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The future for storage in Europe



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Introduction KYOS

Who is KYOS?

- KYOS founded in 2008
- Specialist in energy & commodity markets: trading, valuation, risk management
- Core product: KYOS Analytical Platform
- Software + consulting

What do we offer in power markets?

- KyPlant - power plant optimization, hedging and valuation
- KyCurve - forward curve builder, using market prices
- KySim - Monte Carlo price simulation engine, multi-commodity
- KyPF - fundamental power market model



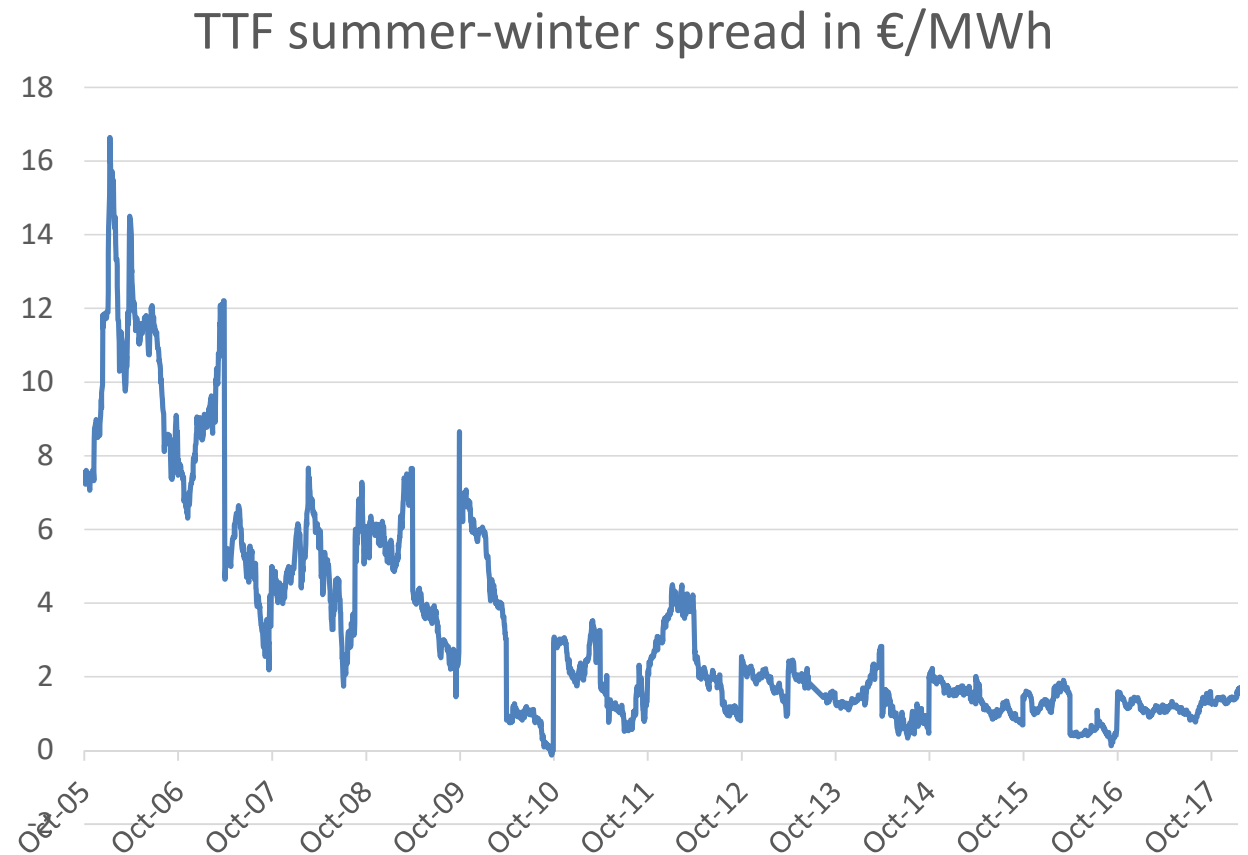
$$= \lim_{n \rightarrow \infty} \frac{\sum_{n=1}^n \frac{h}{n} x f(x)}{\sum_{n=1}^n \frac{h}{n} f(x)}$$



Gas storage market: not a positive decade

- Spreads down
- Volatility down

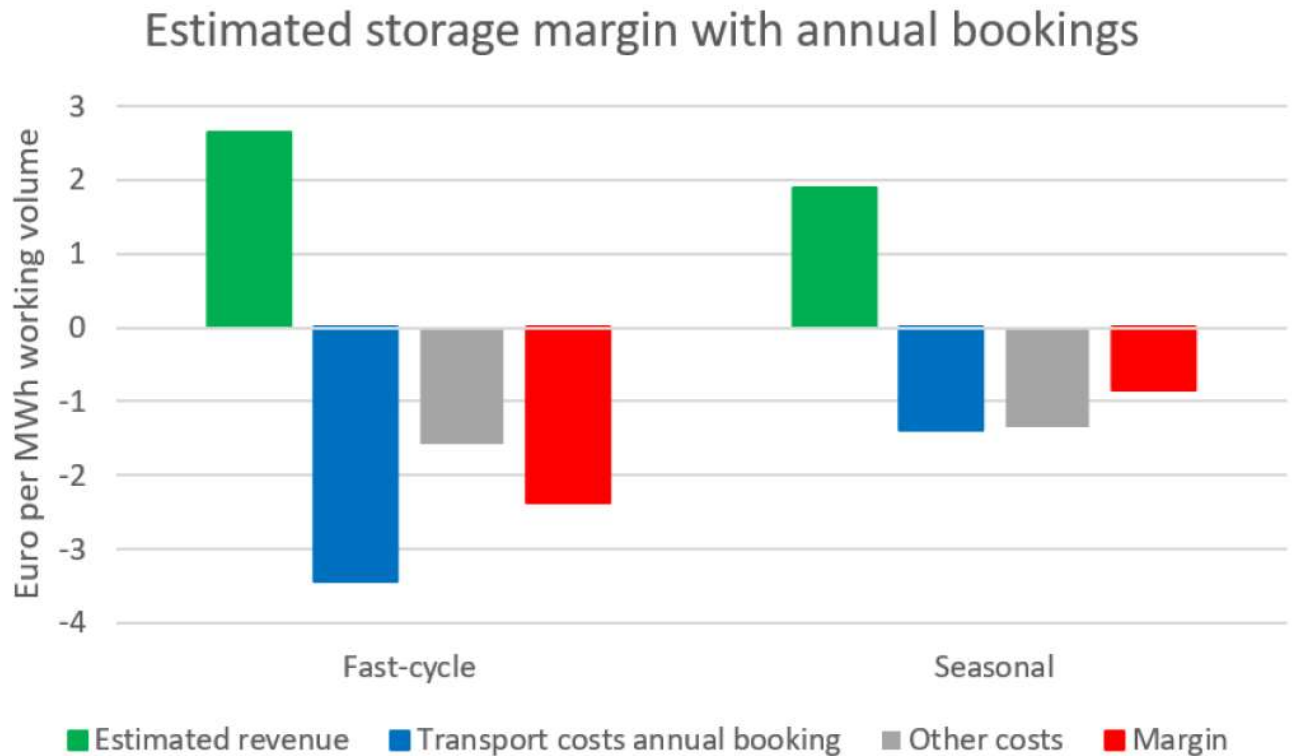
→ (very) low margins



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→ (very) low margins



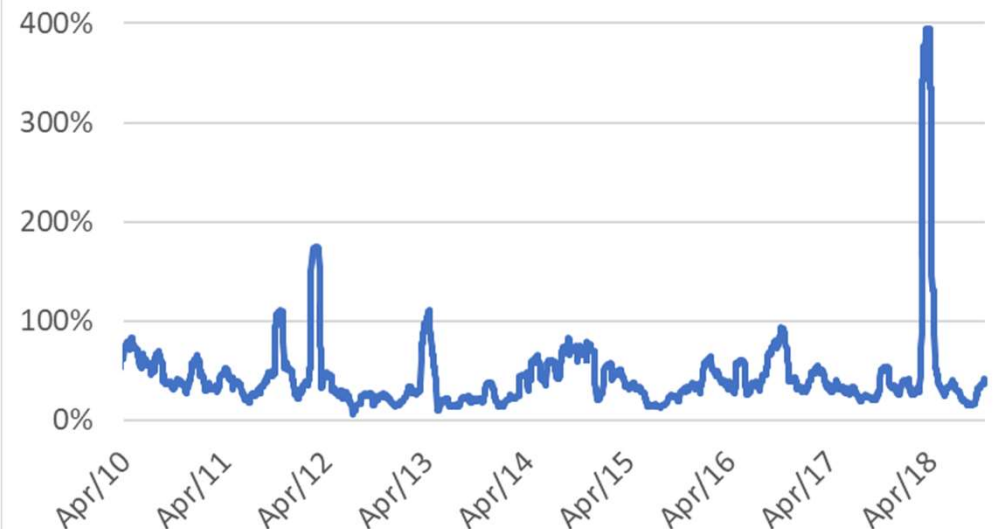
Winter 2017/18: Wake-up call?

- Price peak
- Volatility spike

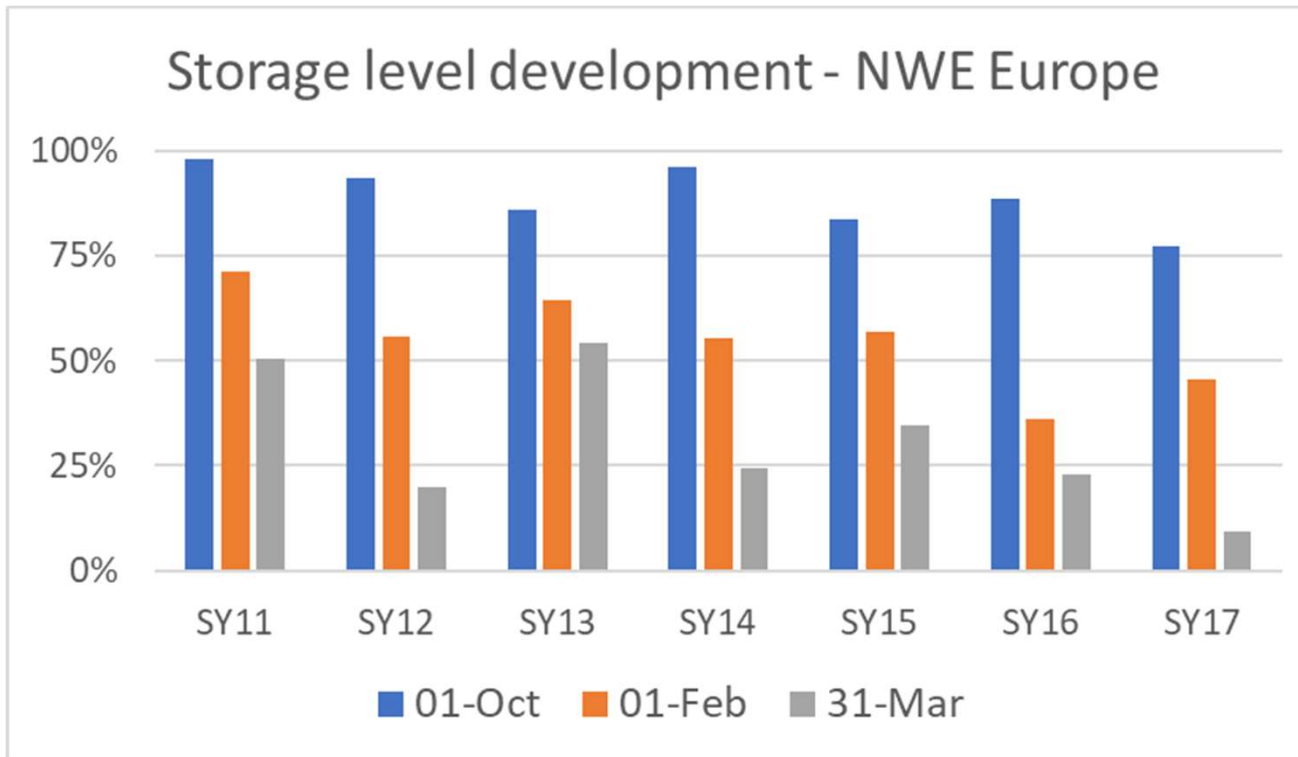
TTF DA development



TTF spot volatility (1 month)



Storage development over winter



SY2017:

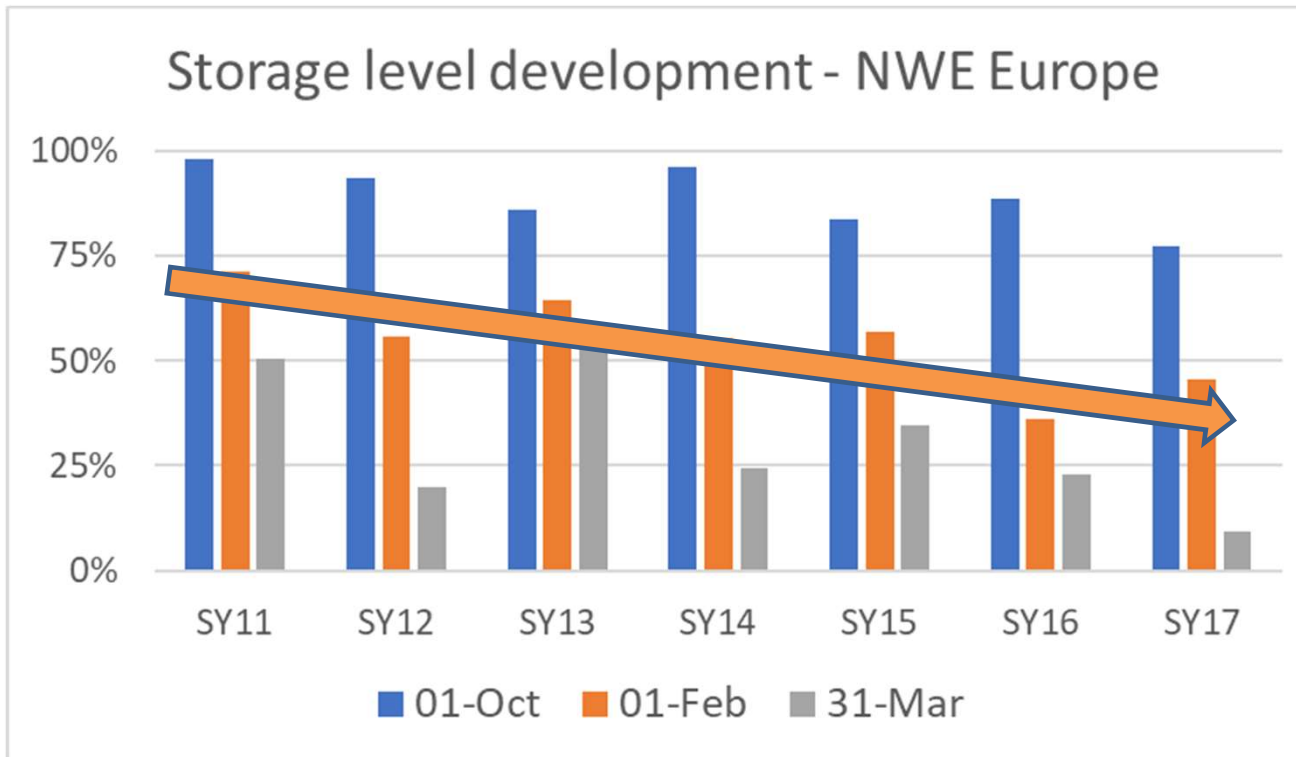
- Mid winter already low
- Very low stock levels end of winter



Source: AGSI, aggregated data for storages in UK, GE, NL, FR, BE



Storage development over winter



SY2017:

- Mid winter already low
- Very low stock levels end of winter

Overall trend: less conservative use of storage

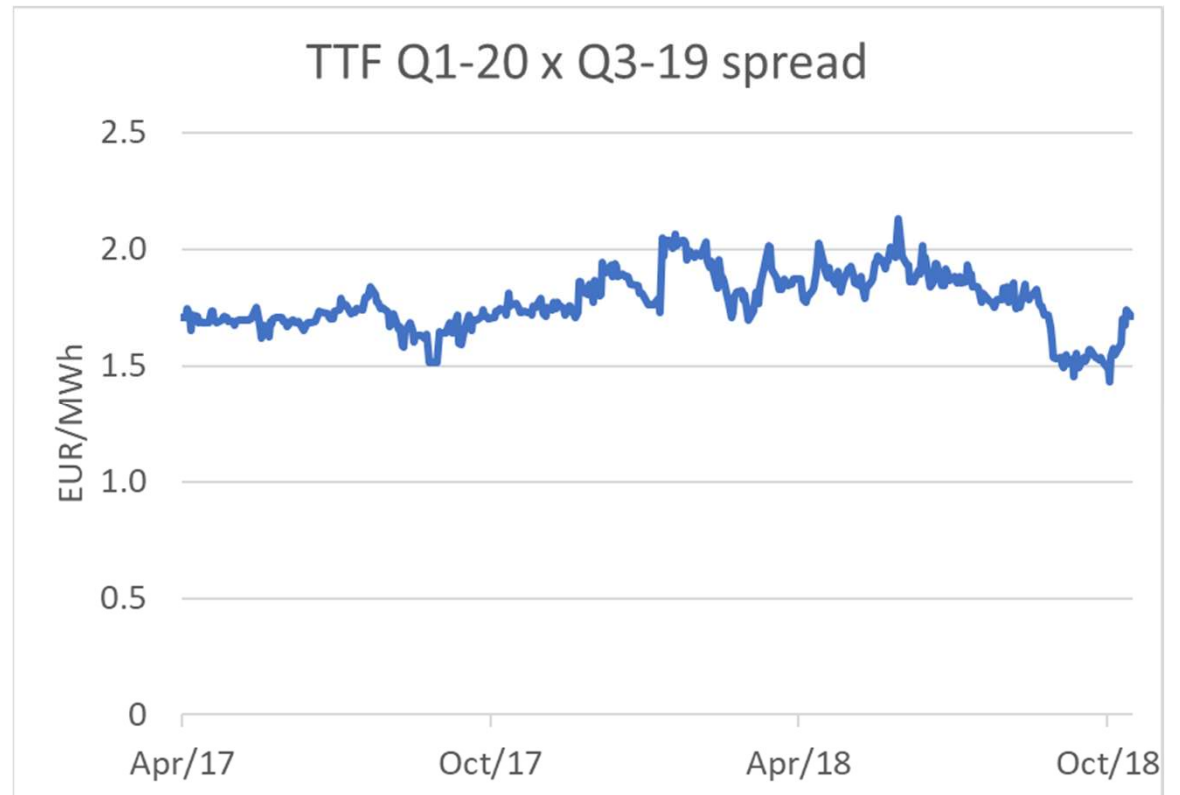


Source: AGSI, aggregated data for storages in UK, GE, NL, FR, BE



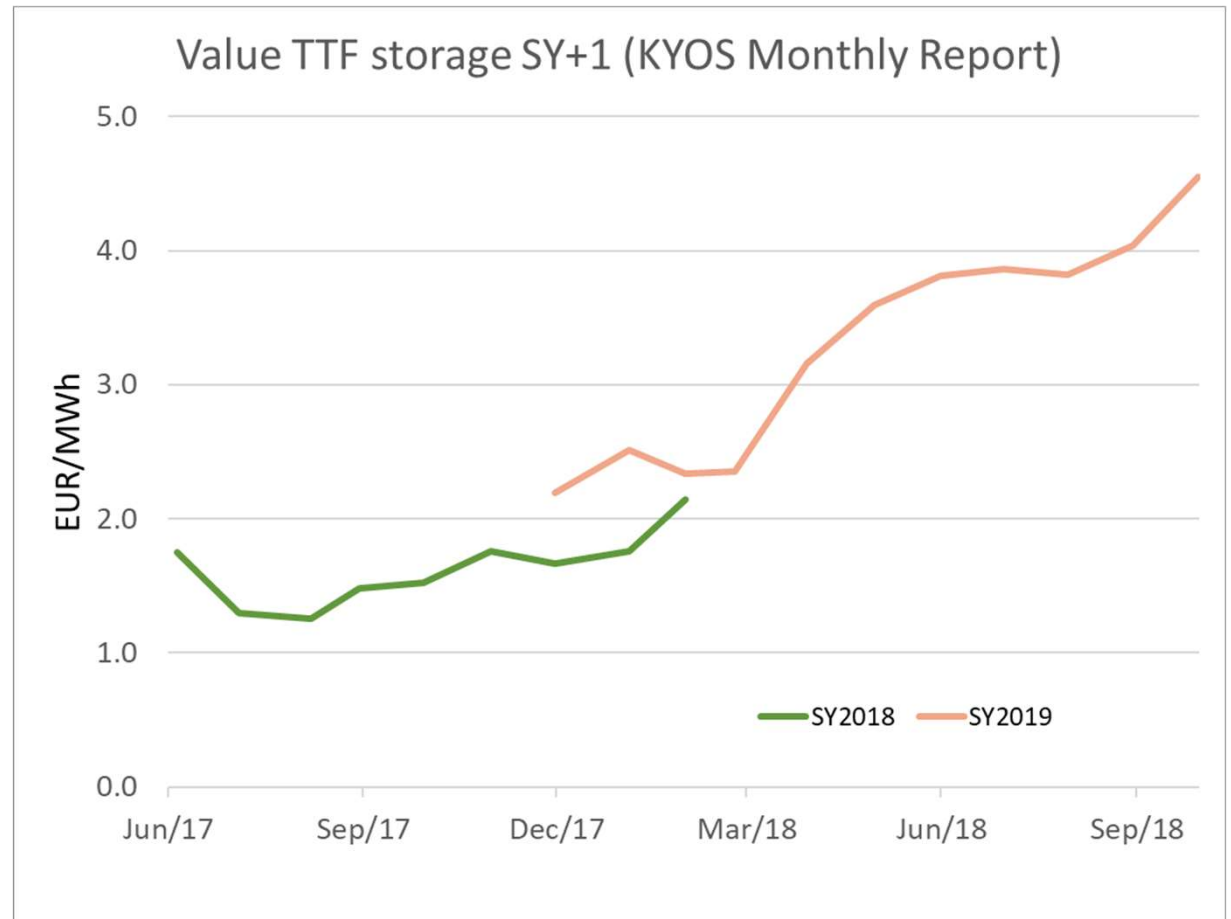
Is it reflected in forward storage value?

- SY2019 spread down
- (spot) volatility up
 - 37% Oct 2017
 - 58% Oct 2018



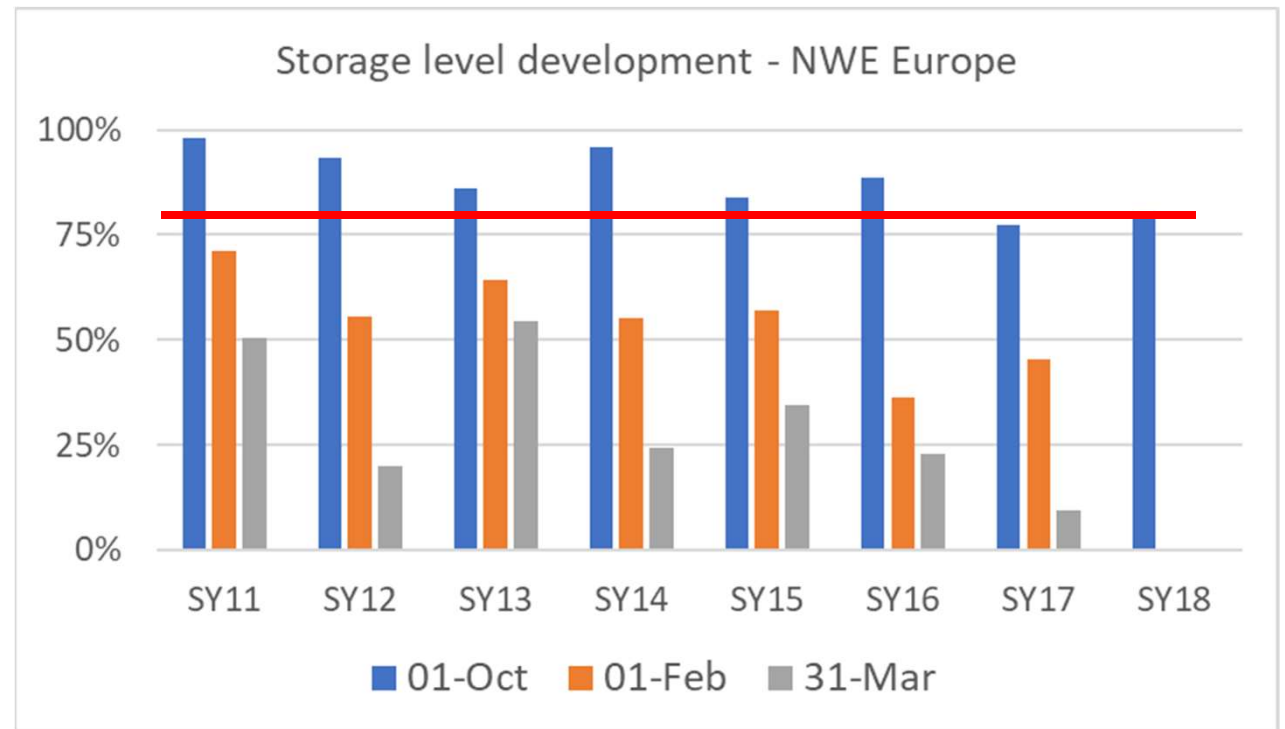
Is it reflected in forward storage value?

- SY2019 spread down
- (spot) volatility up
 - 37% start winter
 - 58% currently
- Market value did react



Where do we stand now?

- Healthy storage levels

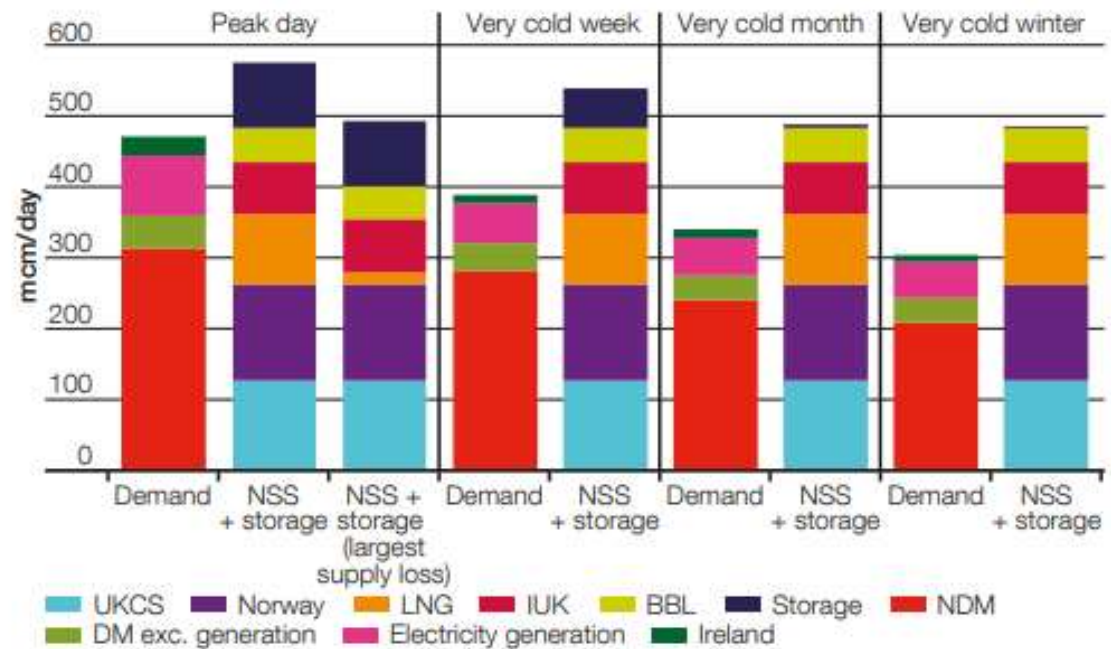


Source: AGSI, aggregated data for storages in UK, GE, NL, FR, BE



Where do we stand now?

- Healthy storage levels
- Winter outlook positive
- But risk remains on upside:
 - Gas/coal switching
 - outages

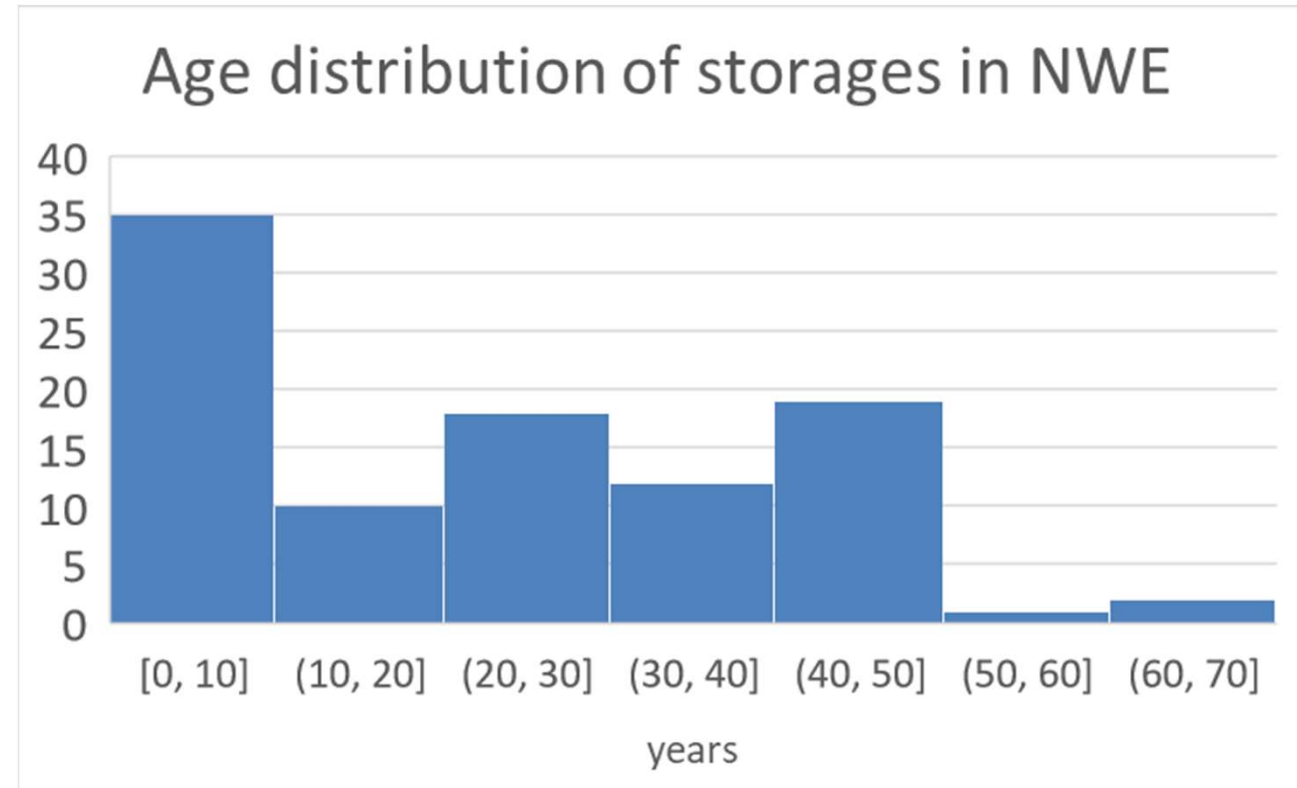


Source: National Grid 2018/19 winter outlook



Ageing storages

- Major maintenance
- Cushion gas value

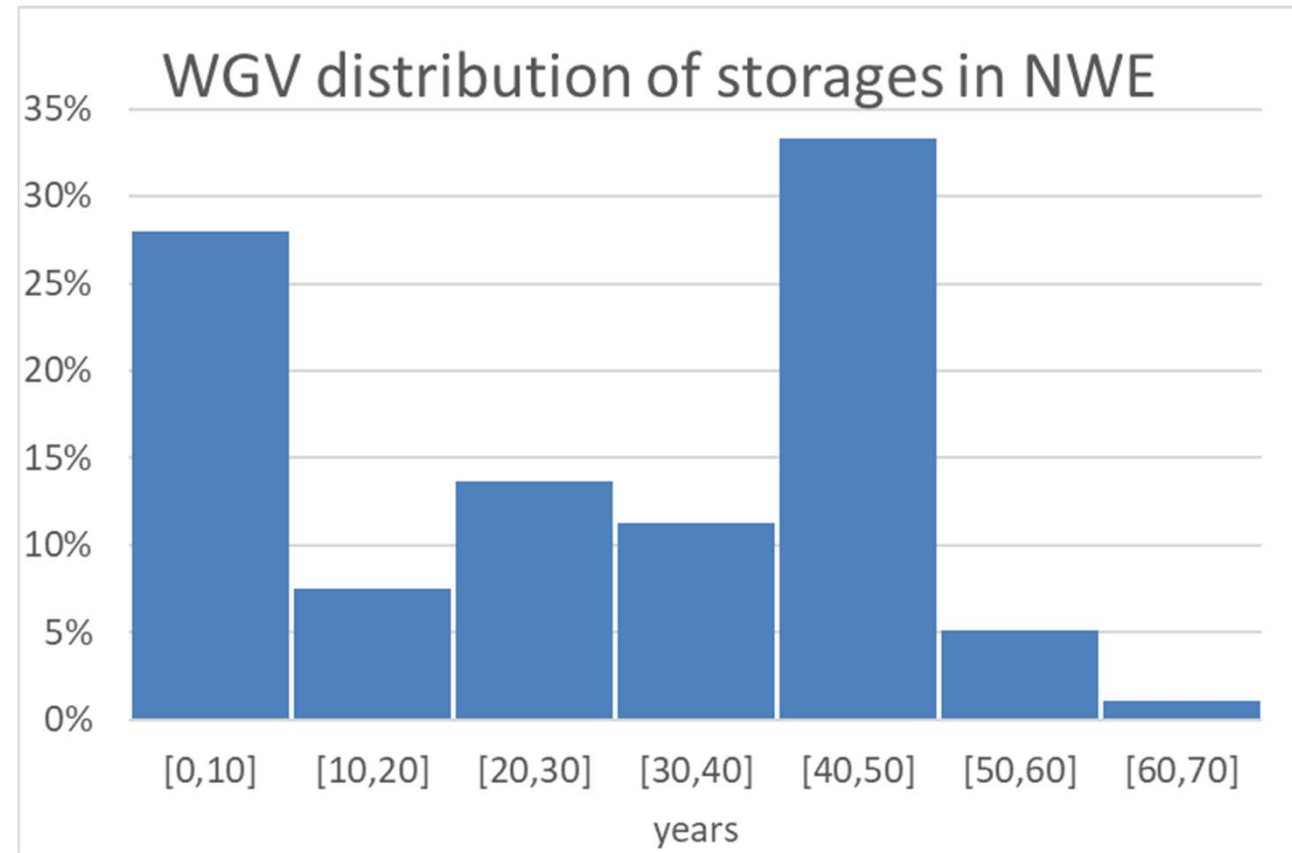


Source: GSE



Ageing storages

- Major maintenance
- Cushion gas value







Source: GSE



Longer term storage outlook

Macro trends:

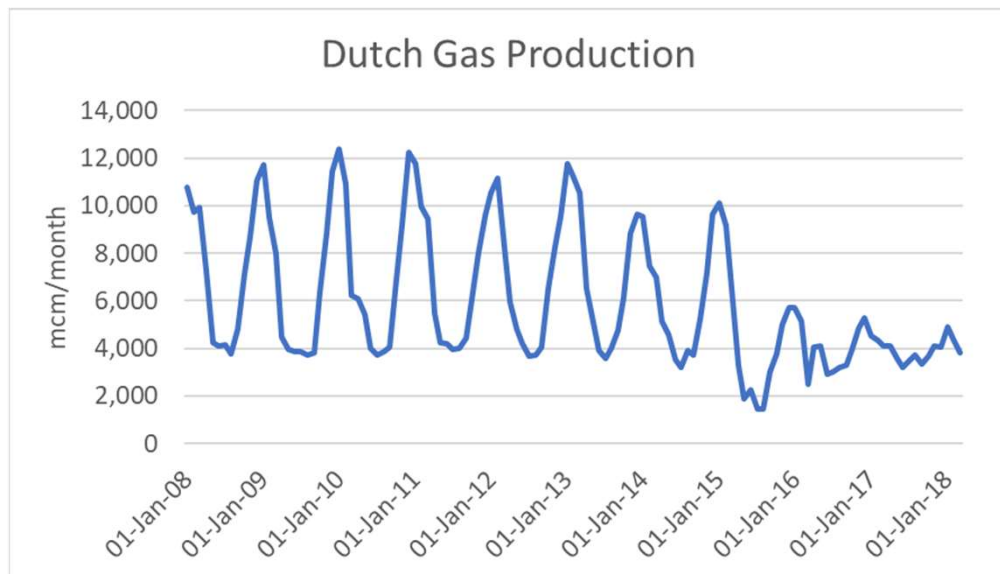
- NWE flex production down 
- Decrease role of gas as heating source 
- Renewable power production 
- Closure coal/lignite/nuclear plants 

- LNG?
- Russia?

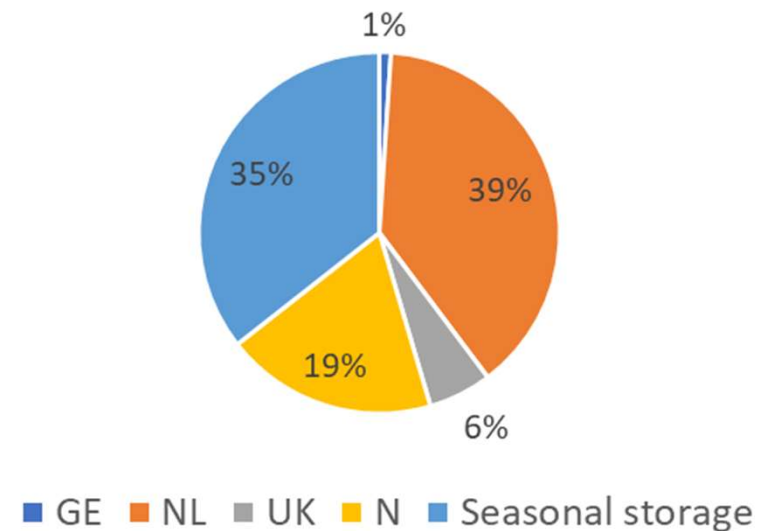


Supply of gas flexibility decreasing

- Domestic production down
- Russian import flatter



SY2008 NWE seasonal gas flexibility

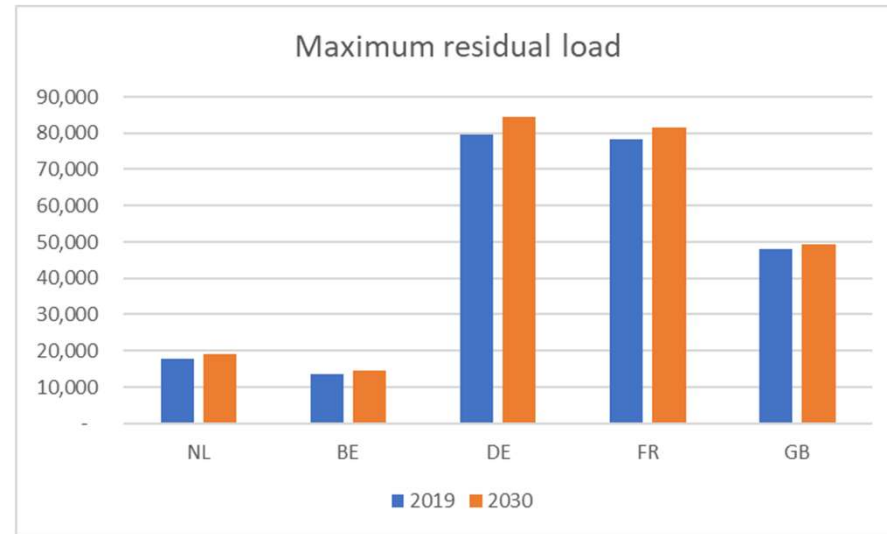
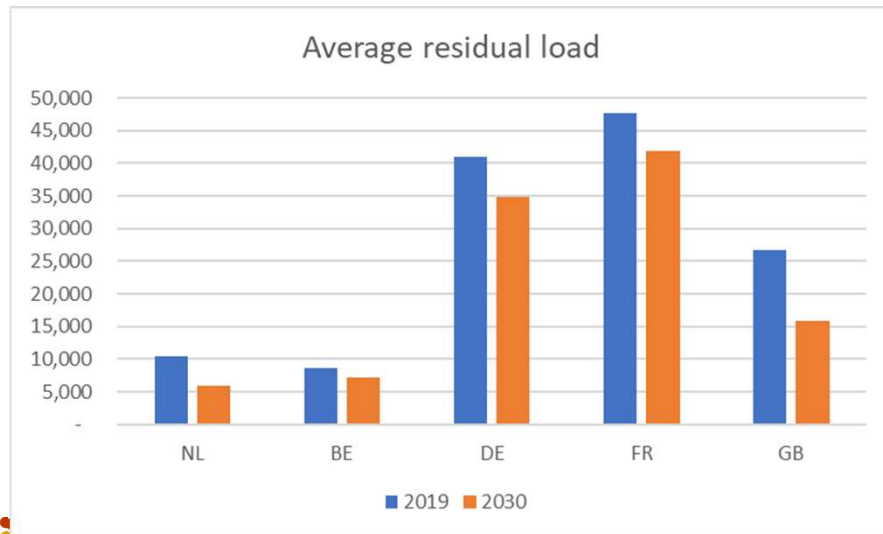


Focus: gas demand from power production

Residual load = Load – (wind + solar + hydro production)

Flexible generation needed to supply residual load:

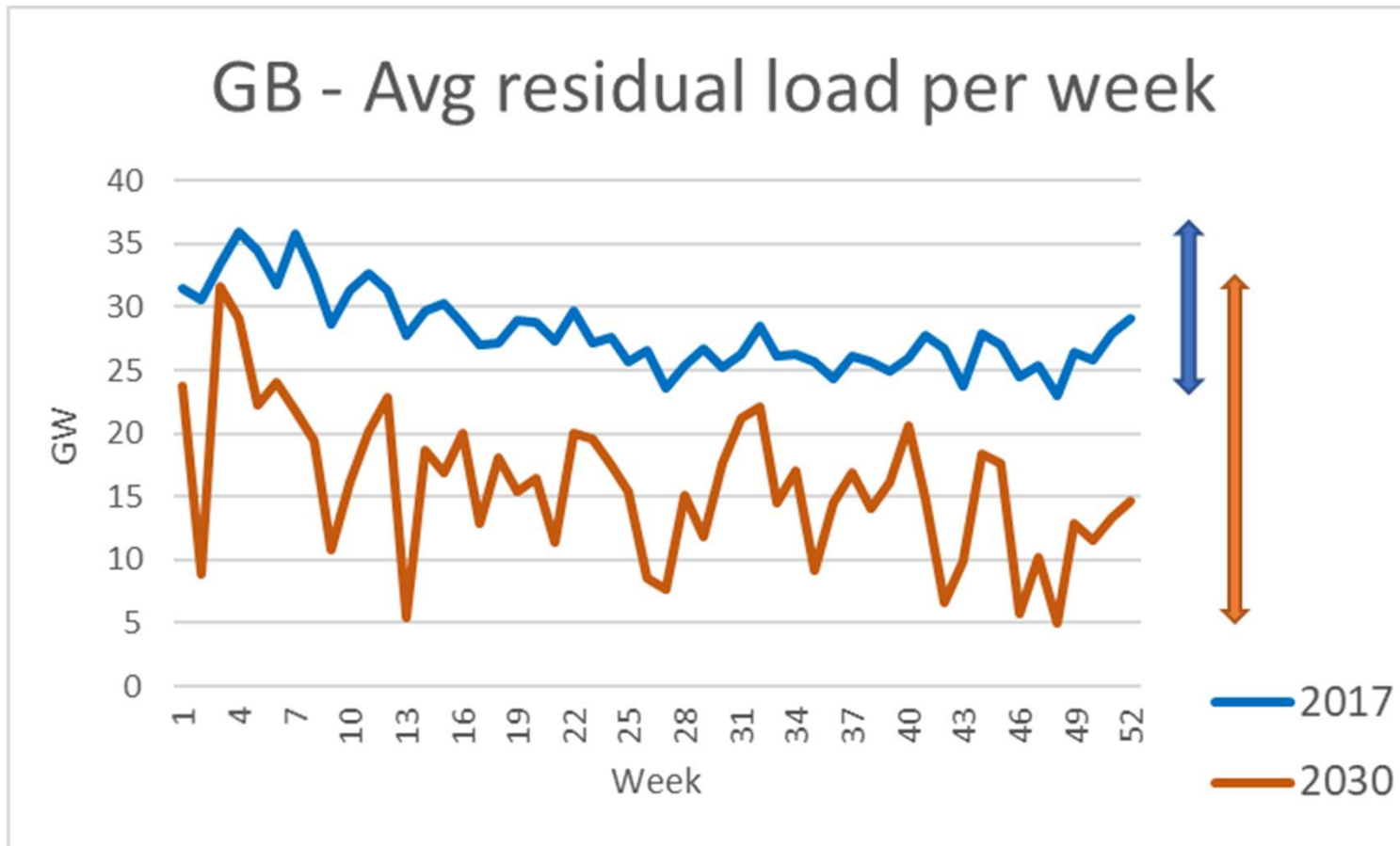
- Average residual load goes down (renewables!)
- But the maximum residual load goes up (e.g. electrification)



Source: KYOS KyPF fundamental power price model, KYOS base case scenario



Required 'swing' capacity will increase



Source: KYOS KyPF fundamental power price model, KYOS base case scenario



Big changes to generation mix

- Combined GW capacities in NW Europe (DE+AT, FR, NL, BE, GB)
- Lignite, coal, oil and nuclear will be reduced
- Gas + biomass have to fill most of the gap

TOTAL PLANT CAPACITIES	2017	2030
Natural gas	93	107
Hard coal	43	21
Lignite	20	6
Biomass	10	25
Nuclear	88	52
Oil	10	7
TOTAL	264	218

rise in gas
fired
generation

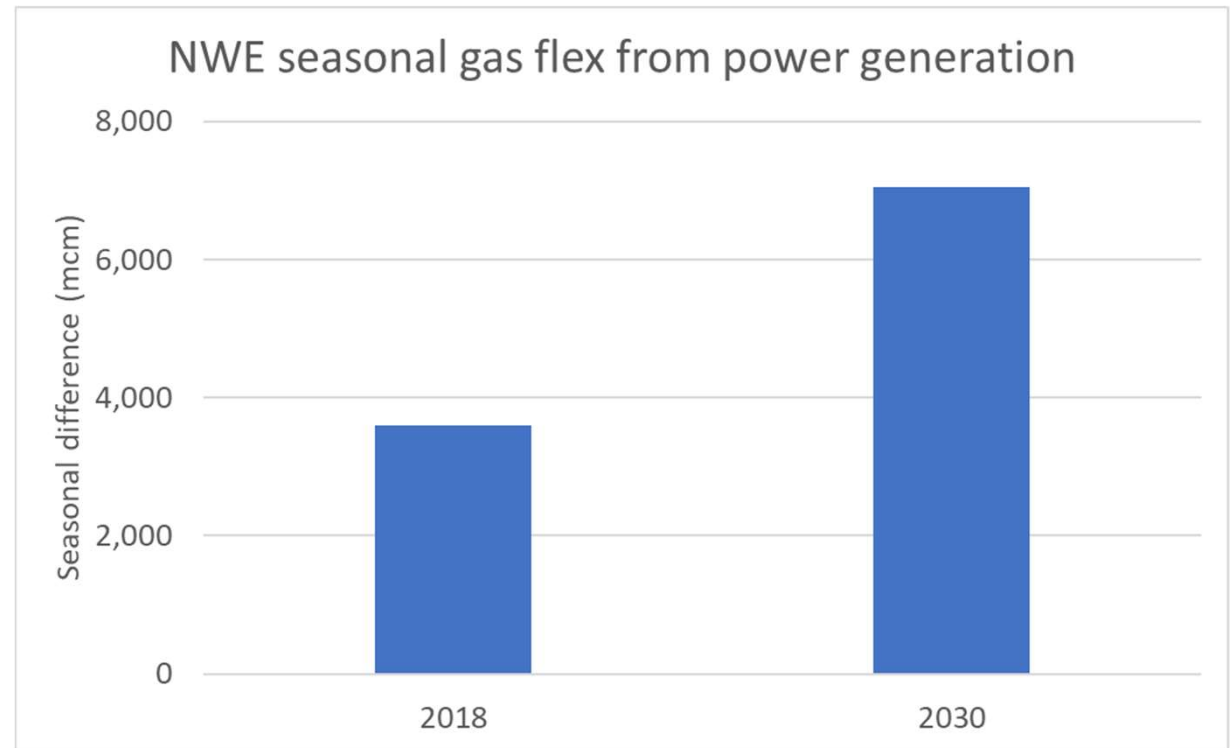
Also rise in
biomass
firing

E-Storage
may fill the
remaining
'gap'



Resulting in more gas flex requirements

- Focus on seasonal gas flexibility
- Similar effect on shorter term gas flexibility



→ Good news for storage owners?



Source: KYOS KyPF fundamental power price model, KYOS base case scenario



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KYOS celebrates its 10-year anniversary
Create your own power price scenarios!



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