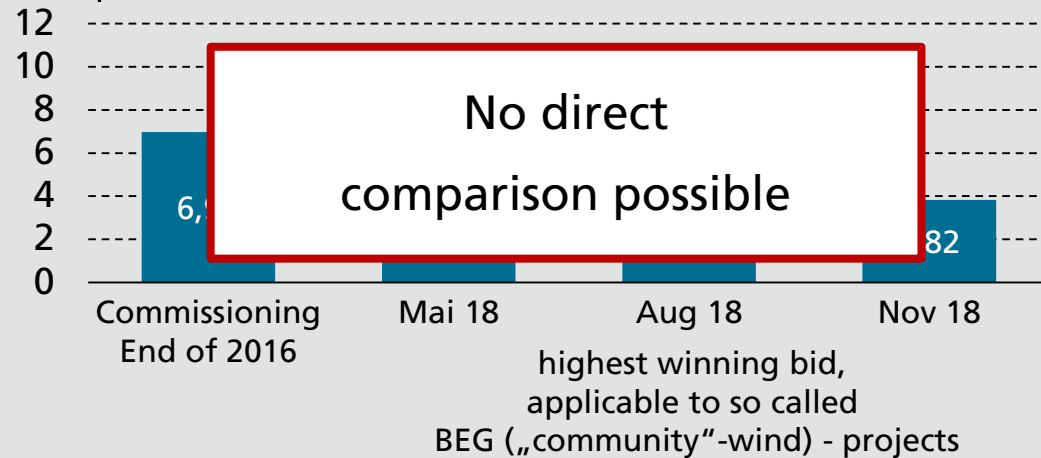

ASSESSING EXPECTED COST REDUCTIONS FROM ONSHORE WIND TENDER AUCTIONS

Volker Berkhout (IEE), Katherina Grashof (IZES), Robert Cernusko (IEE)
23.04.2018, Petten, The Netherlands



PUBLISHED TENDER RESULTS 2017- FIGURES CANNOT BE COMPARED DIRECTLY

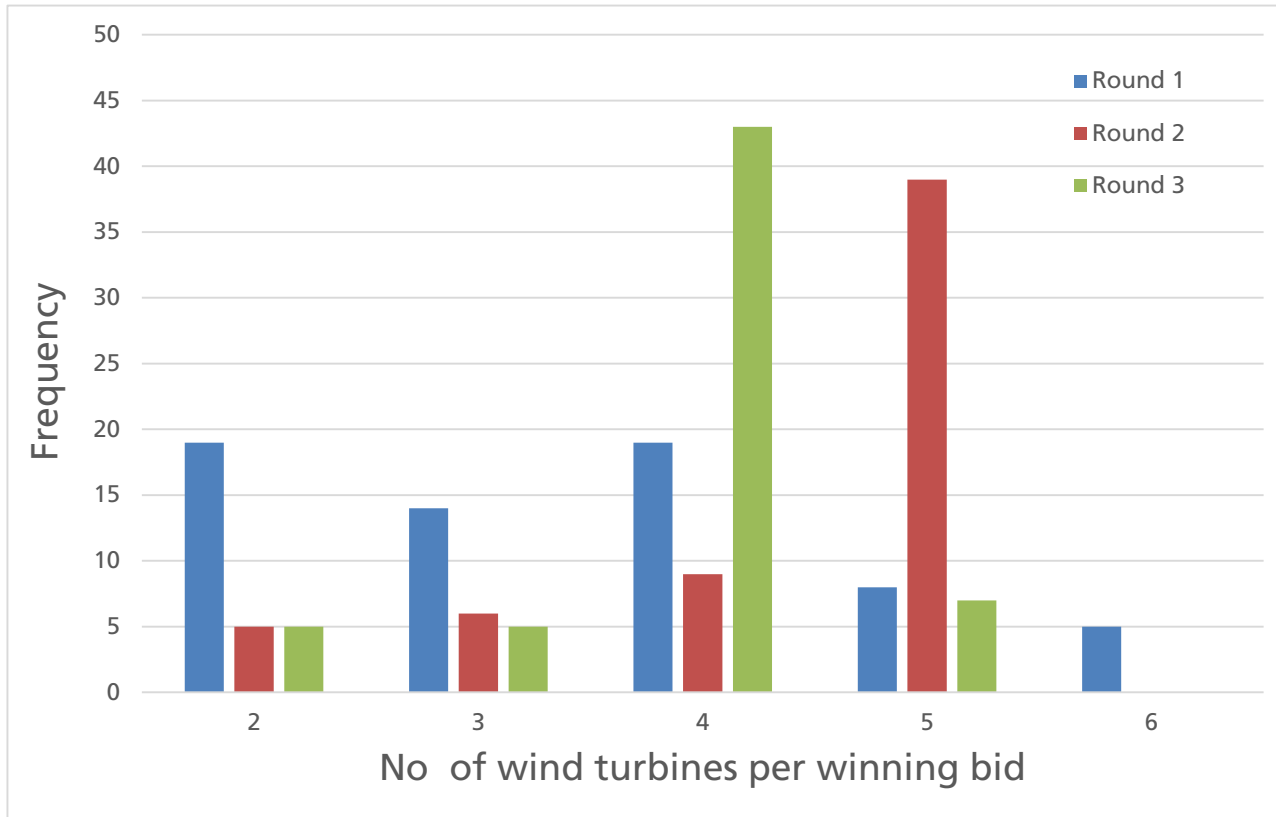
Development of feed-in-tariff



Important issues to adapt for:

- Time of commissioning
- Tariff degression pathway by law
- New reference yield model for levelizing for site quality do apply
- Site quality of awarded projects

WINNING PROJECTS SIZE LIKELY WAS 18 MW WITH 4-5 TURBINES



- 1st tender round: project size from 2-6 wind turbines
- 2nd tender round: mainly projects with 5 wind turbines
- 3rd tender round: mainly projects with 4 wind turbines
- 93 % awarded to BEG-projects
- BEG-auction rules based on De-Minimis regulation of EU-Guideline allowing max. 18 MW
- Implication:
Change in bidding strategy from 1st to 2nd round
Bidders assumed 3,6 MW turbines in second round and 4,5 MW turbines in third round

DEFINITION AND CONDITIONS FOR ‚COMMUNITY‘ WIND

■ Definition

- At least 10 members or shareholders in person
- At least 51% of rights to vote at people living in the community where the turbines are to be installed for at least one year
- No member or shareholder holds more than 10% of votes
- No prior contracts to change the community setup are allowed

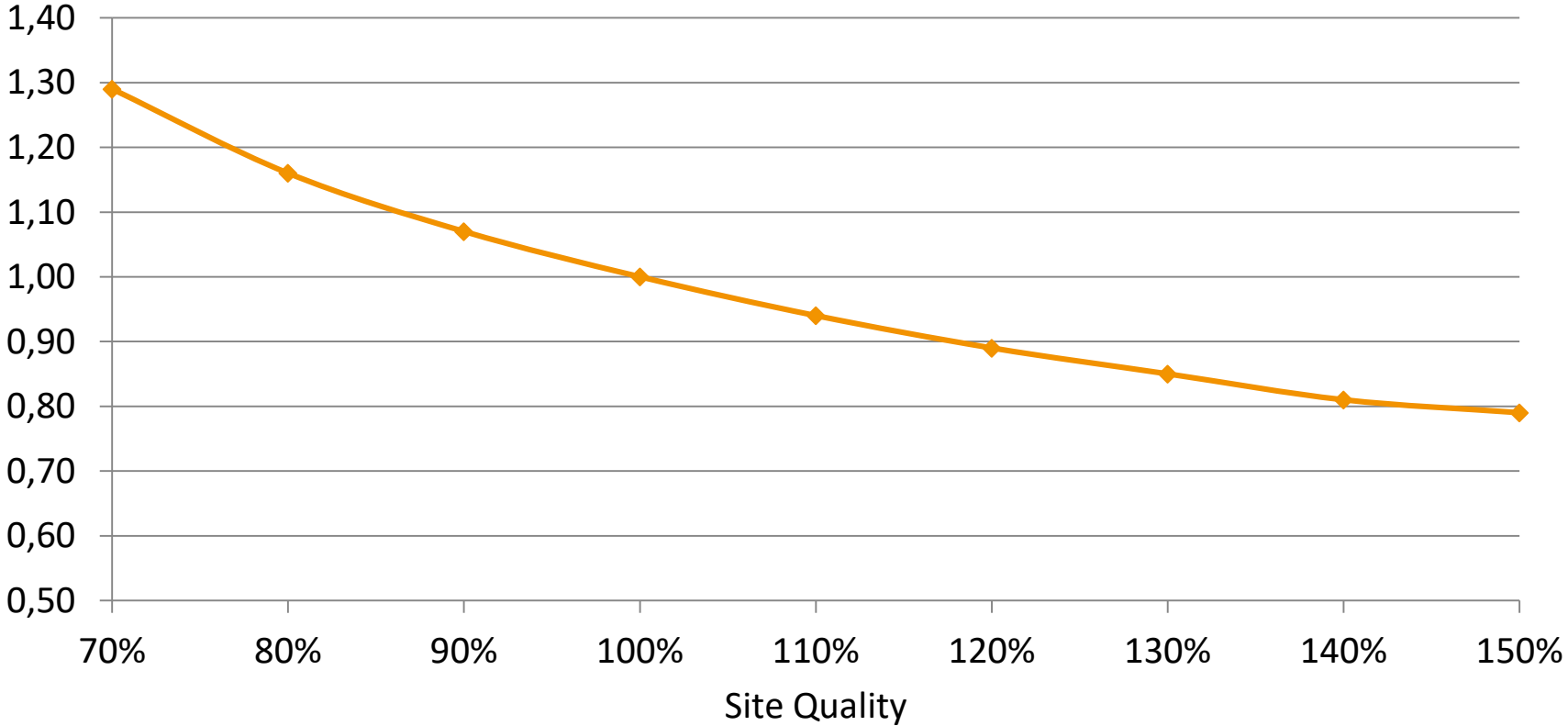
■ Bids

- A community wind bid must not **exceed six turbines with a total of 18 MW**
- Community wind projects may bid **without a permission for the project.**
- Members of the community have not won bids within the last year and are not member of other communities which would exceed 18MW
- Local municipalities have to be offered a 10% project share

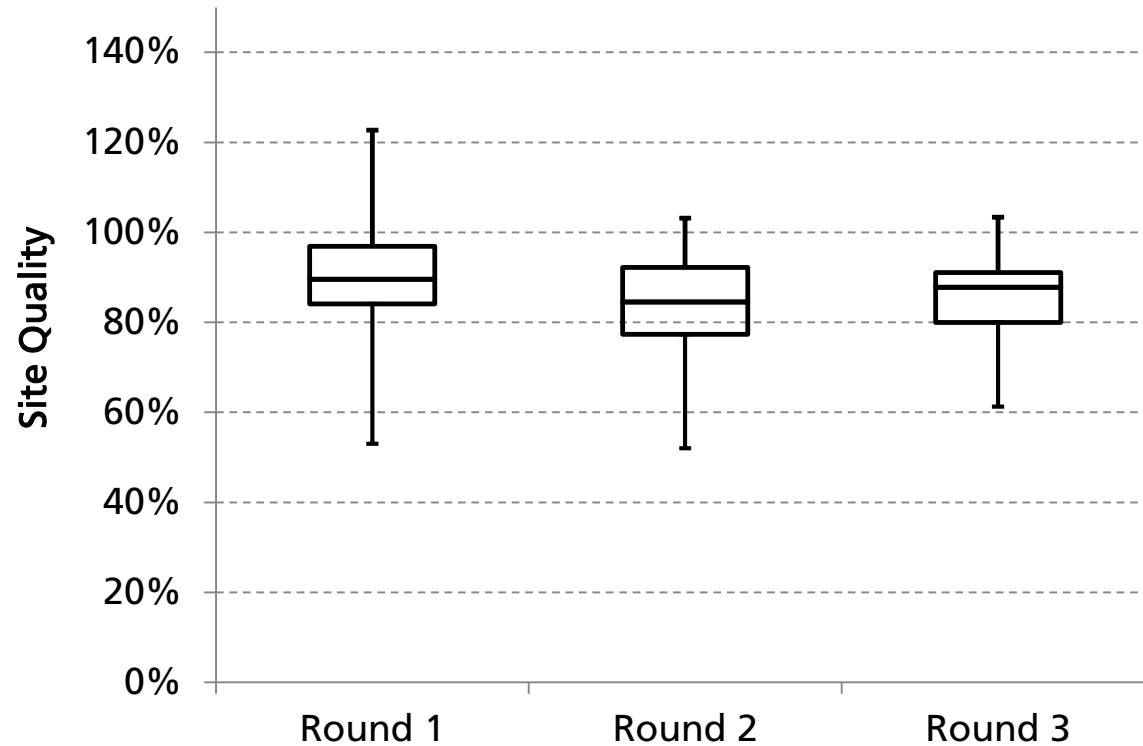
■ Realisation

- Community Wind will receive **price of highest succesful bid in auction**
- Installation has to be **completed within 54 month**

SITE QUALITY CORRECTION FACTOR

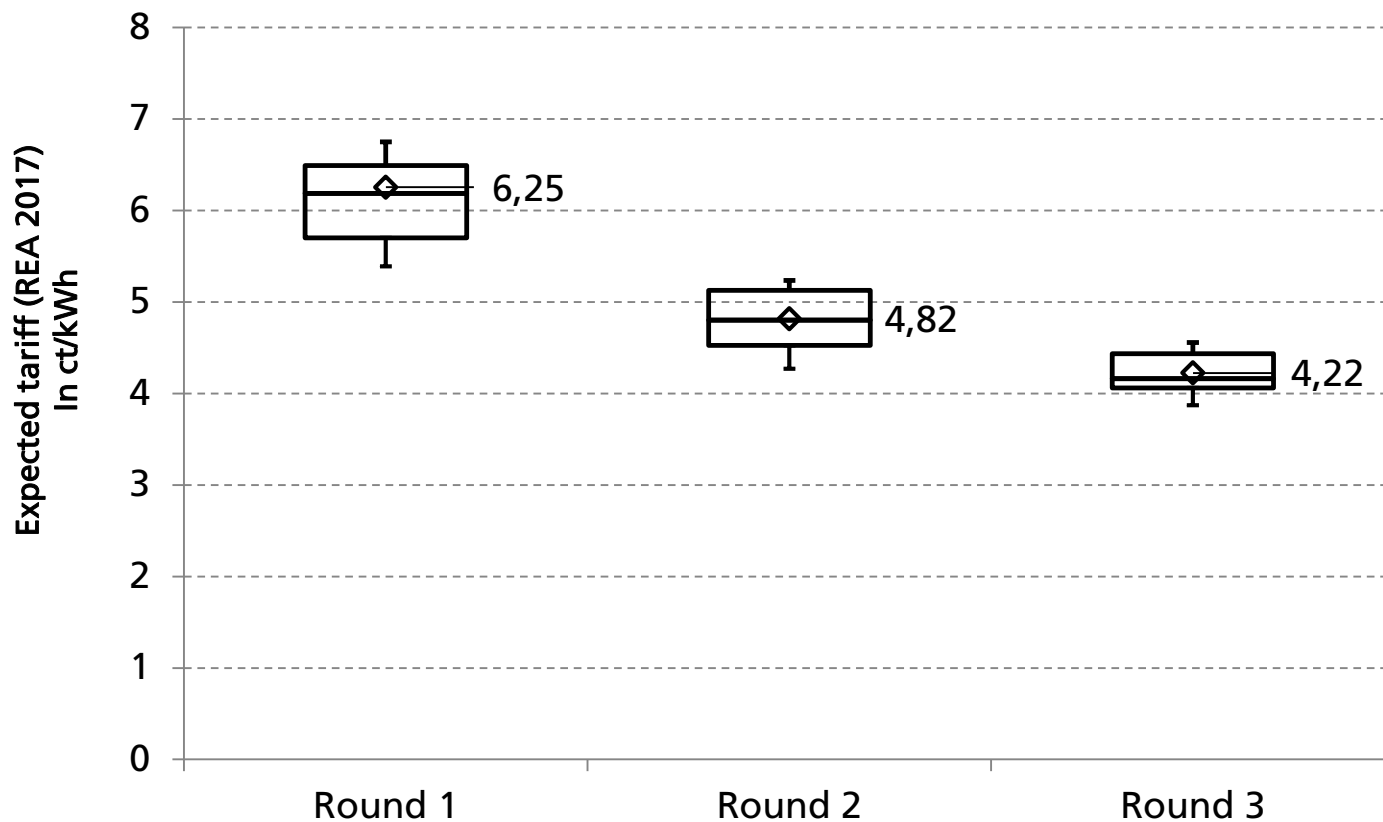


BEST SITES IN FIRST ROUND, LOWEST PRICES ACHIEVED IN LATER ROUNDS



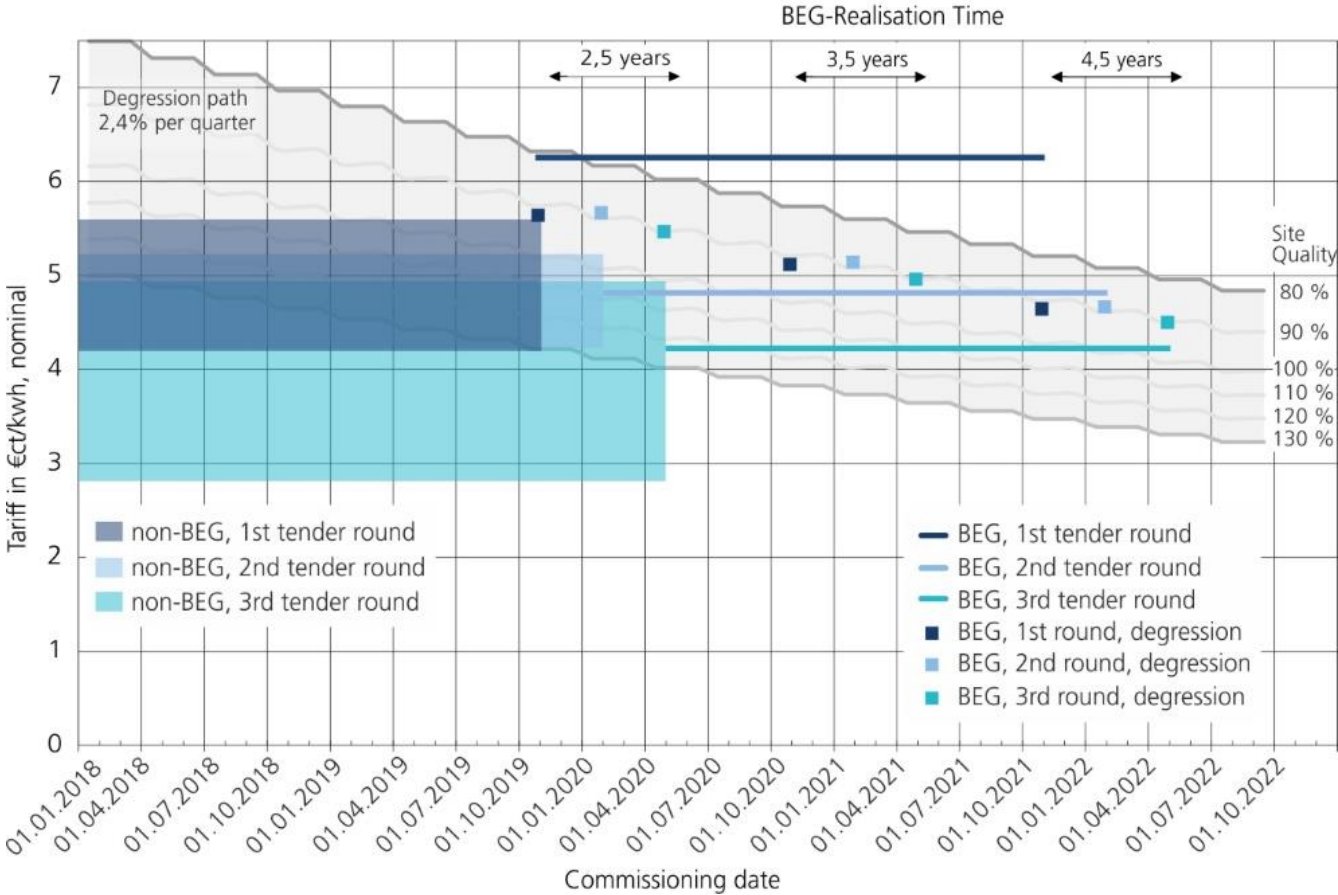
- Site quality compares expected yield to reference wind site with
 - avg. wind speed of 6.45 m/s at 100m hub height and Hellmann-Exponent $a=0,25$
 - Adjustments for
 - different heights
 - Availability
 - Technical losses
 - Not modelled: Regulative effects (noise, fauna)

EXPECTED EFFECTIVE PRICES DECLINE AND RANGE BETWEEN 4 CT/KWH AND 6.5 CT/KWH

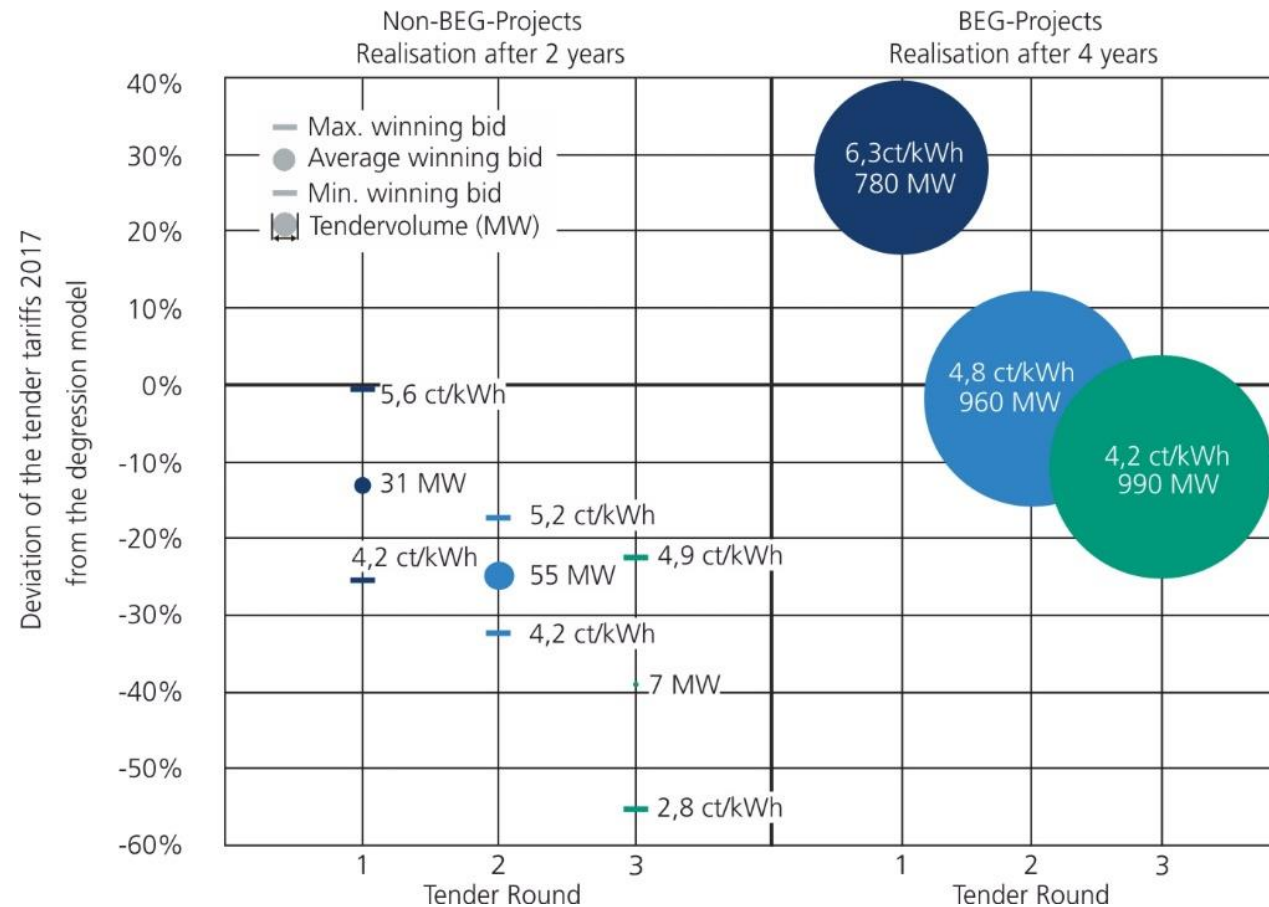


- Expected tariff (RE A 2017)
- Volume weighted average shown

TRARIFF COMPARISON HAS TO CONSIDER COMMISSIONING DATE AND TARIFF DEGRESSION PATHWAY



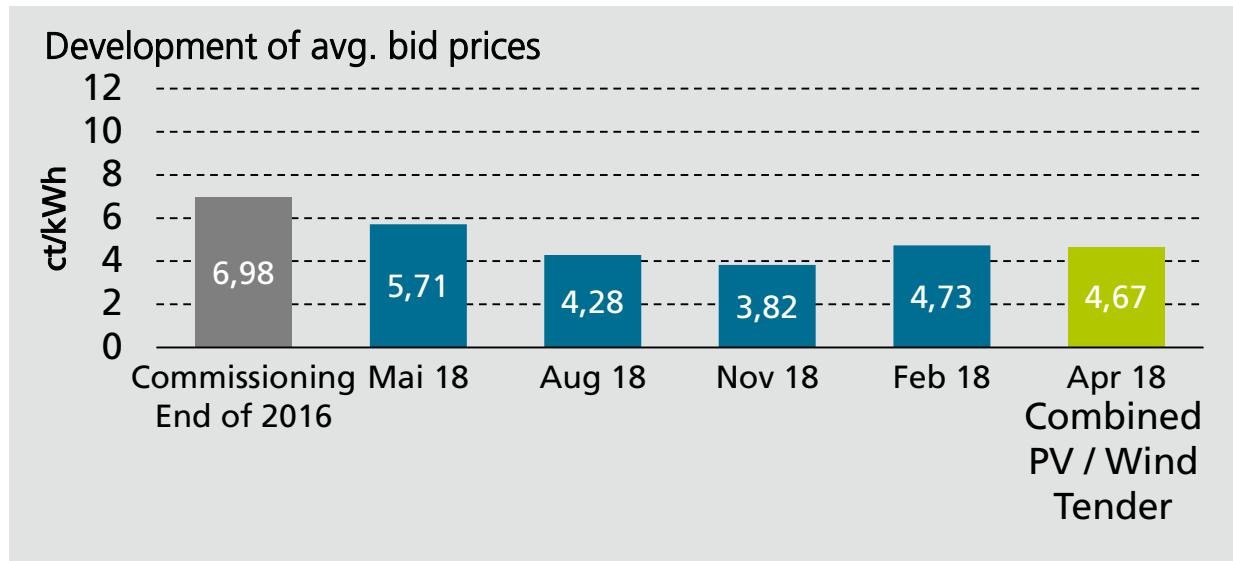
TENDER RESULTS 2017 SHOW ONLY SAVINGS COMPARED TO DEGRESSION PATHWAY FOR THIRD ROUND PROJECTS



CONCLUSION: 2017 TENDER AUCTIONS DID NOT BEAT EARLIER TARIFF DEGRESSION PATHWAY

- > 90% of awarded bids are BEG-projects without permission and realisation deadline of 4.5 years
- Expected Time of Commissioning crucial to assess cost effect of tender price
- Assuming realisation after 4 years no cost reduction compared to older FiT-system with degression path (2.4% per quarter)
- Value of non-BEG-projects not indicative for future bids
- Realisation of projects is subject to permission and further risks
- System change delivered marginal cost reduction at best but induced high efforts and uncertainty within the industry.
- Tender system achieved cap of installation volume, significant realisation risks for awarded projects do apply

OUTLOOK 2018 - CHANGES IN TENDER RULES

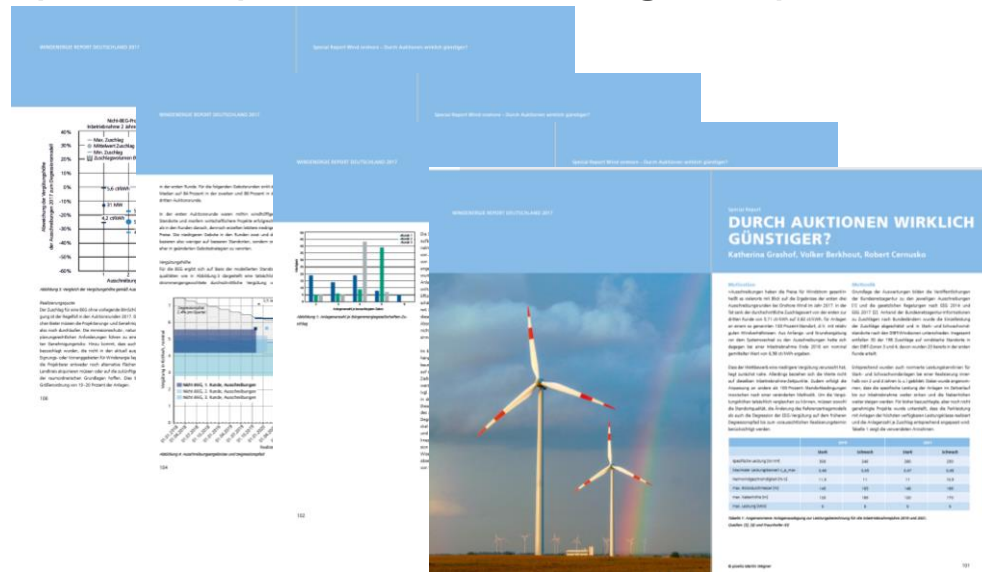


- Rule Change – Permission Required
- Tender Result 2018-February
 - Lower participation
 - Share of BEG-projects decreased
- PV-Wind-Tender May 2018
 - No reference yield model correction
 - No wind power bid awarded
 - Highest winning bid 5,76
- Additional 1 GW Tender in political approval process

Source: https://www.bundesnetzagentur.de/DE/Sachgebiete/ElektrizitaetundGas/Unternehmen_Institutionen/Ausschreibungen/Wind_Onshore/BeendeteAusschreibungen/BeendeteAusschreibungen_node.html

REFERENCE

- „Durch Auktionen wirklich günstiger?“
Special Report in: Windenergie Report Deutschland 2017, Fraunhofer IEE



- To be available online soon (German version only):
http://windmonitor.iee.fraunhofer.de/opencoms/opencoms/windmonitor_de/5_Veroeffentlichungen/1_windenergiereport