Follow up on TAG in CACM 2.0

Prepared for [redacted]

Topics

1 TAG-Cap

2 Model: Alternative Market Coupling vs. Reference Model

3 Prioritization of CfD vs. TAG

TAG Cap

	Basis	Possible CACM 2.0 interpretation: Non project specific, limit by all CI between onshore and offshore BZs	TSO Suggestion: TAG limited by project specific CI of hybrid interconnector
Argumentative reason for this design 	If hybrid interconnector is congested, the revenue is generated as CI at the hybrid interconnector and not at the wind park.	The TAG should be limited by the CI of "bidding zones concerned", to have a secure investment case if the **project CI cannot meet the TAG remuneration**.	The TAG should be limited by project specific CI, as **the project CI is directly related to the lost revenue**. Suggested by offshore wind park developers.
TSOs view 	Need to balance CI use for several purposes	Enables a higher chance for wind parks in hybrid projects for TSOs at the cost of risking funding for grid operation / expansion	**Reduces risk of missing money for other CI uses such** as grid operability and grid expansion
Investment certainty 	There should be a business case (=remuneration scheme) for wind park developers	**Increases investment certainty so assets will be built**	Cap may be lower, but is **proportional to the OWFs revenue loss** in case of capacity restrictions
A German perspective 	Germany might be a high polluter even when no national projects are realized	Favors **the expansion of offshore grid development at the cost of general grid development**	Limits **risks of high TAG compensation** which **affects federal budgets and electricity prices**

- A secure remuneration scheme for offshore wind parks in hybrid interconnections is important for the offshore grid development.
- But the CI has a broader use for grid expansion and grid remedial actions which also offer important economic value that should not be affected by TAG.

→ **Therefore, a TAG compensation with a reasonable limit to enable other CI usage seems ideal.**

→ **CACM 2.0 interpretation unclear, therefore we suggest project specific Cap definition**

Description of TAG design options

Features	Simulation of alternative market coupling results	Reference model

Definition of price & volume	• Determined via **Euphemia rerun based on ceteris paribus principle, only relieving capacity restrictions to 70%**
	• **Provisions to avoid strategic bidding** if OWFs expect TAG to be triggered e.g.:
	  • Reference volume to be defined as the minimum of the counterfactual cleared volume and the volume of an independent offshore wind forecast to prevent strategic bidding (i.e. offering more volume than the forecast allows in anticipation of capacity restrictions)
		• **Reference price** shall be determined as the price that would result from a setup with the interconnectors' nominal capacities, using the actual market-coupling auction prices of the connected bidding zones.
		• **Reference volume** based on OWF generation "capability" e.g. real-time wind measurements or centralised wind forecast
		• **Provisions to avoid strategic bidding** if OWFs expect TAG to be triggered i.e.:
		  • VRef= min {Cap, OWF bid volume}

Cost distribution	• Identifiy TAG relevant CNECs (reduced capacities <70% and non-zero shadow prices) • Cost distribution could be proportional to shadow prices in factual ○ Analysing the sensitivity of shadow prices by comparison of factual and counterfactual values is not possible if a CNEC is pre-solved in the counterfactual flow-based parameters.*	• Identifiy TAG relevant CNECs (reduced capacities <70% and non-zero shadow prices) • Cost distribution could be proportional to shadow prices in factual

*See example on slide 8

Assessment framework for TAG design options

Dispatch efficiency
To what extent the design option provides efficient dispatch incentives avoiding market distortions in expectation of TAG compensation?

Effectiveness/Risk hedging
To what extent/how accurate price and volume risk due to reduced transmission capacity made available during the capacity calculation process are covered?

Simplicity/Practicability
To what extent the design option is simple to implement by TSOs/NEMOs/NRAs and "handy" for OWPs to assess the risk?

Transparency/Reproducibility
To what extent the design option provides transparency and trust on how the compensation is calculated, who is the "polluter" and what is the cost contribution of the "polluter" TSO(s)?

Qualitative assessment: Simulation vs. Reference

	Simulation of alternative market coupling results	Reference model
Dispatch efficiency	**(+)/(-)** Provisions need to be made to avoid dispatch distortions	**(+)/(-)** Provisions need to be made to avoid dispatch distortions
Effectiveness/ Risk hedging	**(+)** More accurate calculation of TAG compensation (at least in DA but not in ID)	**(-)** Rather an estimate thus, less precise calculation of TAG compensation compared with what a full market re-run would show. Prices could be over- or underestimated while volumes are rather overestimated
Simplicity/ Practicability	**(-)** • Not easy and practical for OWFs to model themselves TAG compensation for their business cases • Adds significant complexity and administrative burden on TSOs/NEMOs/NRAs • For ID: IDA order books do not reflect the counterfactual DA results and thus, are not suitable to calculate the counterfactual ID results.	**(+)** • Investor-friendly: Makes it easier and more predictable for OWFs to estimate compensation in their financial models • Reduce administrative burden on TSOs/ NEMOs and NRAs.
Transparency/ Reproducibility	**(-)** • Often Flow-based/AHC models perceived as "black-box" from market parties making it difficult for them to assess the correctness/validity of the simulation results. • Reproducibility of Euphemia reruns can be reduced due to changes in software versions, parameter settings, tie-breaking rules, and any pre/post processing • If the difference between factual and counterfactual is significant, the model might not always indicate the "real polluter" and an accurate cost distribution of TAG payments among polluters ○ Euphemia rerun doesn't allow for sensitivity analysis of the impact that the lack of capacity of a CNEC had and thus, has no advantage regarding cost distribution	**(+)/(-)** • Increase transparency and trust, since OWFs could easily calculate and reproduce outcomes themselves • If the difference between factual and counterfactual is significant, the reference model might not always indicate the "real polluter" and an accurate cost distribution of TAG payments among polluters

Conclusion & recommendations

- **Neither design option scores best across all criteria but has its strengths and weaknesses**:
  - Simulation of alternative market coupling results is theoretically more accurate, but very complex to implement, costly to operate and less transparent for OWFs
  - Reference model is easier to implement as well as to understand and verify by OWFs but less precise
- **A thorough quantitative analysis and evaluation is needed before implementing a certain design option:**
  - This analysis should be conducted during the development of the TAG methodology to compare the outcomes, test sensitivities, and evaluate trade-offs between different criteria to ensure transparent compensation for OWFs while also being implementable and robust for TSOs and NRAs.
  - To this end, the technical annex of CACM 2.0 should be deleted. Alternatively, the current formulation in annex should be broadened to explicitly allow alternative, simpler TAG design approaches and not only simulation of alternative market coupling results (see next slide).
- **Further implications: Euphemia rerun-based TAG methodology opens the door to a broader debate about TSOs' accountability for not delivering the copper-plate**
  - Once a tool based on simulations of alternative market coupling results is in place, it can be used beyond OWF TAG compensation e.g. to compensate other market parties onshore or other TSOs who might be impacted by capacity restrictions by the "polluter" TSO

Suggestion for open formulation in annex

1)The calculation of the transmission access guarantee compensation payments shall be performed for each market time unit ~~and~~ using one of the following approaches:

1. Simulation of alternative market coupling results

a)~~be~~ based on a simulation of alternative market coupling auction results performed by the MCO after the auction results are published. The alternative auction simulation shall take the same inputs to the auction, except for the capacity calculation outputs which shall be modified in such a way that the available capacities not meeting the requirements of Article 54(2) are replaced by capacities that would have fulfilled such requirements.

b)the modified capacity calculation outputs shall be calculated by RCCs. For regions applying the flow-based approach, they shall provide modified flow-based parameters and allocation constraints. For regions applying the coordinated net transmission capacity approach they shall provide modified available transmission capacity values and allocation constraints as well as information on critical network elements and corresponding TSOs which are not meeting the requirements of Article 54(2). The modified capacity calculation outputs shall be published in a similar way to the capacity calculation outputs according to Article 11(3)(c) and provided to the MCO.

c)define the transmission access guarantee compensations as the difference, if positive, between the actual market revenues and the simulated revenues of the offshore renewable electricity generation plant operators under the simulation of alternative market coupling auction results.

Or

2. A reference model based on a reference price and a reference volume determined by the MCO that approximate the market coupling auction results as if no restriction had occurred. The model shall consider at least the following aspects:

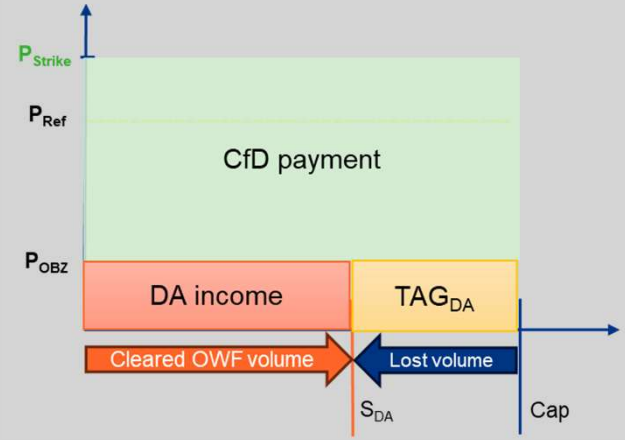
a) the reference price shall be determined using the actual market-coupling auction prices of the connected bidding zones.

b) the reference volume shall be determined as the offshore renewable electricity generation capability in the specific market time unit.

c) define the transmission access guarantee compensations as the difference, if positive, between the actual market revenues and the revenues of the offshore renewable electricity generation plant operators under the reference model.

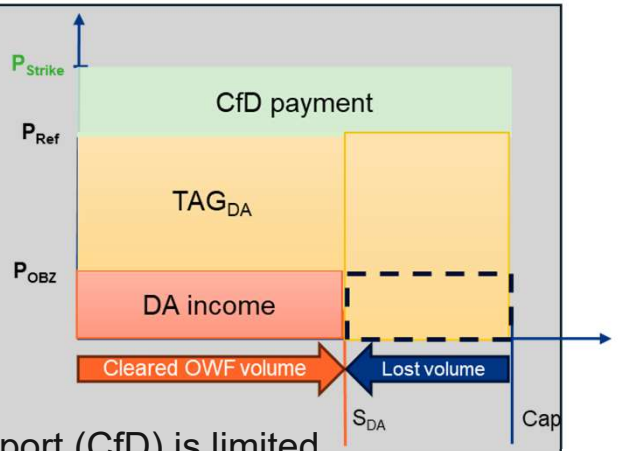
CfD vs. TAG

CfD First



- Amount of CI shifted to OWFs is limited
- Better visibility for developer and state
- Removes adverse incentives for TSOs to push onshore congestions to the HVDC landing point
- Avoids unintended flow of TAG in CfD funds

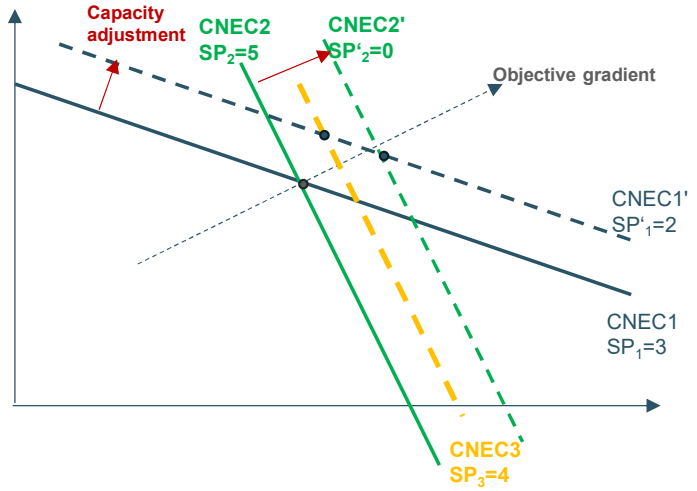
TAG first



- Amount of state support (CfD) is limited
- Theoretically better from a MS view because the polluting TSO covers the specific risk
- Market-based approach as TAG is based on pseudo market outcome
- Hard to avoid overcompensation if TAG and CfD do not have the same price and volume reference

→ Theoretically, covering specific risks first (=TAG first) is better, but practical issues favor CfD first.

Example of the sensitivity of shadow prices by comparing factual and counterfactual



In factual:

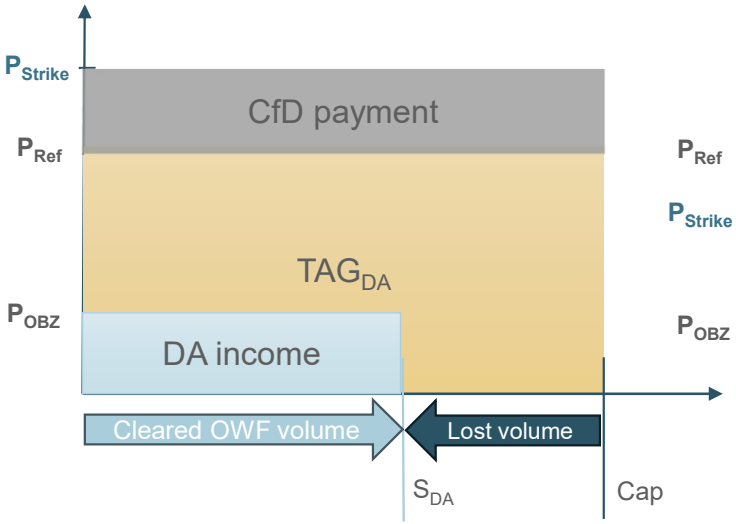
- CNEC 1 has a shadow price SP_1=3 €/MWh
- CNEC 2 has a shadow price SP_2=5 €/MWh

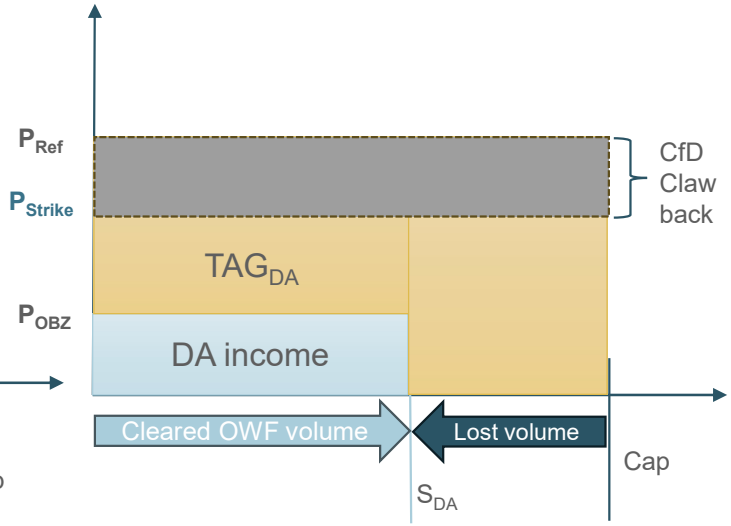
In counterfactual:

- Capacity of CNEC 1 and 2 are adjusted leading to CNEC1' and CNEC2'
- CNEC1' has a shadow price SP'_1=2 €/MWh
- CNEC2' is pre-solved (i.e. outside the FB-domain)
  - No active contraint and no shadow price possible because another CNEC (3) determines the FB-domain.
- Therefore, **a Euphemia rerun doesn't allow for sensitivity analysis of the impact that the capacity reduction on a CNEC has on OWF revenue**

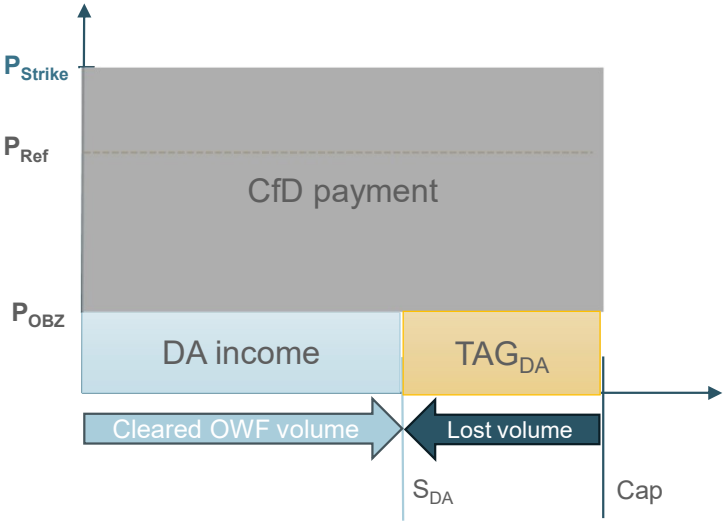
Interaction TAG – „capability“ CfD

1. TAG applies first, CfD on top





2. CfD applies first and TAG compensates only for lost volume below the OBZ price



- When TAG is triggered it is very hard to avoid overcompensation if TAG and CfD do not have the same price and volume reference.
- If TAG applies first there might be an unintended flow of money (see CfD clawback in second picture).