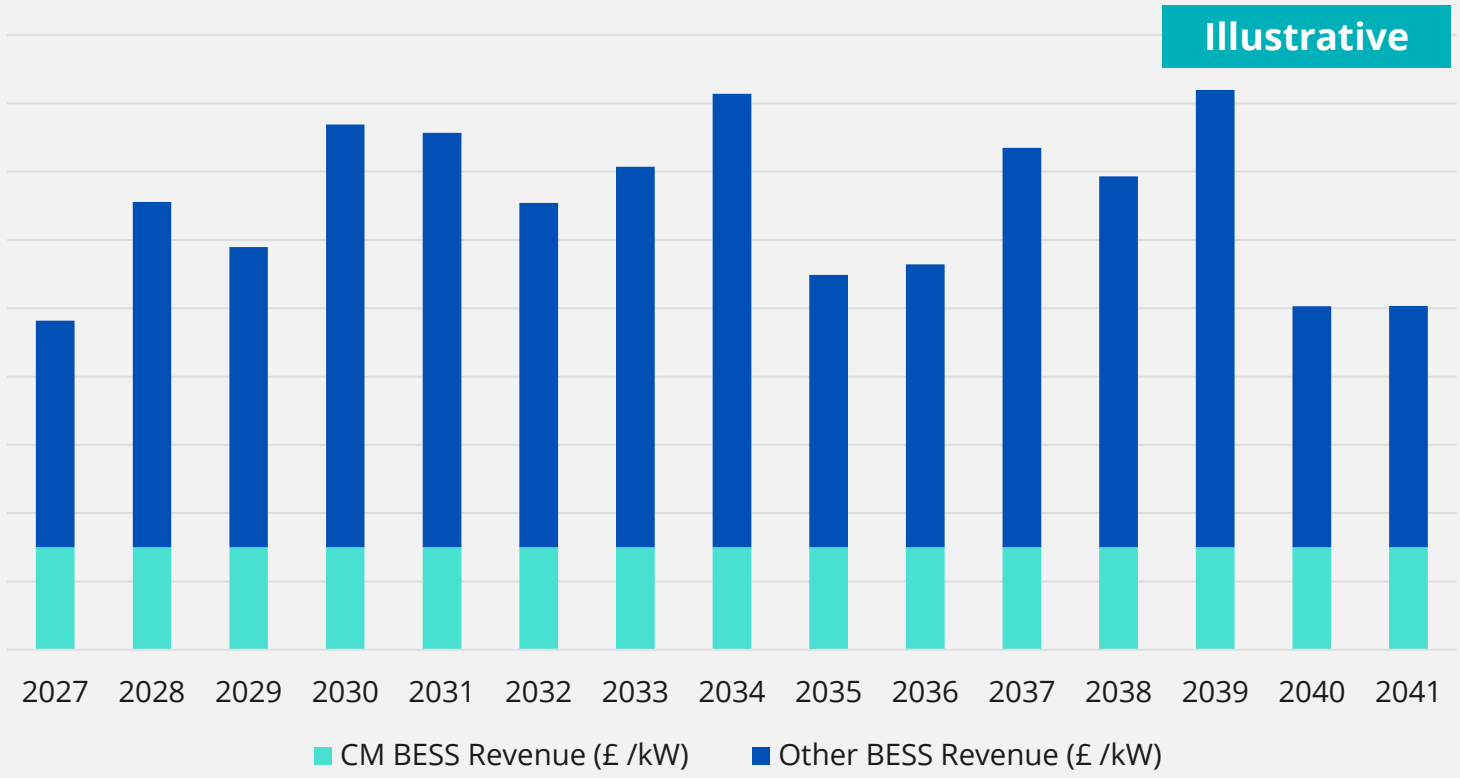


BESS with high reward profile but "black box character" of revenue projections

1) Source: MODO Energy

Capacity markets pay long-term contracted revenues that offer additional security for creditors and investors

Revenue projections for 50 MW asset in GB capacity market



Key take-aways

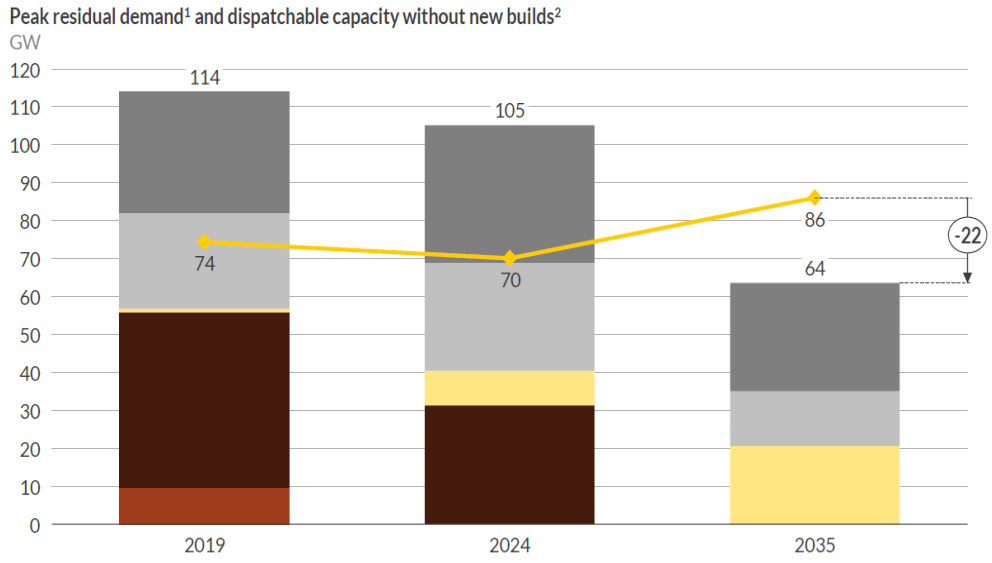
- Capacity market offers payments comparable to a floor payment
  - Long-term
  - Fixed amount
  - High security
  - Bankable
- 1% reduction of cost of debt equals ~1% IRR boost at 70/30 debt to equity split

BMWK outlined plans to introduce capacity market in recent paper

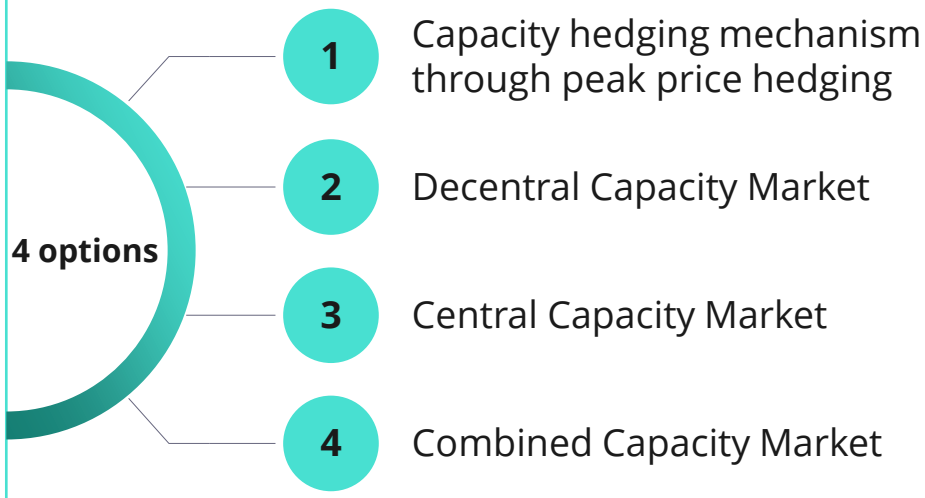
WHAT is a capacity market?

A capacity market is a type of electricity market in which power generators are paid to ensure they have sufficient capacity available to meet future electricity demand, even if that capacity is not used. - ChatGPT

WHY does the BMWK want to introduce a CM?



HOW would it look like?

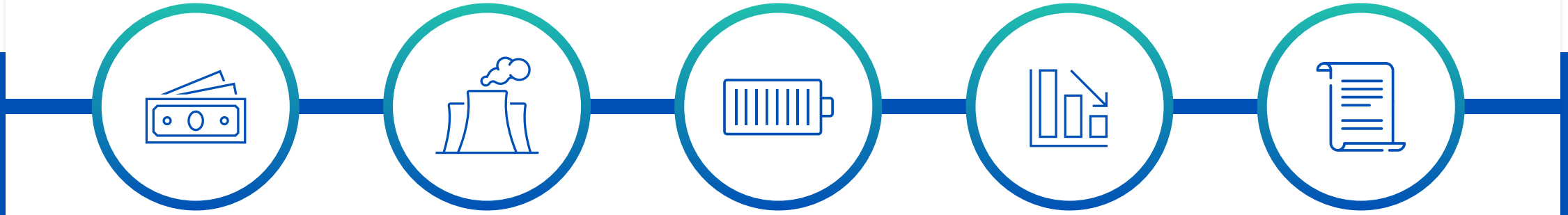


Design goal: technology-agnostic and not risk averse

1) Source: Aurora

Today’s focus: Design requirements for future capacity mechanism

CM success factors

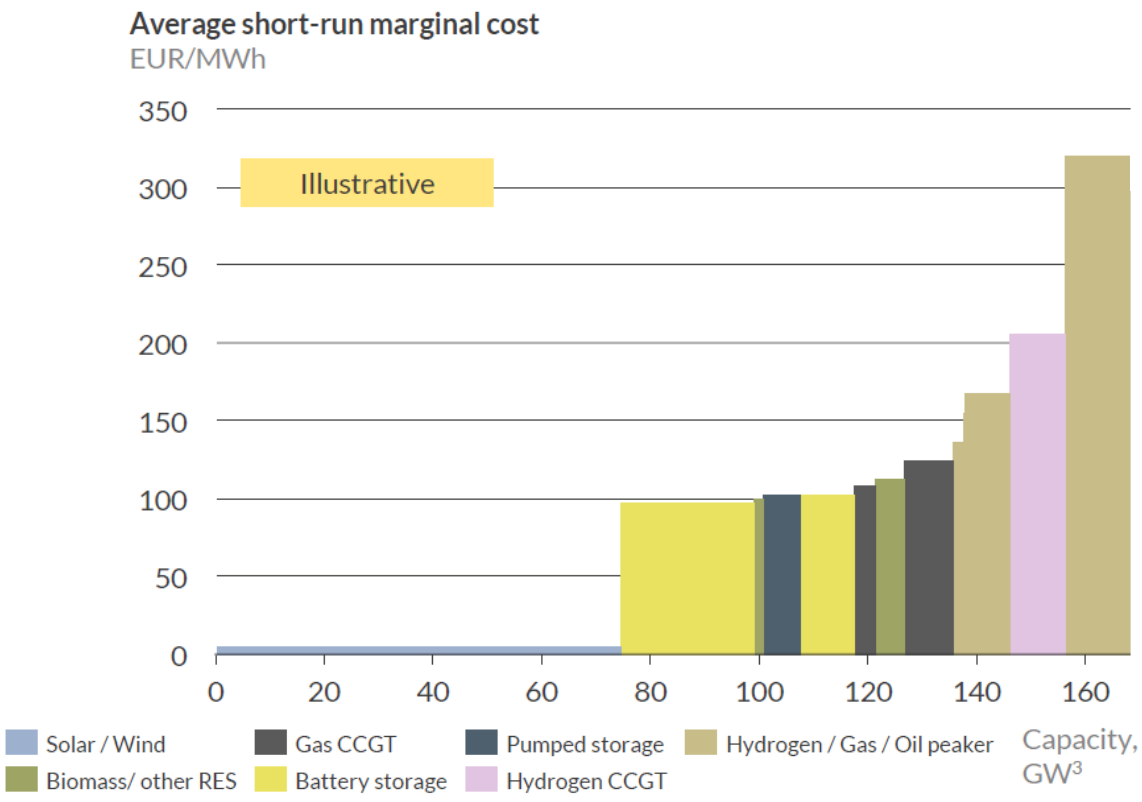


- Total costs
- CO_2 emissions
- Asset availability
- De-rating factors
- Contract terms

Design goal: technology-agnostic and not risk averse

Total costs: Batteries offer low marginal costs and create downward pressure on CM clearing prices

German power market merit order in 2040[1)]

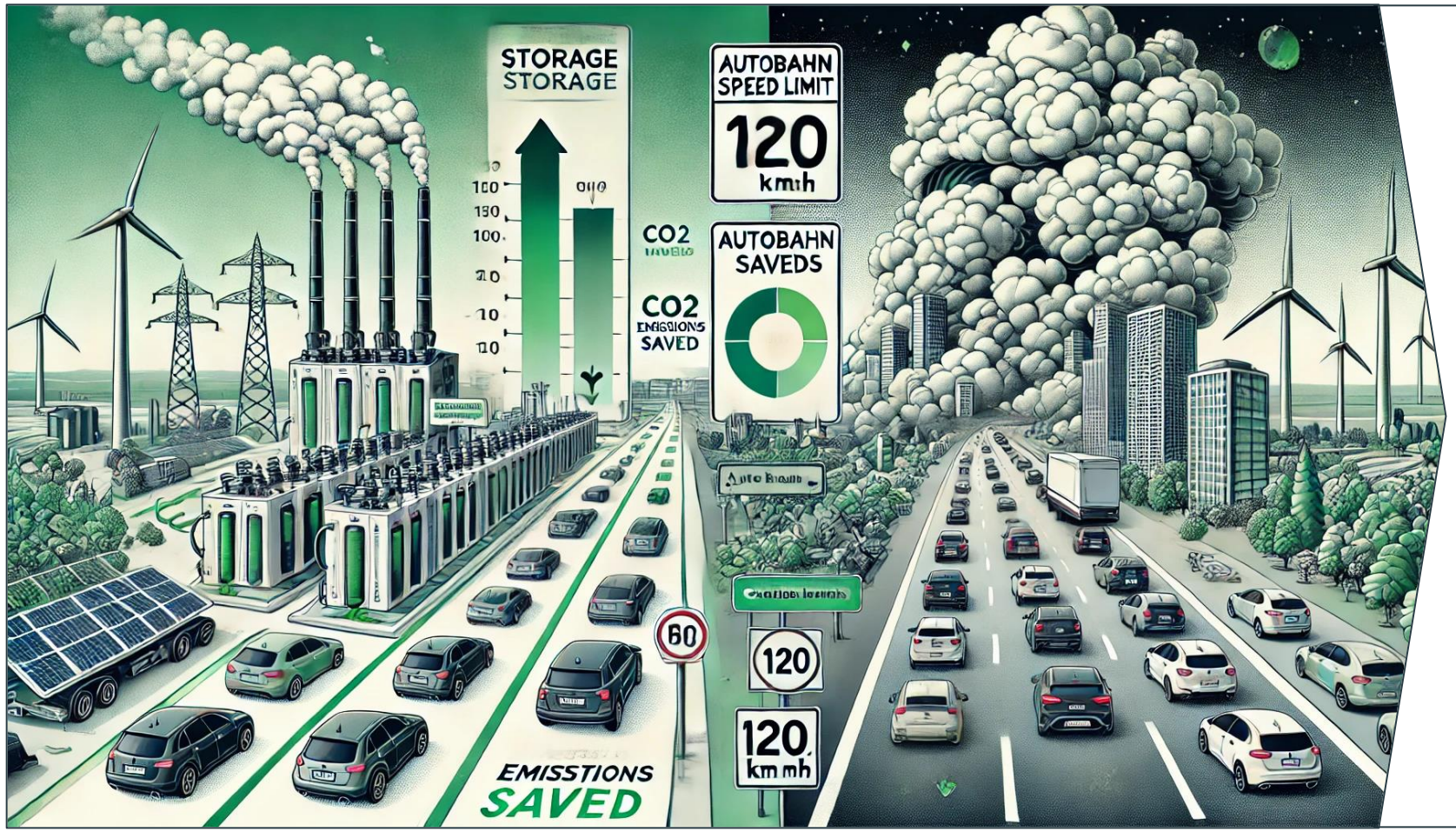


Key take-aways

- Batteries have low marginal costs compared to other generation assets, especially gas peakers
- They thereby create a downward pressure on clearing prices and lower overall costs
- 10 GW of H_2-ready gas power plants already subsidized through power plant strategy (KWS)
- CM should explicitly exclude these assets to avoid capital-intensive double incentivization

1) Source: Aurora

CO_2 emissions: BESS enables dispatchable capacity of carbon-neutral electricity



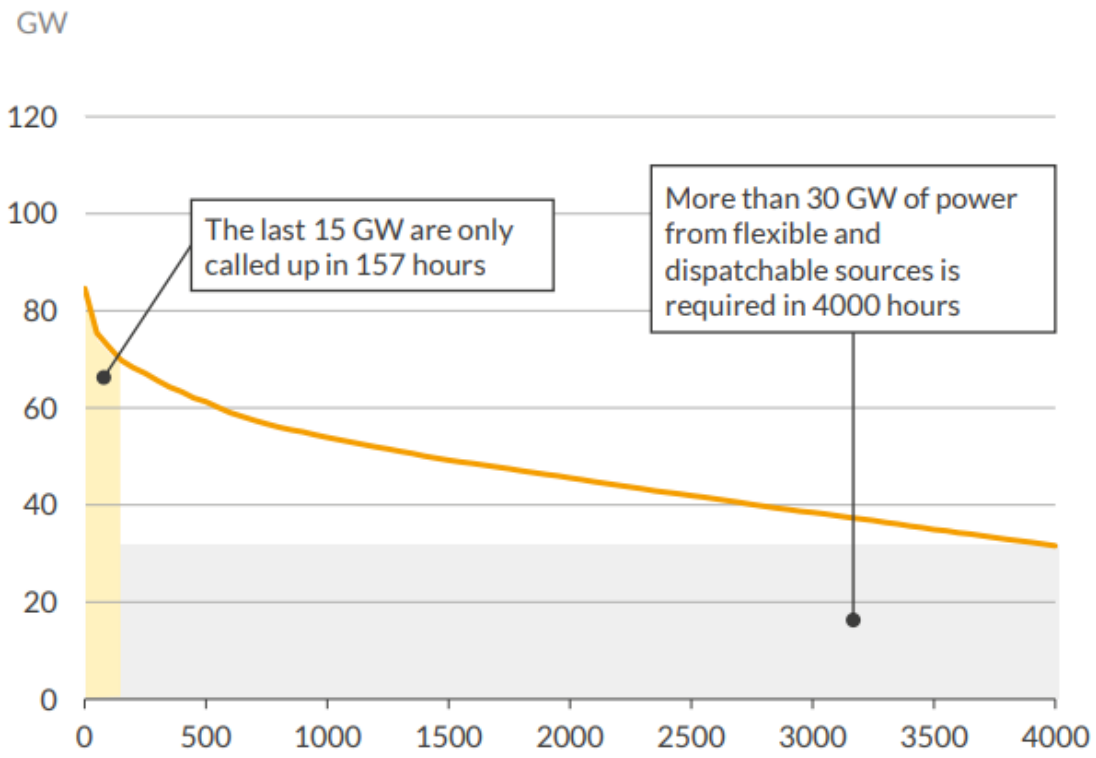
Fronter Economics study

- Recent study showed that grid-scale storage reduces need for gas peakers by 9 GW in 2030
- Equivalent of 6.2mt CO_2 savings in 2030 and 7.9mt in 2040
- Effect of 120km/h limit on all Autobahns: 6.7mt

Picture source: ChatGPT / Dall-E

Asset availability: Capacity market will not replace strategic reserve for extreme events

Residual load duration curve in 2030[1)]



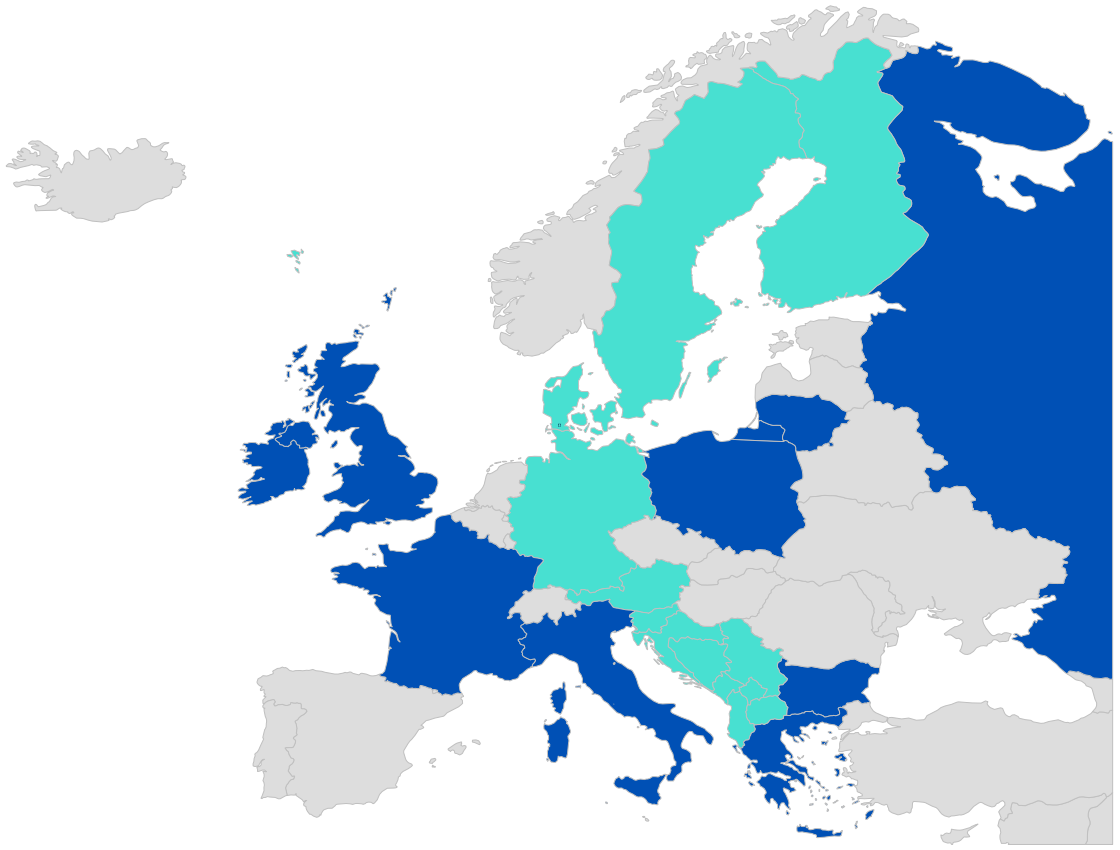
Key take-aways

- Quote from BMWK paper:
  "To counter extreme situations, additional capacities may be useful and necessary [...] these are not provided via a capacity market [...] One such measure is a reserve of controllable capacities. This is held by the TSOs outside the market for extreme situations."
- The capacity market is not meant to be last resort in terms of power supply (i.e., to cover "Dunkelflaute")

1) Source: Aurora

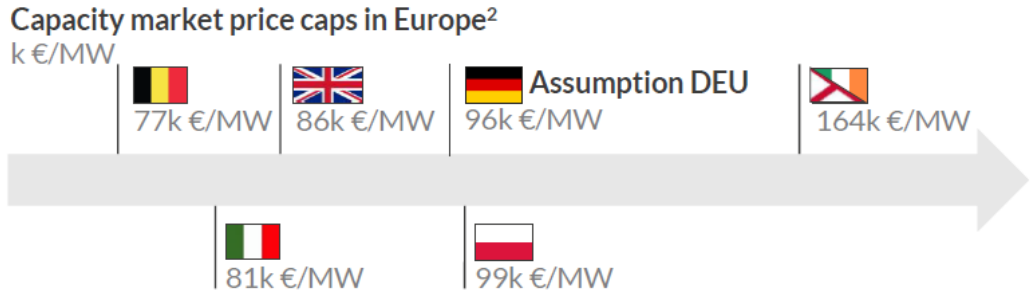
De-rating factors: Realism should outweigh risk-aversion in calculation basis stress scenarios

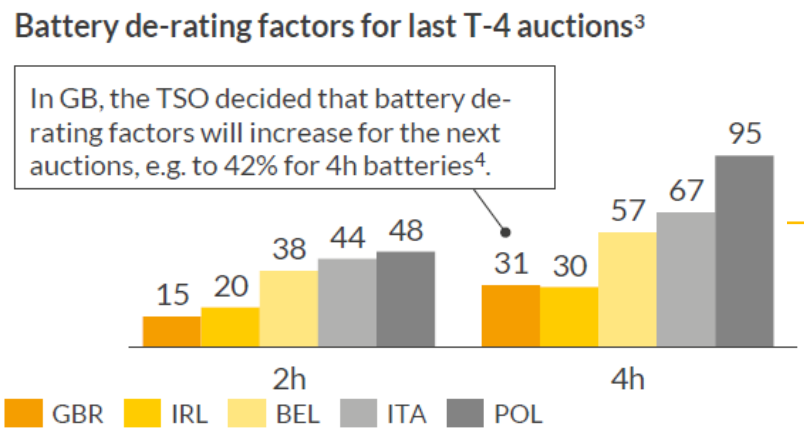
European countries with CM or strategic reserves



Capacity market Strategic reserve

European market price caps and de-rating factors





De-rating factors should reflect
a) most periods of supply shortage only last few hours
b) lack of grid-scale storage capacity in GER

2,3) Source: Aurora

Contract terms: Sufficient time required for thorough pre-qualification process and investor security

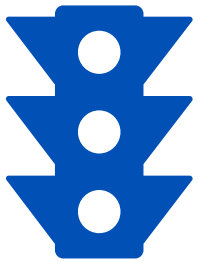
T-4

Contracting aspects

- Longer contract terms offer investment security but should reflect changing market environments and asset degradation
- Recommended contract duration: 12-15 years
- To give room for technical pre-qualification process, auctions should have sufficient lead time (e.g., T-4)

T-1

Q&A



What do you think – will the Capacity Market in Germany be beneficial to BESS and create investor security?

