



TradeRES

New Markets Design & Models for
100% Renewable Power Systems

A German Case Study - Comparison of Support Schemes for Renewables

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Research question

Are RES remuneration schemes needed and if so, how should they be designed?

Approach

- Simulate energy system dispatch
- Apply different remuneration schemes
- Compare market performance indicators



Simulate dispatch

AMIRIS: open Agent-based Market model for the Investigation of Renewable and Integrated energy Systems

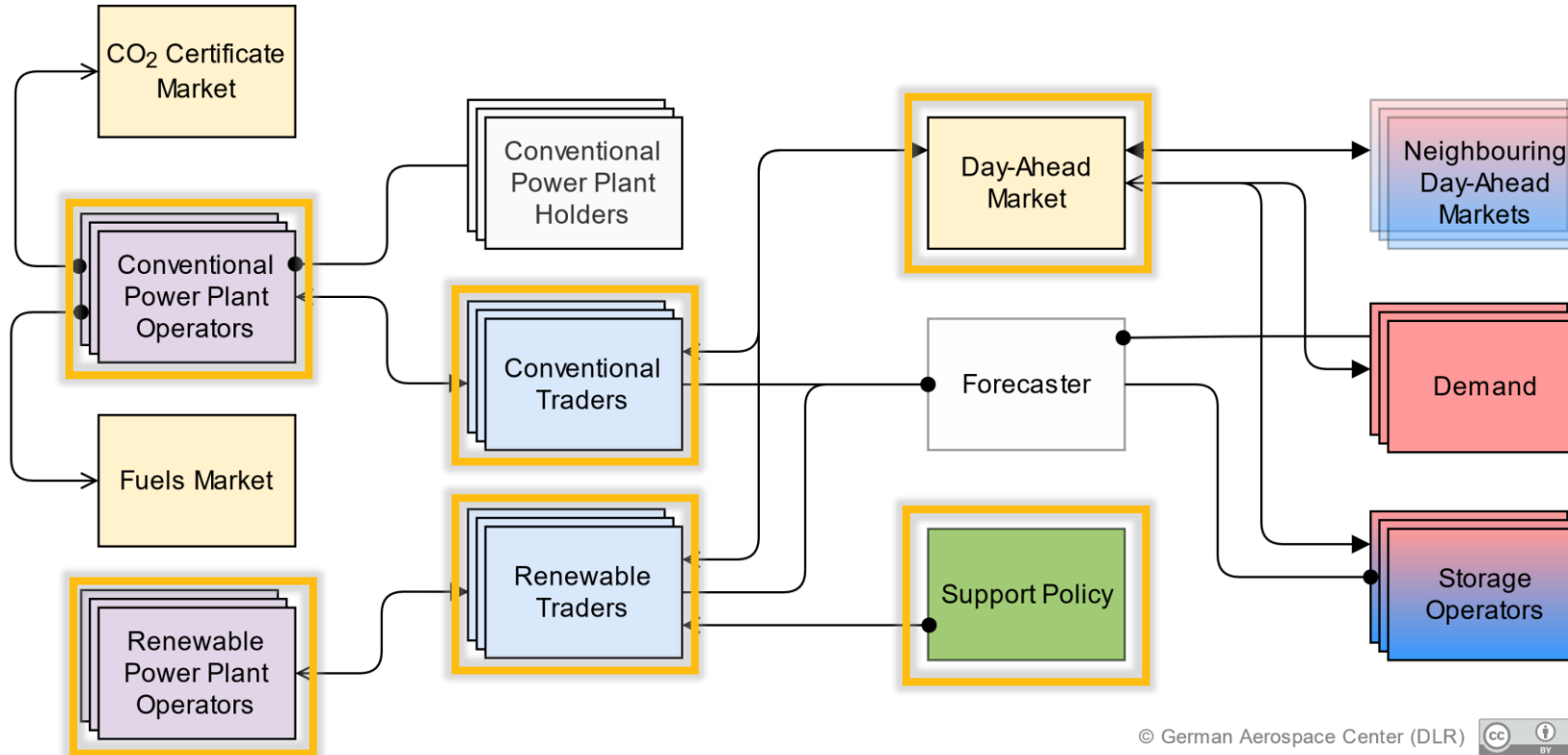
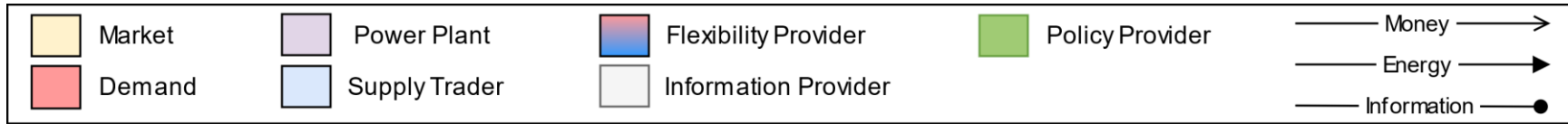
- is an **agent-based** model for the power market
- models **business-oriented** dispatch decision making
- considers different regulatory framework conditions
- is available **open source** at <https://gitlab.com/dlr-ve/esy/amiris>

→ `pip install amirispv`





Simulate dispatch AMIRIS





Renewable Remuneration

Five Market Design Bundles

- “None”: no remuneration
- “CP”: capacity premia
- “MPfix”: fixed market premia
- “MPvar”: variable market premia with monthly reference period
- “CfD”: contracts for differences with monthly reference period

Premia

Adjusted in calculations in advance: each renewable energy technology refinances within a 1% tolerance

Scenario

“S1”, ~85% RES-share // **Ongoing work - preliminary results!**

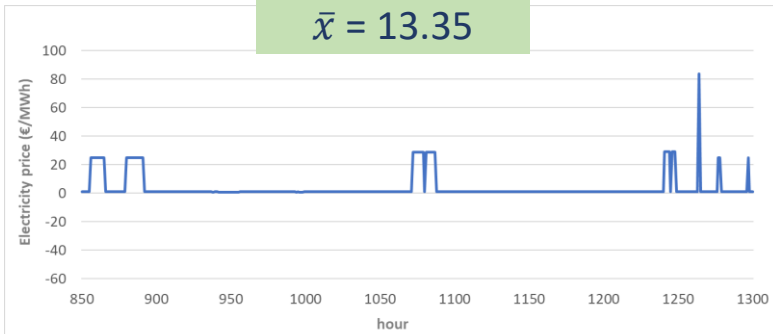


Market Performance Electricity Prices

! Preliminary results !

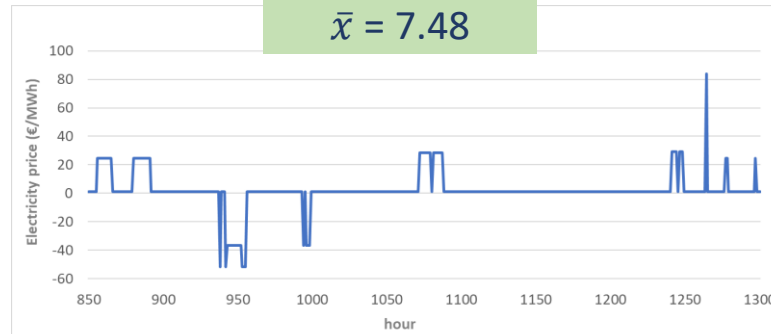
NONE

$\bar{x} = 13.35$



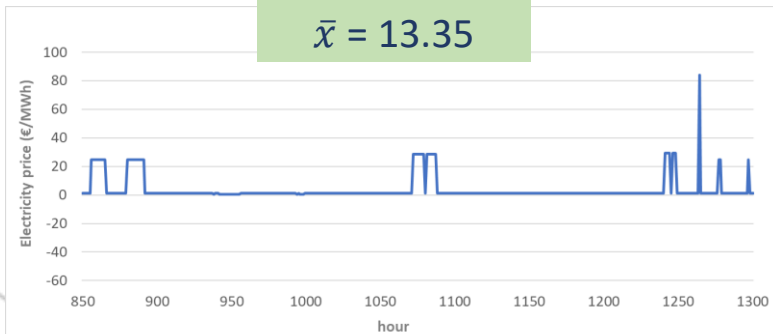
MPFIX

$\bar{x} = 7.48$



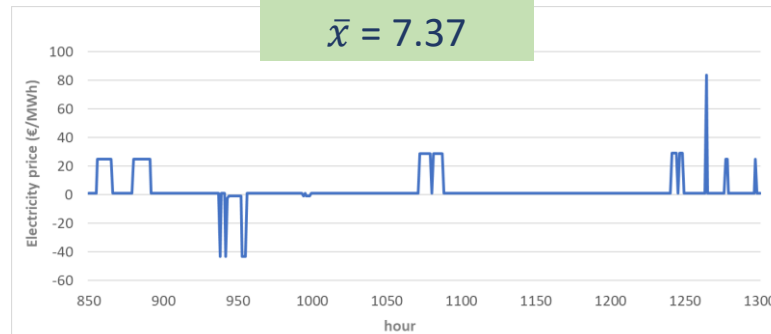
CP

$\bar{x} = 13.35$



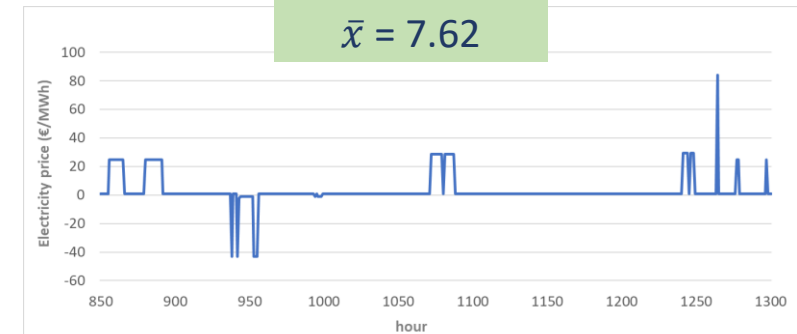
MPVAR

$\bar{x} = 7.37$



CFD

$\bar{x} = 7.62$



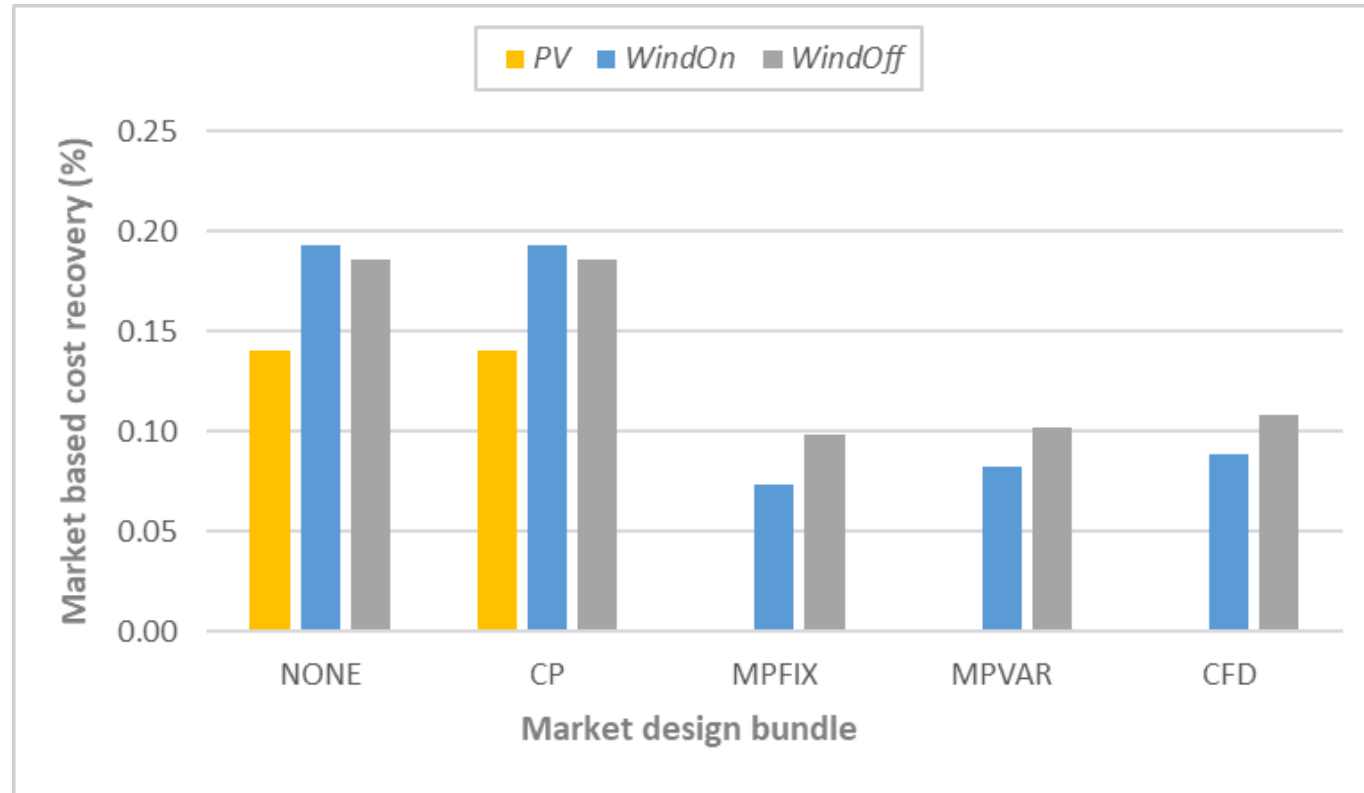
- Impact of support scheme on prices due to strategic bidding behaviour
- Market premia lower electricity prices



Market Performance

Market-based cost recovery

! Preliminary results !



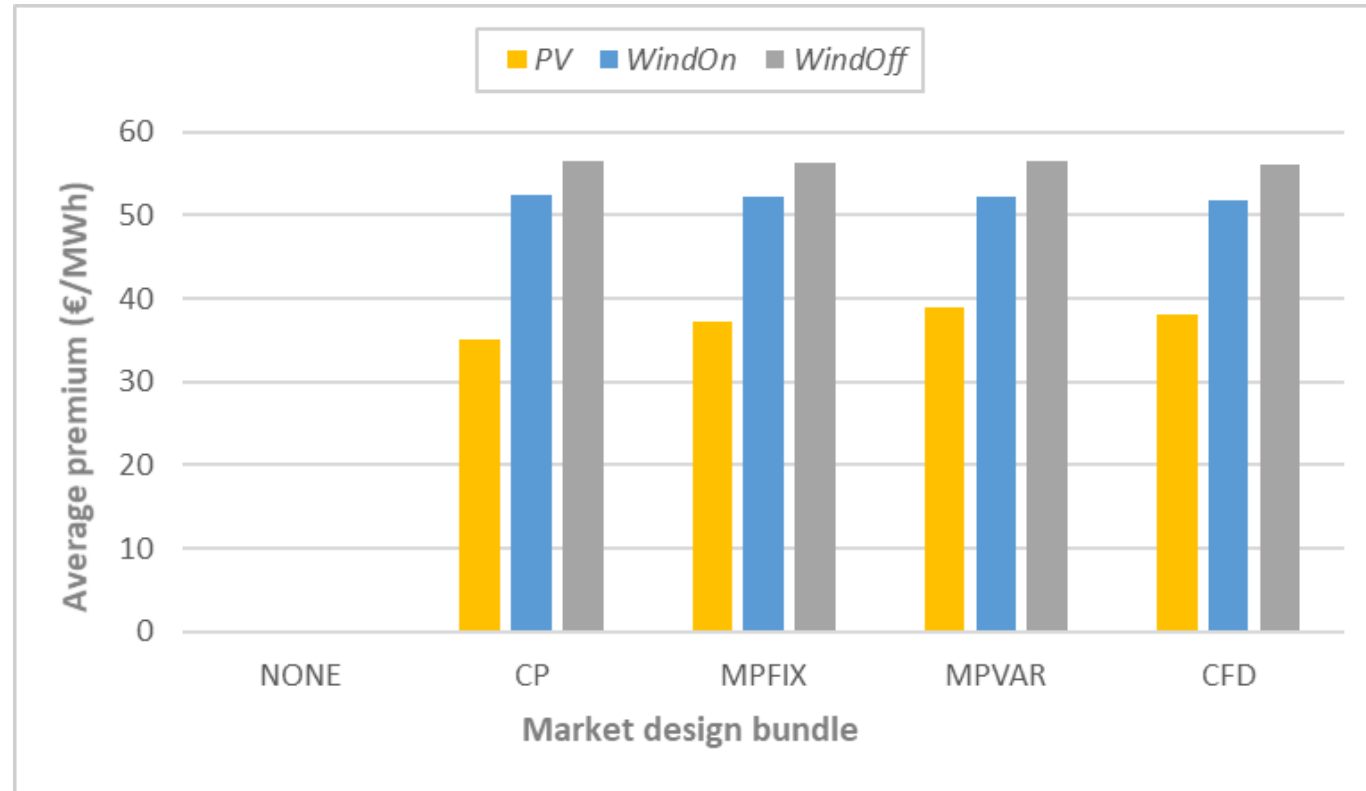
- No RES recovers cost at market, remuneration required
- Market premia may reduce cost coverage



Market Performance

Average RES premium payments

! Preliminary results !



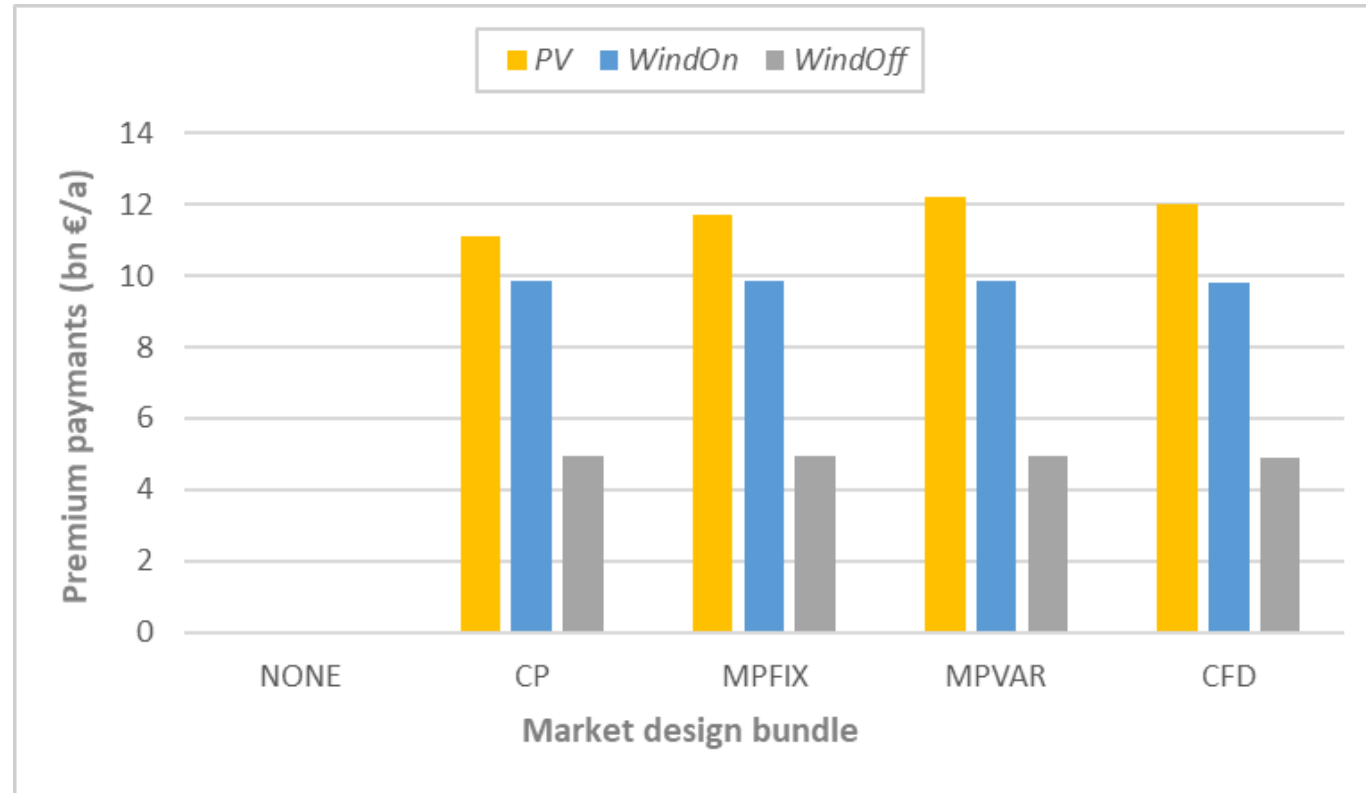
- Overall support cost similar for market premia
- Capacity premia may reduce support cost



Market Performance

Total RES support cost

! Preliminary results !



- Overall support cost similar for market premia
- Capacity premia may reduce support cost

More market design bundles

e.g., financial CfDs

More scenarios

also assess 4 different scenarios at ~95% RES share

More indicators

e.g., curtailment, system cost, loss of load, ...