The economics of control reserve provision by fluctuating RES

Strommarkttreffen

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Overview

- Challenges
- Modelling
- Business model
- Micro-economic assessment
- Conclusion

CHALLENGES

Business model?

Reliability?

What if?

… fluctuating renewables provided control reserve

Economic Impact?

Regulations?

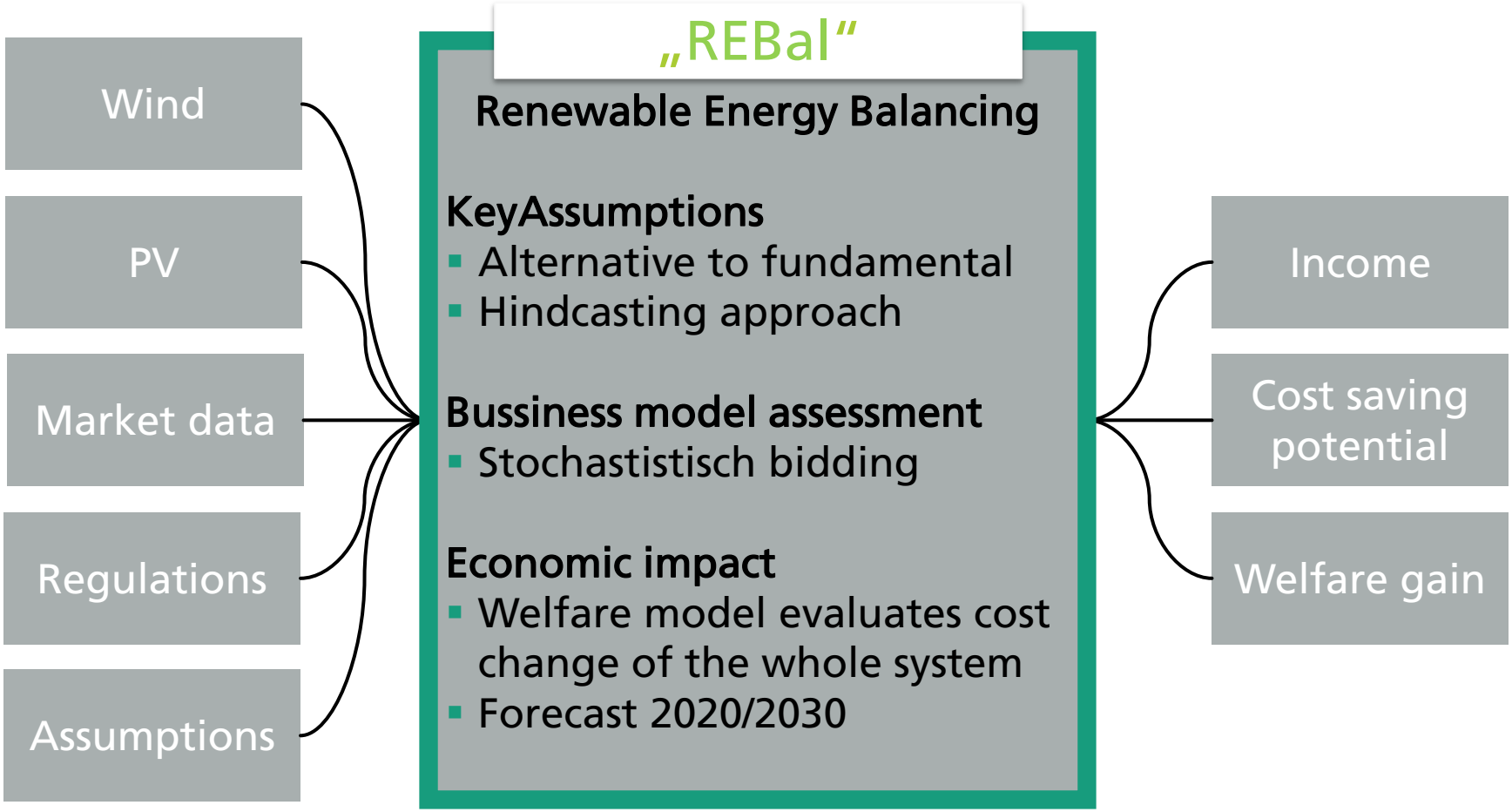
New regulations coming up

- Admitting wind
  - Pilot project ~2 years
- Reliability
  - Guaranteed by market participants
- Proof method
  - Available active power

- Secondary and tertiary control reserve market
  - Daily Tendering
  - 4h product length
- New market
  - Dispatch of tertiary control reserve
  - 15 min product length
  - After last ID trade (22.5 min)

MODELLING

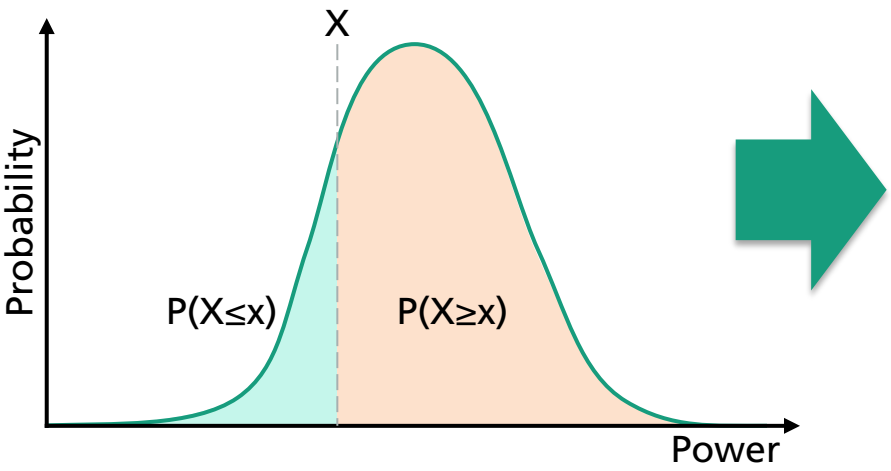
Modelling approach REBal

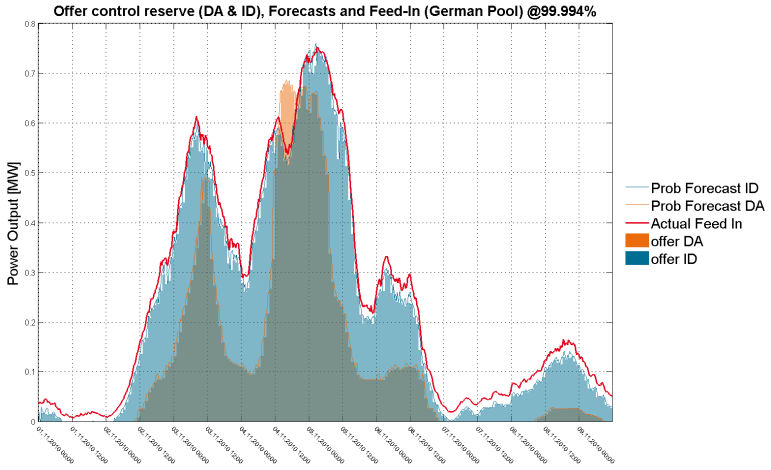


Reliability with stochastic generators

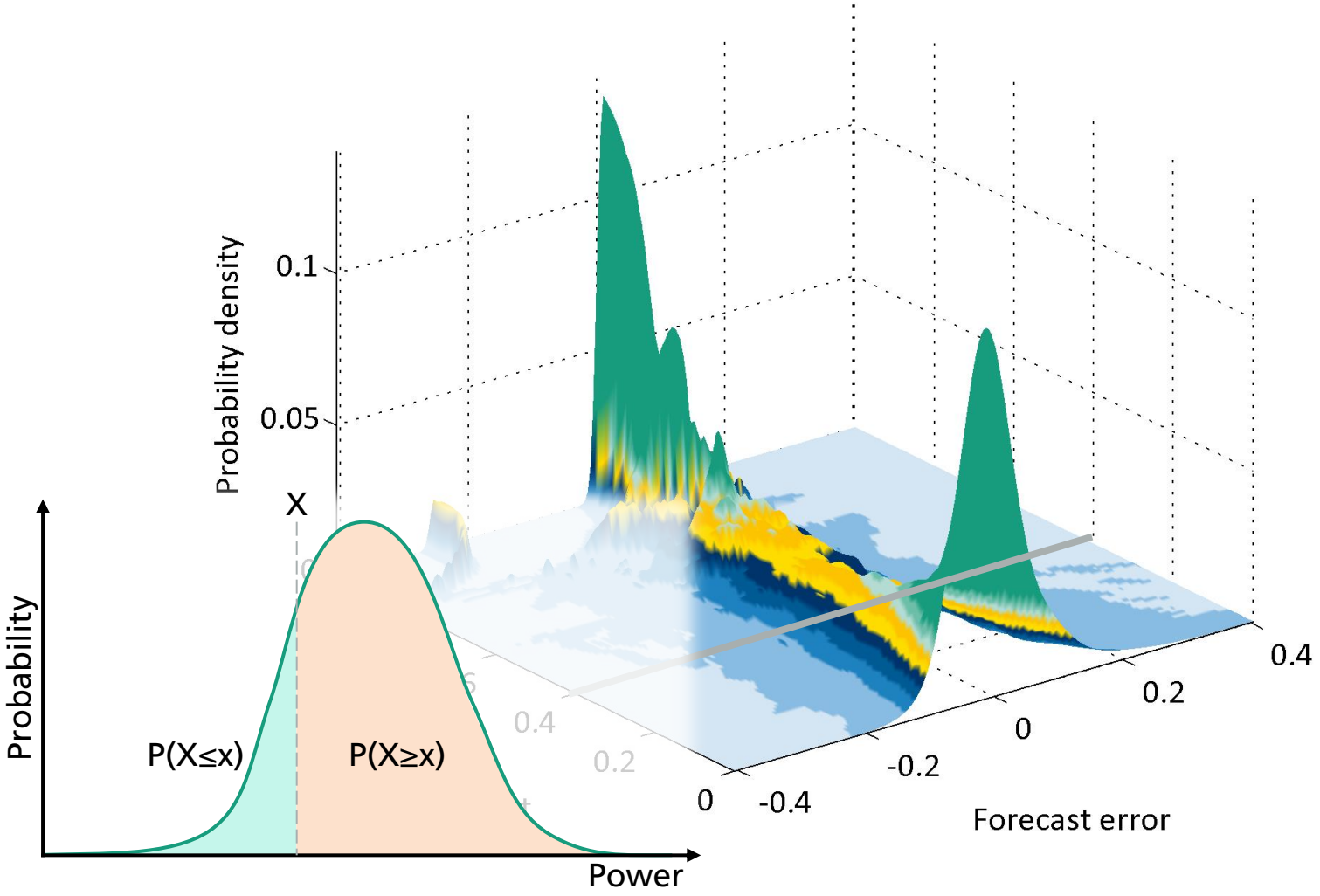
100 % Reliability required → Not possible with real units → Reliability level of 99.994% (TSO recommendation)

Use of probabilistic methods

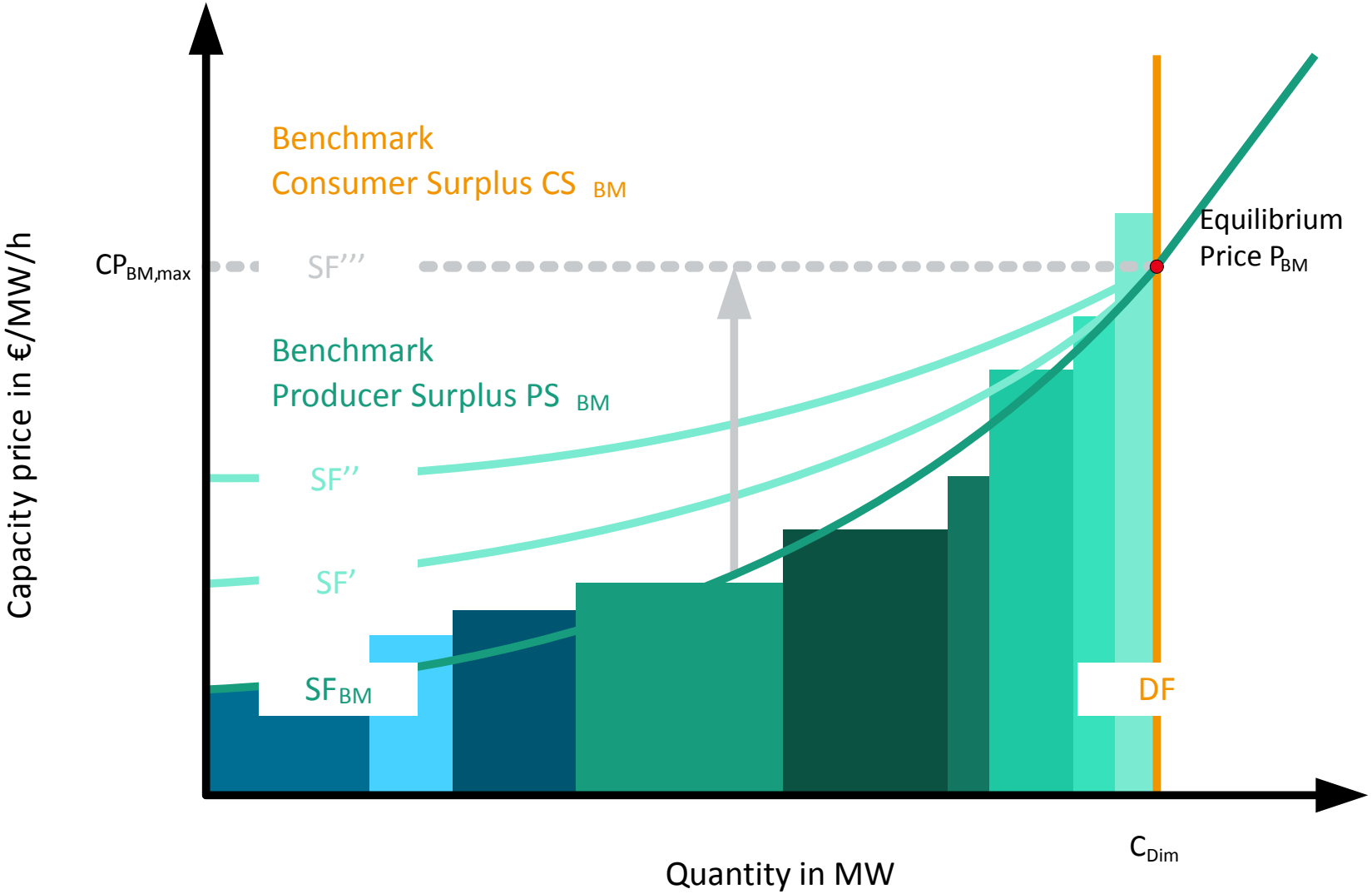




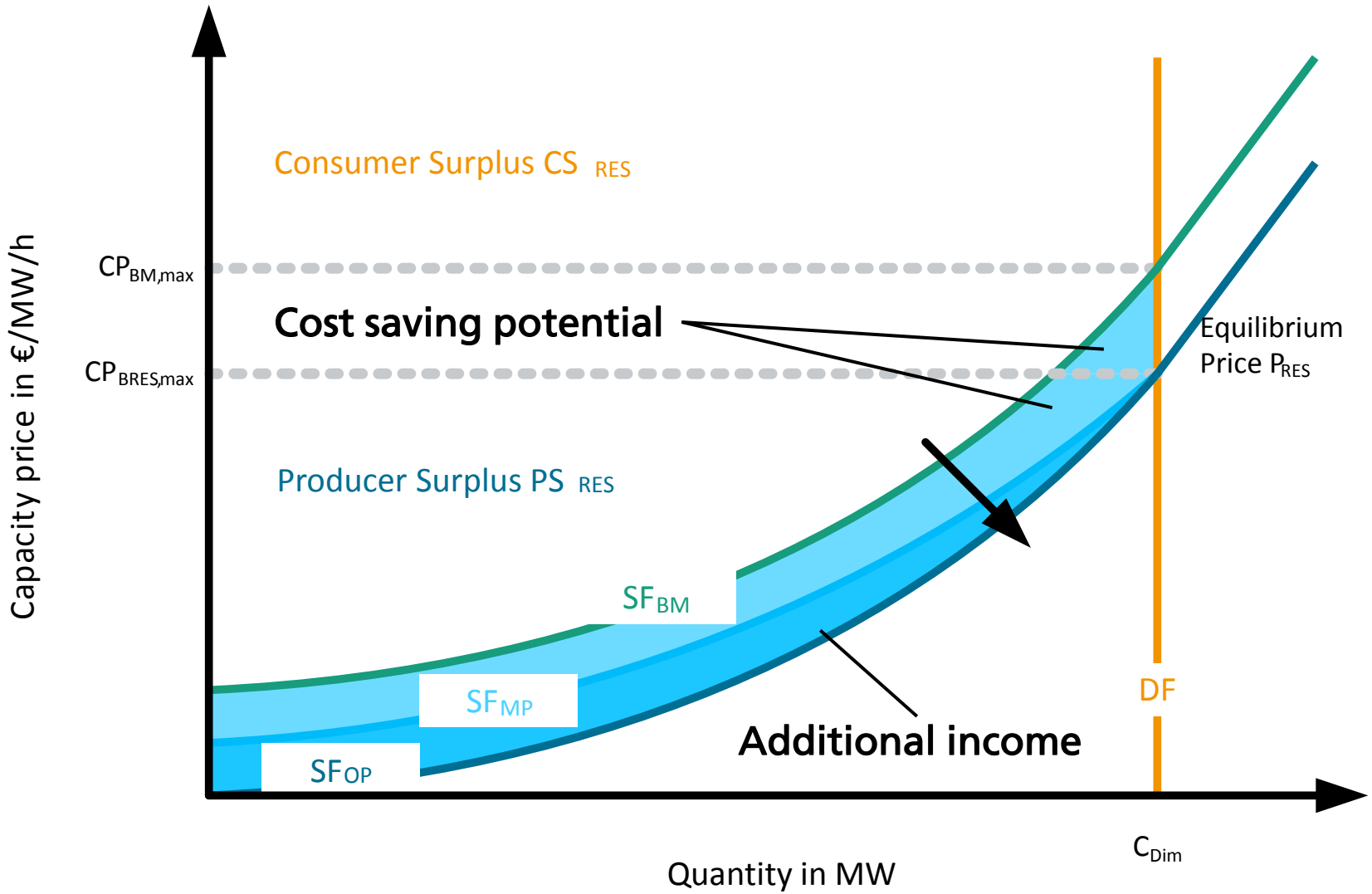
Probability density function of DA wind (30GW)



Economics in the control reserve market …



… when fRES are added to the mix



Additional Income for the fluctuatinG RES Generators

BUSINESS MODEL

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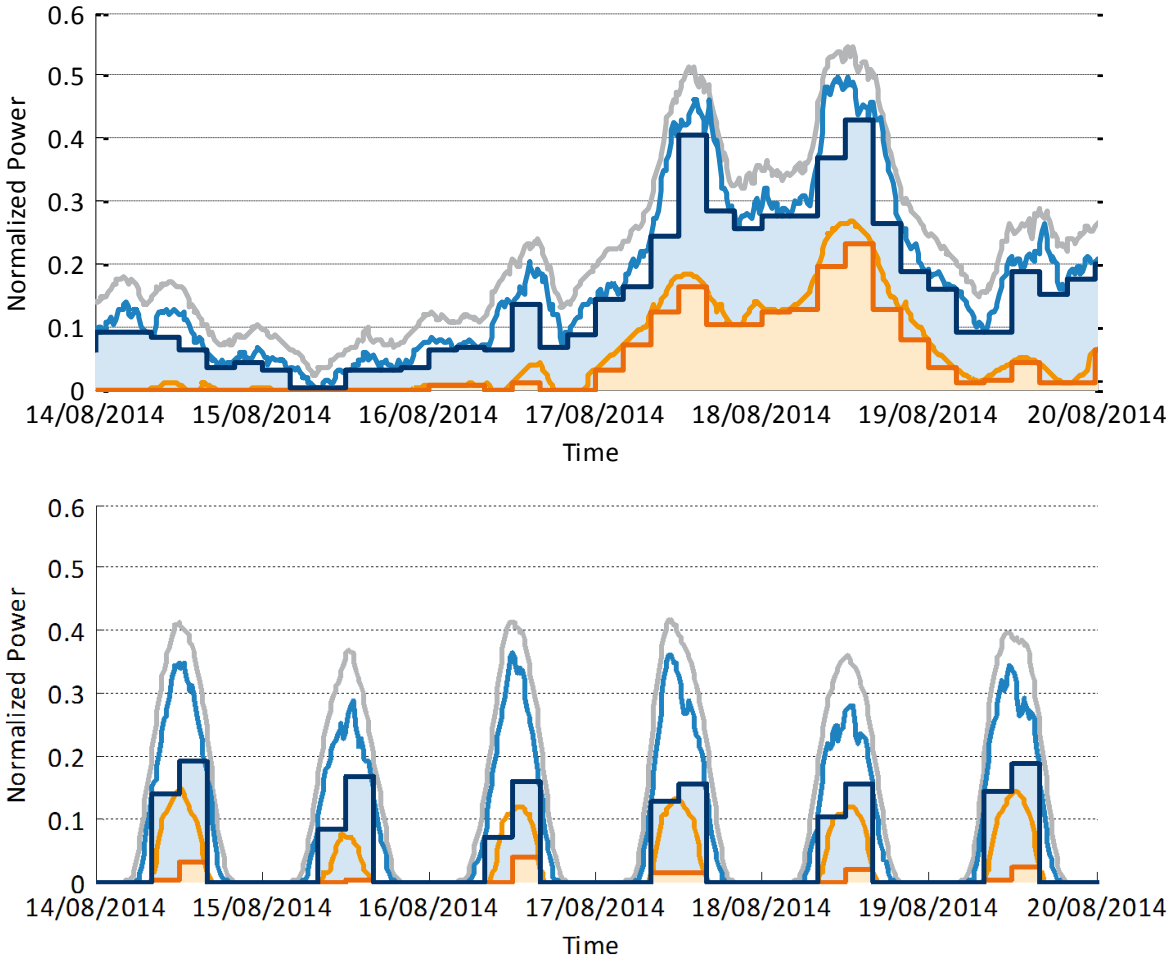
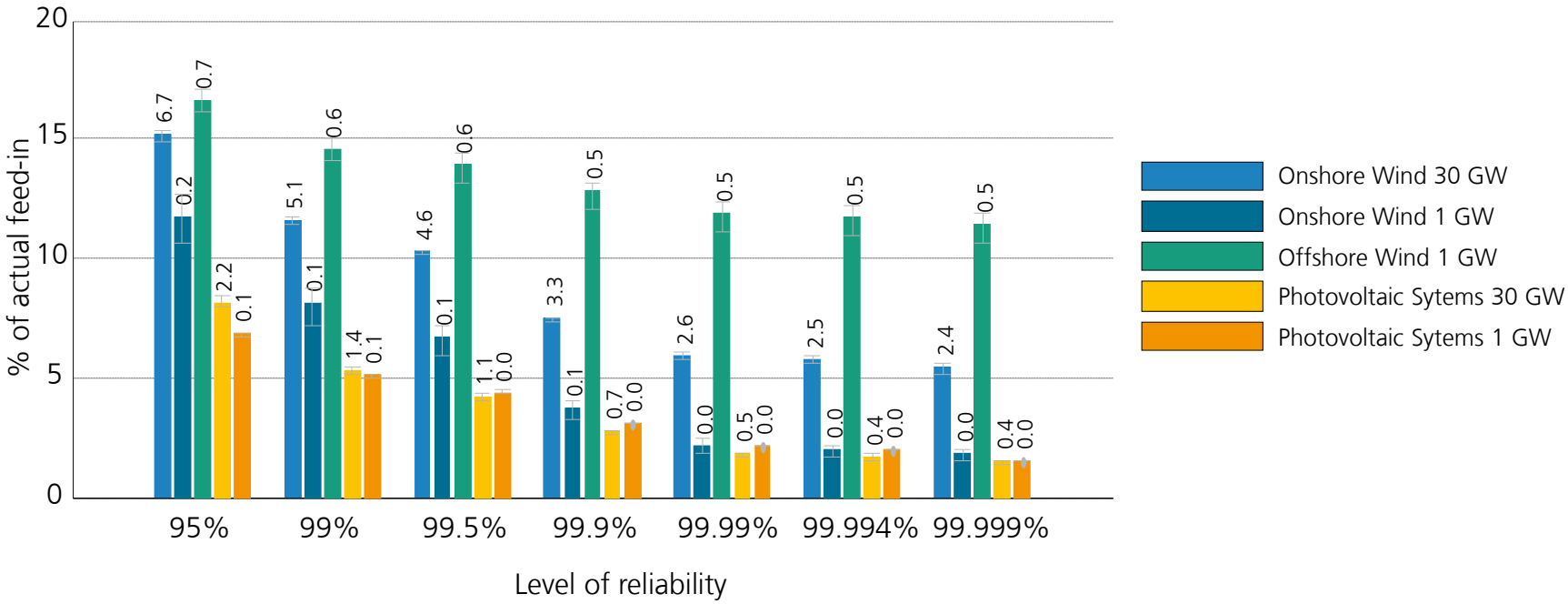
Probabilistic forecasts with a reliability of 99,994%

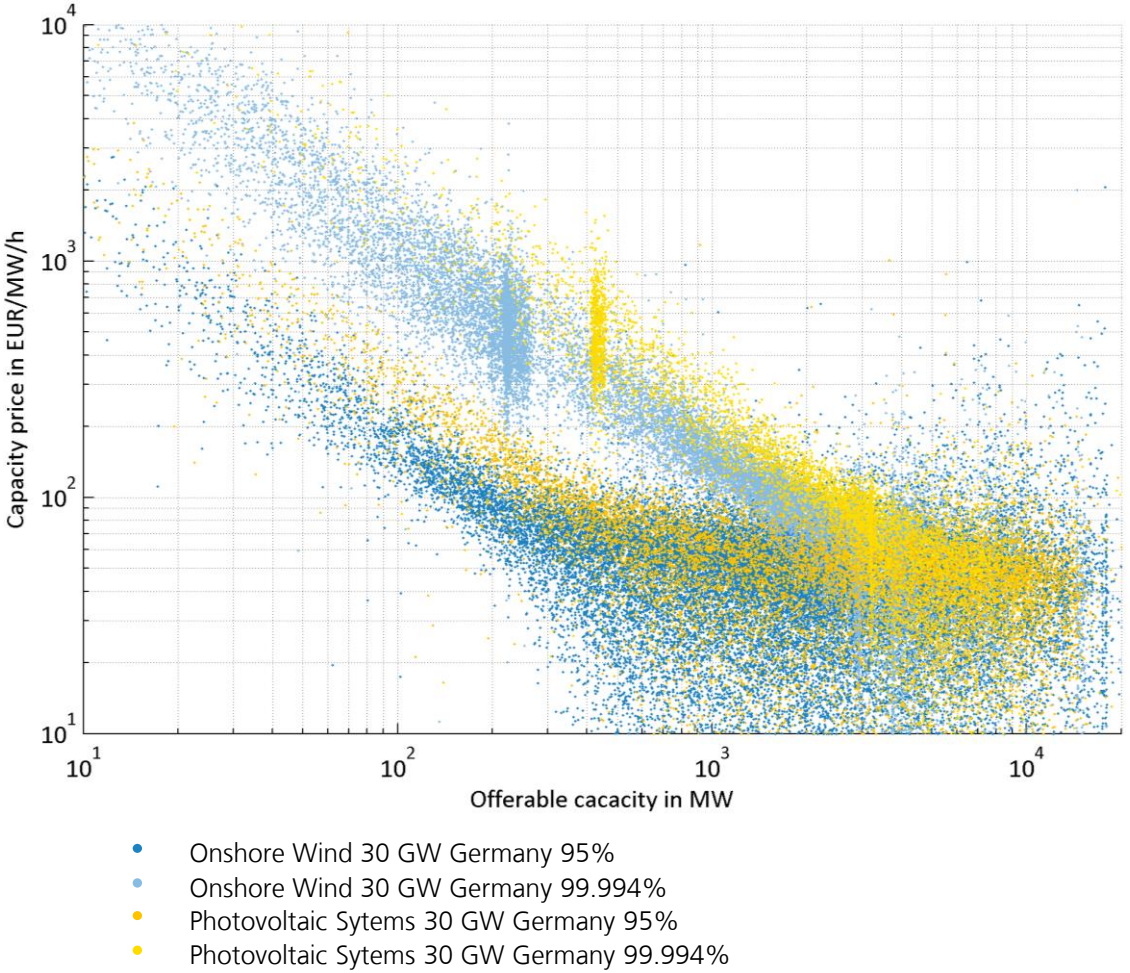


Technical potential



- Decreasing potential with increasing product lengths
- Forecast quality is paramount, not pool size
- Level of reliability → possible optimization potential

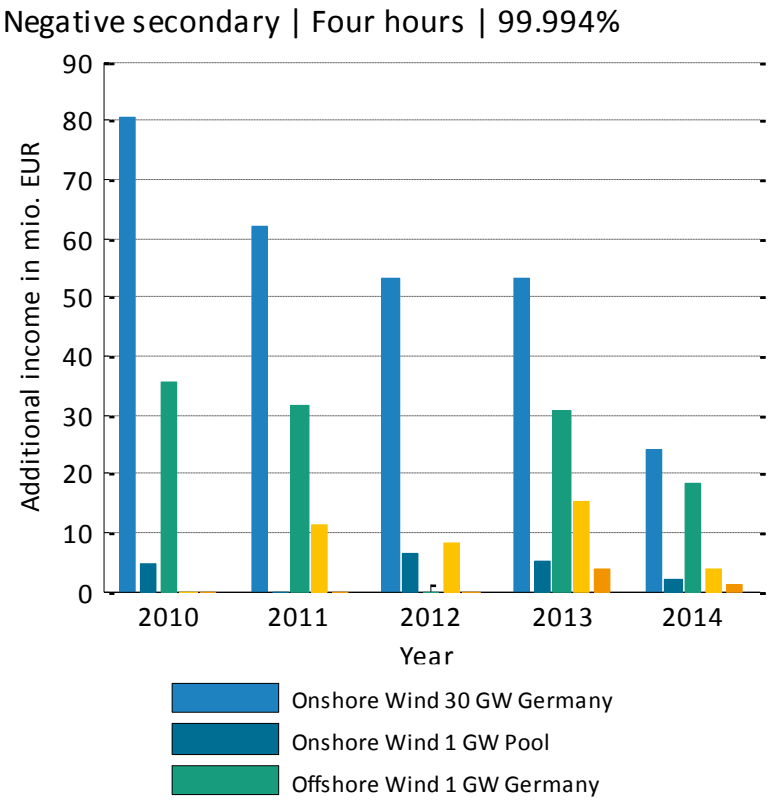
Individual capacity price/quantitiy combinations (pos Reserve)



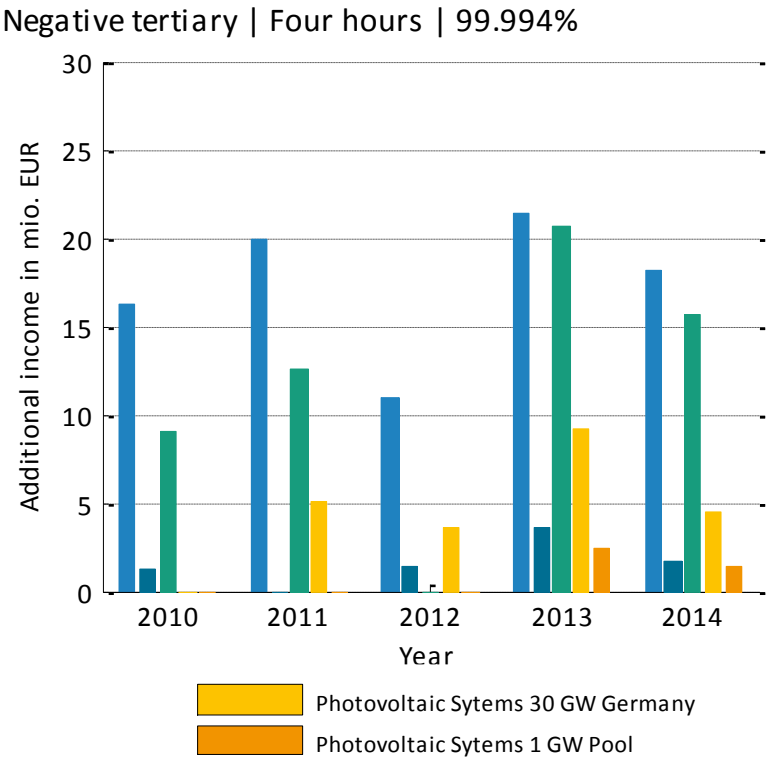
- Opportunity cost based capacity prices
  - Positive reserve highly volatile
  - Negative reserve 0 EUR/MW/h
- Energy prices depend on RES support scheme
  - Negative with positive reserve
  - Positive with negative reserve
- Only some bids will enter the market

Zusatzerlöse durch Regelleistungsbereitstellung

Negative Secondary



Negative Tertiary



Welfare gain

MICRO-ECONONIC VALUE

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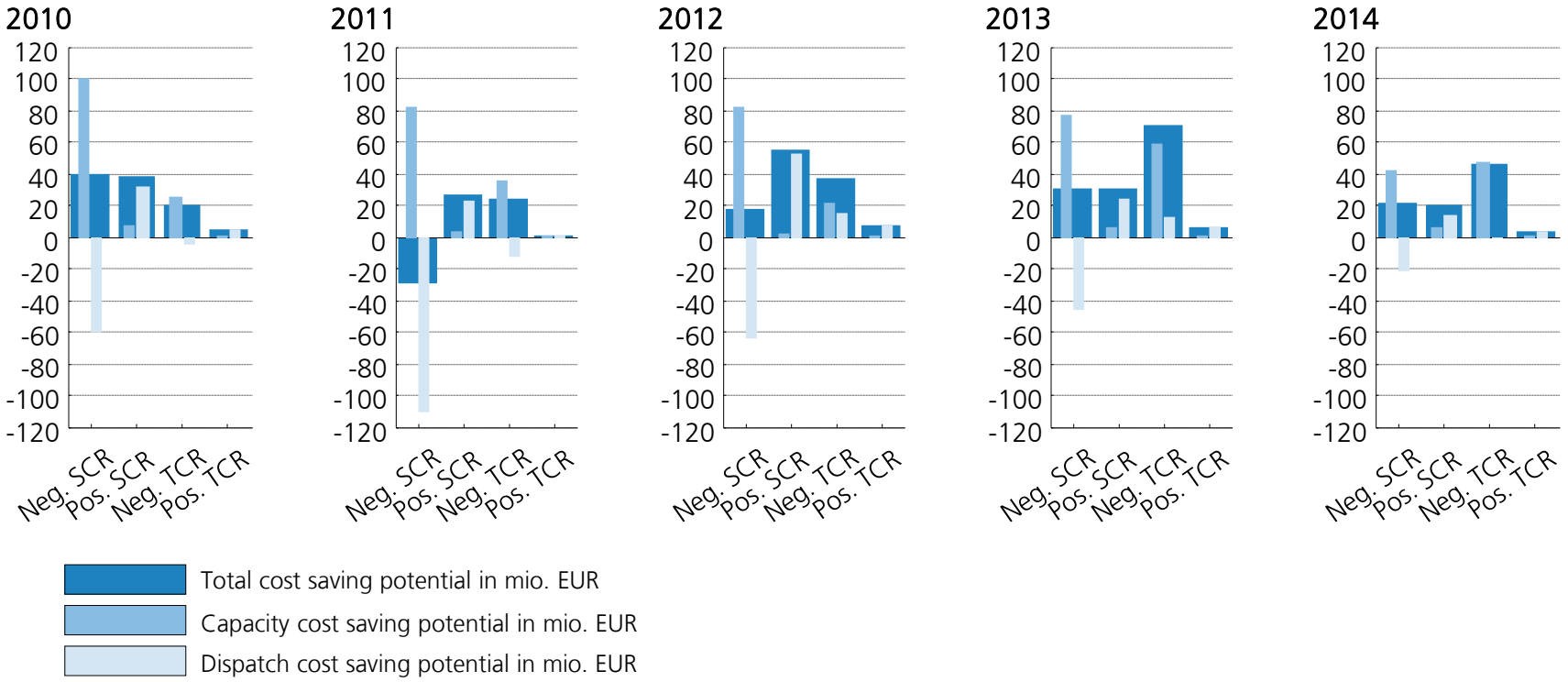
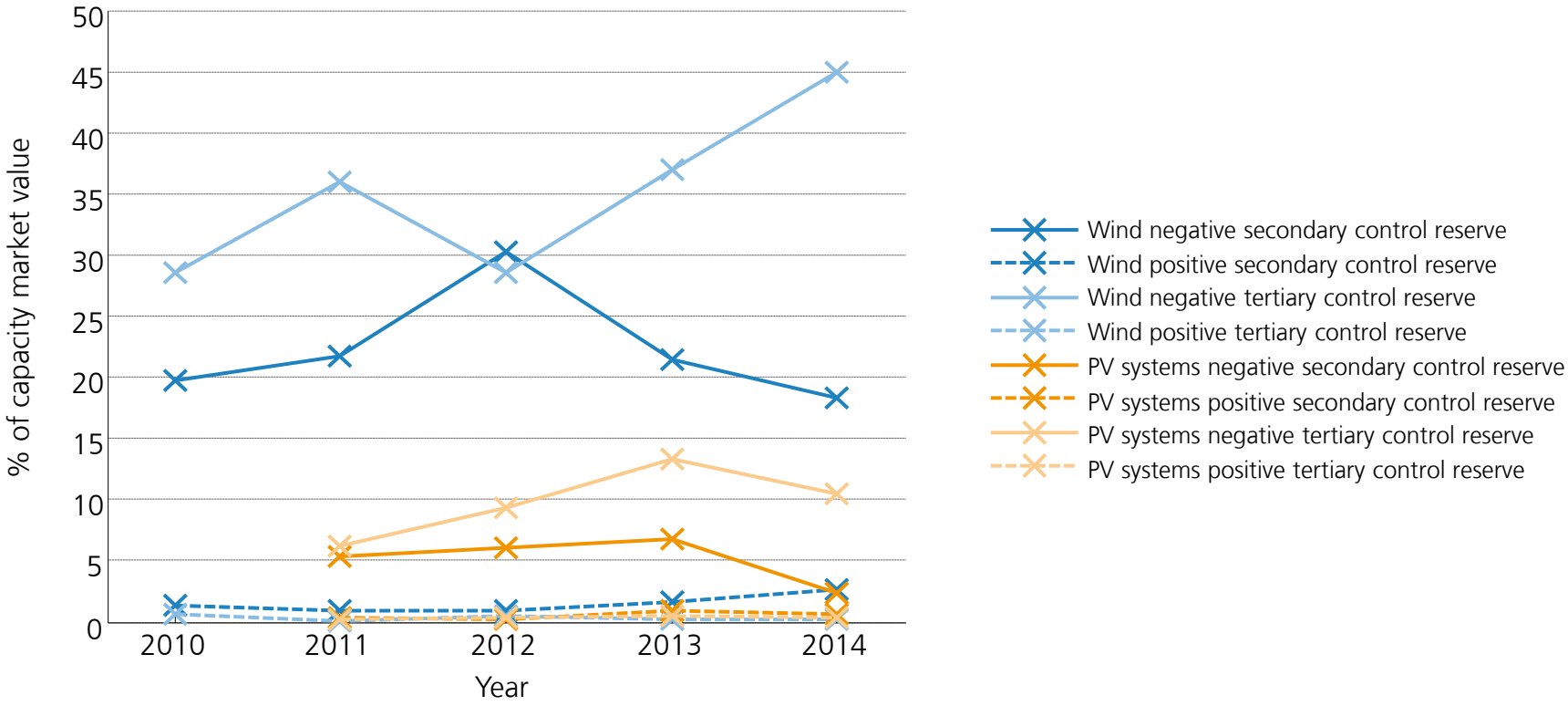
Cost saving potential 30 GW wind | 99.994% | 1h



- Cost saving potential in capacity component
- Increasing potential in the energy component → Market design
- Energy component less important over time → Only cap component

Welfare gain as the share of the market volume



- Relatively constant in the negative reserve markets over the years
  - ~25% Wind | ~5% PV as average between both markets

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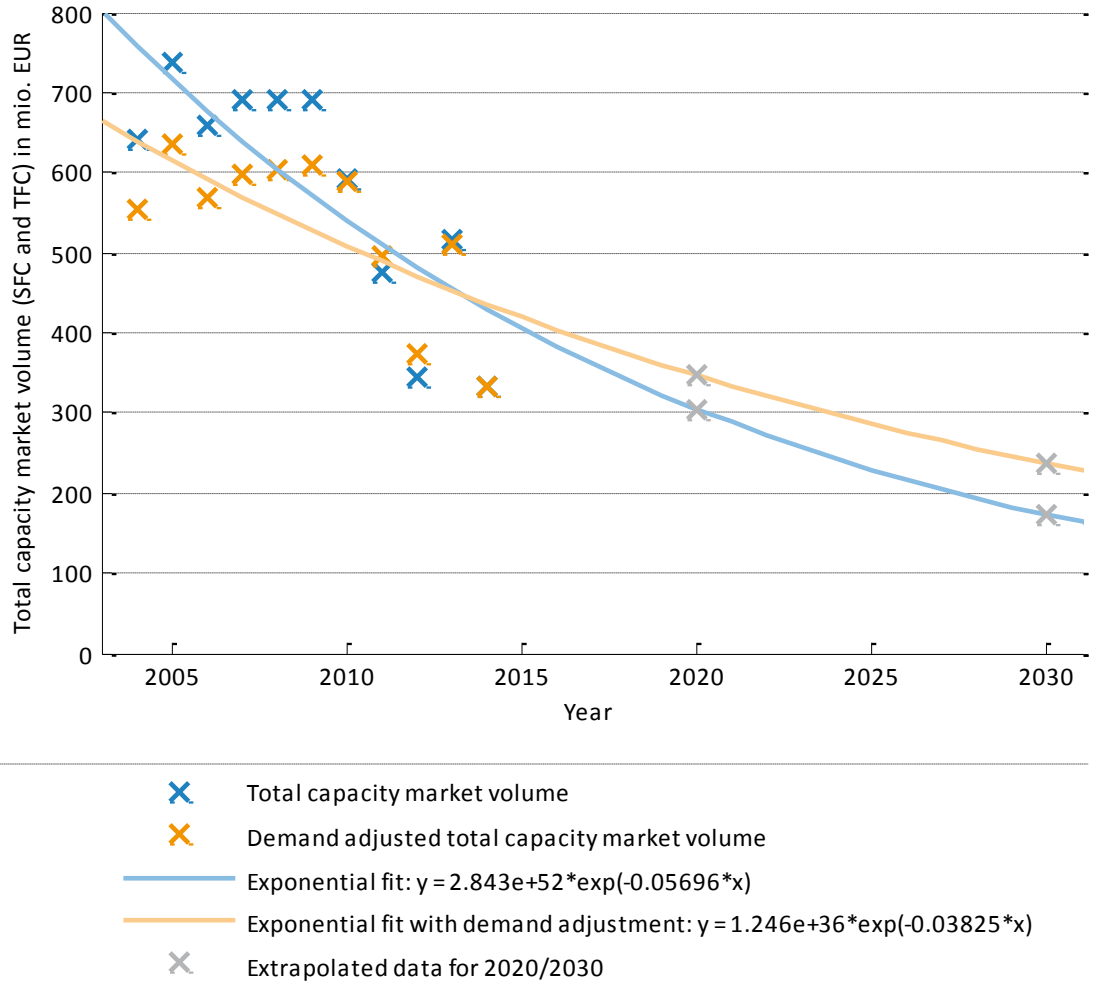
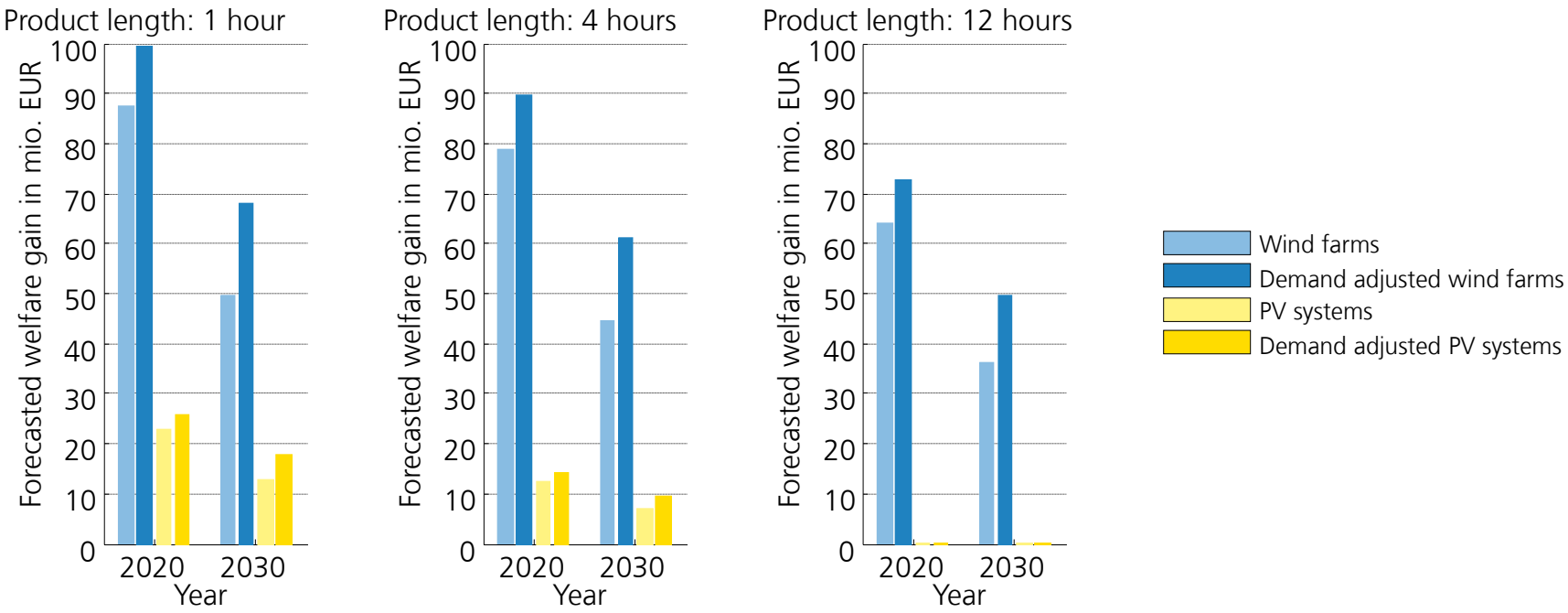
Extrapolation of market volume in the future



Welfare gain in 2020/2030



- Welfare gains in the future to be expected
- Allows the forecast of additional income for wind & PV

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Q&A