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AUSTRIAN INSTITUTE OF TECHNOLOGY
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QUANTIFYING THE EFFECT OF FORECAST UNCERTAINTY ON THE PLANNING AND TECHNO-ECONOMIC PERFORMANCE OF VIRTUAL POWER PLANTS

RESEARCH QUESTION

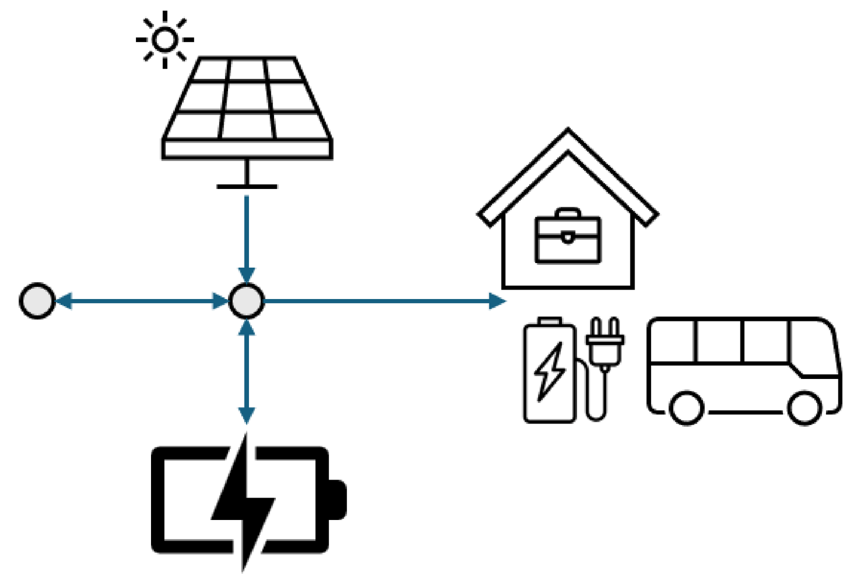
To what extent does accounting for short-term uncertainties in VPP scheduling contribute to

- proper estimation of operational KPIs, and
- the quantification of mis-estimations induced by simplifications like *perfect foresight*?

COMPARED METHODS

- **Perfect Foresight:** Demand, solar photovoltaics production, and market prices are known in advance.
- **Imperfect Foresight:** Demand, solar photovoltaics production, and market prices are uncertain.
- **Real Time Simulation:** Based on scheduling by Imperfect Foresight method, deviations must be resolved by an imbalance settlement.

SYSTEM OVERVIEW



APPROACH

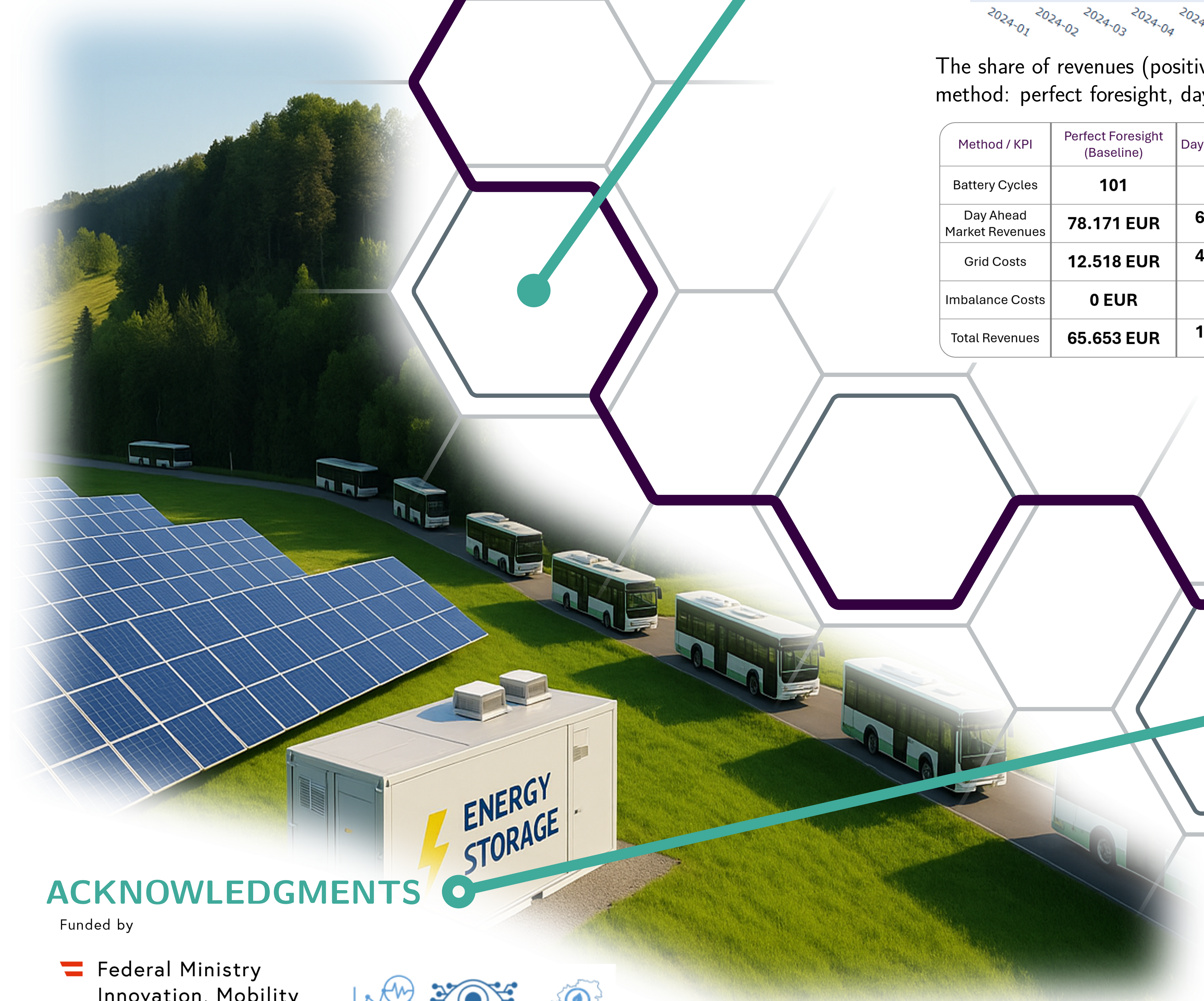
1. Modell a location in Lower Austria using the optimization framework *IESopt*.
2. Generate forecasts based on distributions for solar photovoltaics, demand, and prices.
3. Implement a rolling horizon approach by optimizing three days at a time, further planning ahead for the whole month.
4. Solve the MILP using *HiGHS*.

COMPUTATIONAL RESULTS

The share of revenues (positive) and costs (negative) in each month compared by method: perfect foresight, day-ahead planning and actual operation.

Method / KPI	Perfect Foresight (Baseline)	Day-Ahead-Planning	Actual Operation
Battery Cycles	101	97 (- 4,0 %)	115 (+ 13,9 %)
Day Ahead Market Revenues	78.171 EUR	64.523 EUR (- 17,5 %)	64.523 EUR (- 17,5 %)
Grid Costs	12.518 EUR	48.052 EUR (+ 283,9 %)	39.336 EUR (+ 214,2 %)
Imbalance Costs	0 EUR	0 EUR	7.845 EUR
Total Revenues	65.653 EUR	16.472 EUR (- 74,9 %)	17.343 EUR (- 73,6 %)

Key performance indicators based on computational results for 2024 used to compare the three methods.



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