Monetizing Medium Duration Storage

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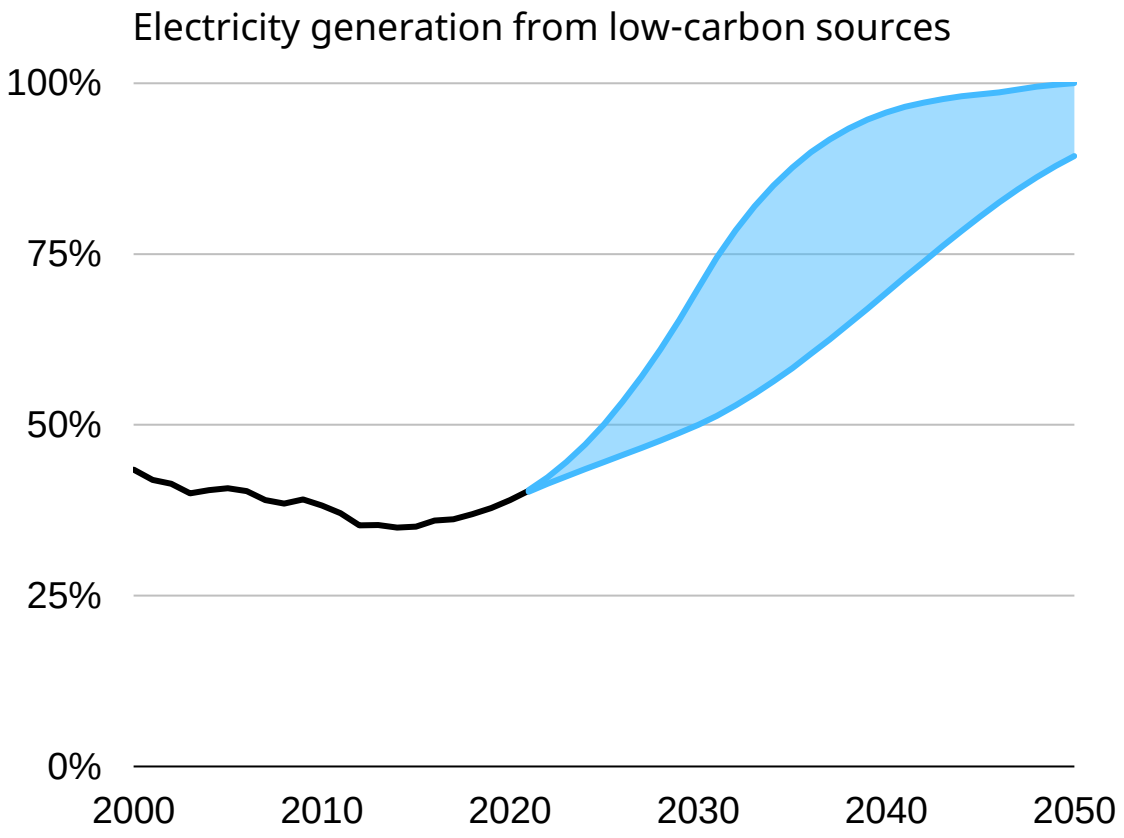
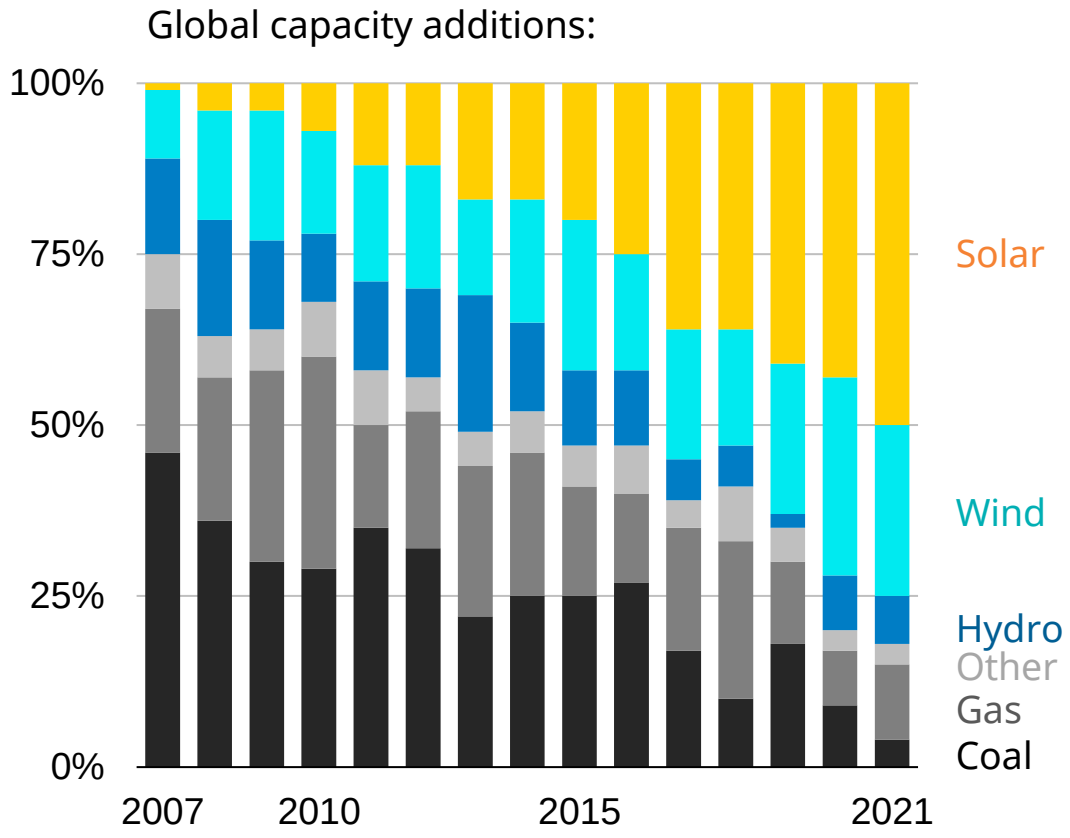
Renewables are the future of electricity generation

What will be needed:



Data from the IPCC 6th Assessment Report

What is already happening:

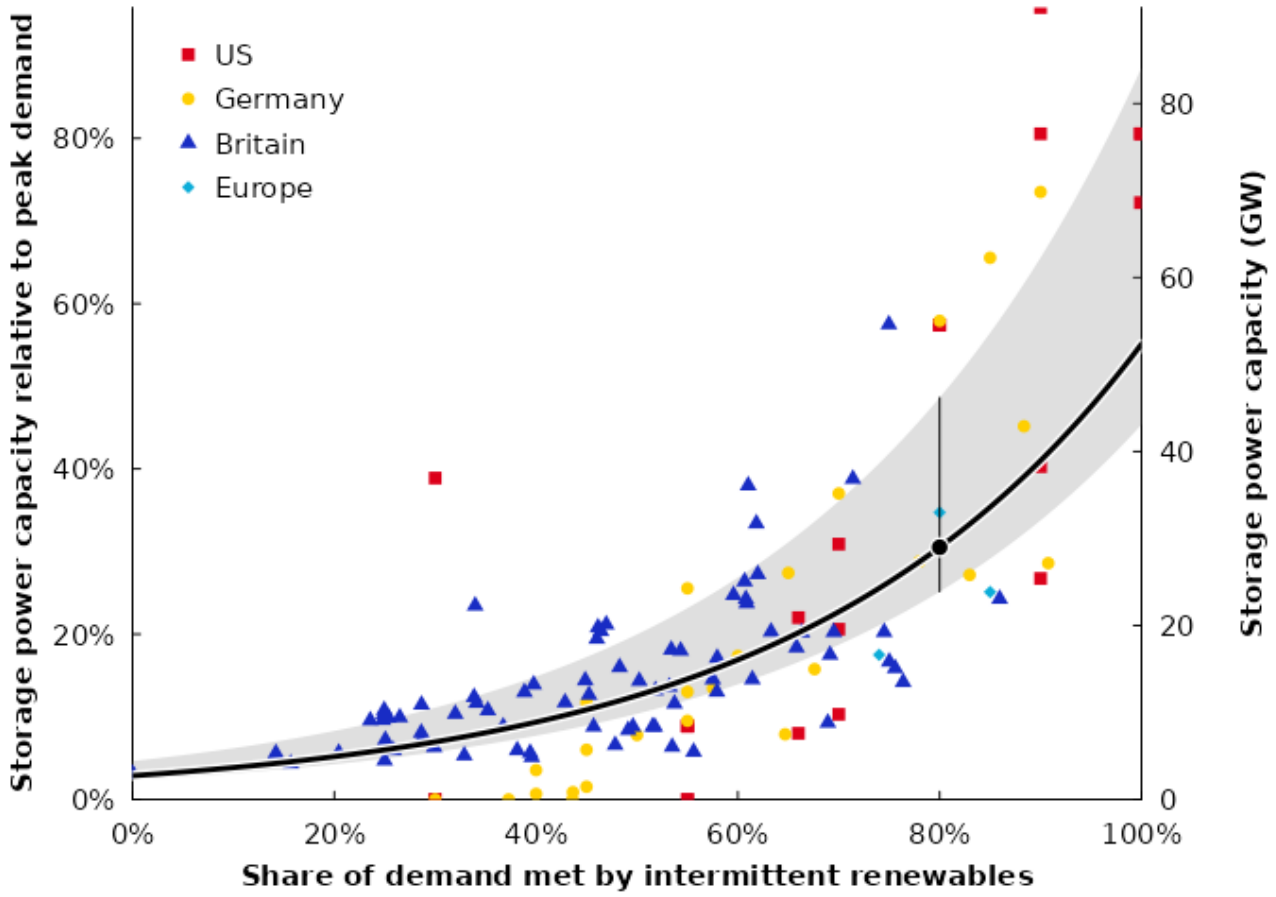


Data from BloombergNEF

So the UK may need 24–46 GW of electricity storage by 2040

‘Leading the way’ scenario from National Grid’s Future Energy Scenarios

- Year: 2040
- Electricity demand: 450 TWh
- Peak demand: 95 GW
- Share of wind and solar: ~80%



You will need 29 GW of storage [24 - 46 best estimate]

Data from National Grid, Future Energy Scenarios, 2023

Chart from www.EnergyStorage.ninja

… that means 170–570 GWh energy storage capacity

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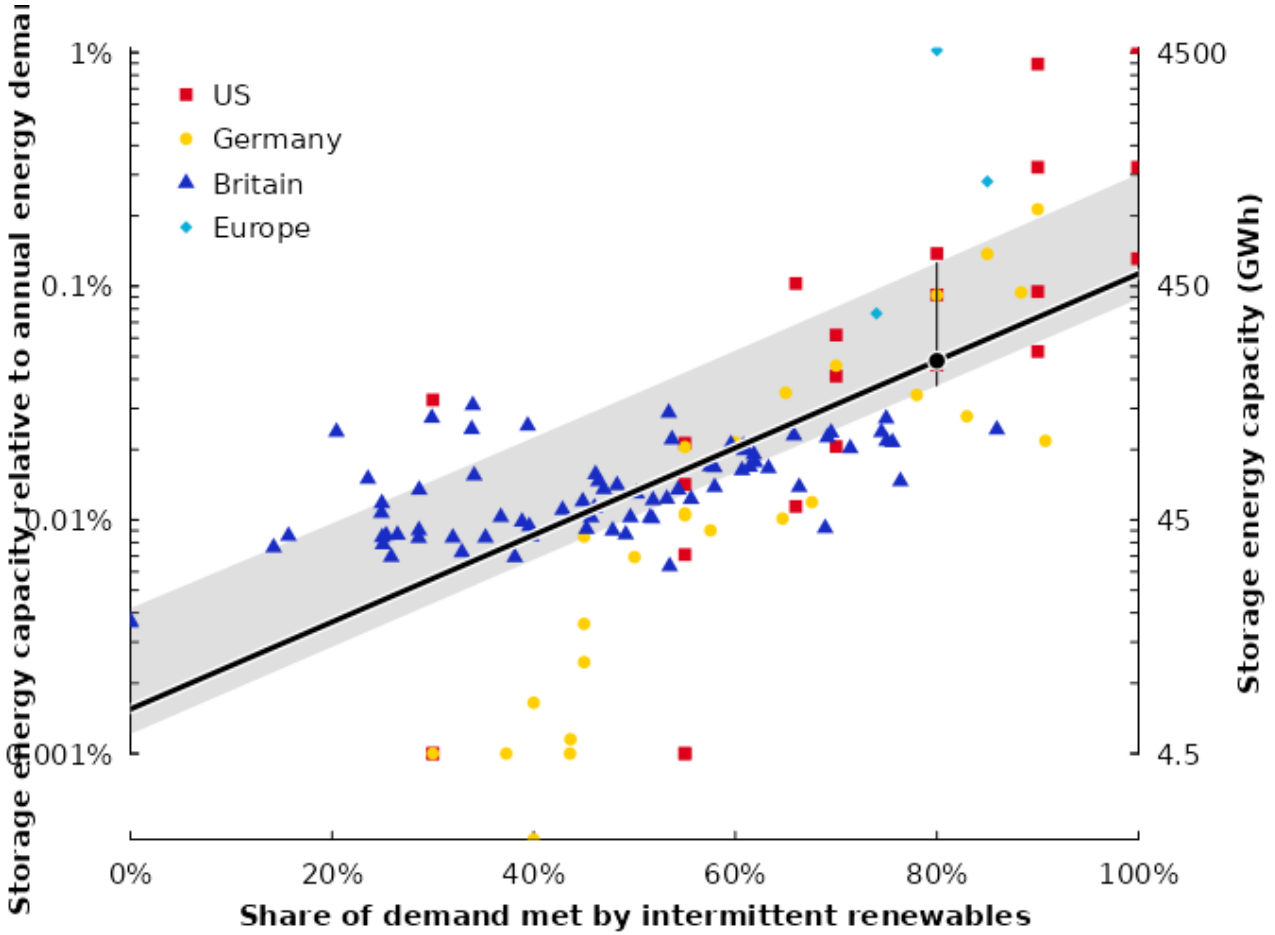


You will need 220 GWh of storage [170 – 570 best estimate]

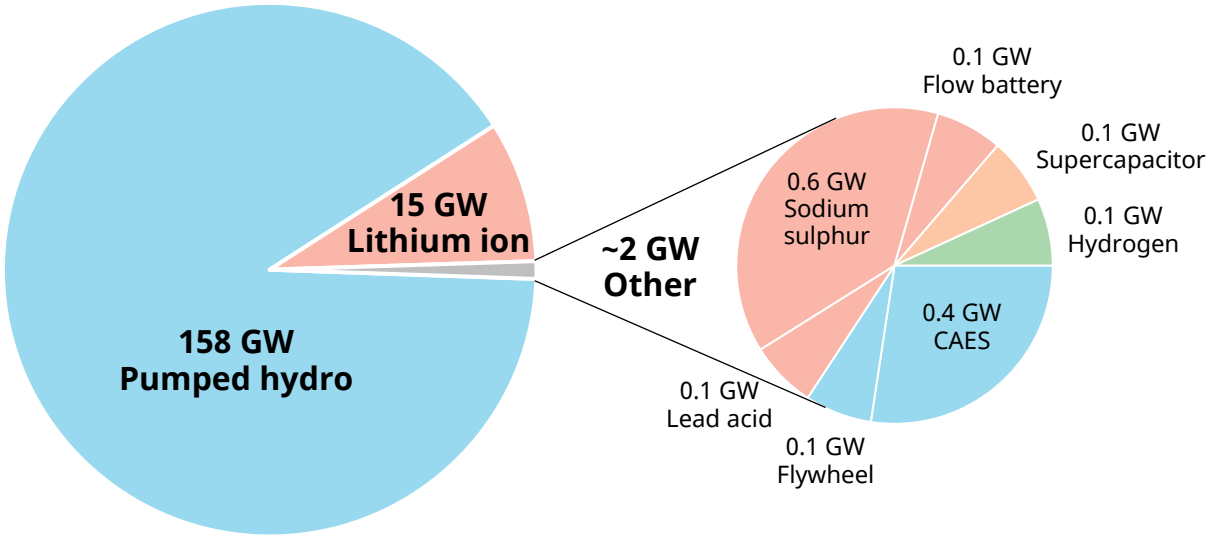
Data from National Grid, Future Energy Scenarios, 2023

Chart from www.EnergyStorage.ninja

So… which technology will we use?

2020 stationary storage:

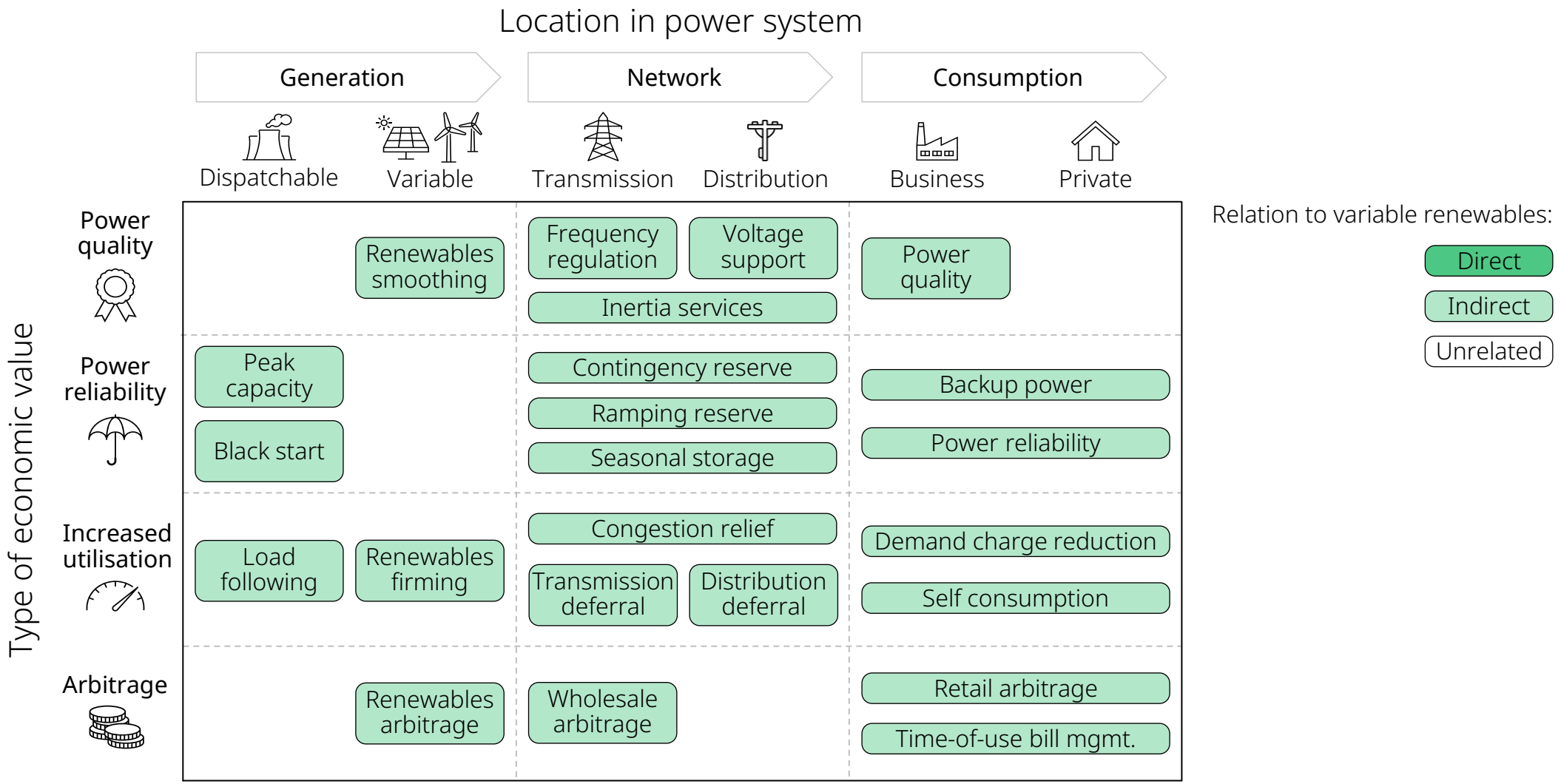
175 GW



2030 stationary storage:

620 GW

Storage provides economic value from various applications



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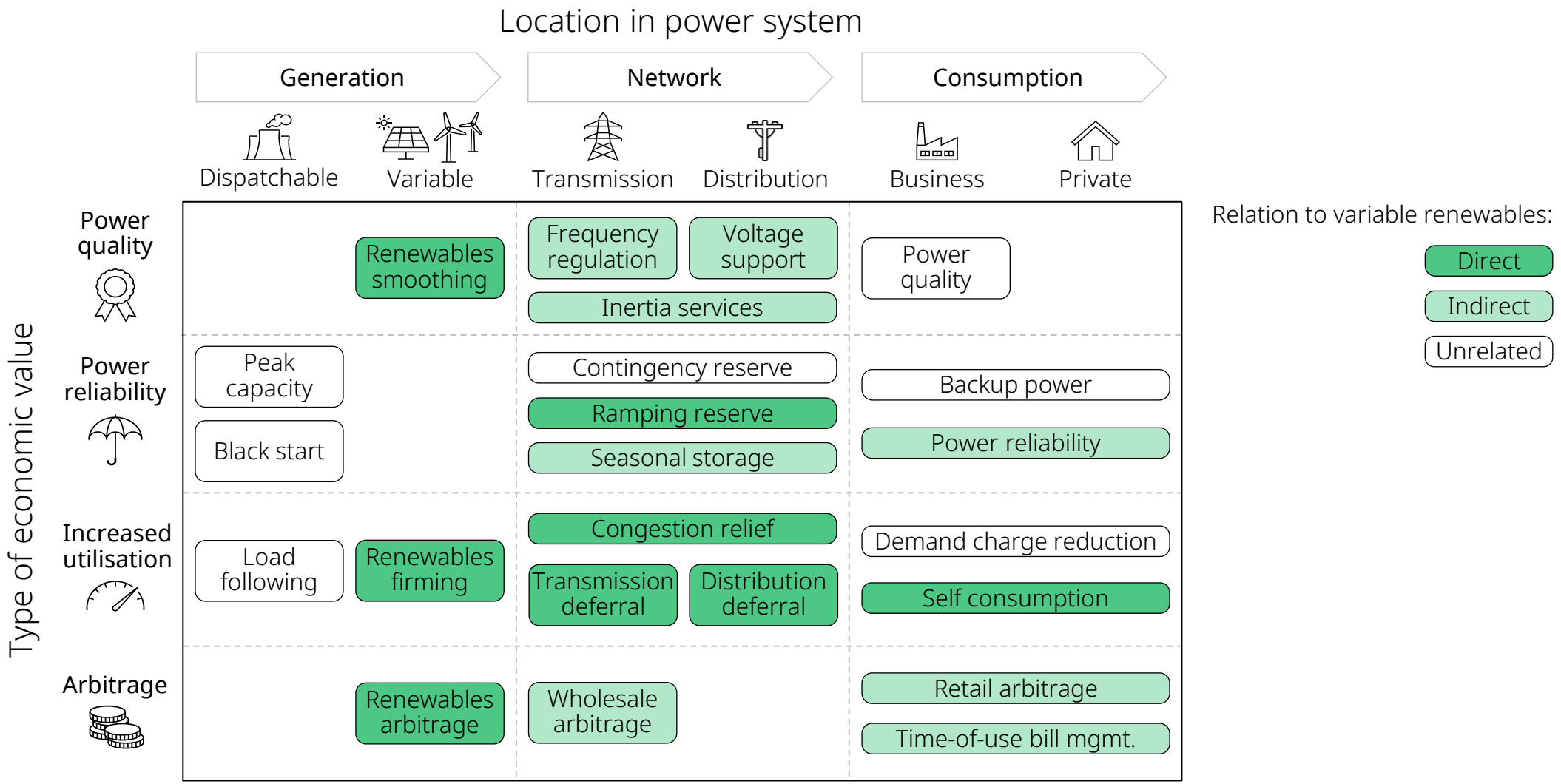
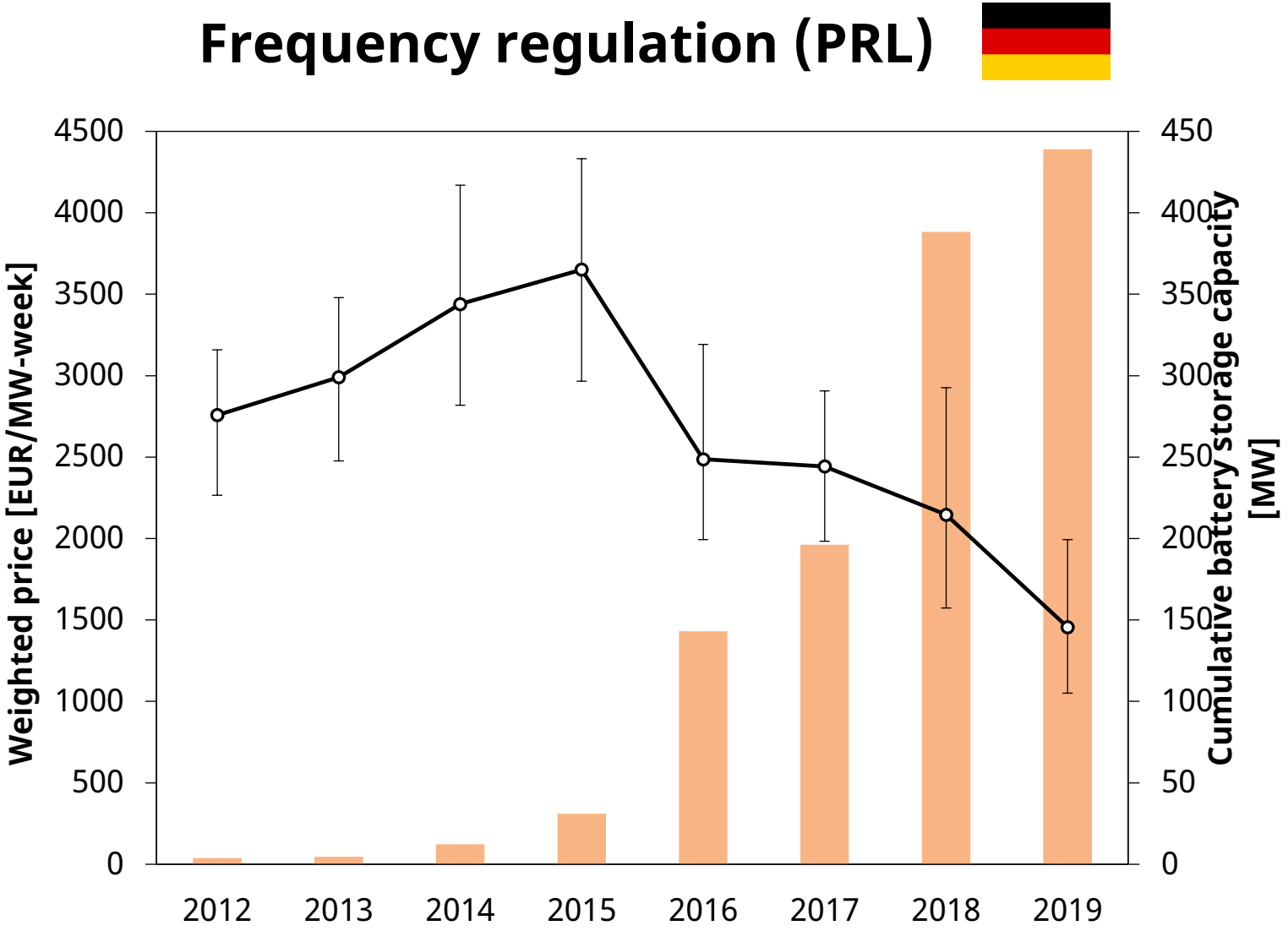


Short-duration markets for ancillary services are relatively shallow…



But spot market arbitrage is not yet profitable, especially as you move to longer durations

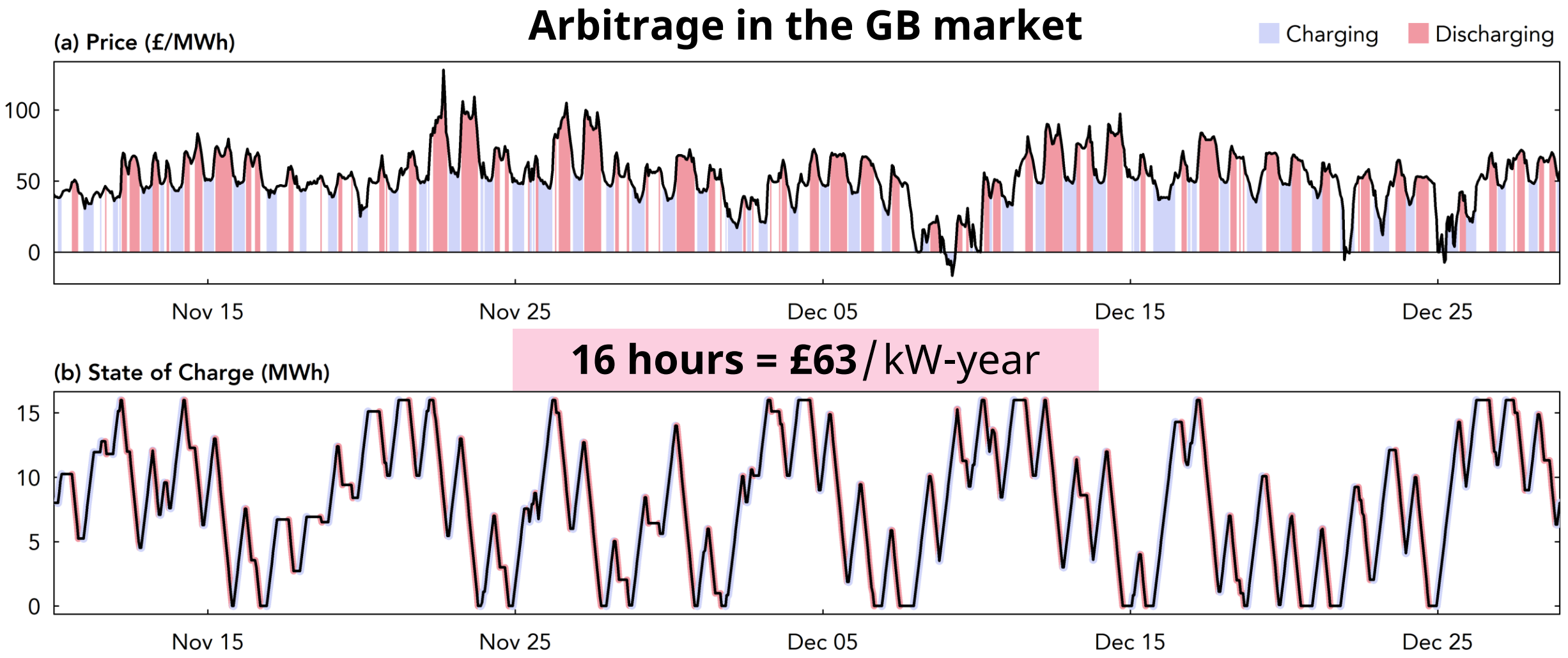
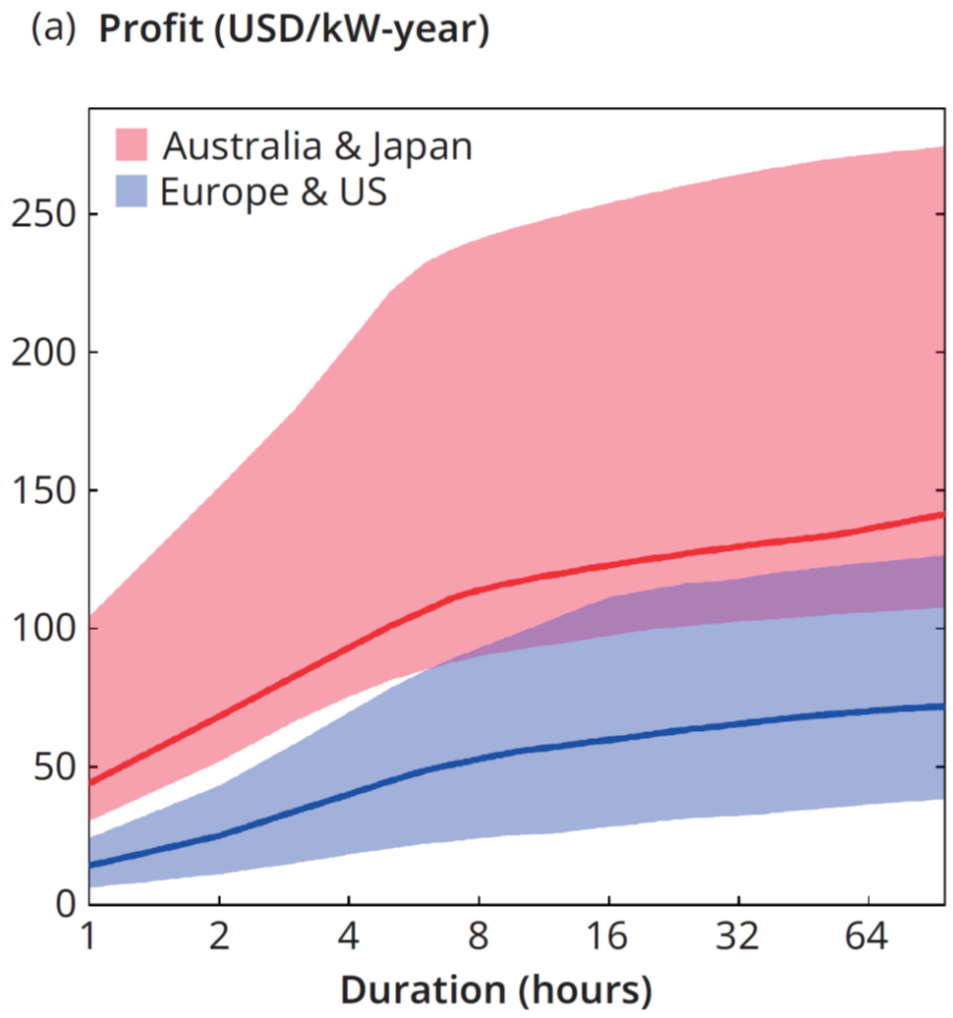
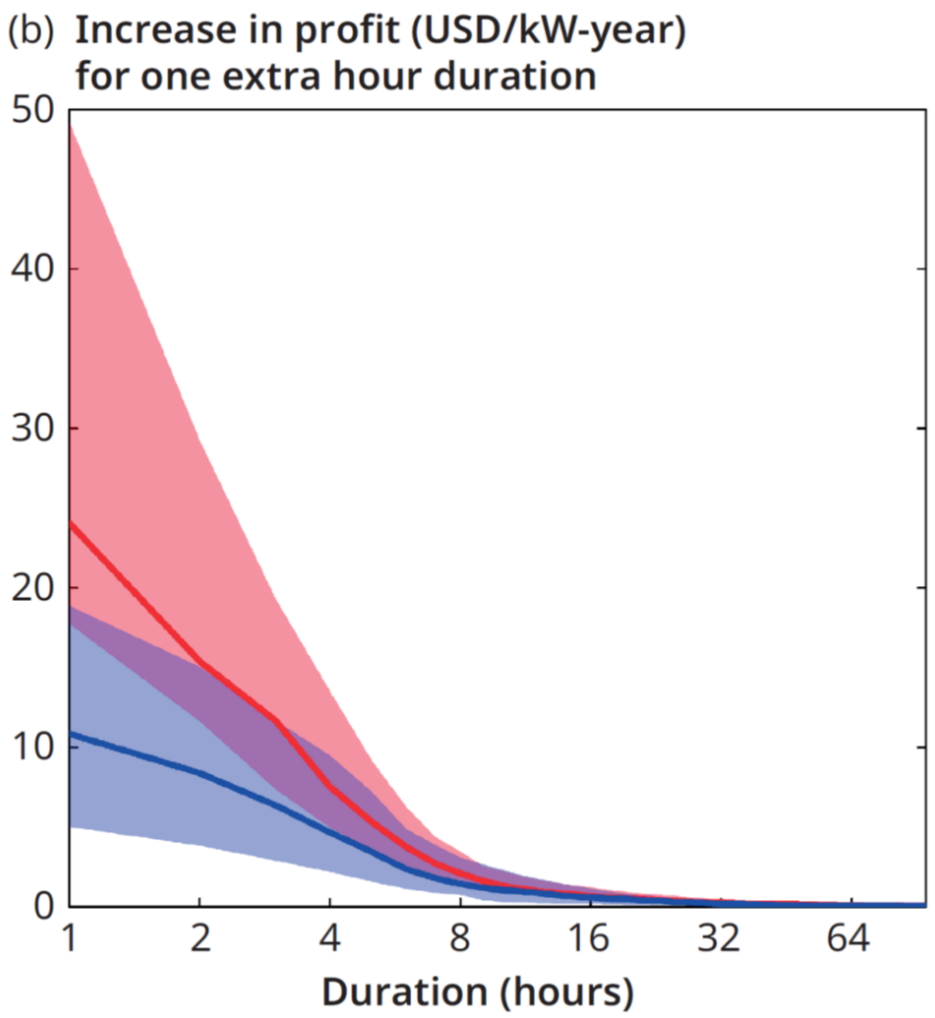


Chart from www.EnergyStorage.ninja

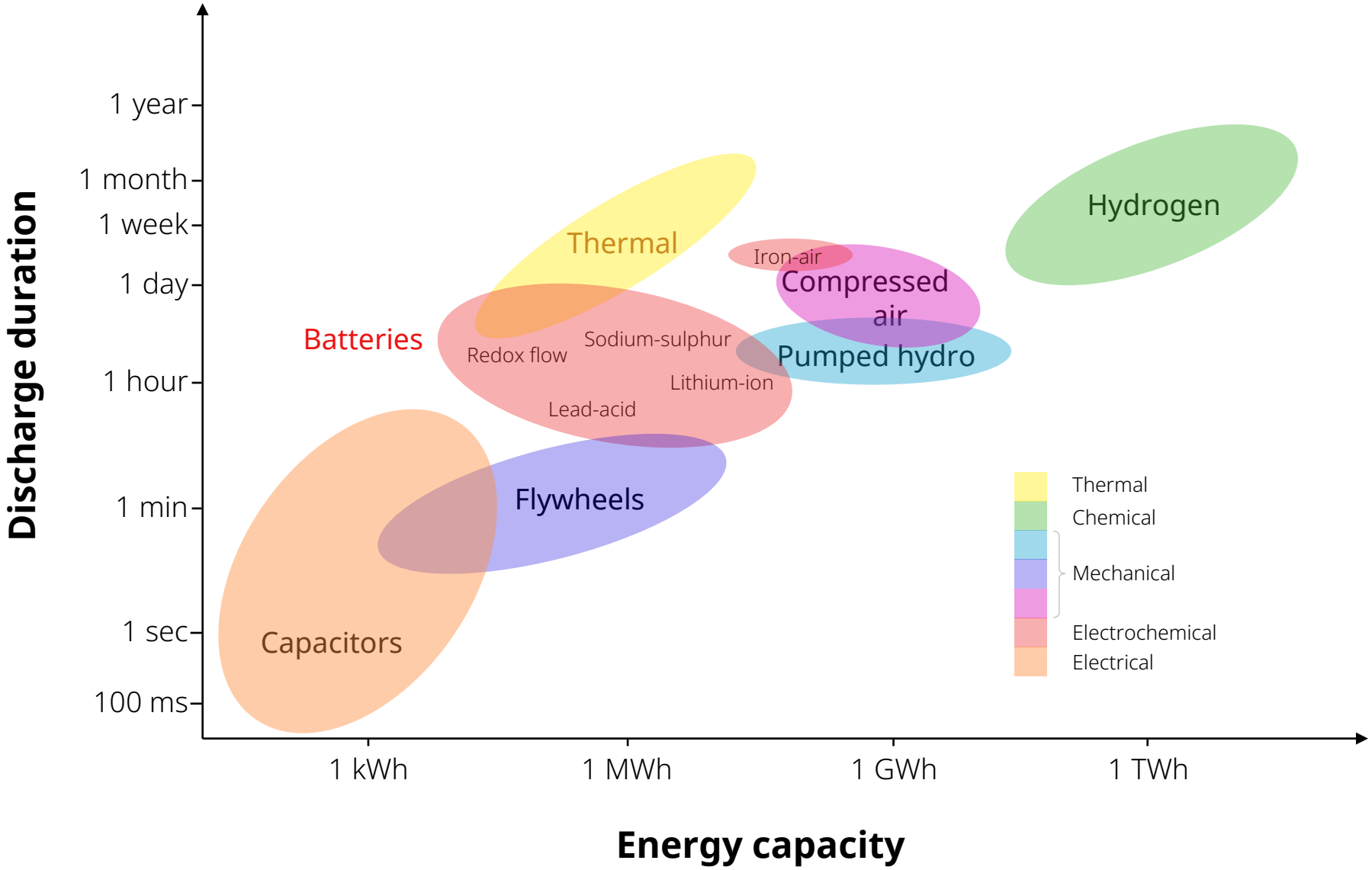
There is limited value to moving energy between seasons, going beyond 8-hour arbitrage adds little to profitability



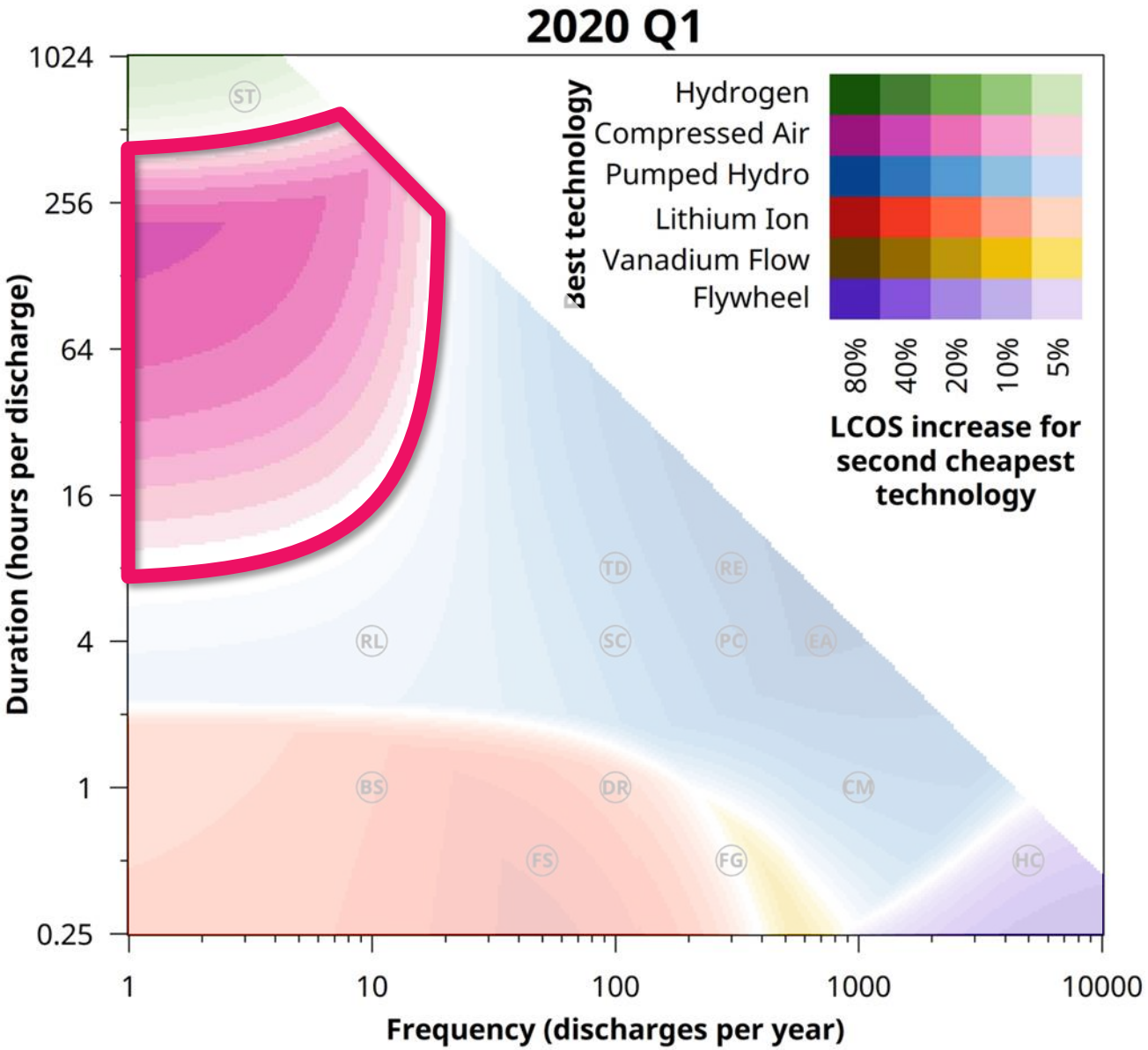


Based on day-ahead wholesale prices from 2012-19 in various markets

Different technologies are best suited to these different applications and durations



A lot of technologies will compete to deliver medium duration storage at lowest cost



Circles denote typical power system applications:

- (ST) Inter-seasonal storage *(not currently monetized)*
- (RL) Power reliability
- (TD) Transmission & distribution investment deferral
- (RE) Renewables integration
- (SC) Increasing self-consumption
- (PC) Peaking capacity
- (EA) Energy arbitrage
- (BS) Black start
- (DR) Demand charge reduction
- (CM) Congestion management
- (FS) Frequency response (ramping / inertia)
- (FG) Frequency regulation (power quality)
- (HC) High cycle *(not currently monetized)*

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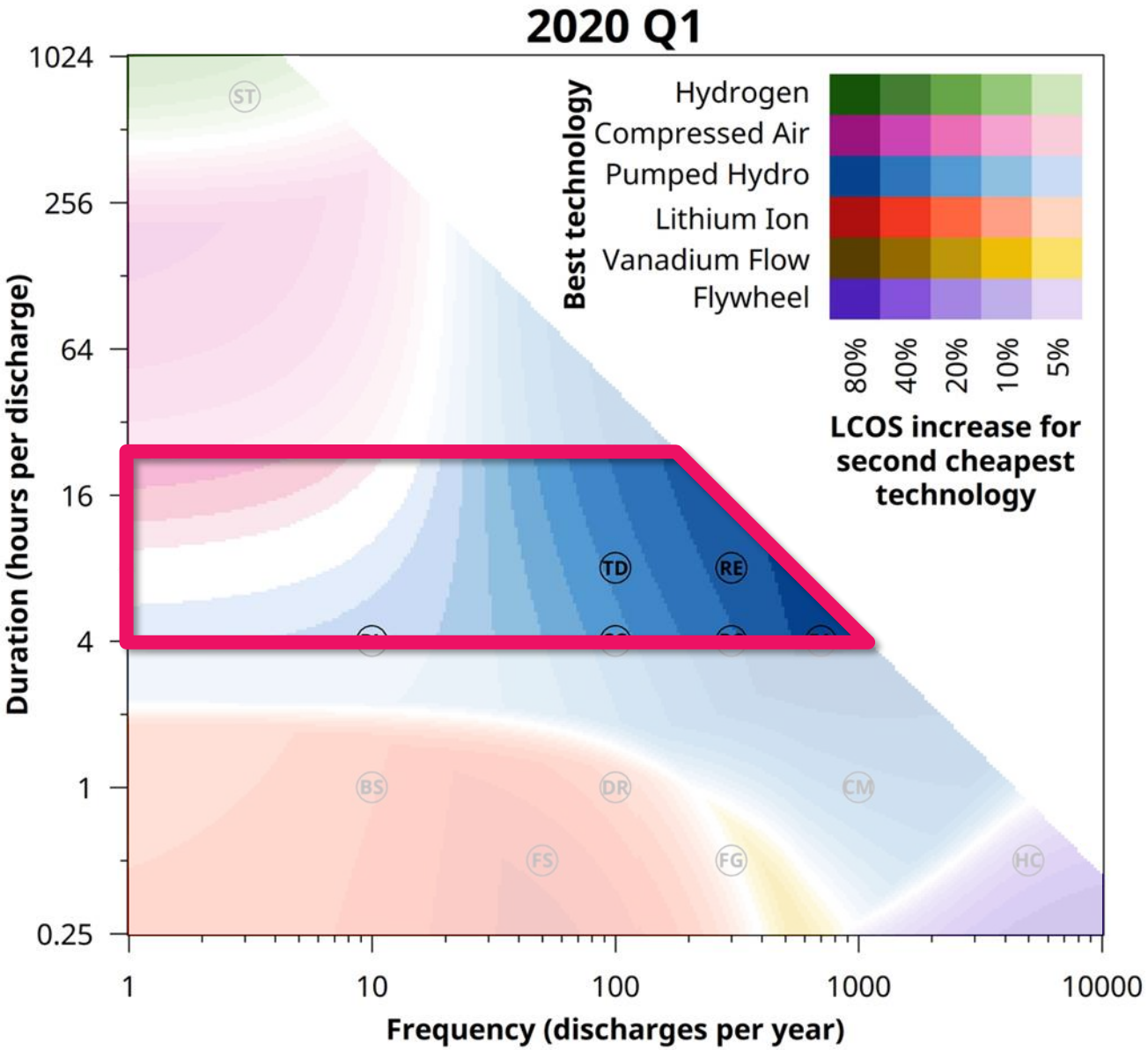

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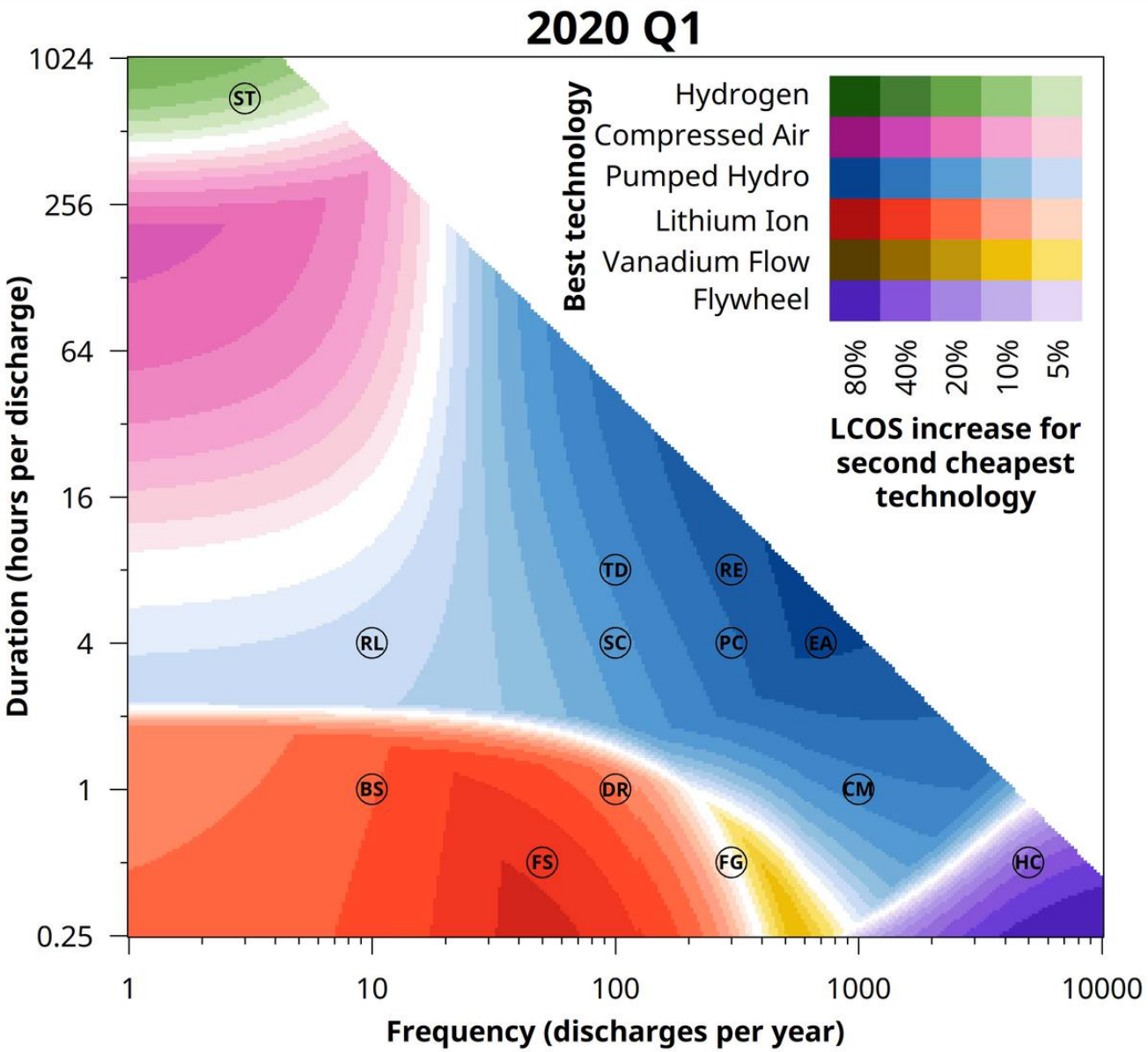

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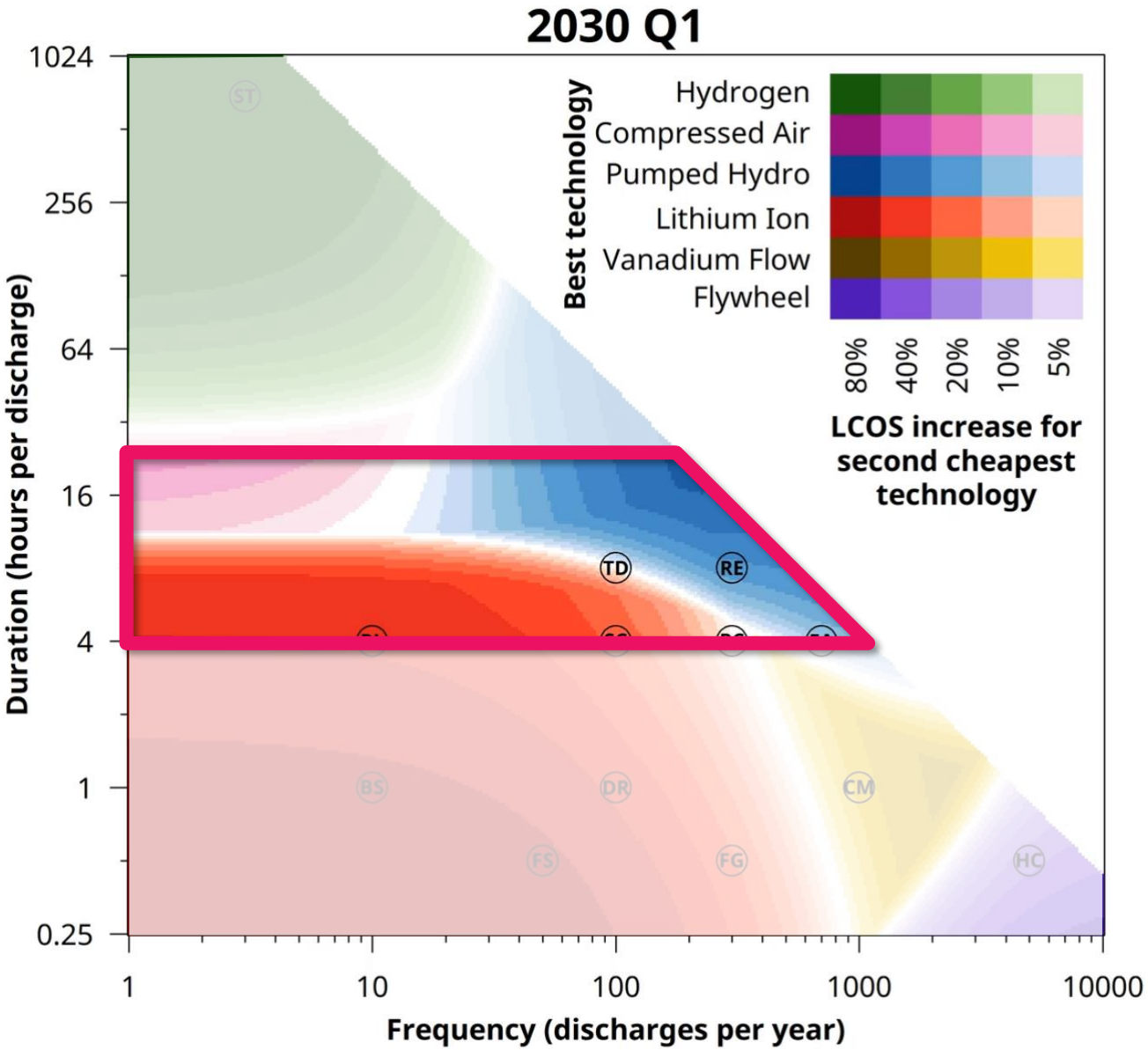

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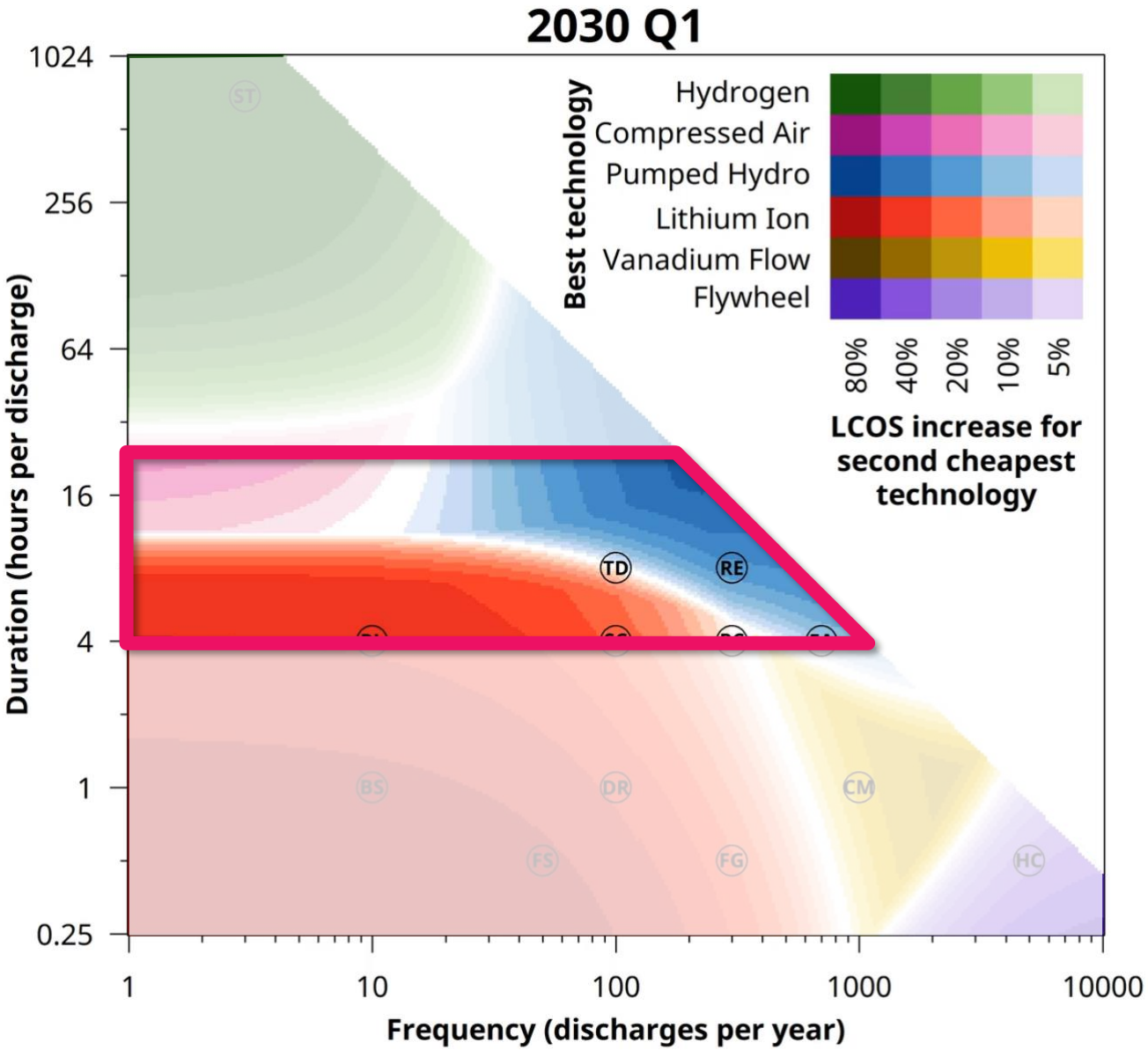

Where might other technologies fit in here?

- Depends on costs
- Depends on learning rates
- Depends on performance
- Depends on lifetime

All the insights and tools shown here are available in this book and website

"Essential for me as an investor to navigate this complex, fast-paced energy storage industry."

Gerard Reid, Alexa Capital

"The go-to resource… exemplary in terms of academic rigour set in a real world context."

Jim Skea, Chair of the IPCC

User-friendly tools for custom analyses: www.EnergyStorage.ninja