

Austrian Deep Dive

Beyond valuation: quantifying risk in renewable energy portfolios



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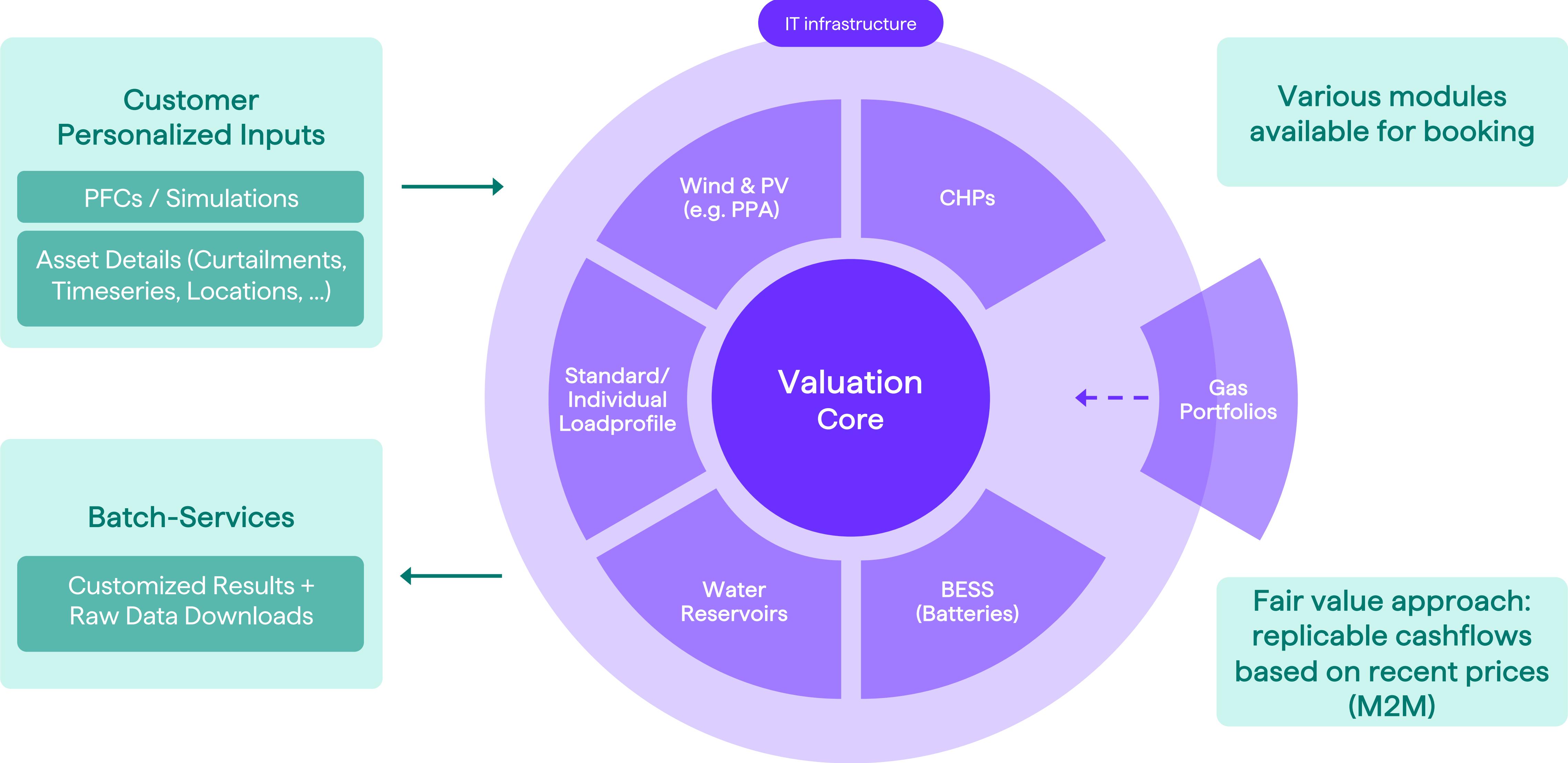
Agenda

1. Motivation
2. Fair Value and general Simulation Model
3. Austrian Simulation Model
4. Product Demo: Montel Value
5. Q&A

Motivation

01

Montel Value



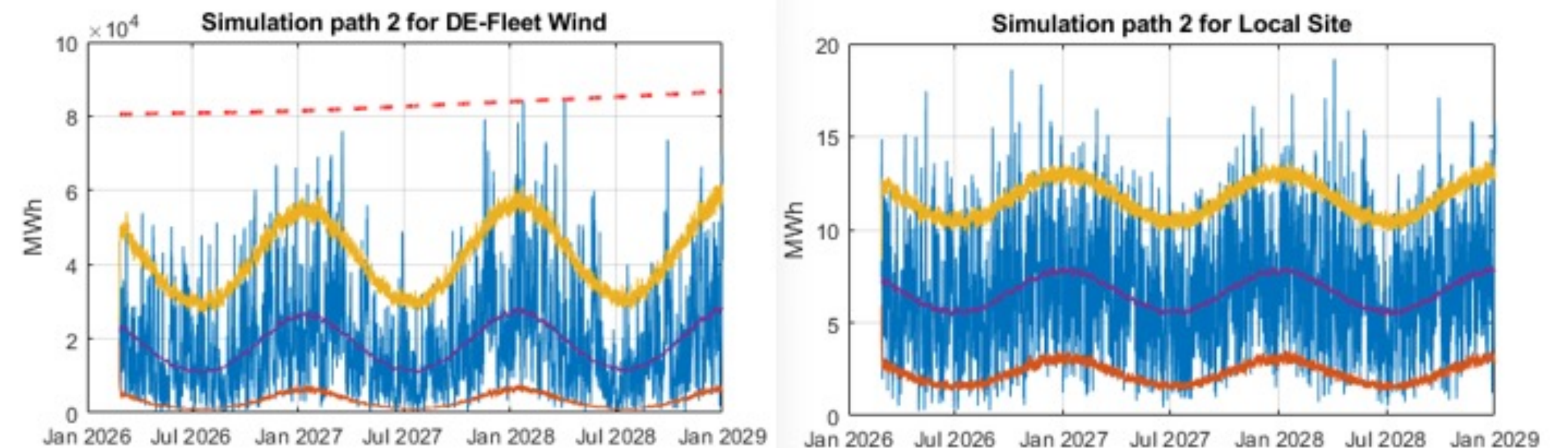
Overview: Fair Value & Simulations

02

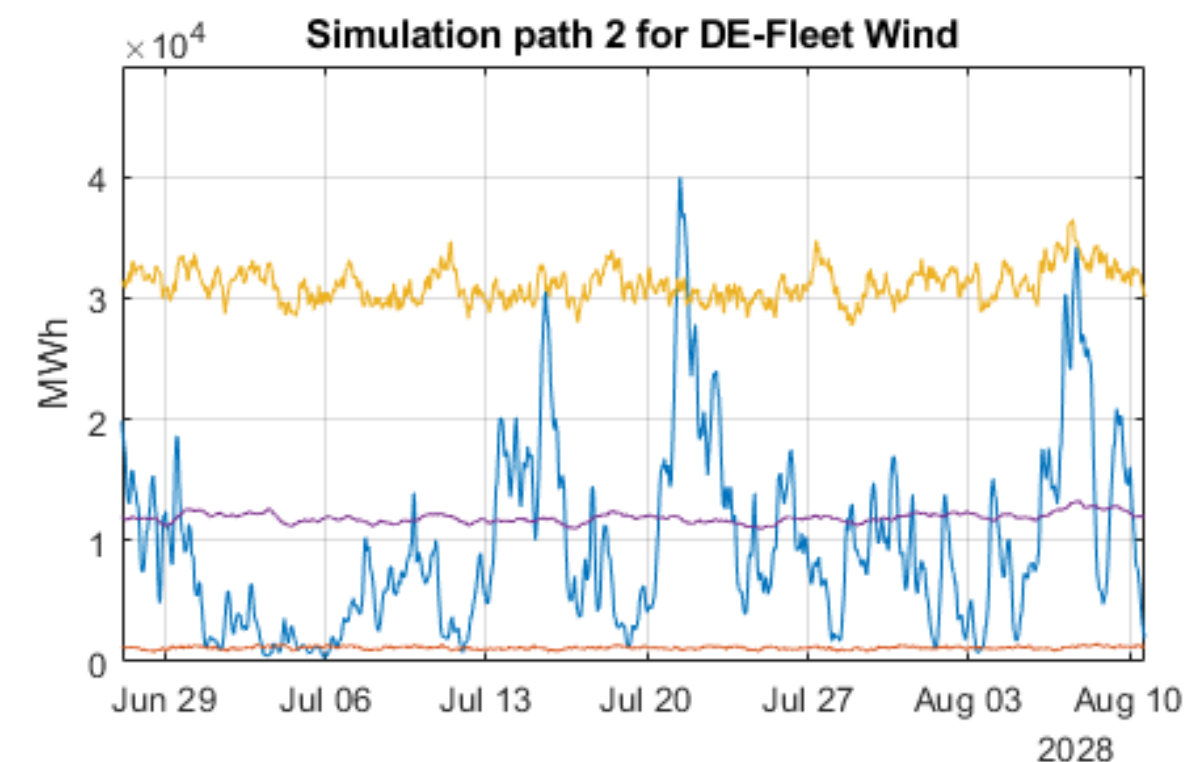
Simulation system for renewables: wind

- The wind model works with **Weibull distributions**
- The fleet and an arbitrary number of sites are simulated simultaneously in hourly resolution (as the spot prices)
- Sites are modelled on the basis of meteoblue weather data
- Learning stuff comprises more than 10 years of hourly data
- Wind is transformed into power by one of a thousand turbine models
- Within 1000 hourly paths every event is weighted as observed in the sample: **we don't order a bad weather year — we find them in the samples**

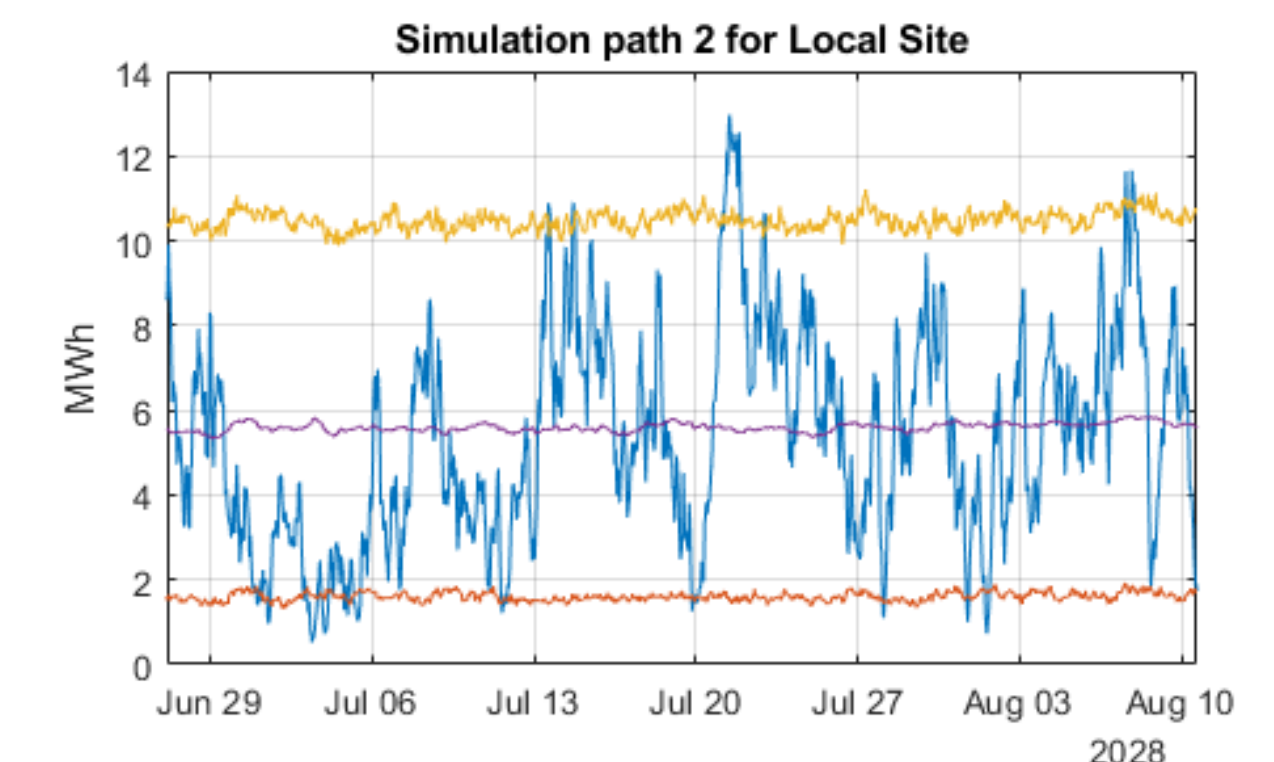
Simulation path over three years — fleet and local site



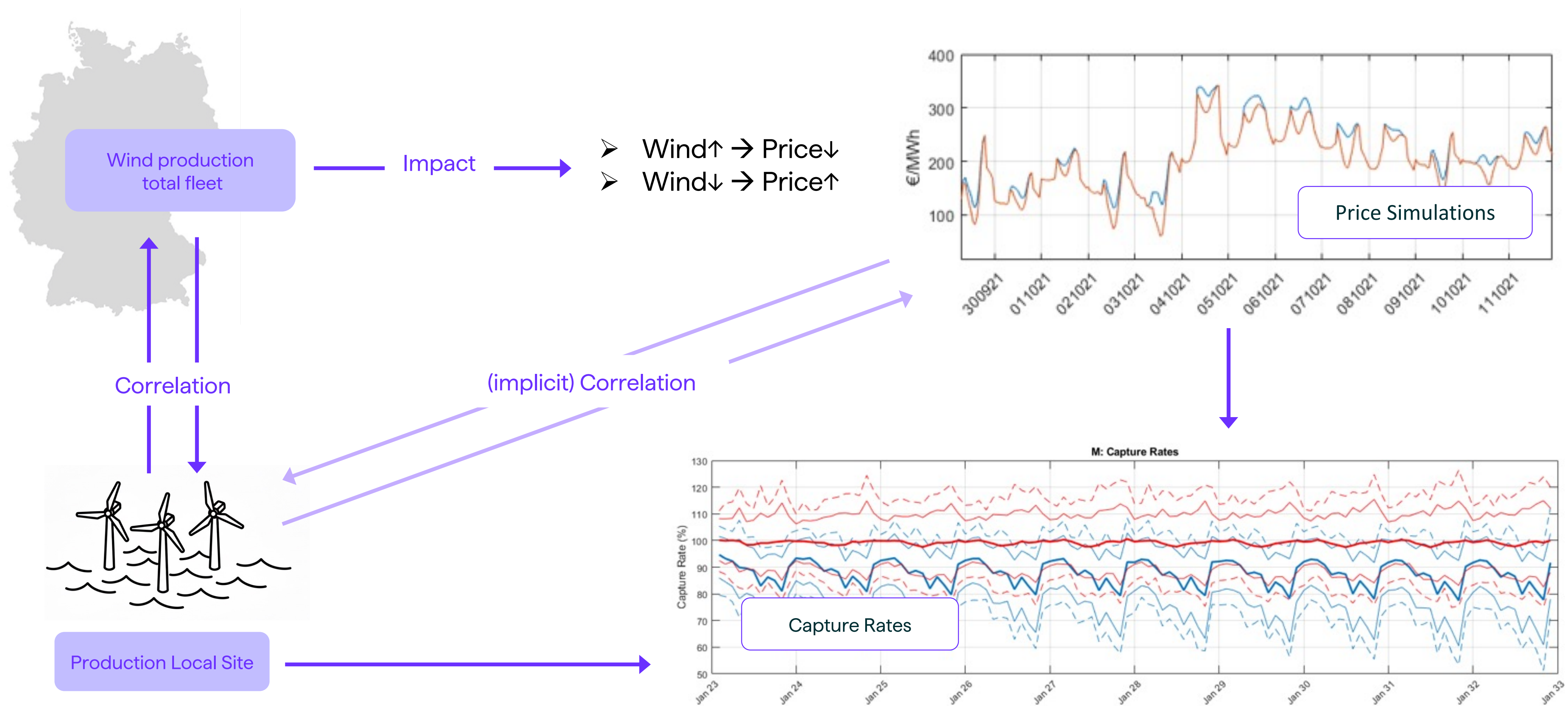
Fleet — six weeks



Local site — six weeks



Main Principle: Linking Local Infeed to Spot



Reading a sequence of simulation path

Each column shows one path

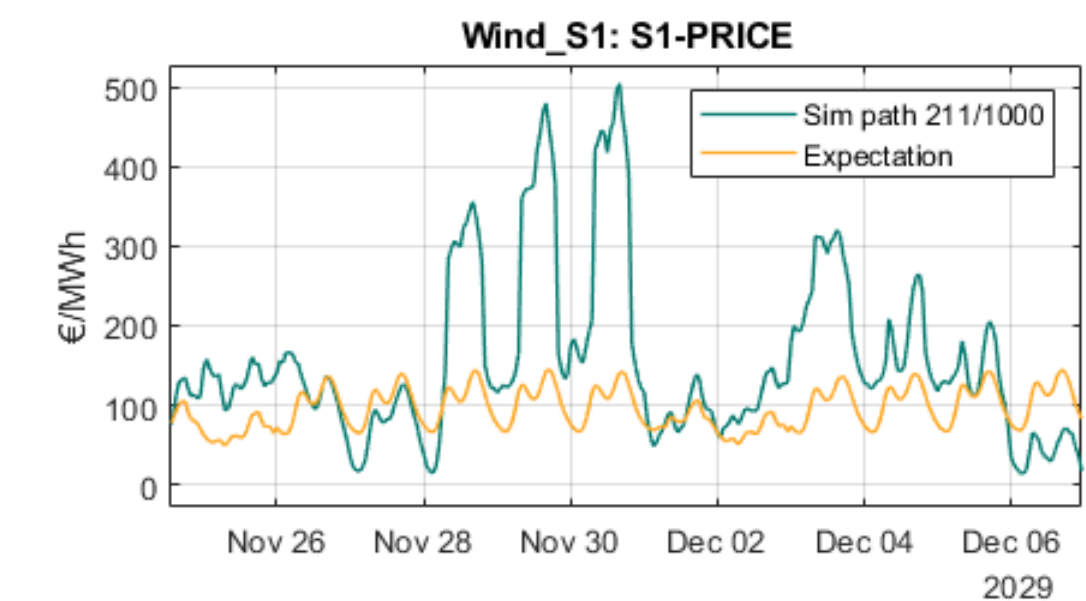
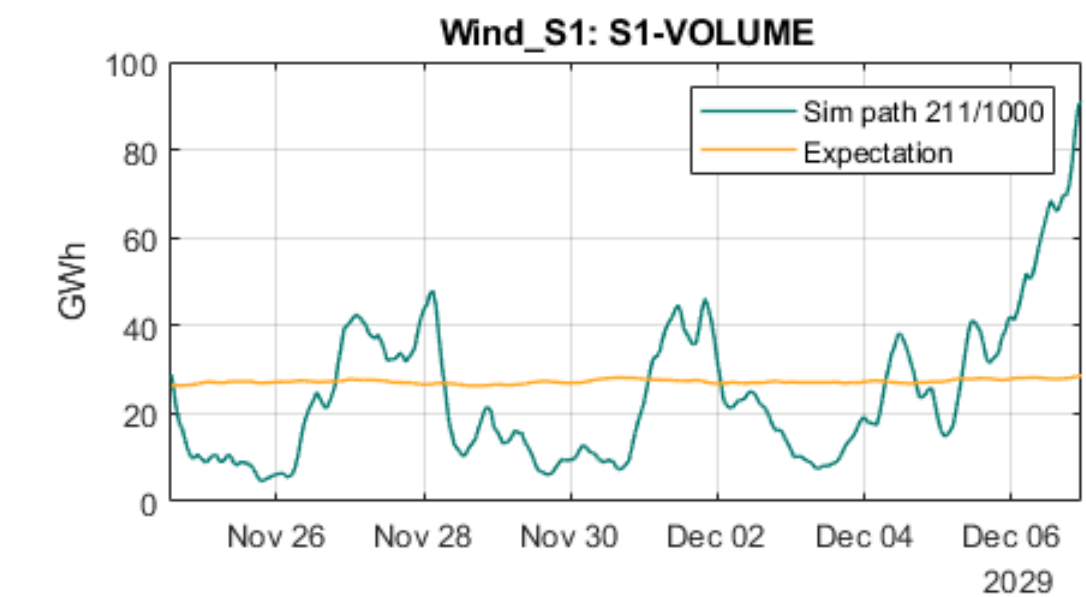
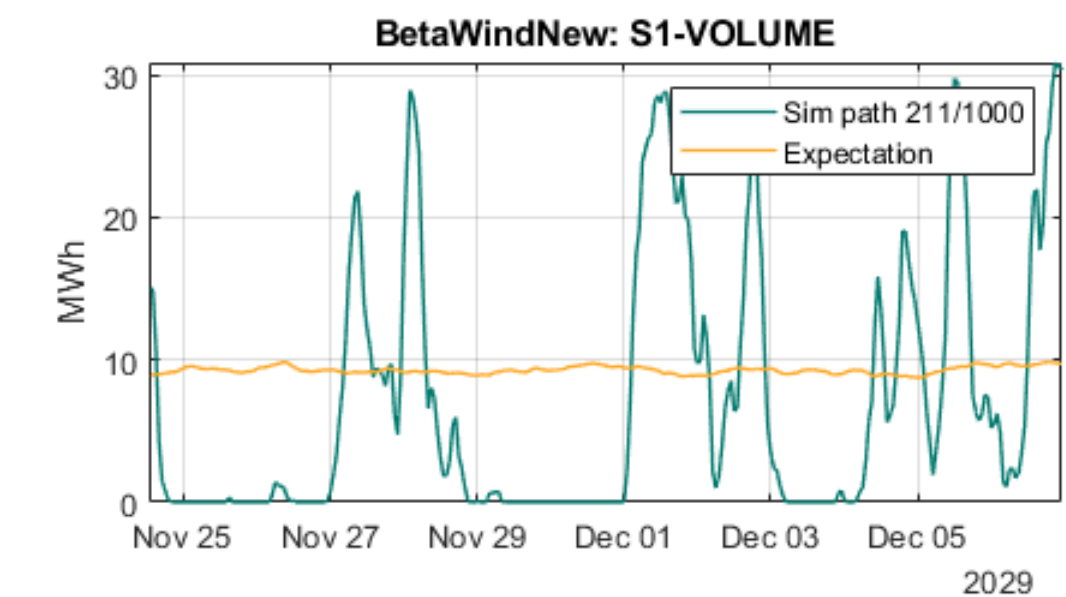
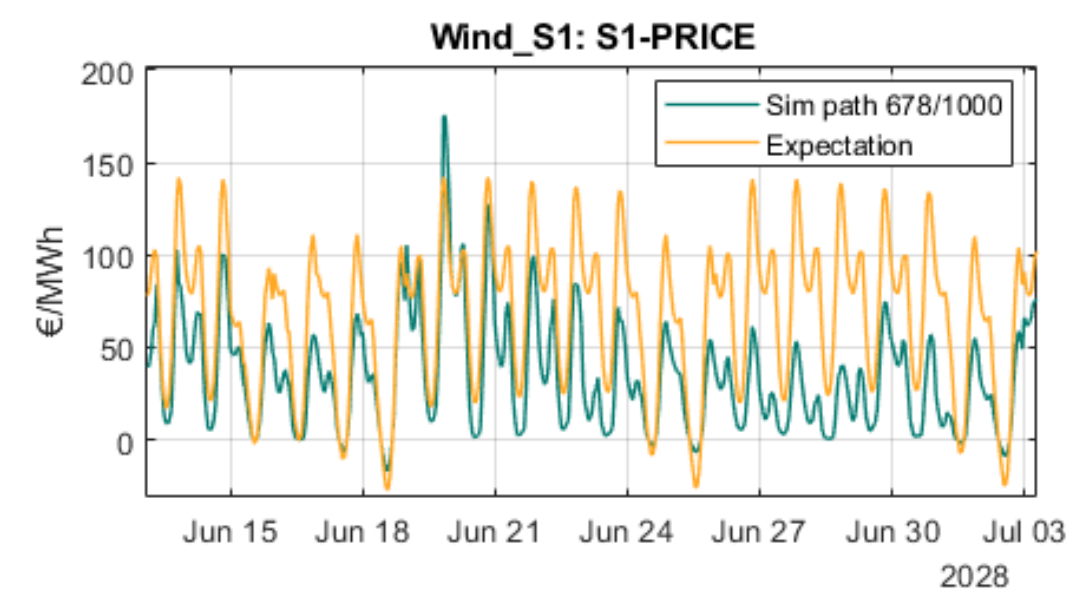
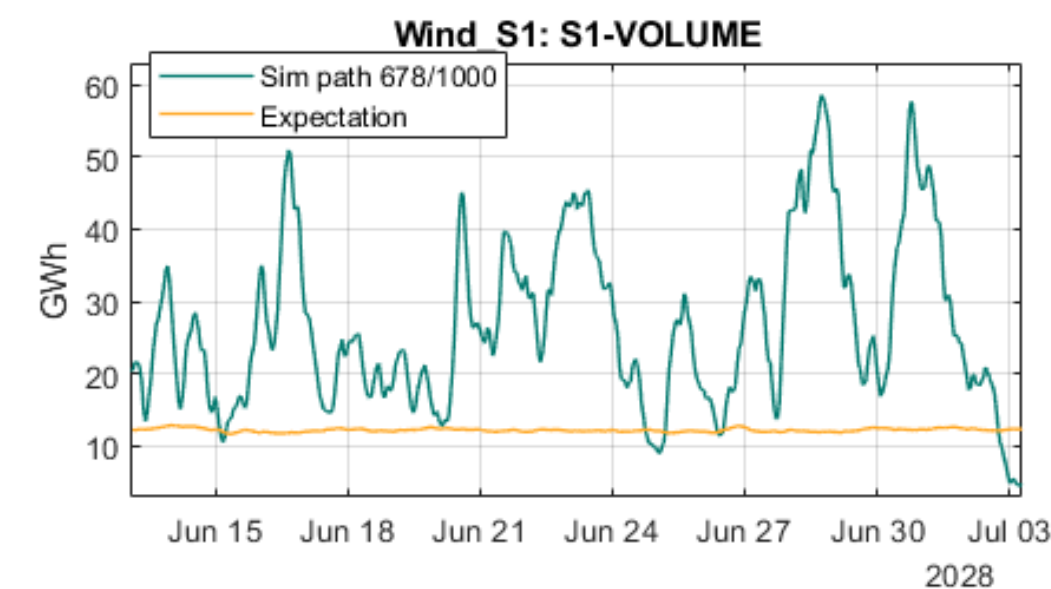
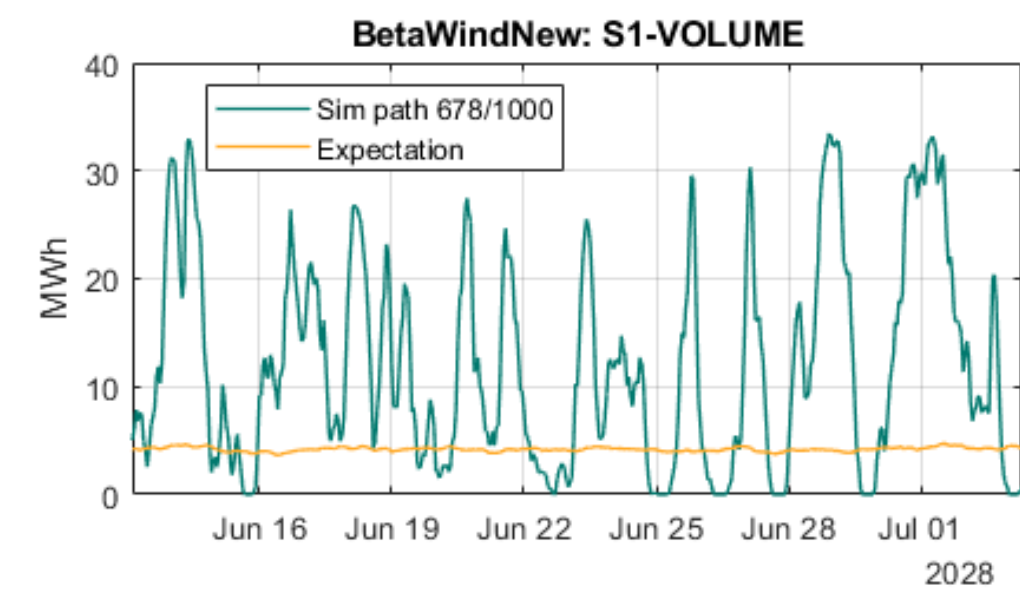
One simulation path (green) out of 1000 and the expectation (yellow), top to bottom: volume site, volume fleet, spot price.

Note

- Fleet vs. site: correlation, the area is smoother
- Impact of infeed on the spot price
- Simulations include all weather years according to their probabilities

The model features

- Hourly resolution
- Correlation over several lags between sites & fleet
- Weibull-distributions and transforms
- Exchangeable long-term expectations



What and how does it capture now?

The key

- We work in hourly resolution
- The same hour's price and volume are negatively correlated

Fair value cashflow

$$CF = E(S) \cdot E(V) + Cov(S, V)$$

Naive alternative

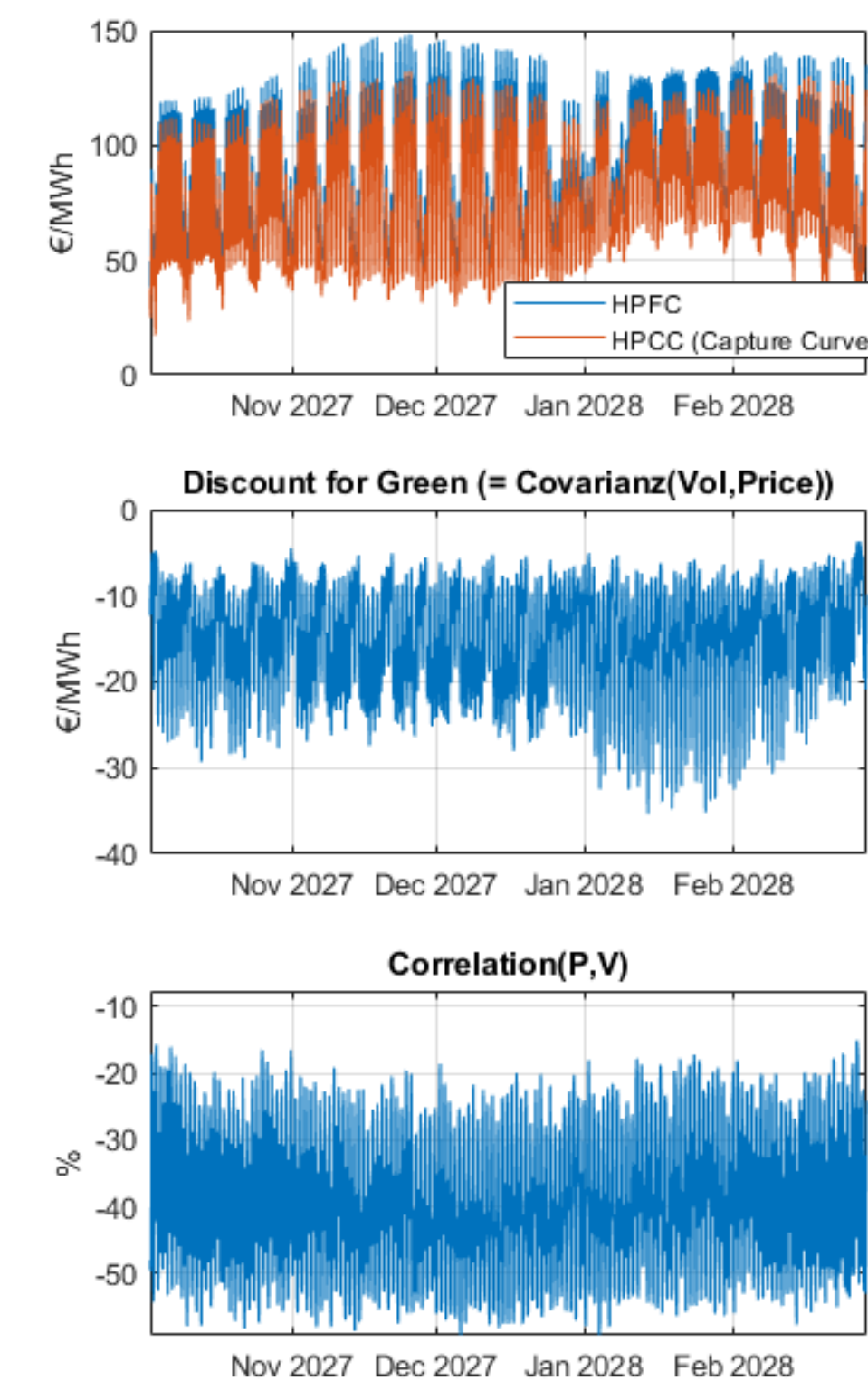
$$CF = E(S) \cdot E(V)$$

With S : price, V : volume and $Cov(S, V) = \rho \sigma_V \sigma_S$. The difference between the two is $Cov(S, V) < 0$ — a price discount for stochastic correlation.

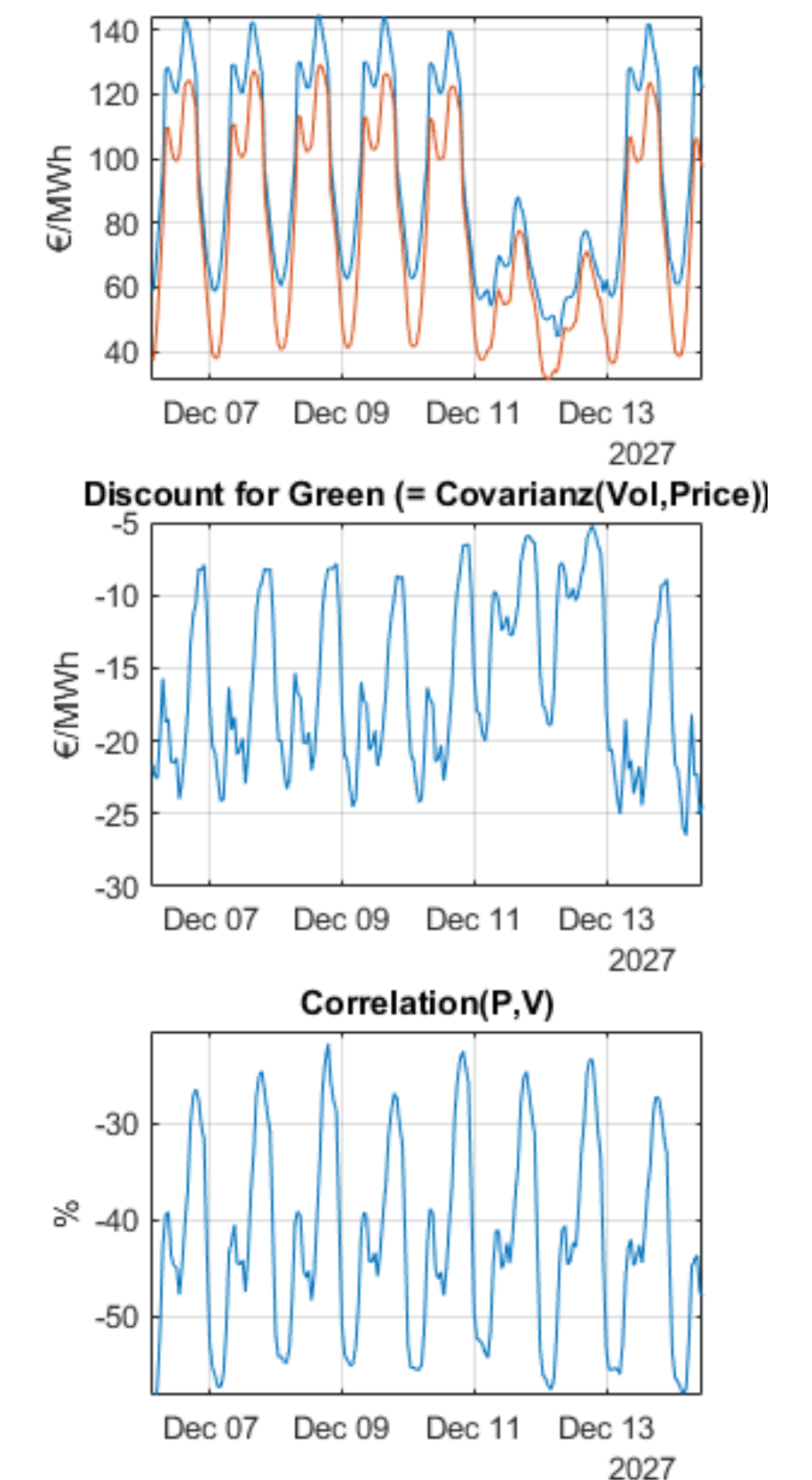
The implications

- Capture rates are endogenous and „fair value“ (an additional fitting to e.g. trade quotes is possible)
- Hourly assets, especially (real-)options, can be valued on the same basis (e.g. power plant or batteries)

Four months



One week, zoomed



Austrian Simulation Model

03

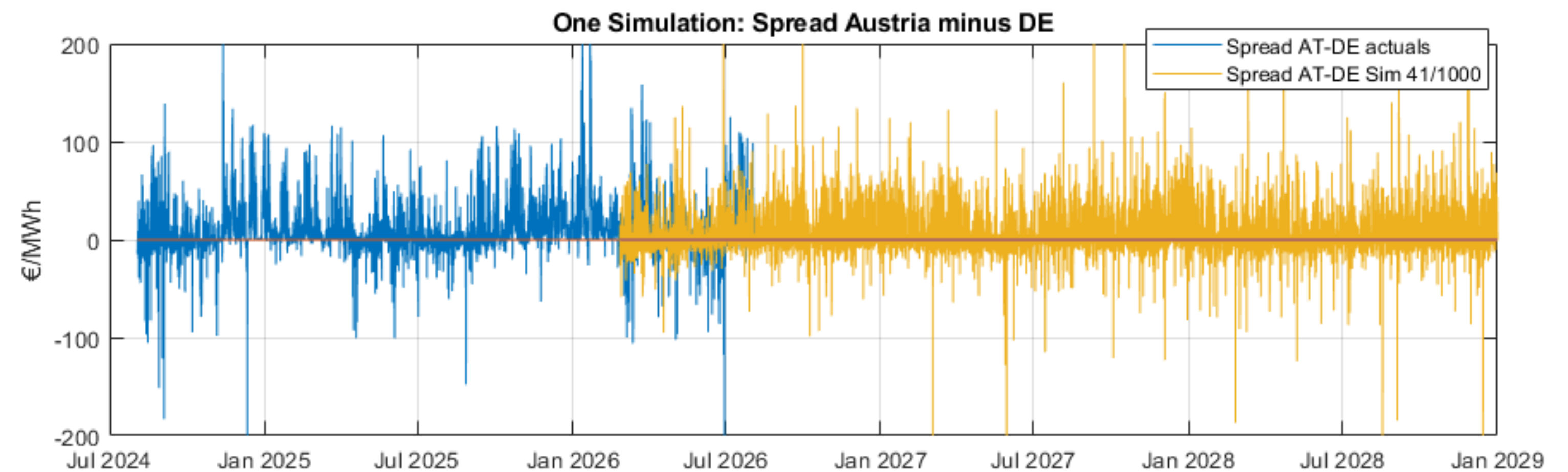
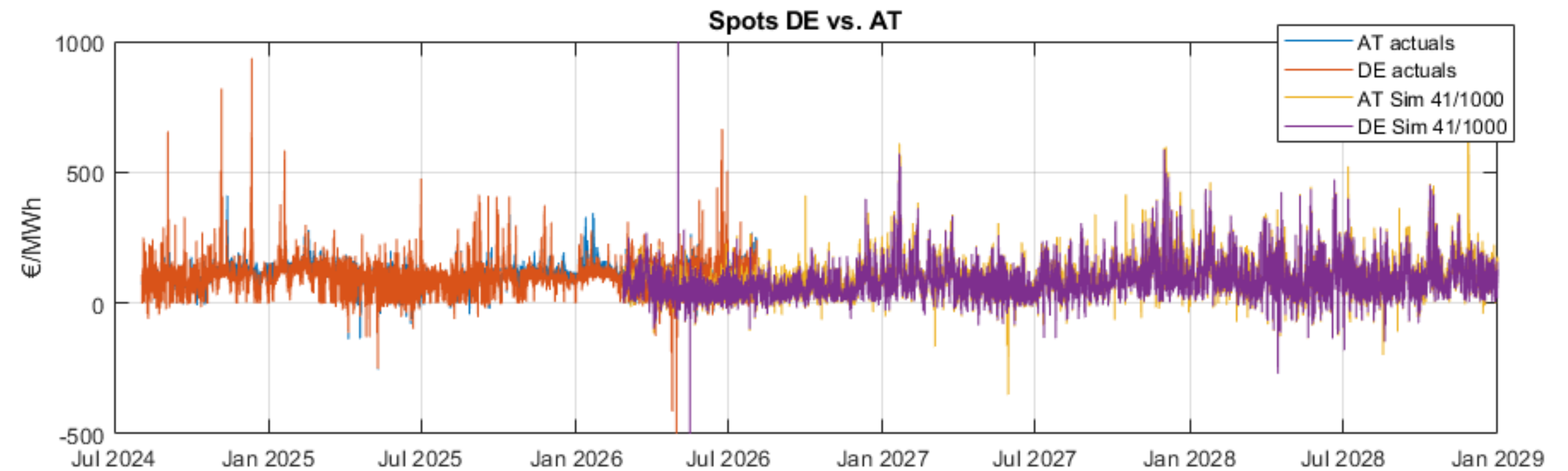
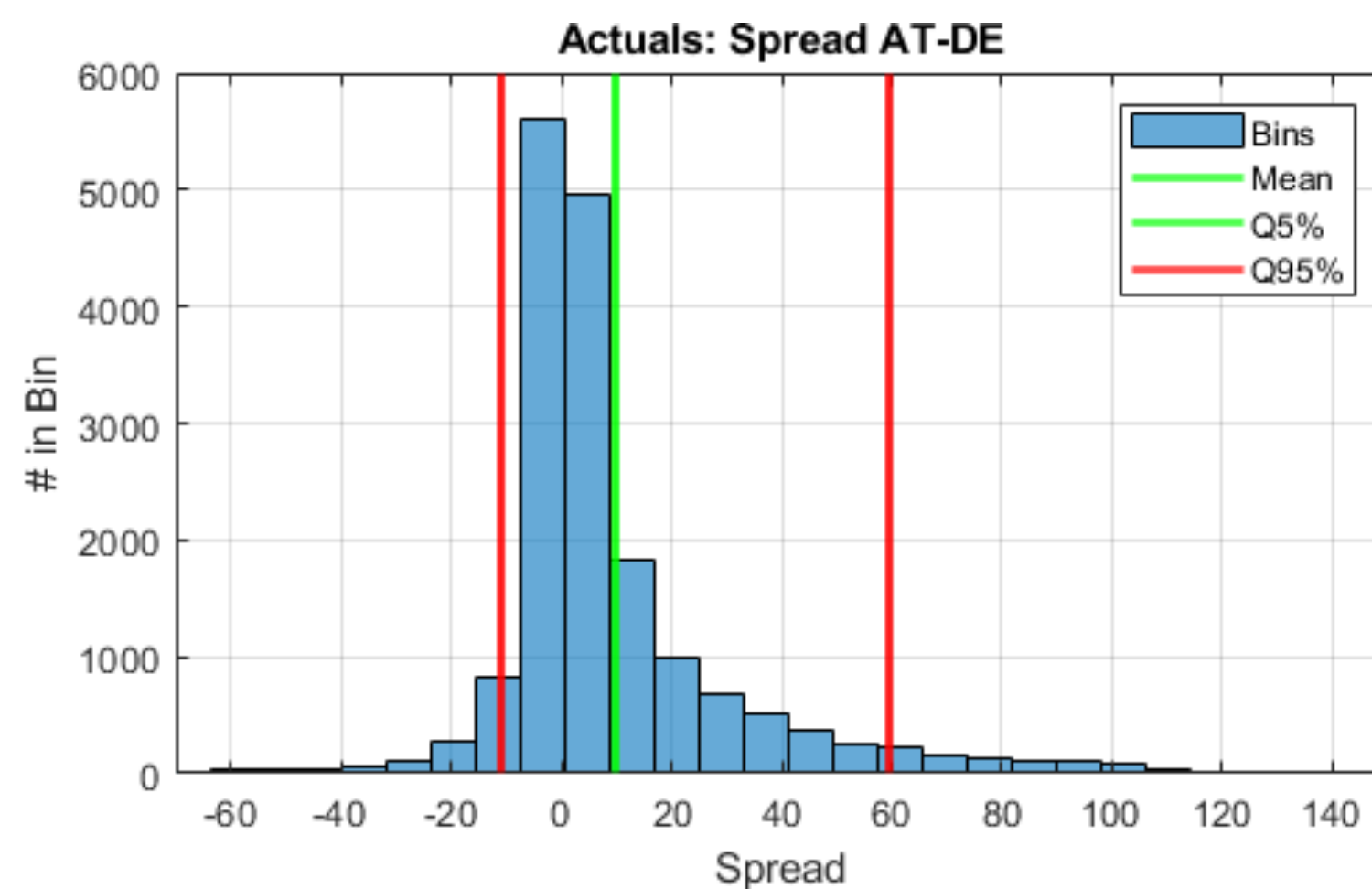
Overview, Challenges & Goals

Challenges

- AT-Prices → Capturing similarities to Germany
- Spread AT-DE exhibits skews → Important to model

For valuation of regeneratives

- What drives the spread?
- Do regeneratives play any role?
- Is the spread connected to the capture rate of an Austrian plant?



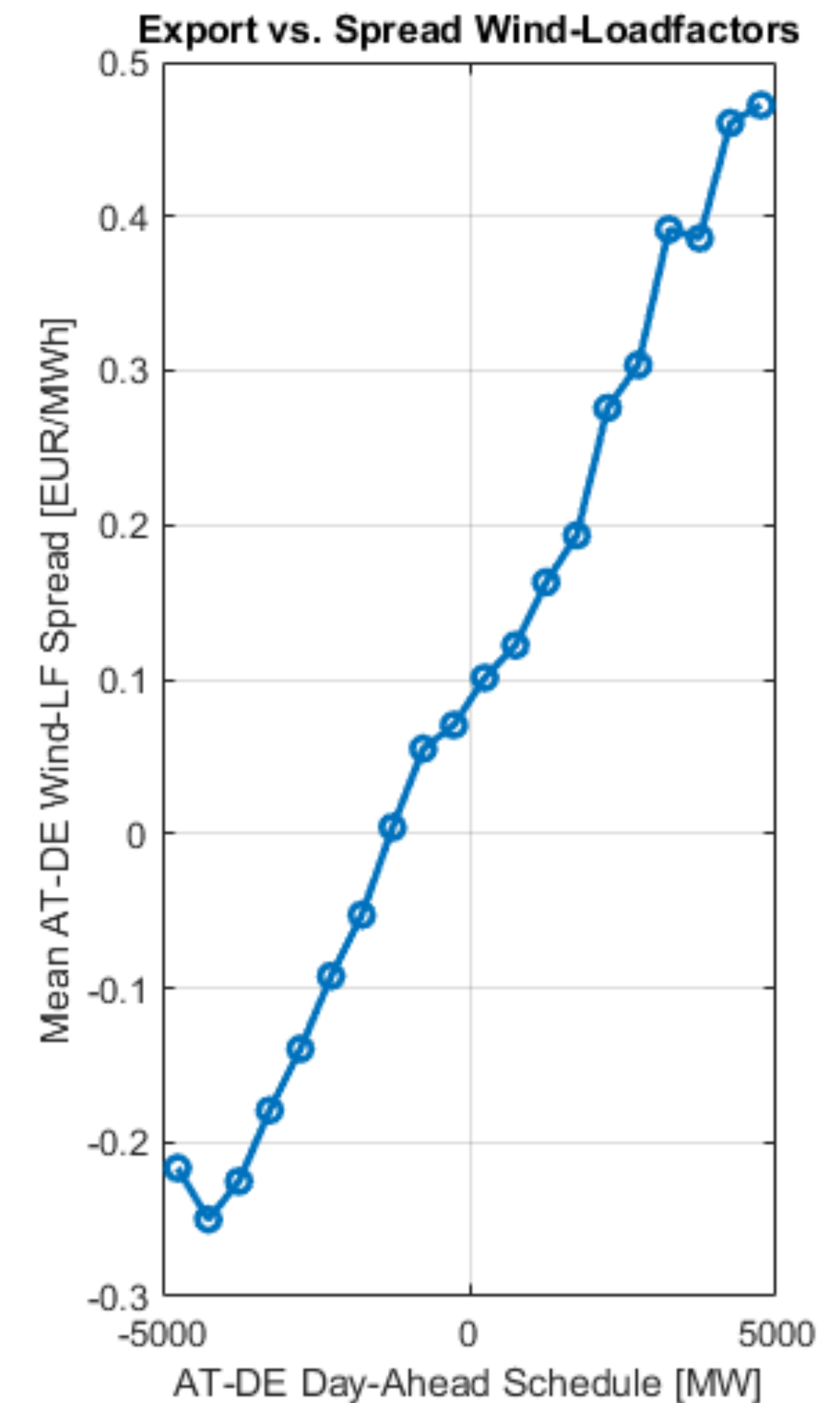
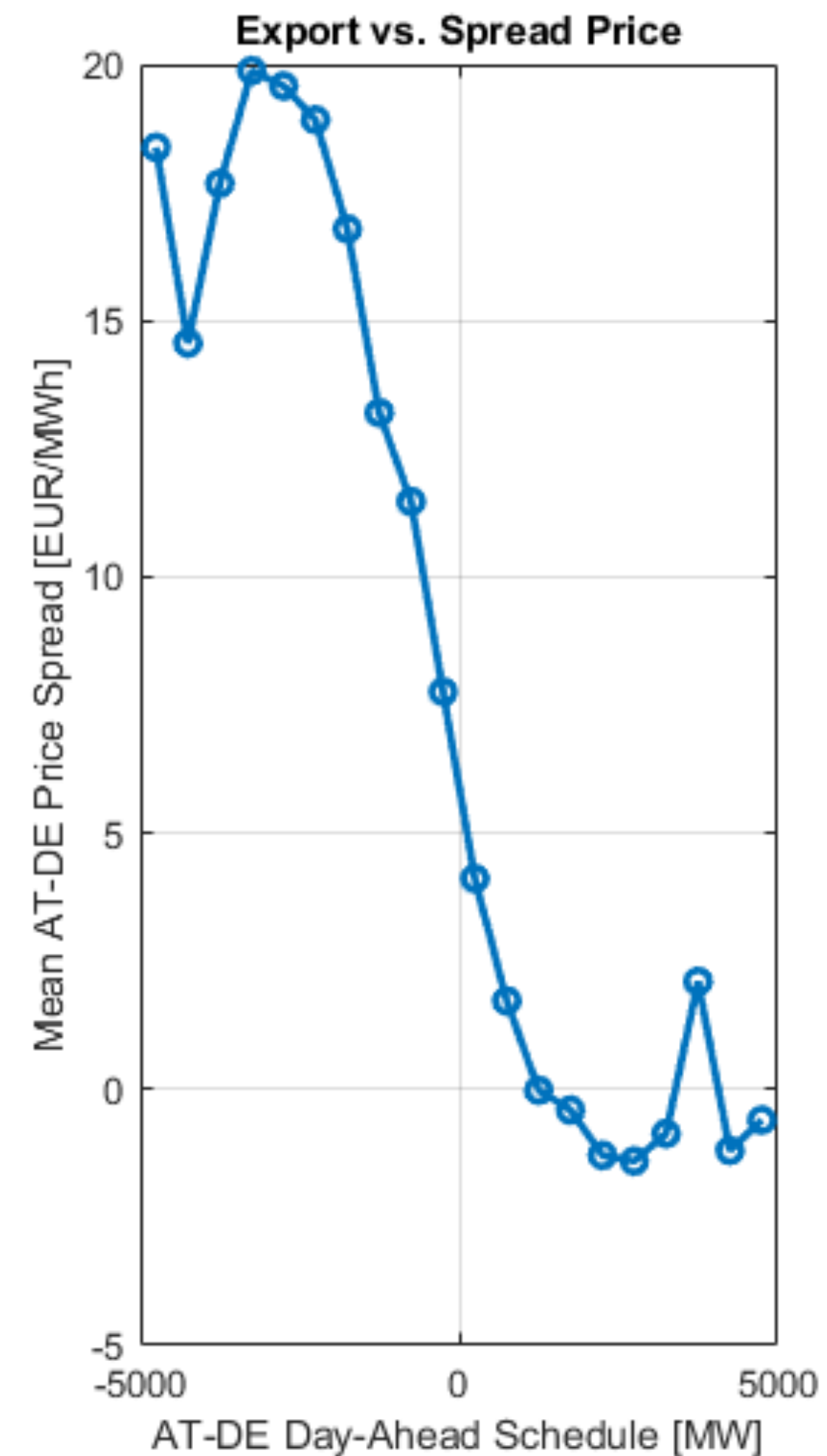
Reaction Scheme 1/2

About the figure

- Bin-Analysis
 - Data is clustered in groups
 - Groups are clustered according Export AT→DE
 - At each export we observe a price → these are also collected
 - The plots show the means in each bin (cluster) for both groups

What do we conclude?

- Expected price spread rises with rising imports
- Export is strongly correlated with the difference in load-factors (LF) of AT and DE
→ the lower the Delta in (LF AT- LF DE) the higher the import volume
- Exports do not have much impact on the price spread



Reaction Scheme 2/2

About the figure

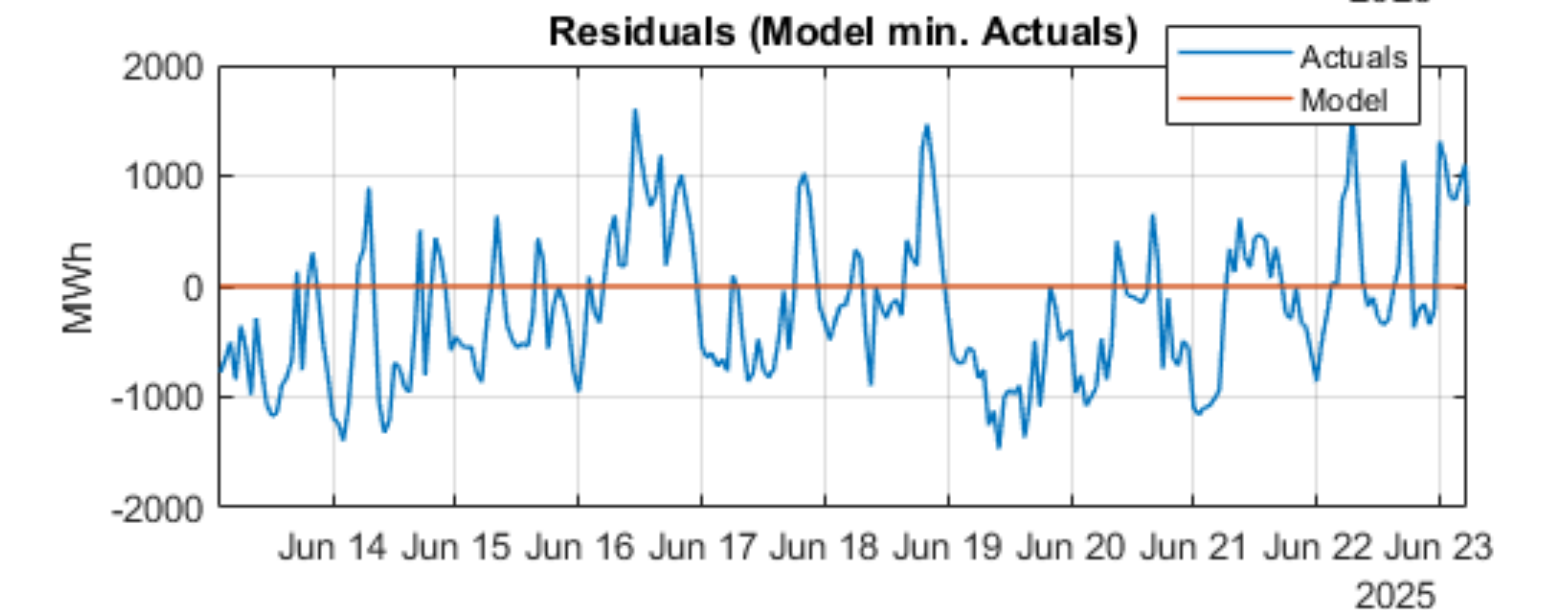
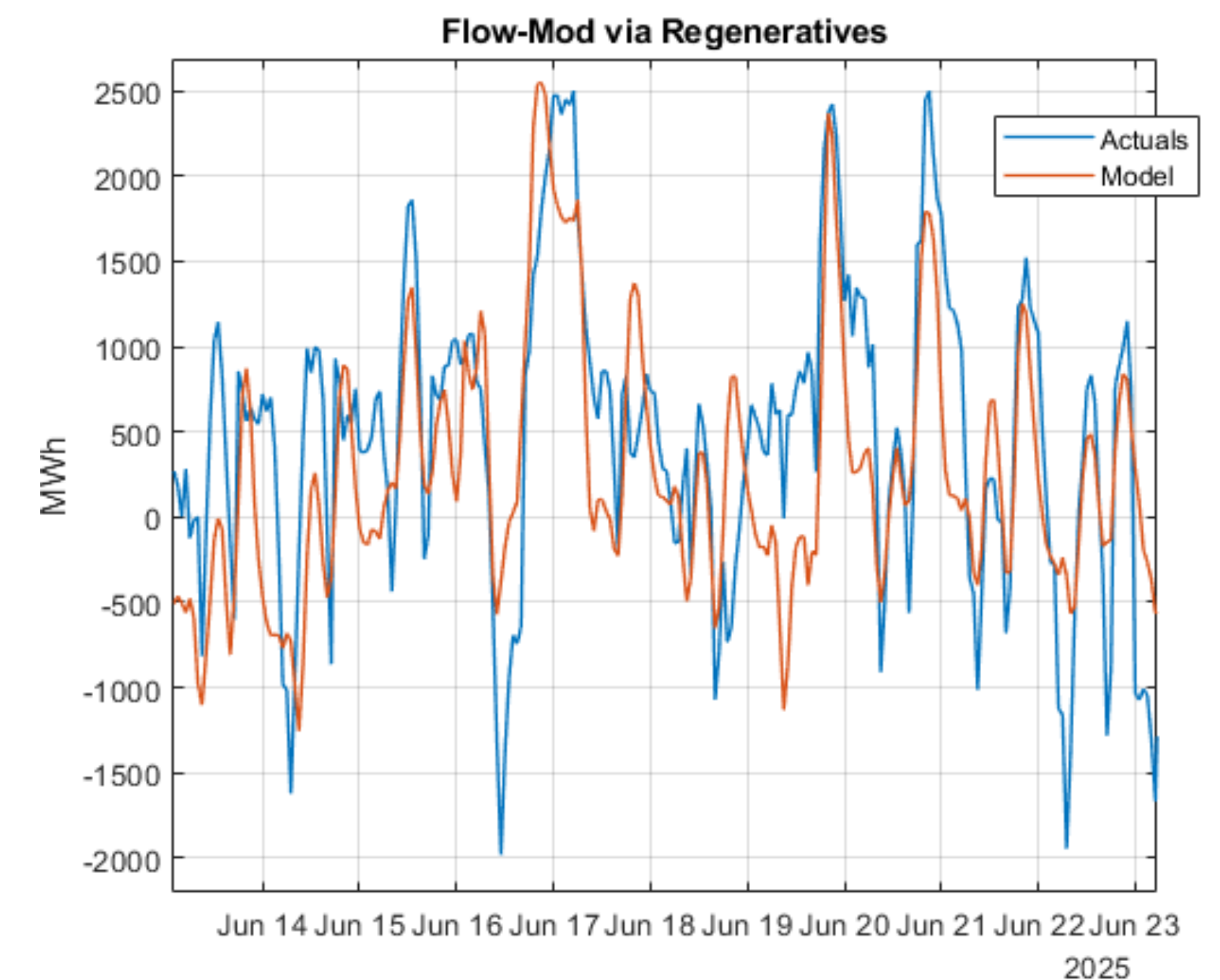
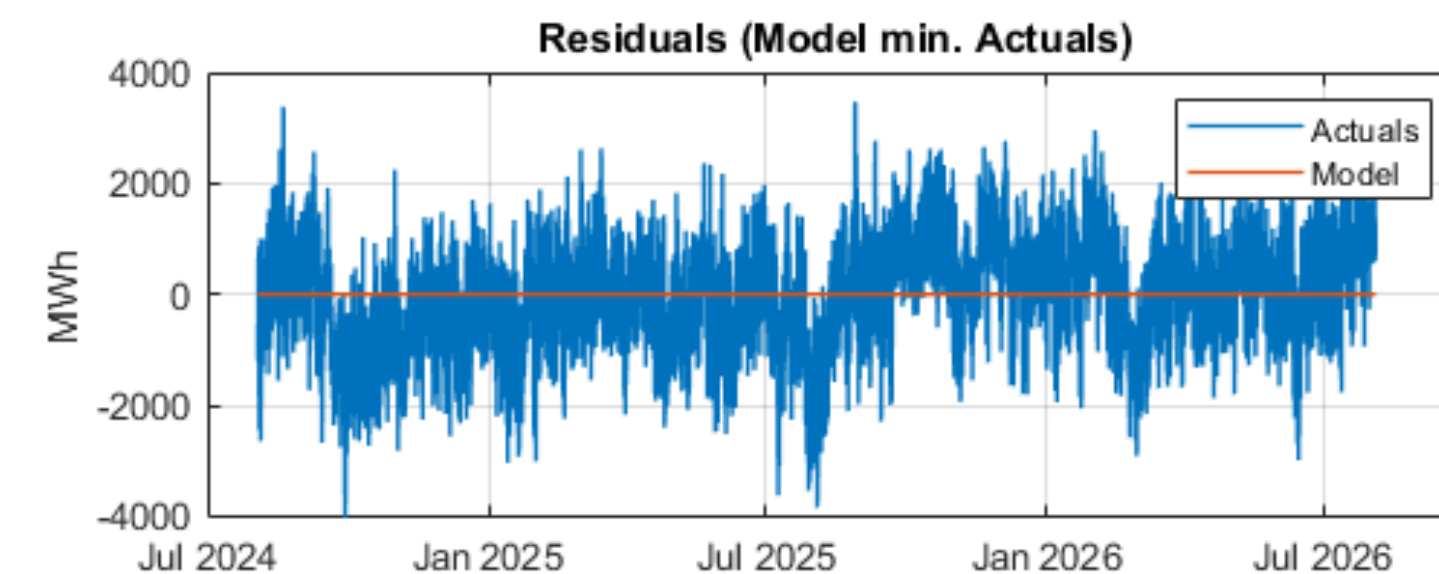
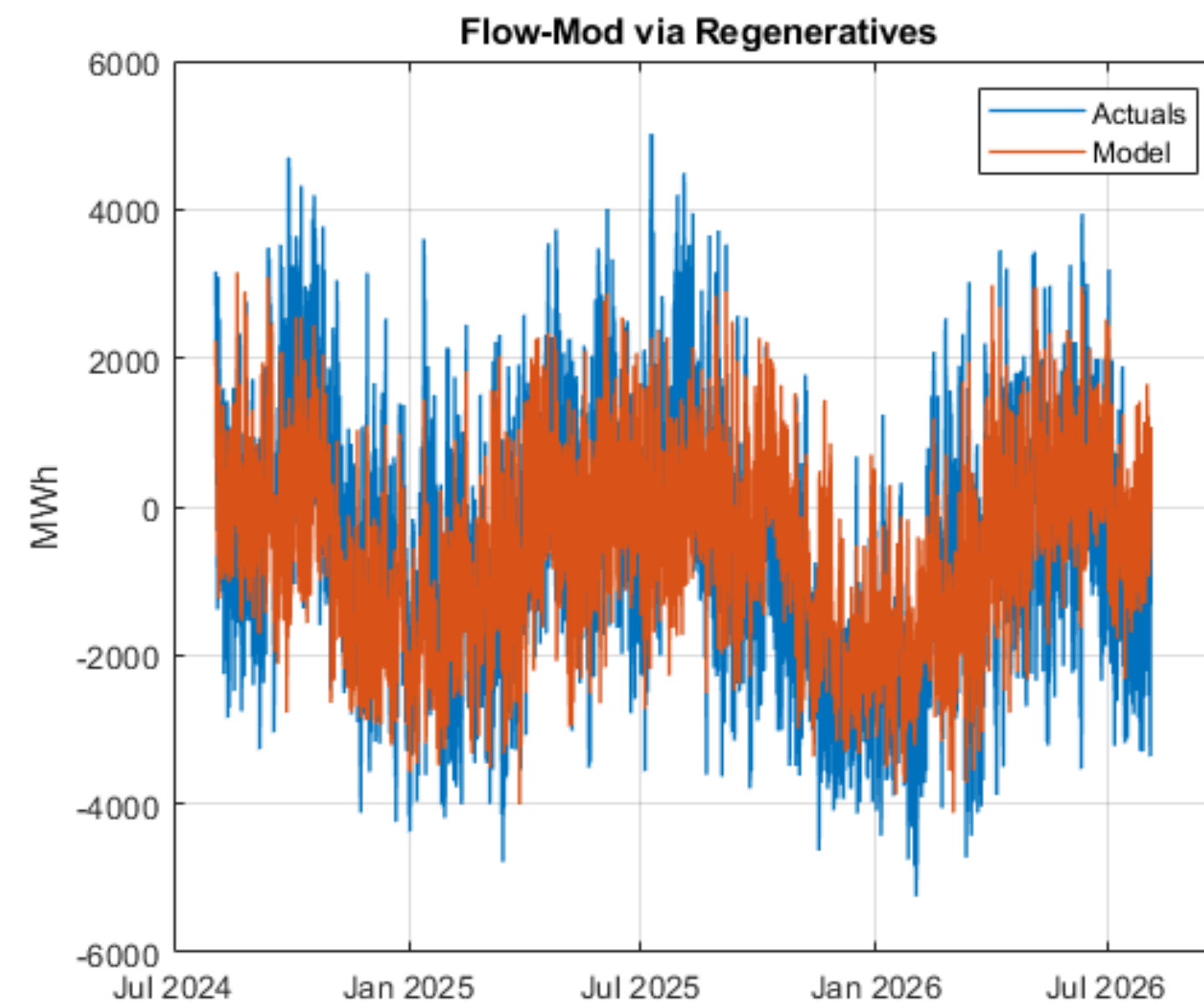
- Left column: 2-year analysis
- Right column: Zoom into left column
- Actuals: Flows from eq: Day-ahead schedule AT→DE
- Model:
 - Deterministic dummies (hour, month)
 - LF Spreads for Wind
 - LF Spreads for PV

What do we conclude?

- LF Spreads do explain roughly 60% of the flow-dynamics
- There's a chain reaction:
LF-Spread → Flow → Spread

Note

Congestion plays an important role for rising spreads. Due to FBM and CNECs we don't recognize congestion explicitly here



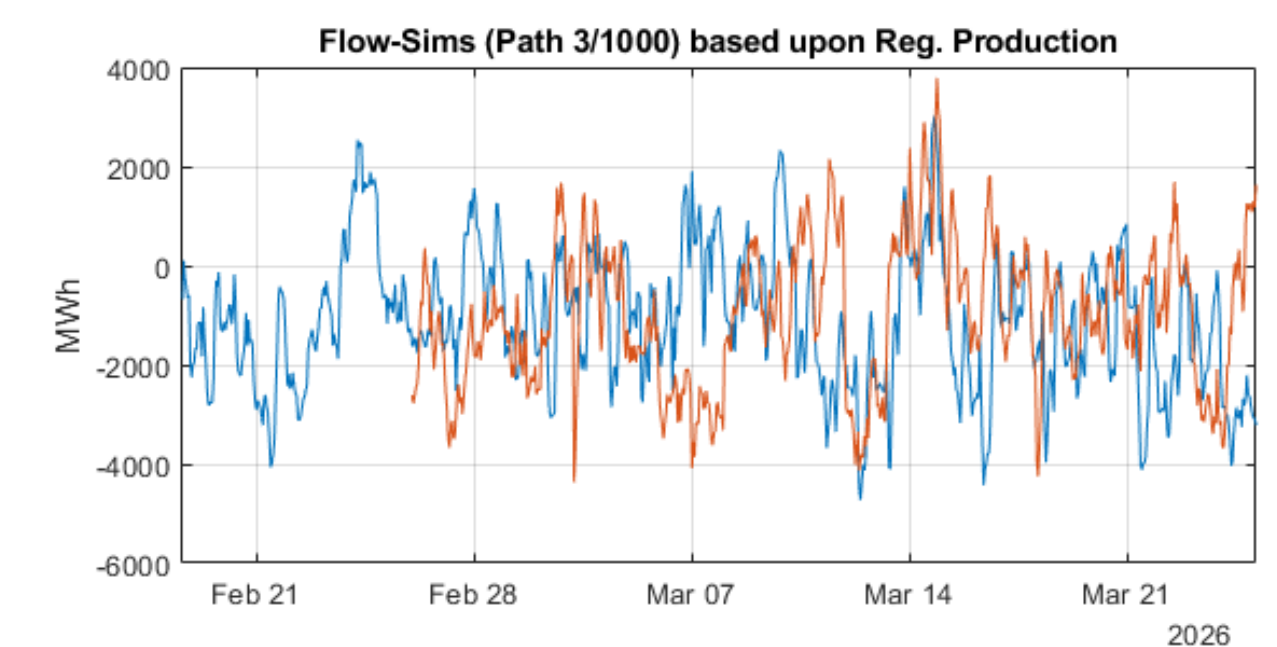
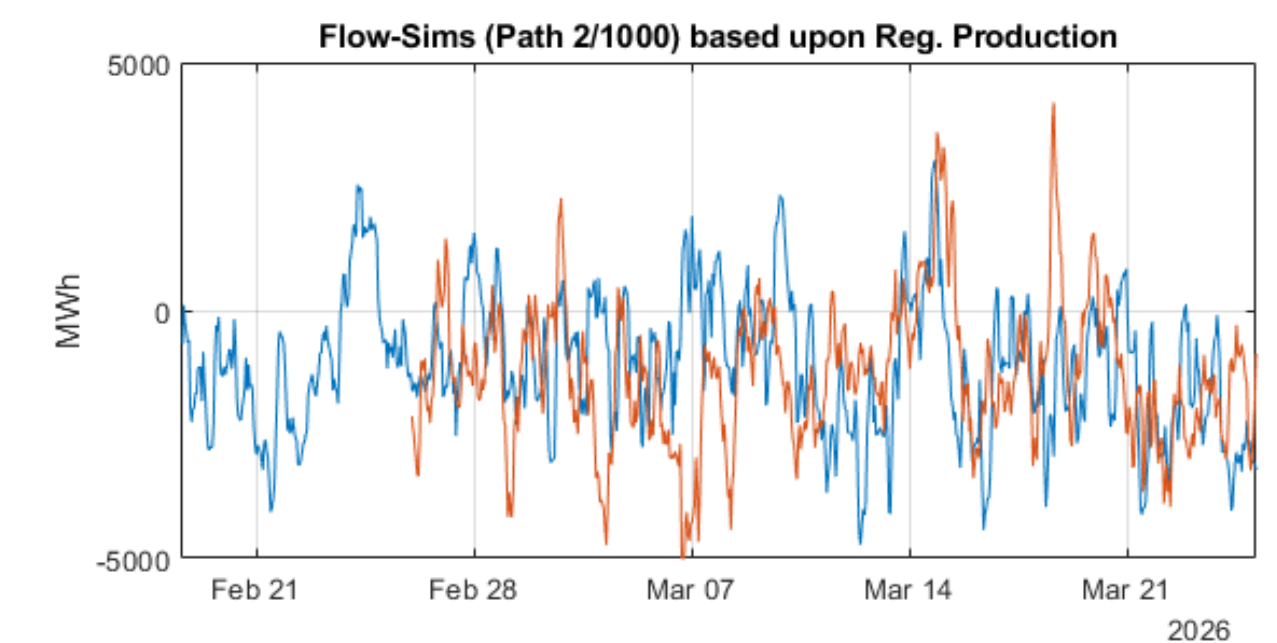
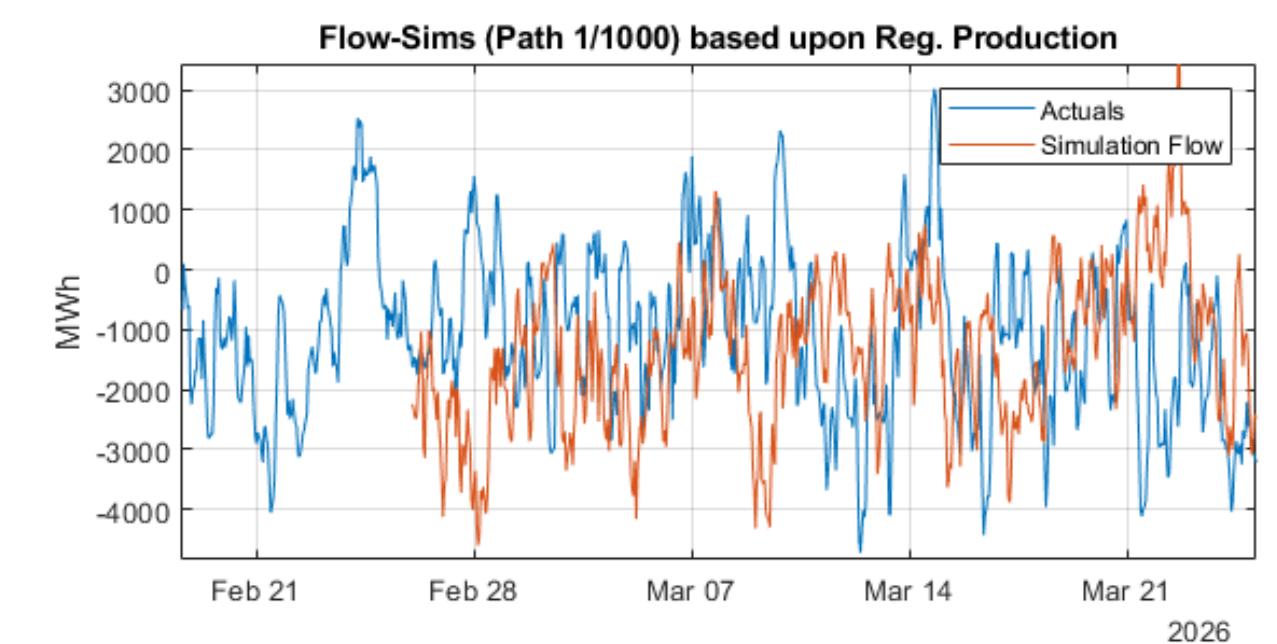
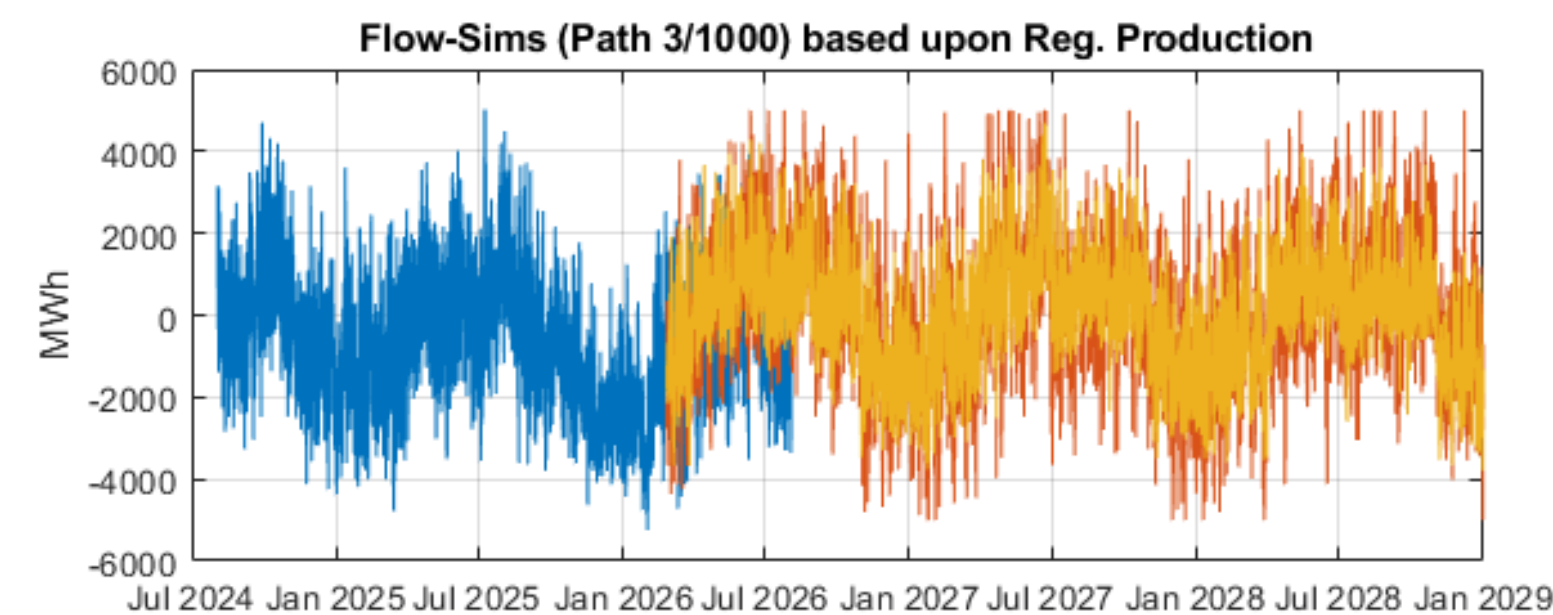
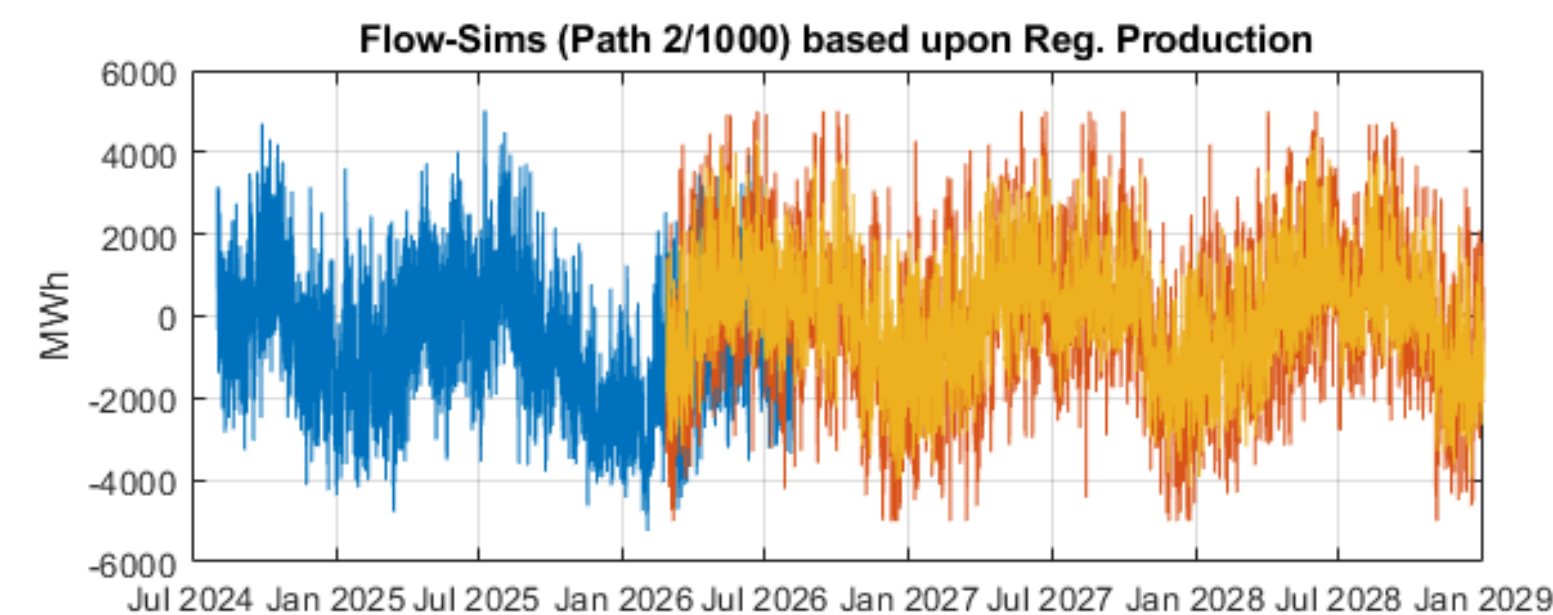
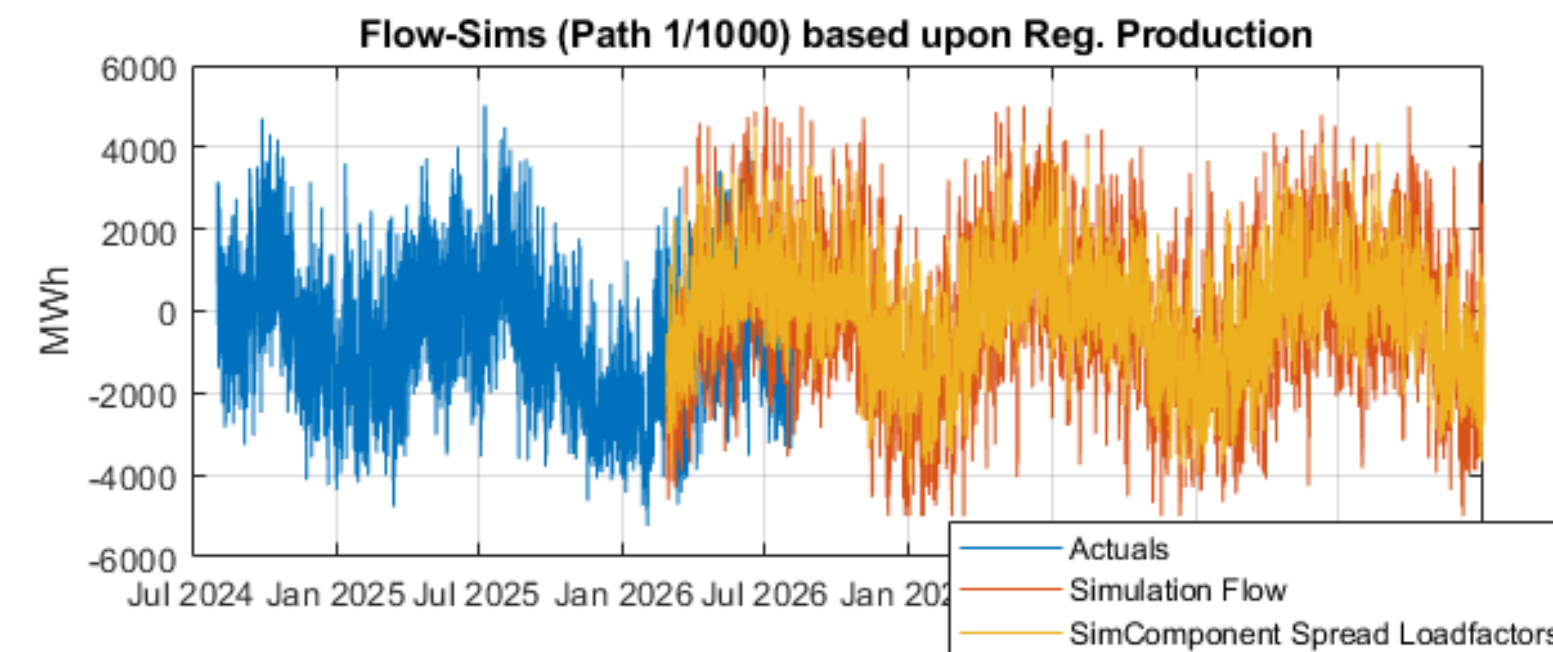
Conclusion

About the figure

- Flow Simulations
- The model chain:
 - Co-Simulating DE-fleet and AT-fleet (Wind & PV)
 - Calculating “Delta LF” for Wind, PV
 - Delta-LFs simulations drive flow-simulations
 - Flows determine the choice of cluster model

What do we conclude?

- Capture rates in AT differ from DE mainly in the case of $LF\ DE \gg LF\ AT$
- Volatility of capture rates is different in AT
- Price-risk in AT can be modelled via some fundamental factors
- Spread AT-DE plays an important role when doing valuation for regeneratives



Live Dive: Montel Value

04

Austrian Deep Dive

Thanks for listening

Meet us at our Montel Value stand.



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What questions do you have?

Q&A