Auctions for renewable energy
- goals and current empirical record

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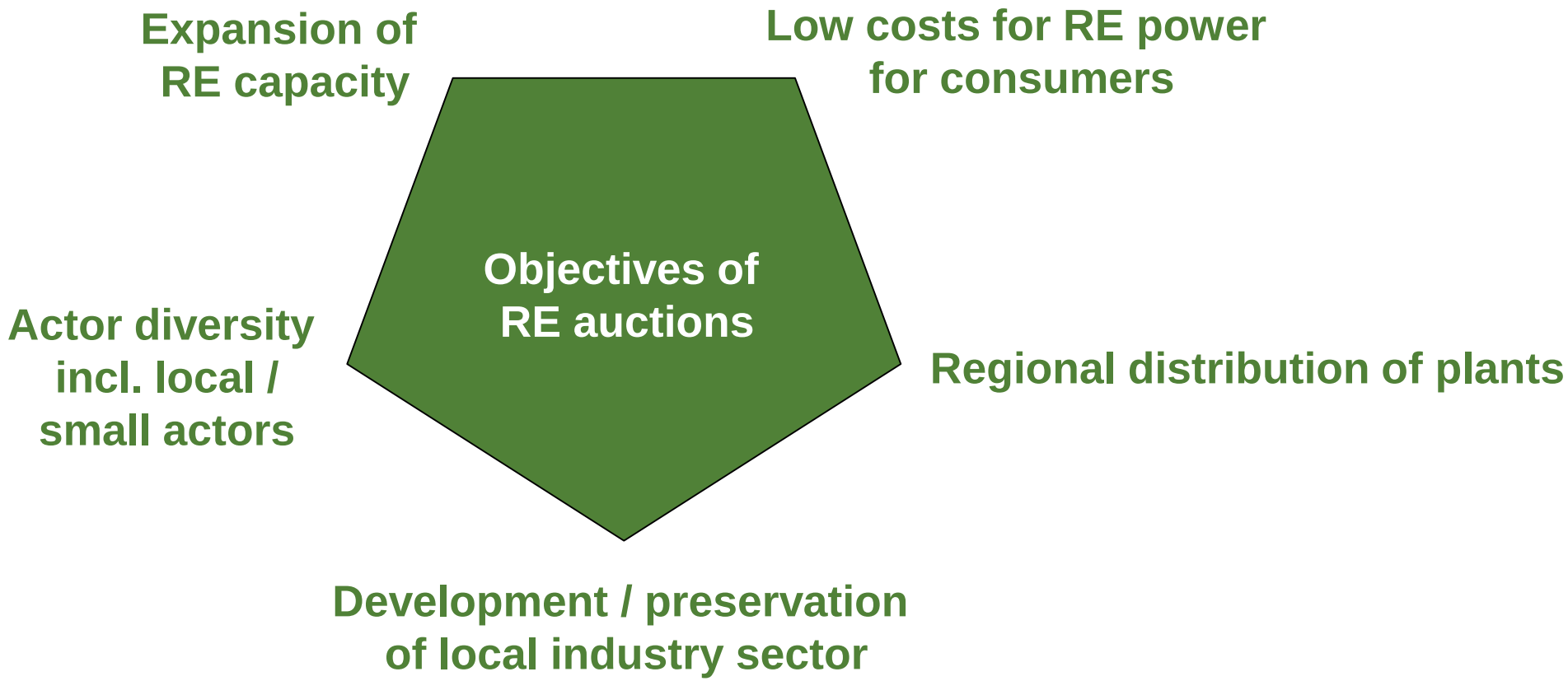
Structure of the presentation

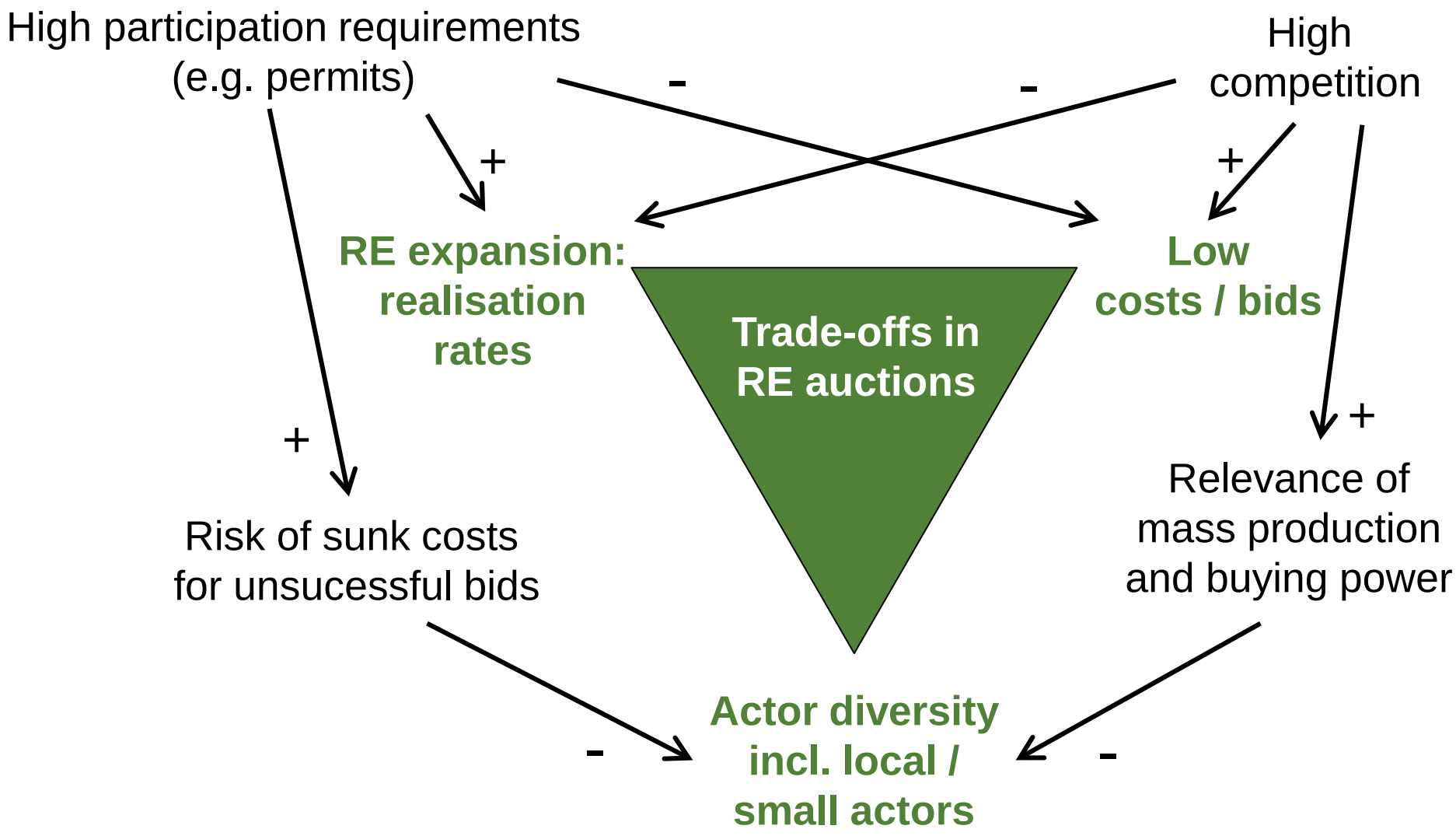
1. Common objectives of RE auctions
2. Trade-offs in RE auctions and fundamental choices in auction design
3. Some empirical experiences
4. Ongoing research project
5. Conclusions

Objectives of RE auctions



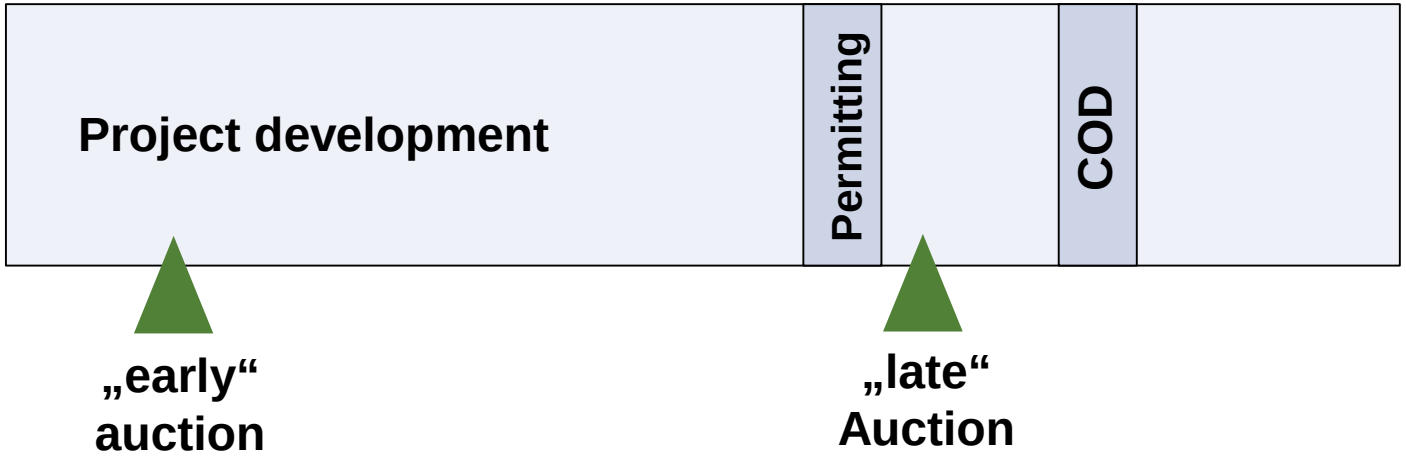
Source: author

Objectives and trade-offs in RE auctions



Source: author

Design of RE auctioning schemes: fundamental choices



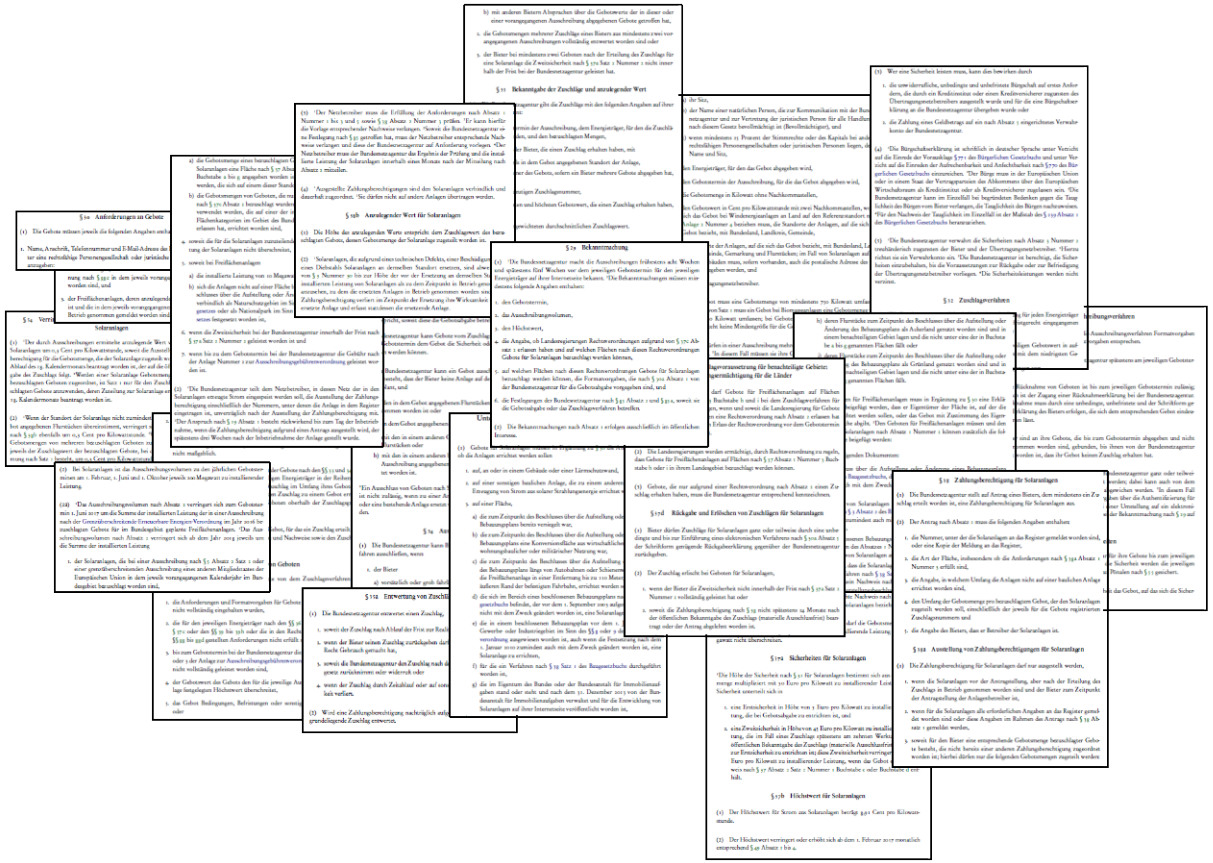
Realisation deadline	long (e.g 4 - 5 years)
Material pre-qualification	low
Securities/ Penalties	very high
Transferability of award	yes

Source: author

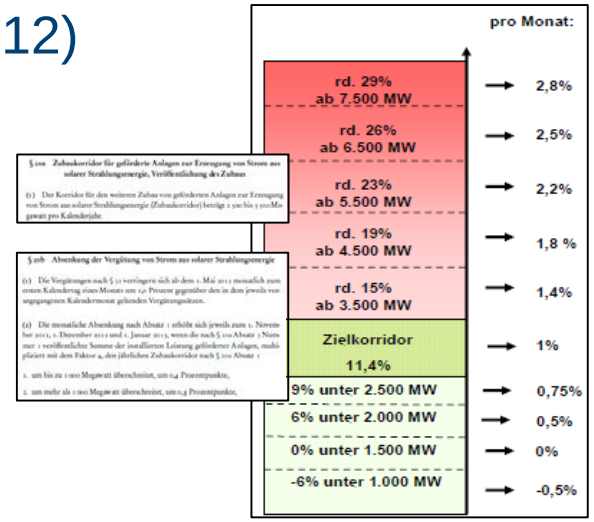
Design of RE auctioning schemes: administrative complexity

Guaranteed FIT for large-scale solar in DE (EEG 2012)

Auction scheme for large-scale solar in DE (EEG 2017)



Adaption of FIT to installation rates in DE (EEG 2012)



Source: author

Difficult to assess, but tendency to miss targets

Many systems established recently: no/few rounds with terminated deadlines

- UK (1990s)
  Results: Only 30% realisation rate
  Reasons: volumes, participation requirements, realisation deadlines, no penalty

- Brasil (10 rounds 2009 - 2014, realisation deadlines terminated), as of 2/2017:
  - 70 % realised
  - Remainder capacity still underway?

  Reasons: local content requirements, participation requirements did not fit grid situation?

- But: South Africa (2 rounds 2011-12, realisation deadlines terminated): 100%
  Reasons: limited competition, participation requirements?

Mixed, but some spectacular results lately (realisation to be seen)

- Spain (Jan 2016) in the news: € 0/MWh above wholesale price
  Note: long realisation deadline, low participation requirements, re-start after moratorium, low penalty

- Peru (Feb 2016) in the news: Ø USD 37 / MWh for onshore wind
  Note: tax benefits, low volume, high capacity factors, green bonds

- Mexico (Sept 2016) in the news: Ø USD 32 / MWh for onshore wind
  Note: further revenues, high capacity factors, low IRRs, large projects

- Long realisation deadlines allow for speculation (e.g. German PV & wind schemes)

Tendency for large (international) firms as winners

- South Africa (2011 – 2014): 4 winners secure 60% of volume (23% Enel Green Power, 18% Mainstram Renewables)
- Brasil (2009 – 2015): winners are mainly large utilities, investment banks, international developers
- Spain (Jan 2016): 500 MW awarded to Grupo Forestalia (300 MW), Jorge (102 MW), EDP (93 MW)
- Peru (Feb 2016): 326 of 430 MW awarded to Enel Green Power
- Mexico (Sept 2016): large awards to subsidiaries of Enel Green Power, Acciona Energy, SunPower, Tractebel

Research project of IZES gGmbH & Leuphana University of Lüneburg (2016 – 2019), commissioned by Germany Environment Agency (UBA)

- Define
  - actor diversity
  - Individual types of actors (e.g. community energy)
- Develop a measuring methodology
- Measure actor structure of existing plants (installed since 2010)
  - PV (>750 kW)
  - onshore wind
- Determine actor structure in German auctions (until 2019)
  - bidders & winners of PV auctions
  - bidders & winners of wind onshore auctions

Conclusions

Results so far

- RE capacity expansion: *tendency to miss targets*
- Prices: *low lately, but*
  - *prices comparable despite different contexts?*
  - *caused* by *auctions?*
  - *realisation rates of rounds with lowest prices?*
- Actor structure: *large firms fare better*

→ Auction design is complex and trade-offs prevent ideal-type solutions

In the best case:
Much new capacity
at low prices

If we're not so lucky:
Lag behind targets
at prices inflated by transaction costs & speculation
run by a dominant oligopoly

Thank you for your attention!

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Backup

German auctioning scheme for onshore wind (starting in 2017)

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Auction design

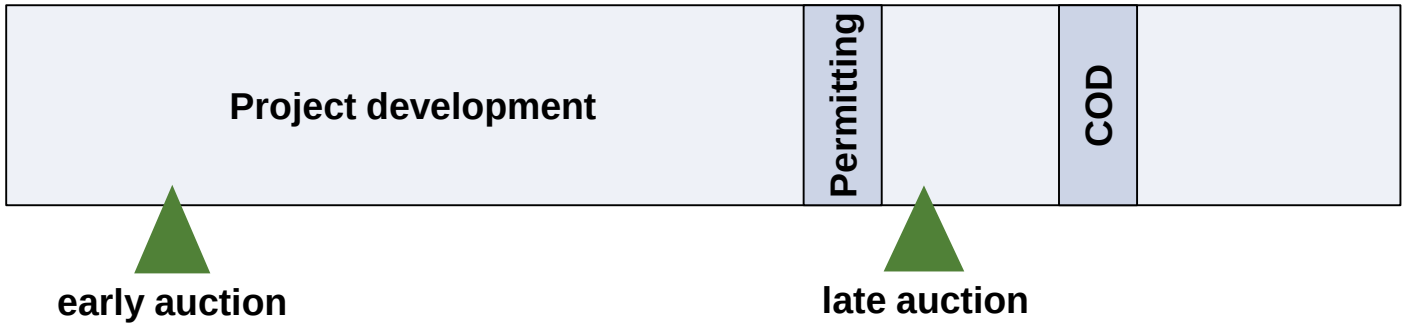
- Onshore wind power plants ≥ 750 kW
- 3 - 4 rounds / 2800 - 2900 MW per year; 1st round: 800 MW
- Late auction: Building permission required, realisation deadline: 24 + 6 months
- Special rules for community energy bidders: earlier auction, uniform pricing
- Penalty: € 30 / kW
- Regional distribution of awards: remuneration varies with location/FLH
- Awards cannot be transferred to other sites
- Pricing rule: pay-as bid
- Ceiling price: 7 ct/kWh (for ~3000 FLH)
- For sliding feed-in premium, 20 years
- Acknowledgement of force majeure: for lawsuits against building permission

German auctioning scheme for onshore wind (1st round 5/2017): results

- > 250 bids for > 2,1 GW (1,5 GW community wind), of which 70 bids (807 MW) successful
- Average remuneration awarded: 5,71 ct/kWh
- Lowest bid submitted: 4,2 ct/kWh, lowest remuneration awarded: 5,25 ct/kWh
- Highest succesful bid (= remuneration for community wind projects):
  in northern area: 5,58 ct/kWh, in center and southern area: 5,78 ct/kWh
- 65 bids won by community energy groups (partly supported by larger developers)
  → general principle of late auction reversed to early auction
- Resulting insecurities:
  - Realisation rates?
  - Influence of project developers in community wind projects?
  - Chances for already permitted projects in future rounds?

2nd round average: 4,3 ct/kWh (3,5 – 4,3 ct/kWh)

2nd round: 60 bids, 37 bids (600 MW) attributable to one company



Sources: BNetzA, BMWi, author

German auctioning scheme for solar PV (pilot 2014 – 2015)

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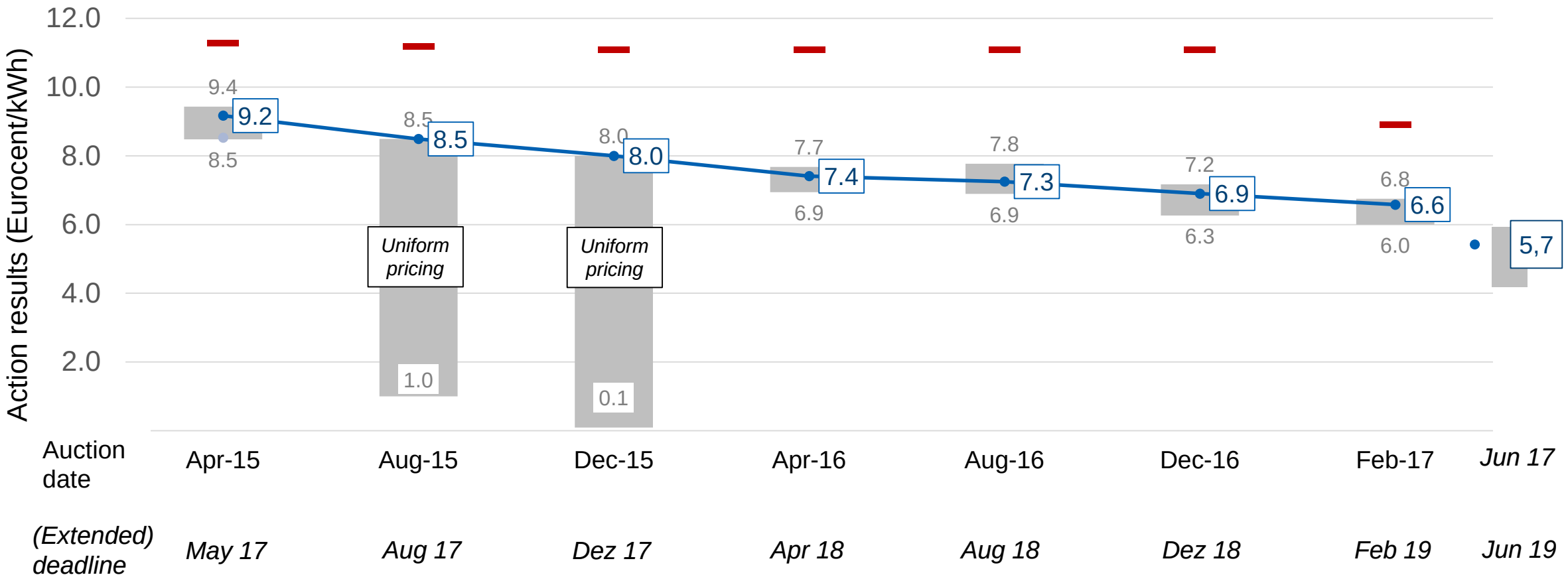
Auction design

- Pilot: Ground-mounted solar plants (100 kW - 10 MW)
- For sliding feed-in premium, 20 years
- 3 rounds / 450 MW per year
- Early auction (low pre-qualification)
- Realisation deadline: 18 + 6 months
- Penalties: € 25 - 50 / kW (depending on maturity of project)
- Transferability of awards to other sites: with reduction of remuneration
- Pricing rule: single auction, mostly pay-as bid; ceiling price: ca. 11,2 resp. 8,9 ct/kWh
- No acknowledgement of force majeure, but limited award return option at reduced penalty
- No steering of regional distribution of awards

German auctioning scheme for solar PV (pilot & regular auctions 2014-2017): results



Ceiling price | Average auction result | Lowest / highest awarded bids

Source: BNetzA