



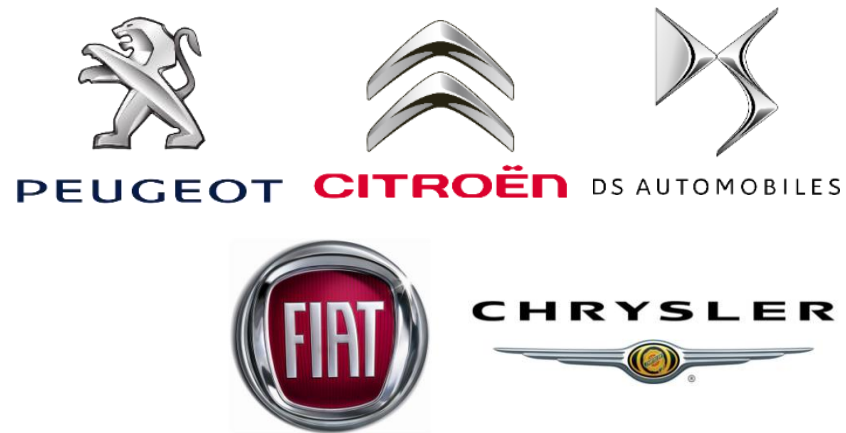
ENSURING FLEXIBILITY DELIVERY: THE ROLE OF PENALTIES ON LONG- TERM DISTRIBUTION FLEXIBILITY TENDERS

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STELLANTIS



FREE²
MOVE

Electromobility research: Chaire Armand Peugeot

- Grid integration and flexibility services (V2G)
- Charging infrastructure deployment
- Electromobility business models
- Coordination services for long trips



AGENDA

Flexibility for distribution grids

Long-term flexibility tenders and the role of penalties

Case study: EV fleets participation according to penalty conditions

Conclusions

INCREASING NEED FOR FLEXIBILITY

Power systems are facing serious challenges:

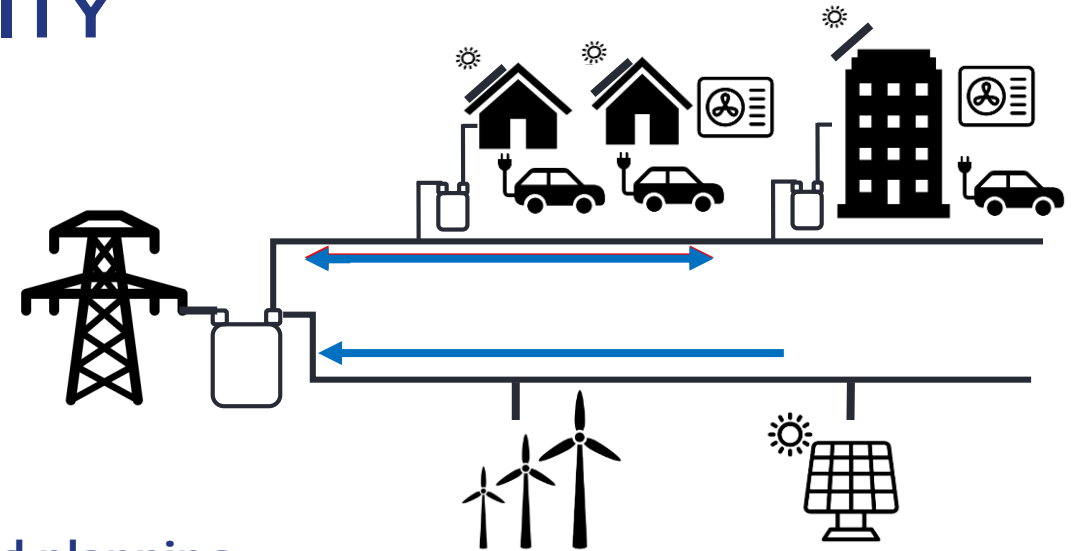
- Integration of distributed generation
- Electrification and new uses (mobility, heating, IT...)

Significant investments to upgrade infrastructure

Using *flexibility* can help distribution grid operation and planning

EVs can provide flexibility to the grid ! - smart charge and V2G

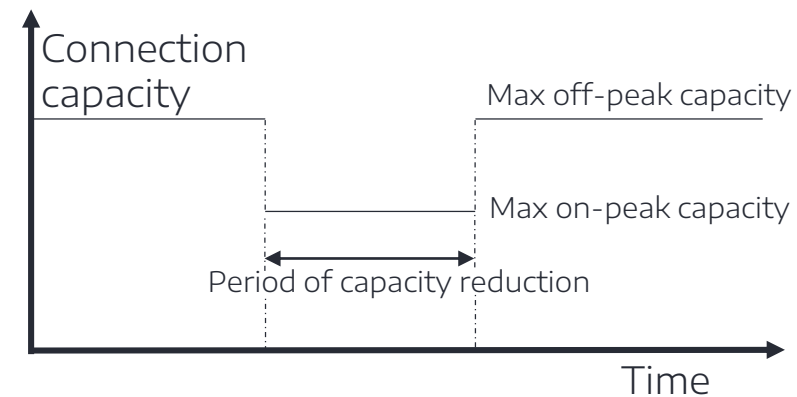
- Creating value for grid operators, aggregators, BRPs, end-users
- Lowering total cost of ownership for end-users



USING FLEXIBILITY AT THE DISTRIBUTION LEVEL

Different frameworks to unlock flexibility

- Network tariffs
From uniform/static to locational and variable
- Flexible (smart) connections
Allowing faster or less costly connections
From 'firm' capacity to 'variable'
- Market-based
Short-term flexibility markets
Long-term tenders (UK, France)



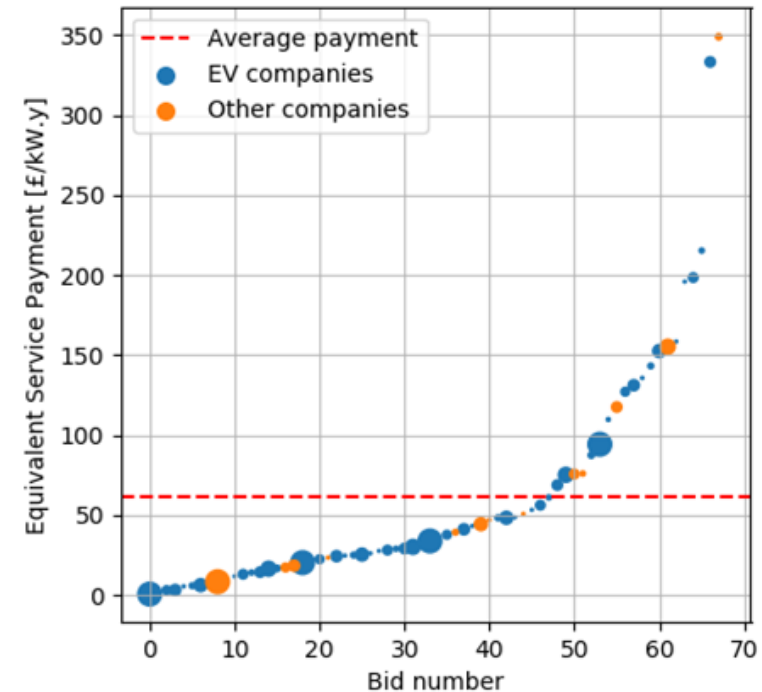
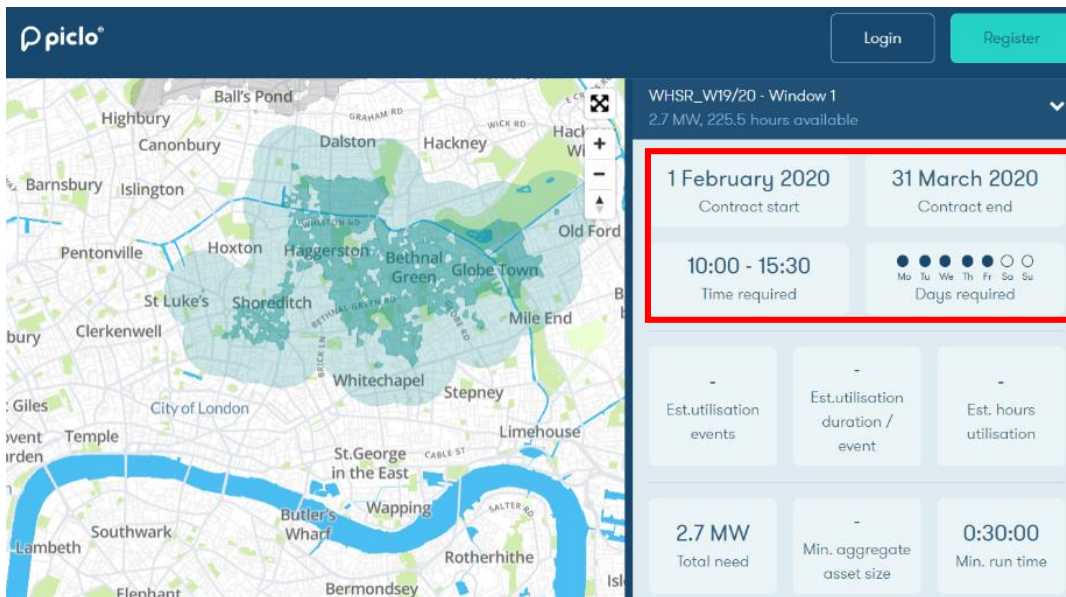
FLEXIBILITY TENDERS - HOW DO THEY WORK?

Identification of zones and periods where congestion might occur

- Availability required during months/weeks
- Activation in real-time, a few time per year (<10)

Contracts for 1-7 years for flexibility provision

Results from UKPN 2020 tenders show potential high value of flexibility



WHY HAVING LONG-TERM TENDERS?

When using flexibility as an alternative to investment deferral, DSOs need to be sure flexibility will be available when needed.

- High risks if only relying in short-term local markets

Risk sharing through long-term contracts

- Providing security of flex availability
- Ensuring revenues to flex operators

Penalties to ensure flexibility delivery when needed

- UKPN: low penalties to foster competition
- Enedis: aligned with balancing mechanism (system-wide)

Ensuring reliable flexibility can be a challenge for variable resources aggregators (EVs, DR)

- What is the impact of penalties on the participation of these resources?

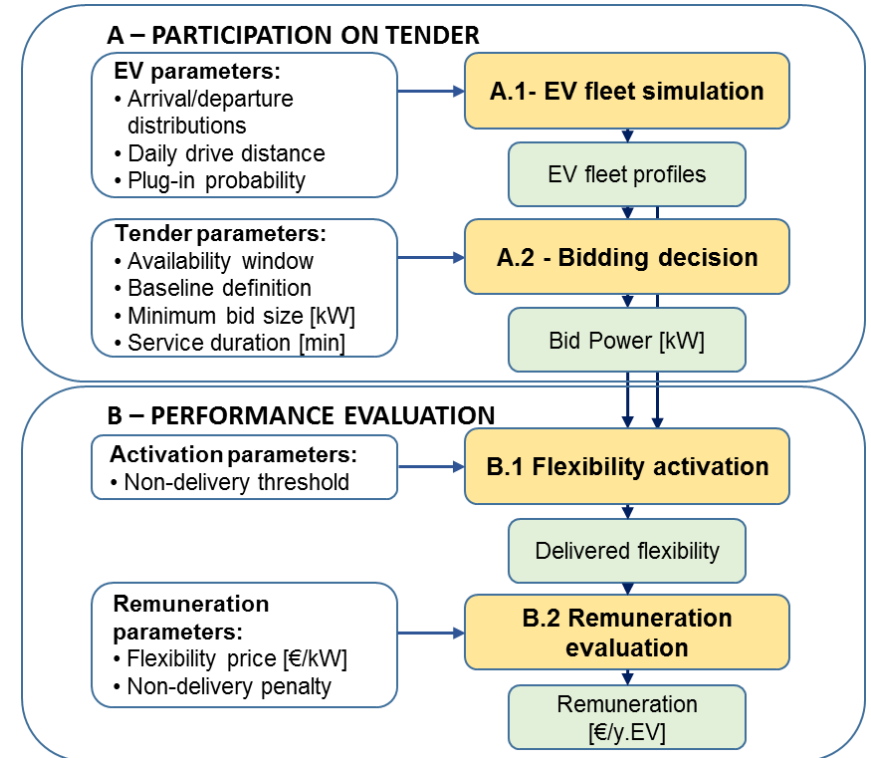
METHODOLOGY & CASE STUDY

METHODOLOGY FOR EV FLEET PARTICIPATION

Simulation based methodology that mimics the tender process

- First stage: Participation evaluation (bid), considering expected EV usage patterns and tender conditions.
- Second stage: Performance evaluation, simulation of flexibility activations and computing remuneration.

Considering penalties!



Gonzalez Venegas, Petit, Perez, *Participation of electric vehicle fleets in local flexibility tenders: analyzing barriers to entry and workable solutions*, EUI-FSR Working papers, Feb, 2021. <https://fsr.eui.eu/publications/?handle=1814/69860>

CASE STUDY ON EV FLEETS

EV fleets cases

Case study using real data from demo projects (Parker, DK; Electric Nation, UK):

- Company fleet: Always plugged-in
- Commuter fleet: Average plug-in 5 days/week

Tender cases

Two availability windows in study:

- Evening (5pm-8pm)
- Full-day

Three penalty conditions:

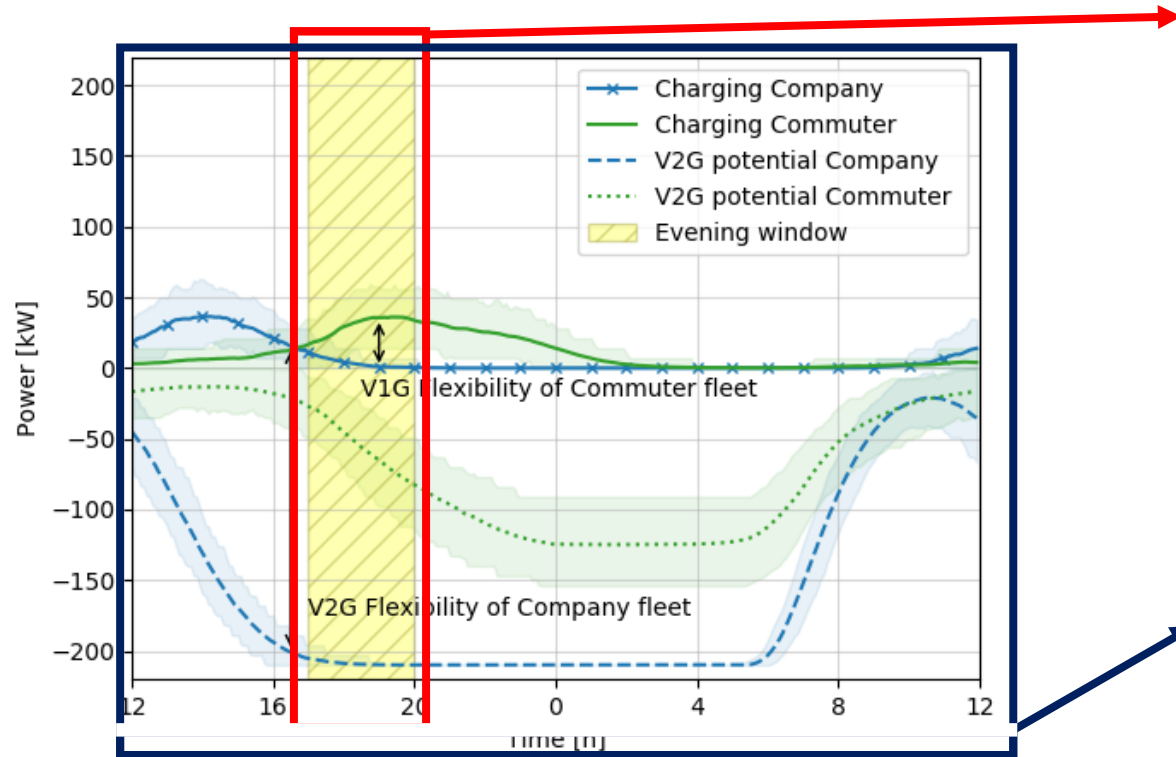
- Low, medium, high

Scenario	Case	Threshold	Penalties
Low	UKPN	60%	0%
Medium	Enedis	80%	35%
High	-	90%	70%

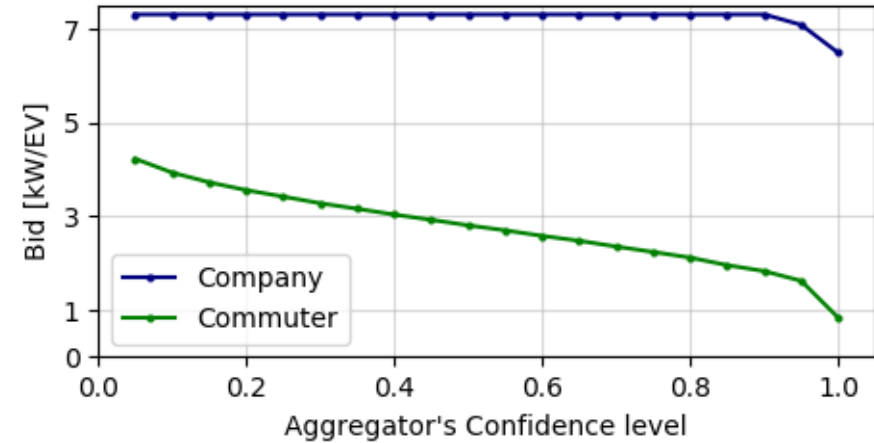
RESULTS

VARIABLE AVAILABILITY PROFILES

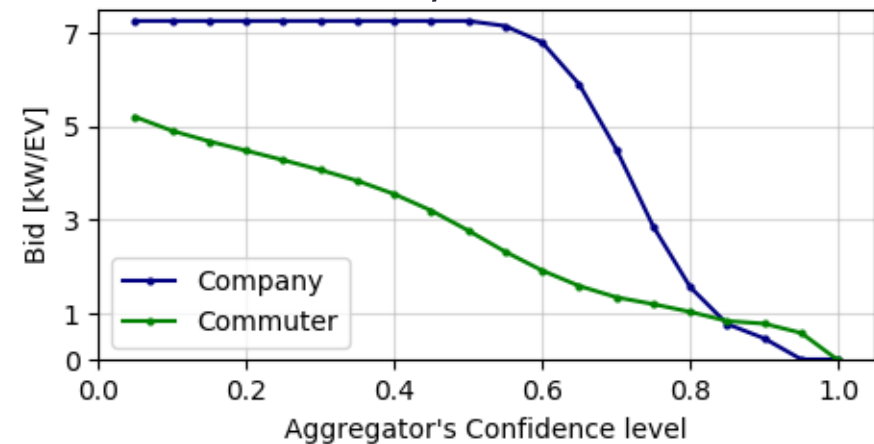
Charging and flexibility profiles for a 30-EV fleet



Evening window



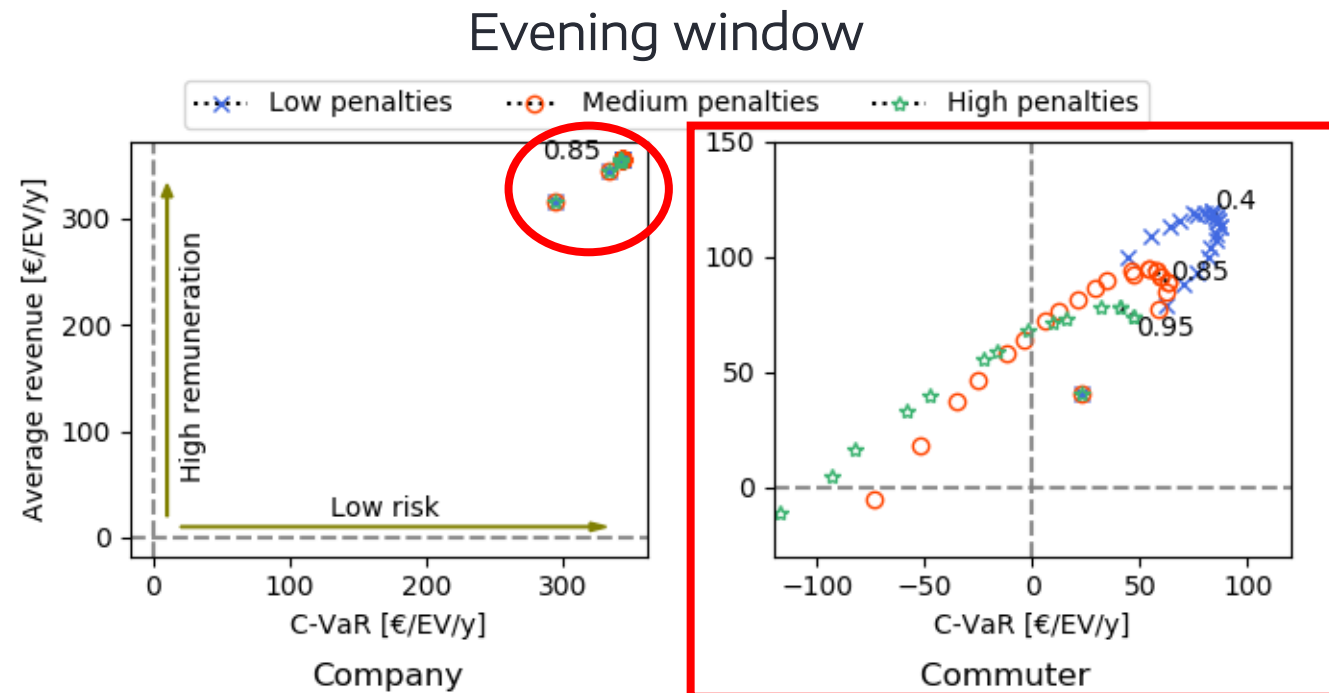
Full-day window



IMPACT OF PENALTIES ON AGGREGATORS BIDS

We simulated flexibility activations and computed remuneration and risk (C-VaR) for bids at different confidence levels

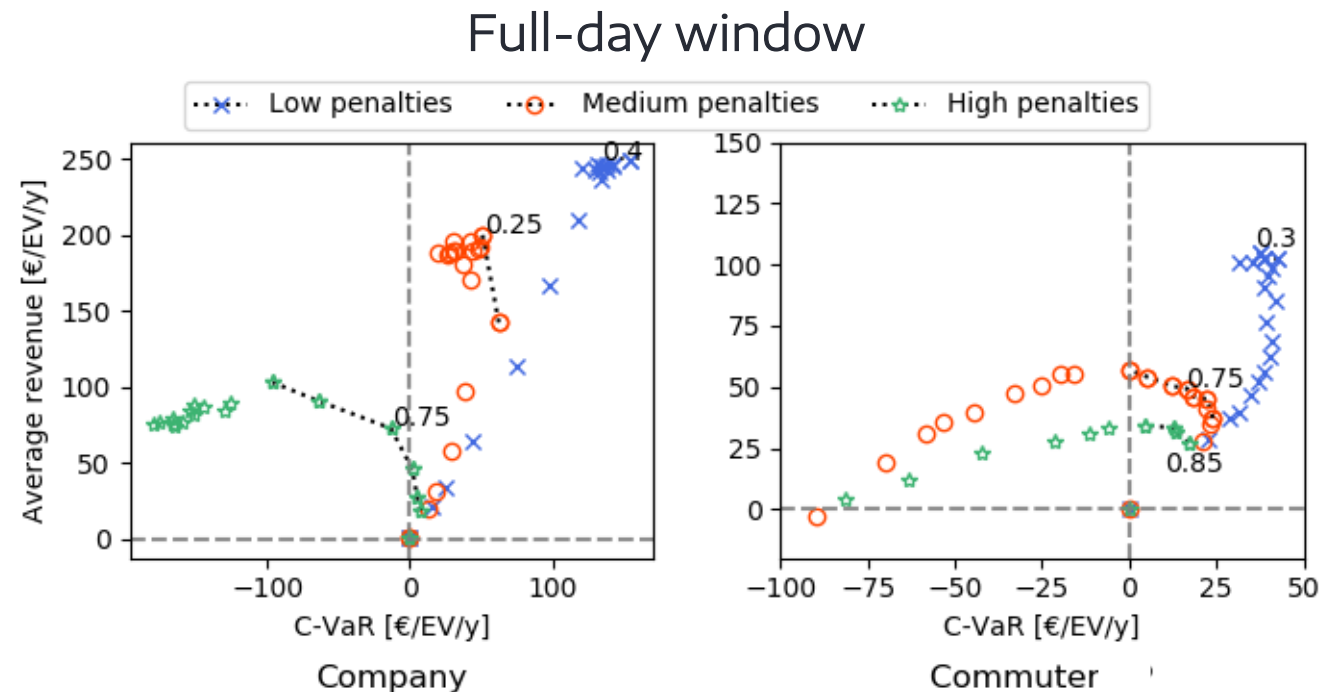
- For high-reliability cases (Company + Evening window), penalties don't have much impact.
⇒ Fleet will bid the maximum flexibility
- For low-reliability cases (Commuter), penalties affect the optimal bid level
⇒ A trade-off between expected revenue and risk
⇒ High penalties make aggregators propose only high-confidence bids



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ARE PENALTIES ENSURING DELIVERY?

The low penalty scenario allow fleets to bid high levels of unreliable flexibility

- The unsuccessful activations (UA) reach >40%
- Additional measures can limit this effect (ban from market if repeated failure)

Higher penalties ensure higher flexibility delivery

- But limit the amount of flexibility available to the DSO

=> A trade-off between lowering entry barriers and flexibility reliability

Fleet	Penalty Scenario	Evening		Full-day	
		Bid [kW/EV]	UA [%]	Bid [kW/EV]	UA [%]
Company	Low	7,3	0,0%	7,3	29,0%
	Medium	7,3	0,0%	7,3	32,3%
	High	7,3	0,0%	2,9	23,8%
Commuter	Low	3,0	9,6%	4,1	45,5%
	Medium	2,0	4,4%	1,2	17,7%
	High	1,6	2,9%	0,8	9,8%

UA: Unsuccessful activations

CONCLUSIONS

Flexibility tenders enable DSOs to procure flexibility for the long-term

- They ensure flexibility availability for DSOs as well as revenue certainty for flex operators
- First step to build liquid local flex markets

Penalties are needed to ensure flexibility delivery

- A trade-off between reliability and volume

Different penalty strategies have been implemented

- UKPN has a low penalty strategy to allow participation to new actors => Learning by doing effects
- Enedis focuses on higher reliability and standardization with national markets

Alternative measures can be designed to increase participation in local markets

- Implementing well-defined availability windows
- Allowing for firm + variable flexibility bids

THANKS!
ANY QUESTIONS?