



The future of European Gas Storage

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Agenda



- Overview KYOS
- Current EU storage situation
- Good news for storage operators?
- Outlook for gas storages
- Conclusion



KYOS Energy Analytics



Background

- Activities started in 2002; KYOS founded in 2008
- Since 2016 active in the Japanese market
- Specialist in energy & commodity markets: trading, valuation, risk management
- Core competence: combine quantitative background with practical solutions
- Experienced and dedicated expert team

Activities



- Modelling

Apply quantitative financial techniques to energy markets



- Consulting

Advise on energy trading, valuation and risk management



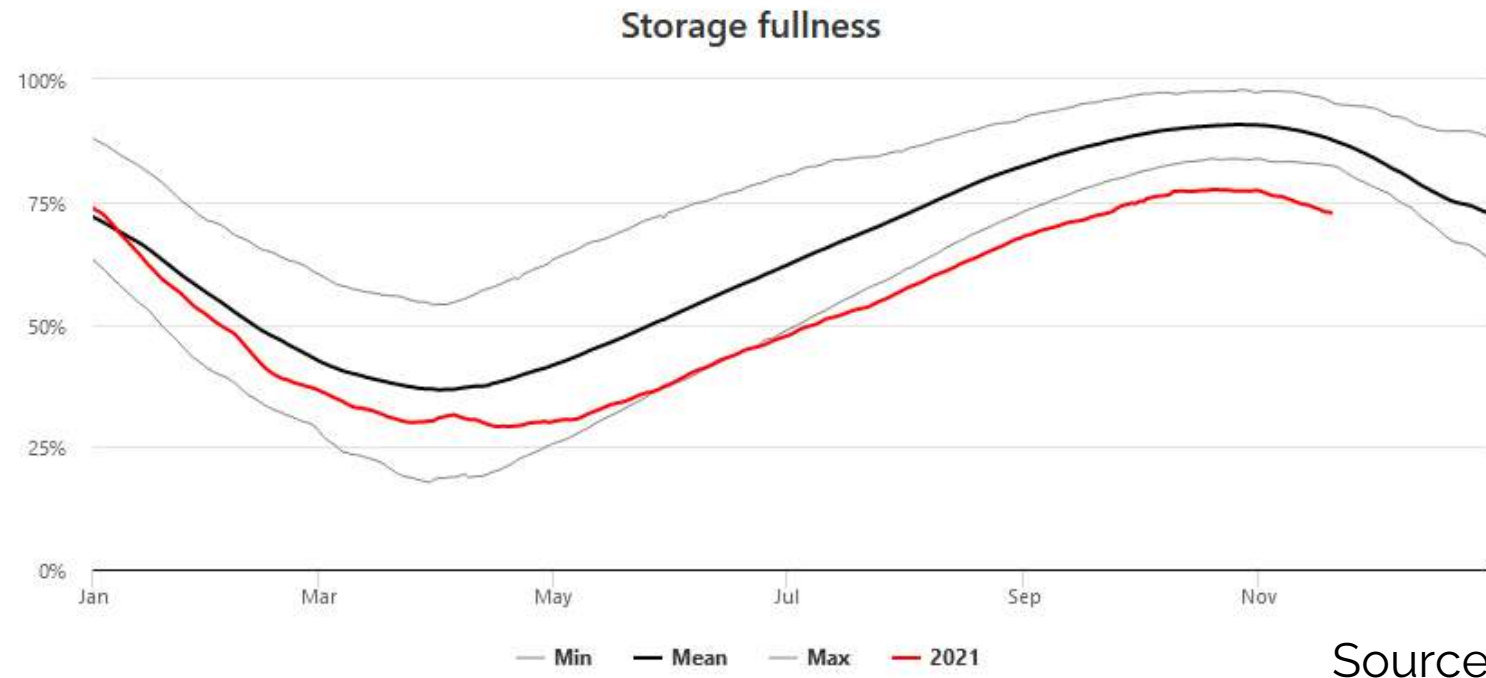
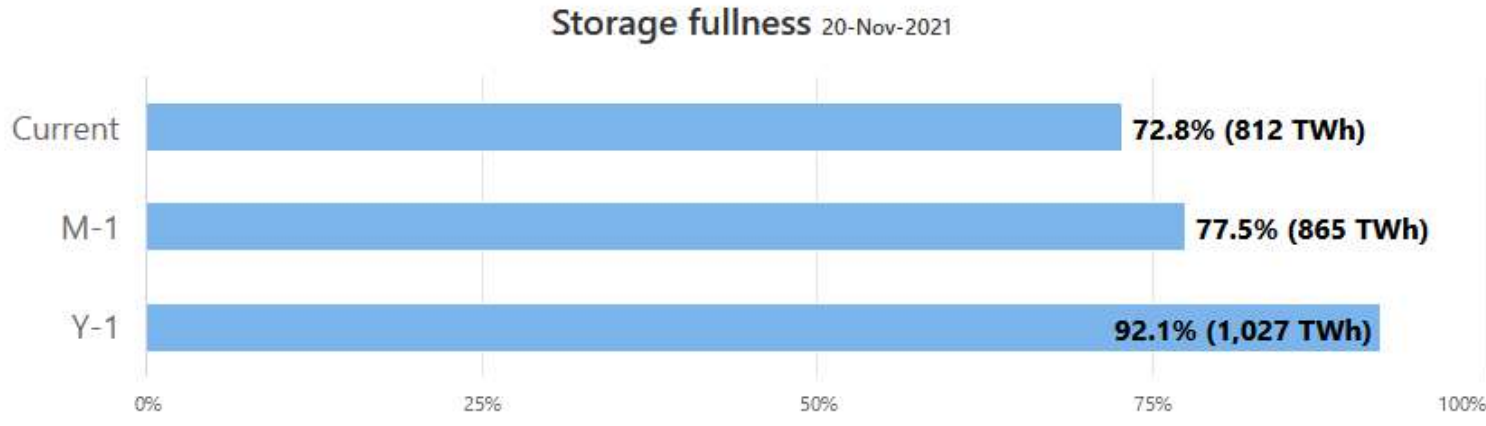
- Training

Combine theory with real life examples



Current situation gas storages

Record low storage levels...

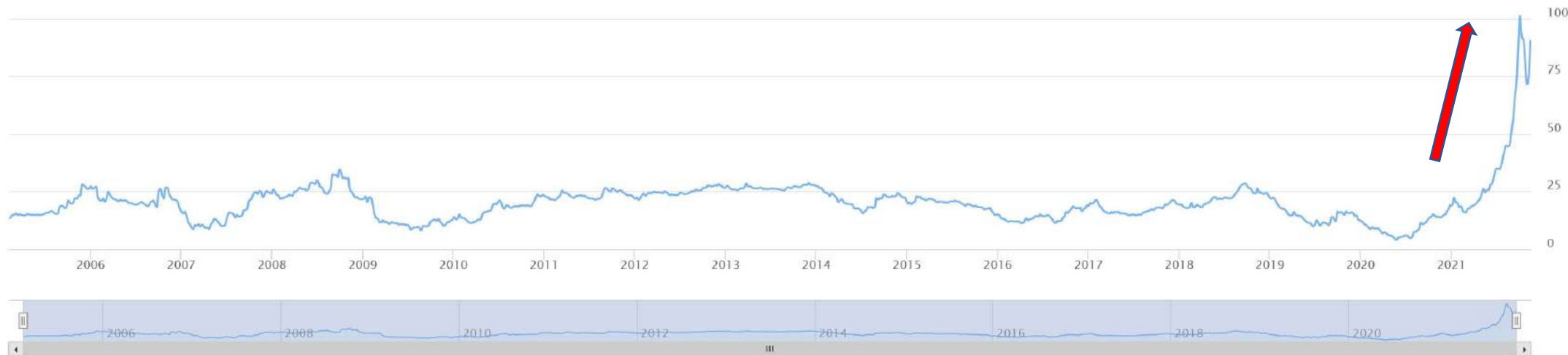


- Shown here data for EU
- Low injection over Summer
- Mainly a result from storages linked to Gazprom

Source: gas.kyos.com



... against record high TTF prices



Explainer: Could a 'strategic reserve' ease Europe's gas crisis?

EURACTIV.com with Reuters

7 Oct 2021

Advertisement

Handelsblatt

Deutsche Gasspeicher voller als befürchtet
– Putins Lieferzusage entspannt die
Energiekrise dennoch nicht

Natural gas + Add to myFT

FINANCIAL TIMES

Gazprom's low gas storage levels fuel questions
over Russia's supply to Europe

Putin says he has told company to pump more gas into its facilities in Germany and Austria

Kyos Energy Consulting

Menu nrc

Op naar de eerste winter met
onvoldoende gasreserves

COAL | ELECTRIC POWER | ENERGY TRANSITION | LNG | NATURAL GAS — 20 Oct 2021 | 18:23 UTC

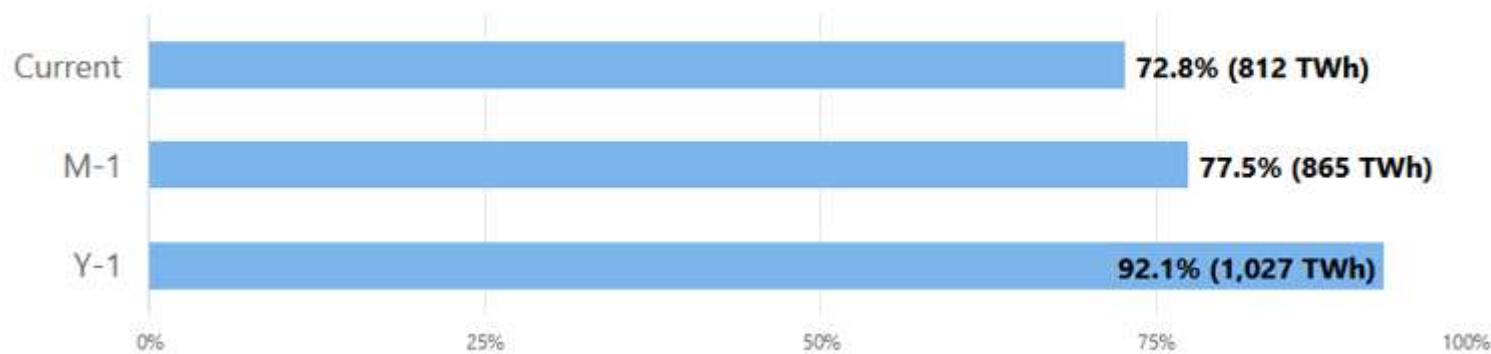
S&P Global
Platts

TotalEnergies CEO backs European gas
storage plan, urges German power plant
construction

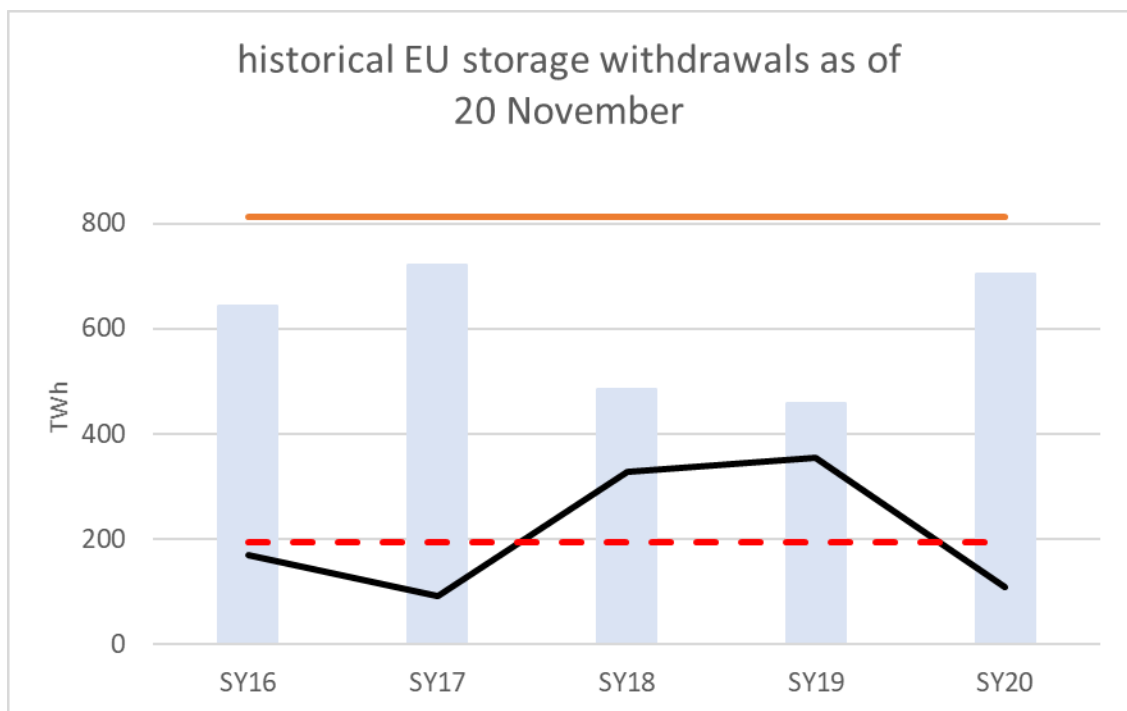
Winter 21 situation



Storage fullness 20-Nov-2021



historical EU storage withdrawals as of 20 November



- Current level
- Expected level end of Winter 2021
- - - Lowest recorded level (March 18)



Good news for storage operators?

Storage pricing

- Storage value driven by two main factors
 - Current forward price spread: defines intrinsic value
 - Price volatility: defines extrinsic value
- Complex calculation, requires sophisticated models: KYOS KyStore model

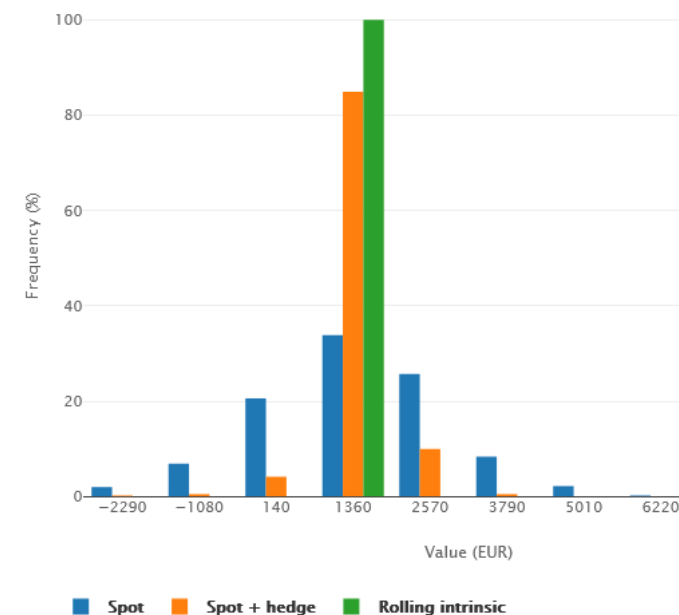
Intrinsic

	Monthly (EUR)	Tradable (EUR)
Value	597.58	597.58

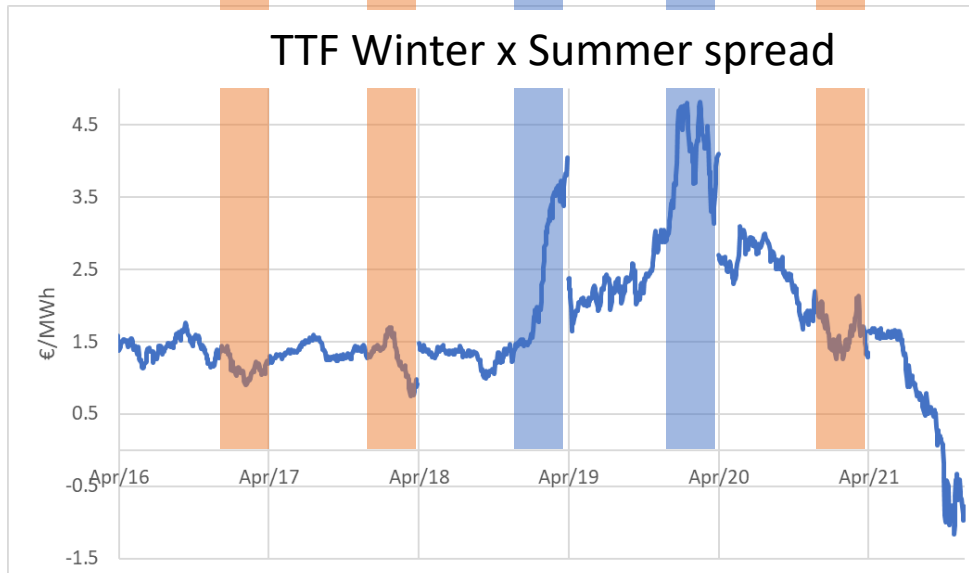
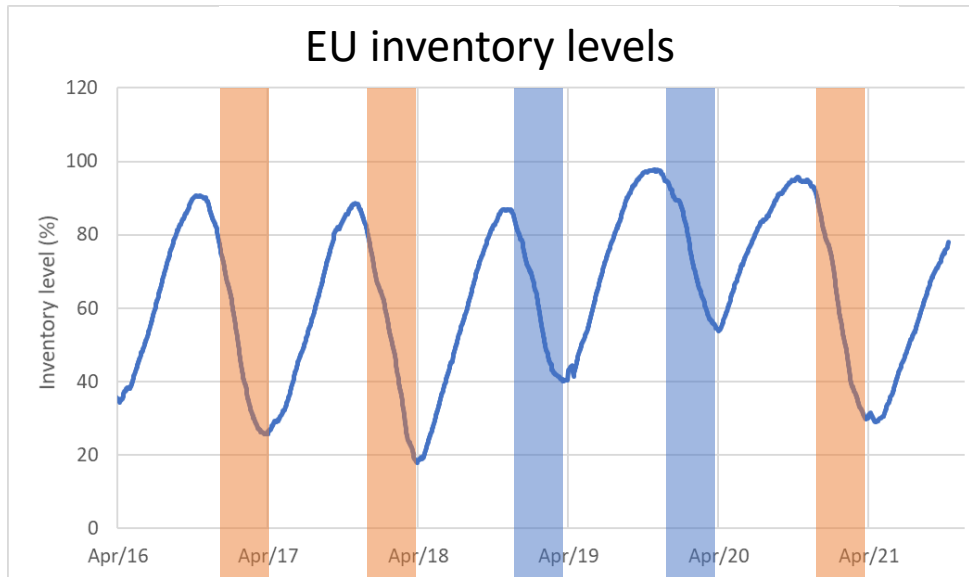
Monte Carlo

Strategy	Spot (EUR)	Spot & Hedge (EUR)	Rolling intrinsic (EUR)
Hedge Product	No	Months	Tradable
Rehedge	No	Static delta	Daily
Avg	1,475	1,475	1,070
Std Deviation	1,454	479.71	153.04
5 % low	-909.00	780.69	861.27
10 % low	-390.47	989.01	878.23
25 % low	531.39	1,234	960.40
Median	1,510	1,480	1,038
75 % high	2,400	1,705	1,172
90 % high	3,279	1,987	1,275
95 % high	3,796	2,208	1,317

Value histogram



The storage paradox



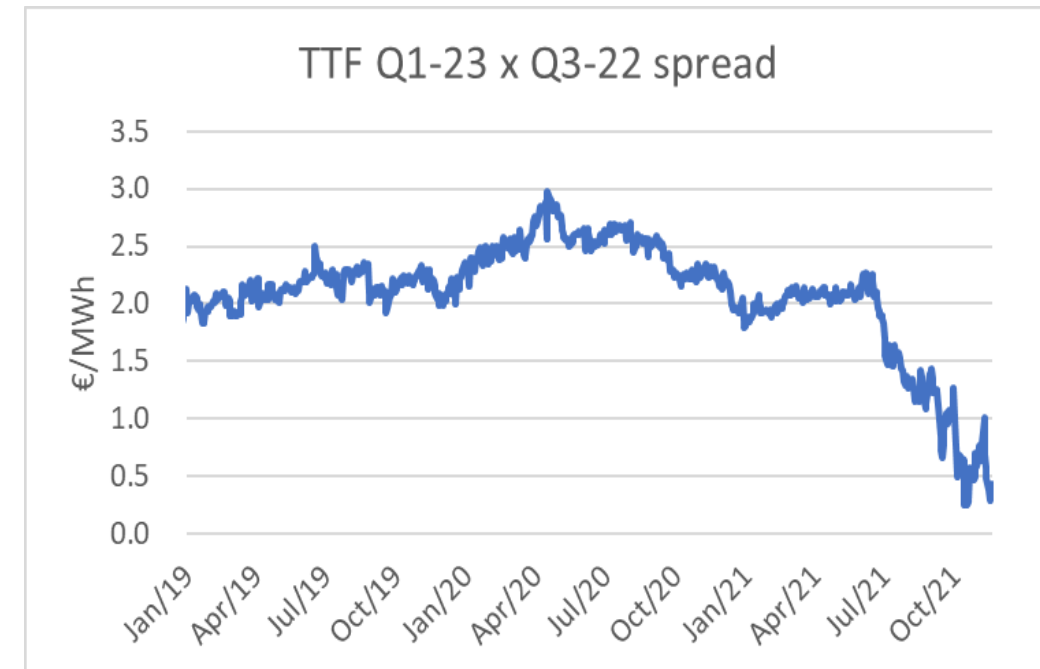
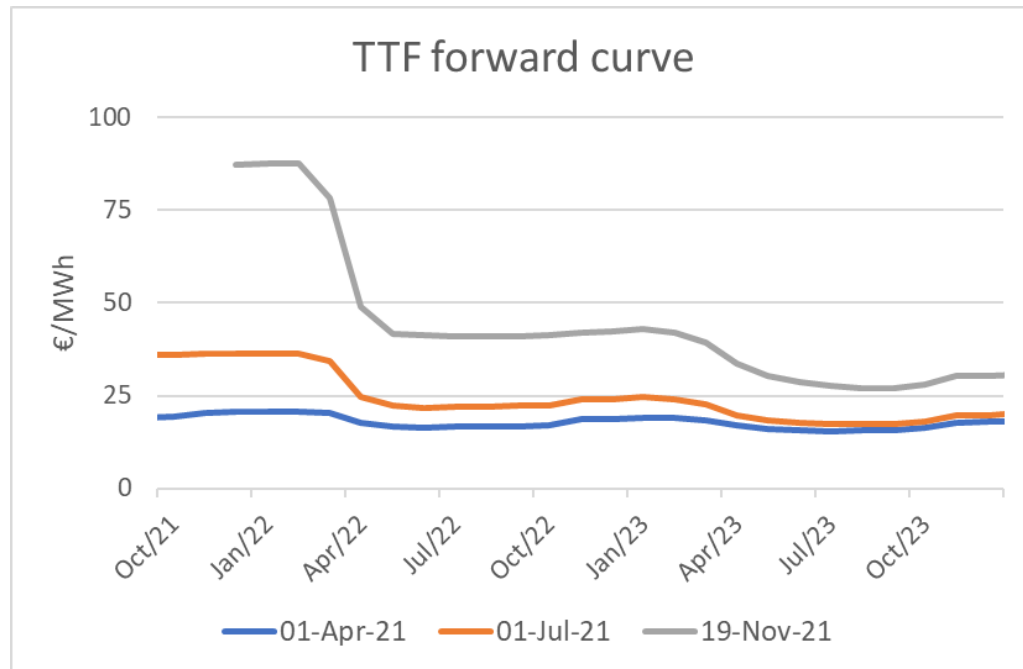
- Strong usage of storage is not always good news for storage operators!
 - High withdrawals -> strong buying interest in Summer -> lower Win x Sum spread
- Storage marketing:
 - (often) yearly products
 - preceding storage year

- Above average storage utilization
- Below average storage utilization

Current situation



- Very high spot and Winter prices
- No positive effect on storage spread for next storage year

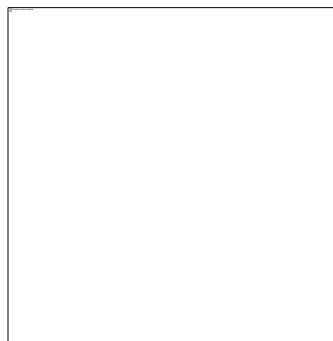


- Intrinsic value decreasing!
- Important to get accurate forward curve for pricing!

What tools do SSOs have



- Timing of storage auctions
- Length of auctions
 - 1 year
 - Multiple years
- Product design
 - Fixed price
 - Index price
 - Profit sharing
 - Others



OFFER
2022
2023

Together,
let's develop
the flexibility
of your energy

[Read more](#)



ASTORA SUCCESSFULLY MARKETS Haidach CAPACITY FOR STORAGE YEARS 2022/23 AND 2023/24



Marketing of our gas storages

Innovation meets reliability



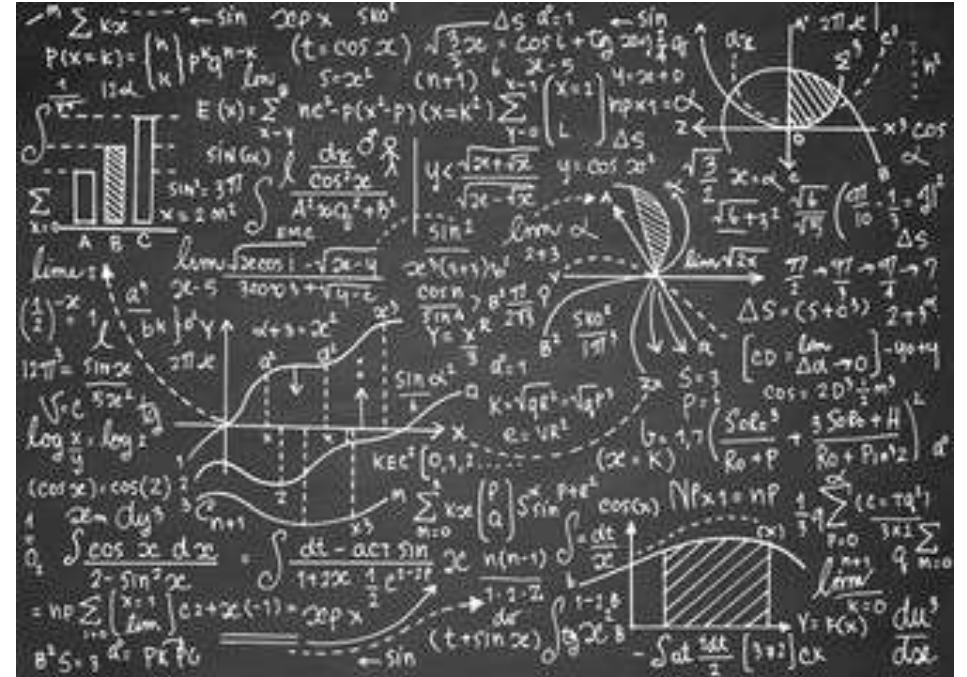
Outlook for European gas storages

Future role of gas storage in EU



Many complex questions define this:

- General role of gas in EU?
- Decreasing production flexibility
- Role of gas in heating
- Complement renewables?
- Timing of coal phase out
- LNG!!
- Conversion to hydrogen?



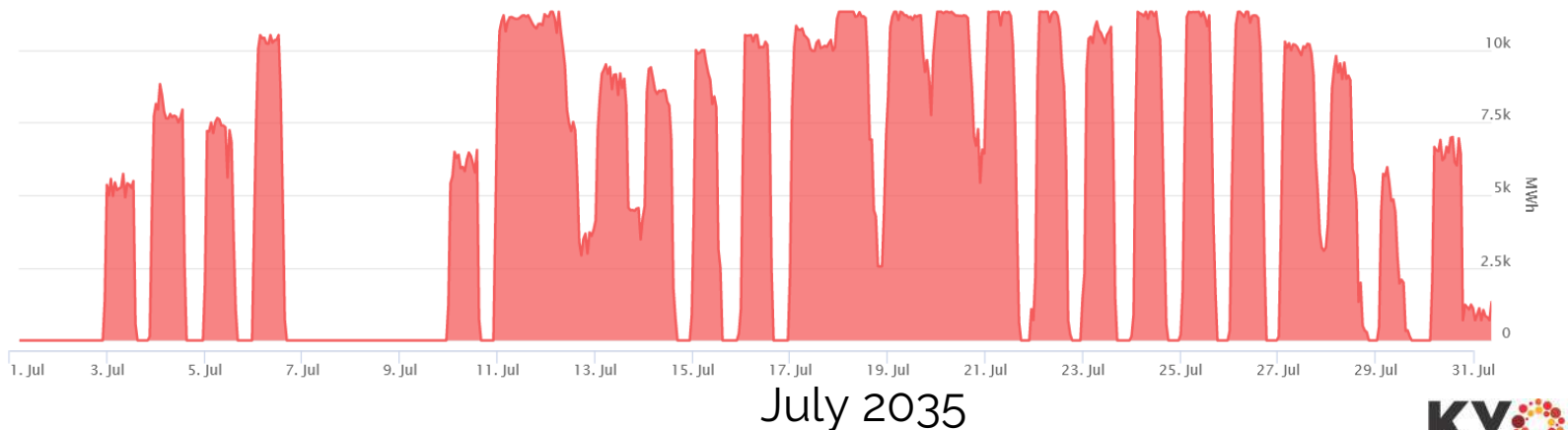
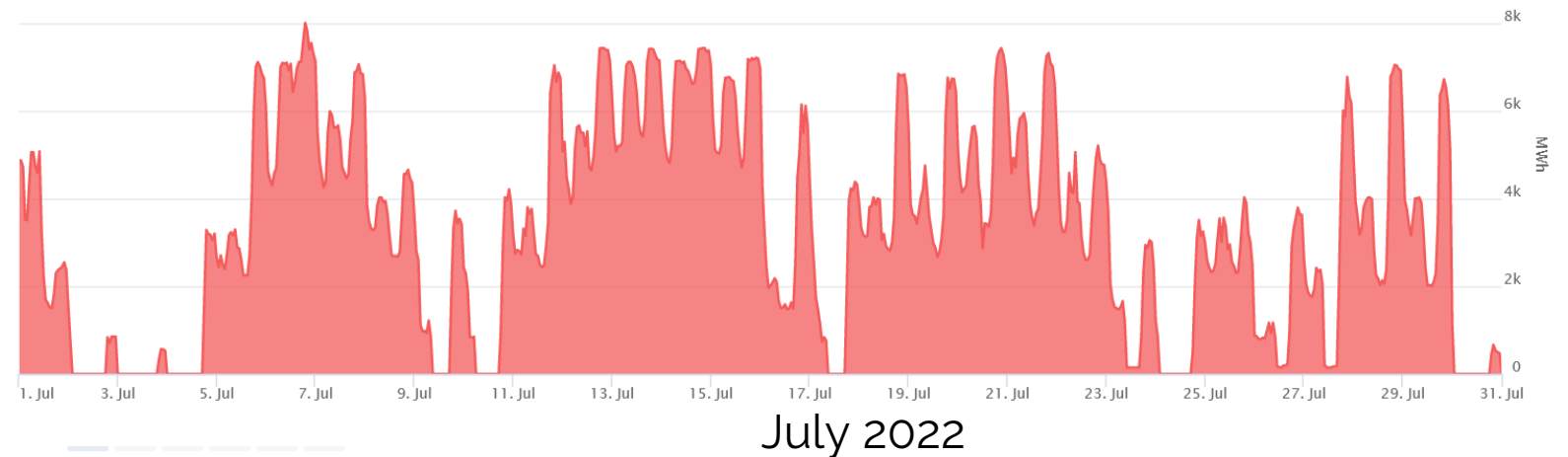
Example 1

Gas will be the main source of flexible power to complement renewables
Example: typical Dutch gas-fired power production profile in July 2022 versus July 2035
(source KYOS fundamental model KyPF)

Much larger hourly swings in 2035

Exact timing uncertain due to intermittent behaviour

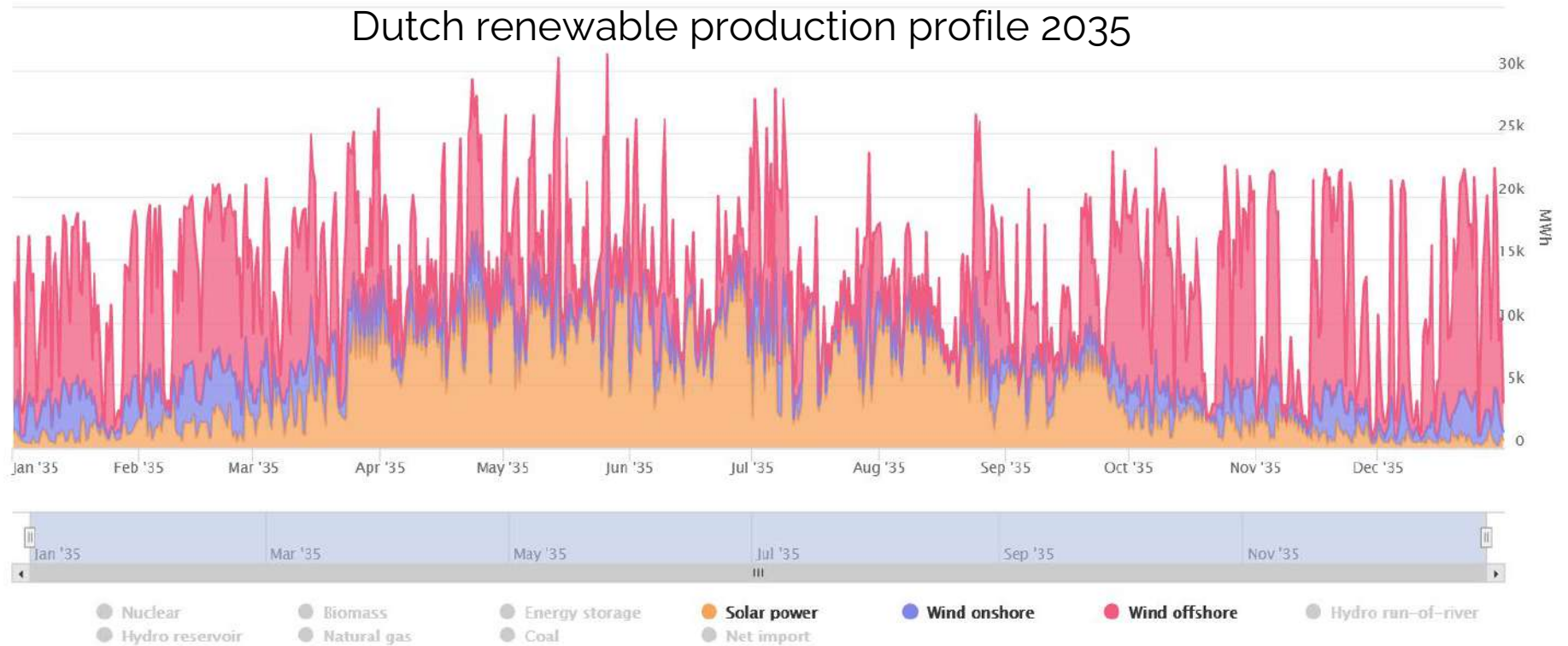
Leads to increase in (gas)price volatility



Example 2

Build out of solar and wind capacity important:

- Wind and solar have partly offset production profiles
- Ratio between wind and solar capacity defines seasonal gas demand





Summary

Summary



- Gas storage is back on everybody's mind
- Storage operators can not (yet?) profit from this interest
- Positive (long-term) outlook for EU storage value

We look forward to supporting you with our models and consulting services to better understand the gas storage market and its potential!

Questions?



Time for Q & A



We look forward to supporting you in the rapidly changing energy sector!

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