aFRR Capacity Auction
Cap on TCO degradation

Stakeholder workshop

15/02/2023

Context and goal of the workshop

Context of the workshop

- During the discussions on the design of the aFRR capacity auctions in 2021, the need to implement a cap on the TCO degradation had been identified. It has however not been implemented as:
  - ✓ It was urgent for market parties to implement the new aFRR capacity auction design;
  - ✓ The need of the cap as of the go-live was not demonstrated.

- In the meanwhile, the market conditions have evolved. The monitoring of the TCO degradation has shown that the threshold fixed has been exceeded for the 1st time in November 2022.

- The implementation of a TCO degradation cap has been planned in the EU balancing roadmap for this year.

Goal of the workshop

- Remind previous discussions on the need to implement a cap on TCO degradation and the associated principles.

- Present the proposed approach to implement the cap on TCO degradation.

General overview
High-level process
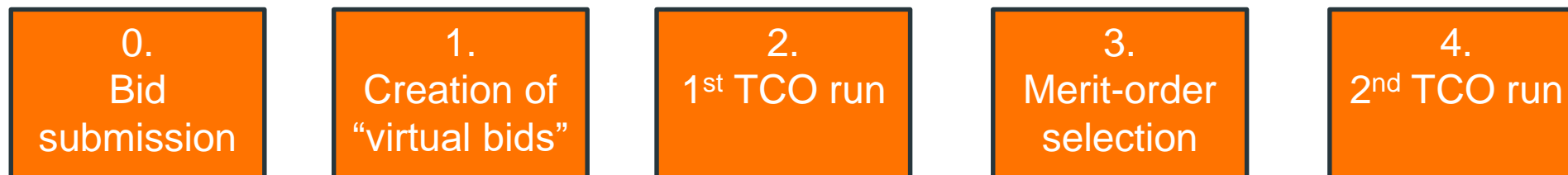
| 0.
Bid submission | 1.
Creation of "virtual bids" | 2.
1st TCO run | 3.
Merit-order selection | 4.
2nd TCO run |

0. Bid submission

1. Creation of "virtual bids" by aggregating single CCTU bids in 24h bids

2. A 1st TCO run is used to select virtual bids selected in the TCO and determine a reference price for Up and Down

3. Selection of virtual bids in a merit-order selection

4. Selection of remaining volume in a 2nd TCO run

Introduction of a TCO degradation cap
High-level principles

- The 1st all-CCTU run results in the most cost effective solution, as it includes all bids received.

- The merit-order selection with the mark-up allows to open the market to new entrants.

- When high volume of new entrants or running thermal units are available, the 2nd all-CCTU run will provide an additional opportunity to avoid paying must-run costs on a limited volume.

- However, it can not be excluded that, when insufficient volumes are available to cover the full capacity to be contracted, the merit-order selection leads to a significant degradation of the results of the TCO, increasing the costs for the system.

- For that purpose, Elia intends to implement a TCO degradation cap with following principles
  - ✓ The TCO degradation cap is set at 1,2 x "average cost of the 1st all-CCTU run". This TCO degradation cap is not directional, only the total cost of the auction is considered
  - ✓ The selection of virtual bids in the merit-order selection is restricted by the TCO degradation cap

Introduction of a TCO degradation cap
Numerical example

1st TCO run	Merit-order selection	2nd TCO run

1st TCO run
- Total auction cost of 90k€
  - ➜ **TCO degradation cap set at 108k€**
- Reference price UP: 24€/MW/h
- Reference price DOWN: 7€/MW/h
- No virtual bids selected in this step

Merit-order selection
- 115MW of virtual bids selected in each direction
- Average price UP: 22€/MW/h
- Average price DOWN: 4€/MW/h
- **Total cost UP + DOWN: 71,8k€**

2nd TCO run
- 30MW to be procured in each direction
- **Total cost for 30MW: 40k€**

➜ The resulting cost of the auction would be 71,8k€ + 40k€ = 111,8k€ > 108k€ ➜ TCO degradation cap reached

➜ Reduction of virtual bids selected in order to respect the TCO degradation cap

Introduction of a TCO degradation cap
Practical implementation

- The implementation of the TCO degradation cap requires a modification of the all-CCTU algorithm, which would combine the merit-order selection and the 2nd all-CCTU run. Objective of the algorithm would be to clear as much virtual bids as possible, while respecting the constraint of the TCO degradation cap. Feasibility of this modification is confirmed.

- Important design question: how to choose between Up and Down virtual bids when reaching the cap?

- The need for TCO degradation cap as of the go-live is not demonstrated, based on:
  - ✓ Previously presented analysis of the evolution of the average cost in function of the volume (which has been extended to about 30 delivery days representing various market conditions)
  - ✓ The volumes expected to be prequalified in the short-medium term

➔ In order to not delay the implementation, the TCO degradation cap should be implemented in a 2nd stage, based on a monitoring of the market conditions


Average cost in €/MWh in the all-CCTU auction - 5/3
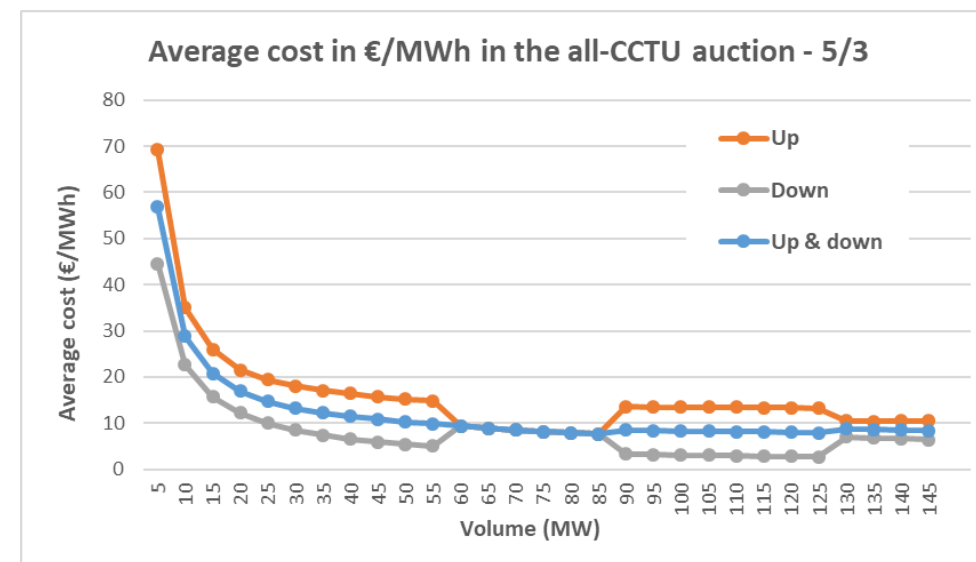
Summary

| 0.
Bid
submission | 1.
Creation of
"virtual bids" | 2.
1st TCO run | 3.
Merit-order
selection | 4.
2nd TCO run |

5. TCO degradation correction

0. Bid submission

1. Creation of "virtual bids" by aggregating single CCTU bids in 24h bids

2. A 1st TCO run, which includes the virtual bids in addition to the all-CCTU bids, is used to:
    - ✓ Select virtual bids selected in the TCO. These virtual bids are awarded whatever happens in next steps
    - ✓ Determine for Up and Down the reference price as the average price with a mark-up. The mark-up is initially set to 20% and can be reduced by the CREG
    - ✓ In a 2nd stage (not at go-live), define the maximum auction cost

3. Run merit-order selection of the virtual bids: virtual bids with a price ≤ (reference price * RC factor) are selected

4. Selection of remaining volume in a 2nd TCO run, which includes all-CCTU and not yet selected virtual bids

5. In a 2nd stage, check on the TCO degradation and reduce amount of selected virtual bids if needed

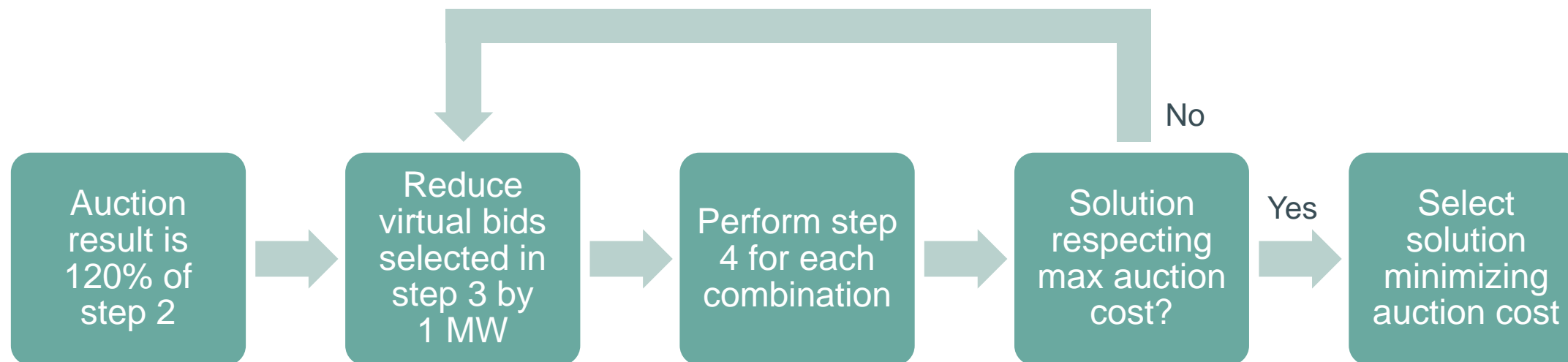# Impact of merit-order selection (step 3) on auction cost
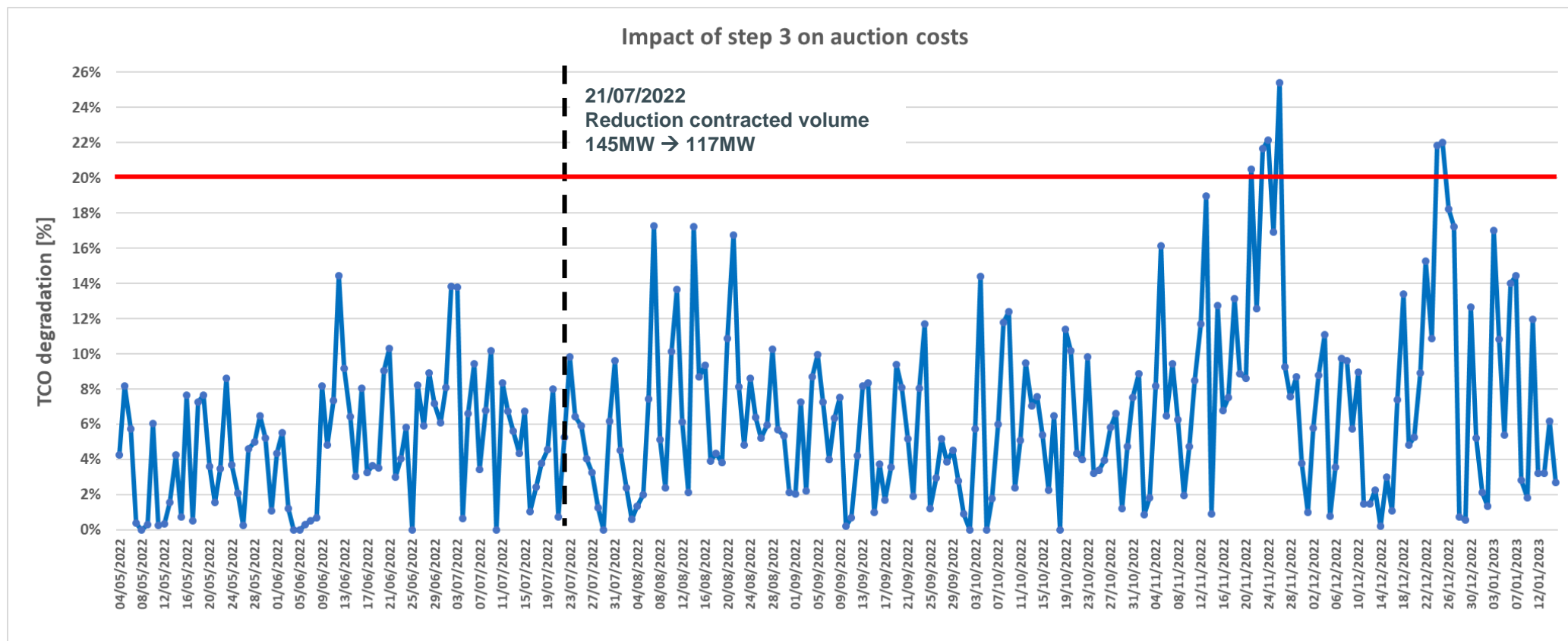
- The average TCO degradation since the go-live is 6%; the 20% threshold has been exceeded for the 1st time end of November.

- Reduction of contracted capacity, increase of prequalified volumes bidding in single CCTU and better forecasting of reference price by the BPSs increase the risk of reaching the threshold

Solution proposed

- When the 20% threshold is exceeded, the only way is to limit the volume of virtual bids selected. The question is: how to choose between Up and Down virtual bids when reaching the threshold?

- Proposal is to add in the optimizer a 20% constraint on the TCO degradation and to

  - Select the solution which results in **awarding the highest possible volume among the virtual bids that were selected in step 3 of the auction** (irrespectively whether these are UP or DOWN bids)**, while respecting the 20% constraint**

  - In case this results in **several solutions, select the cheapest one**

Solution proposed

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                                    ┌──────────────────────────────────┐
                                    │                                  │
                                    ▼                                  │
┌─────────────┐      ┌─────────────┐      ┌─────────────┐      ┌─────────────┐   No   ┌─────────────┐
│  Auction    │      │   Reduce    │      │ Perform step│      │  Solution   │────────┘│  Select     │
│  result is  │─────▶│ virtual bids│─────▶│ 4 for each  │─────▶│ respecting  │   Yes   │  solution   │
│  120% of    │      │ selected in │      │ combination │      │ max auction │────────▶│ minimizing  │
│  step 2     │      │ step 3 by   │      │             │      │   cost?     │         │ auction cost│
│             │      │   1 MW      │      │             │      │             │         │             │
└─────────────┘      └─────────────┘      └─────────────┘      └─────────────┘         └─────────────┘
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All possible combinations are evaluated.
Example for 3 MW:
- 0 MW in UP and 3 MW in DOWN
- 1 MW in UP and 2 MW in DOWN
- 2 MW in UP and 1 MW in DOWN
- 3 MW in UP and 0 MW in DOWN

Solution proposed – numerical example

- Study case
  - ✓ Total cost of the auction after step 2 (1st TCO) : **100k€** ➔ maximum auction cost set to **120k€**
  - ✓ Step 3 (merit-order selection) leads to the selection of 23MW in UP and 60MW in DOWN
  - ✓ Total cost of the auction after step 4 (2nd TCO): **124k€** ➔ TCO degradation cap is exceeded

- Search for possible solutions

1 MW virtual bids "unselected" in step 3	2 MW virtual bids "unselected" in step 3	3 MW virtual bids "unselected" in step 3	4 MW virtual bids "unselected" in step 3
• 1MW ↑, 0MW ↓ ➔ 123k€ • 0MW ↑, 1MW ↓ ➔ 123k€	• 2MW ↑, 0MW ↓ ➔ 123k€ • 1MW ↑, 1MW ↓ ➔ 123k€ • 0MW ↑, 2MW ↓ ➔ 122k€	• 3MW ↑, 0MW ↓ ➔ 122k€ • 2MW ↑, 1MW ↓ ➔ 122k€ • 1MW ↑, 2MW ↓ ➔ 121k€ • 0MW ↑, 3MW ↓ ➔ 121k€	• 4MW ↑, 0MW ↓ ➔ 121k€ • 3MW ↑, 1MW ↓ ➔ 121k€ • 2MW ↑, 2MW ↓ ➔ 121k€ • **1MW ↑, 3MW ↓ ➔ 119k€** • **0MW ↑, 4MW ↓ ➔ 120k€**

- The process stops at 4MW, as at least one solution respecting the maximum auction cost is found

- The cheapest among those 2 solutions is retained ➔ 1MW in UP and 3MW in DOWN will be "unselected" in step 3 of the auction

Resulting auction process

0. Bid submission	1. Creation of "virtual bids"	2. 1st TCO run	3. Merit-order selection	4. 2nd TCO run

5. TCO degradation correction

0. Bid submission

1. Creation of "virtual bids" by aggregating single CCTU bids in 24h bids

2. A 1st TCO run, which includes the virtual bids in addition to the all-CCTU bids, is used to:
   - ✓ Select virtual bids selected in the TCO. These virtual bids are awarded whatever happens in next steps
   - ✓ Determine for Up and Down the reference price
   - ✓ Define the maximum auction cost as 120% of the result of the 1st TCO

3. Run merit-order selection of the virtual bids: virtual bids with a price ≤ (reference price * RC factor) are selected

4. Selection of remaining volume in a 2nd TCO run, which includes all-CCTU and not yet selected virtual bids

5. If auction cost ≥ (max auction cost defined in step 2), reduction of amount of virtual bids selected to respect the cost constraint

Results on past auctions

- The adapted solver has been applied on the days where the threshold was exceeded, leading to following results

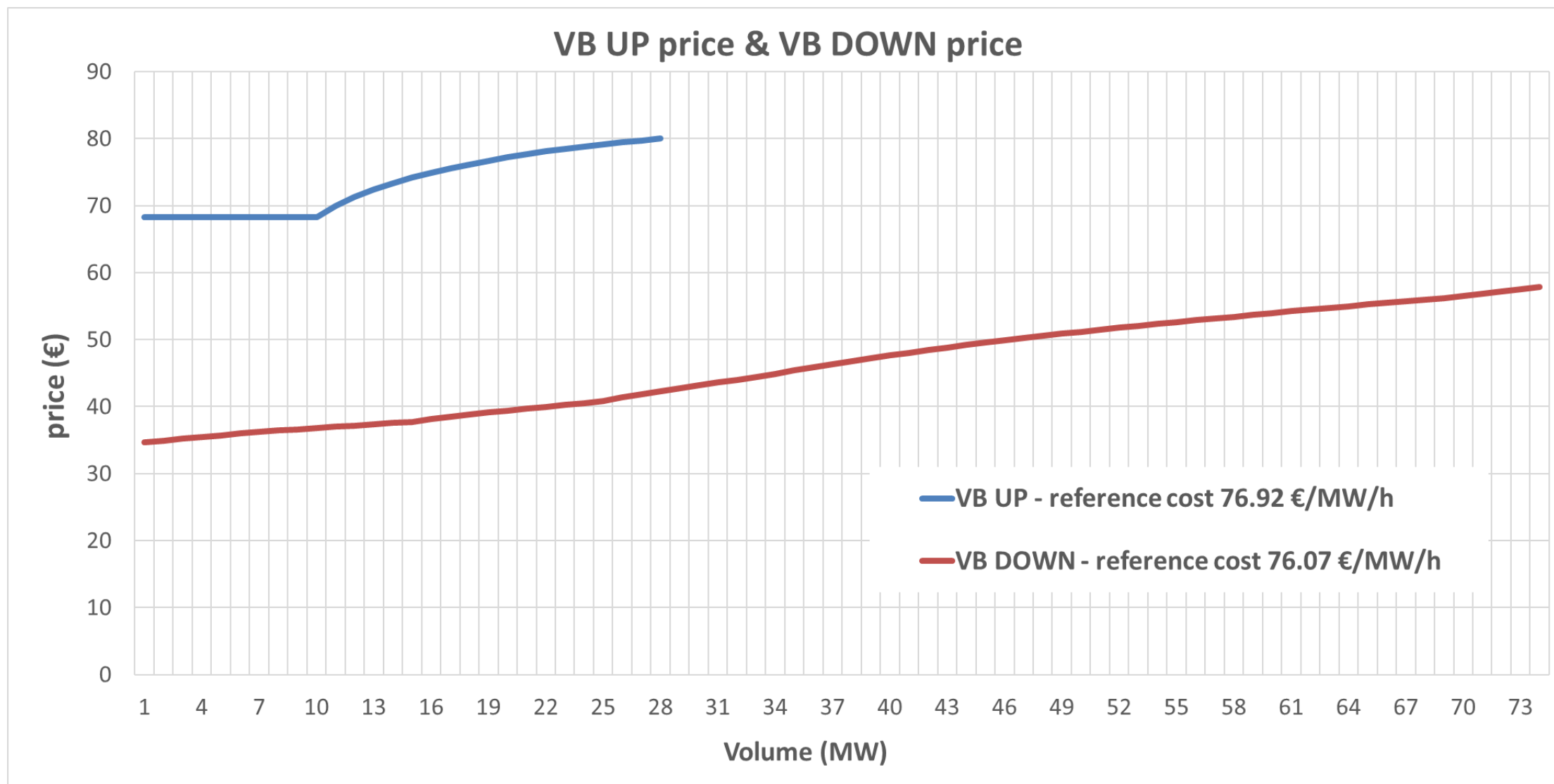| Date	Step 2 (1st TCO)	Step 4 (2nd TCO)	Step 2		Step 3		Step 4		TCO degradation	Corrected volume UP	Corrected volume DOWN	Final total cost	Corrected degradation	Delta VB UP	Delta VB DOWN
			Volume UP	Volume DOWN	Volume UP	Volume DOWN	Volume UP	Volume DOWN							
21/11/2022	413.751 €	498.587 €	0	17	48	64	48	64	21%	47	64	496.184 €	19,9%	1	0
23/11/2022	546.032 €	664.437 €	0	22	48	67	48	67	22%	38	67	655.120 €	20,0%	10	0
24/11/2022	474.833 €	580.008 €	0	0	48	68	48	68	22%	42	67	568.075 €	19,6%	6	1
26/11/2022	429.596 €	538.825 €	0	0	28	74	28	74	25%	13	74	515.451 €	20,0%	15	0
24/12/2022	559.813 €	682.076 €	0	22	31	79	31	79	22%	28	77	669.285 €	19,6%	3	2
25/12/2022	555.844 €	678.254 €	0	0	13	83	13	83	22%	9	82	665.881 €	19,8%	4	1

- This confirms the feasibility and effectiveness of the proposed approach

- Results show that, on the cases studied, the majority of "unselected virtual bids" are UP bids. The sample is however still limited to 6 days concentrated in 2 periods

Results on past auctions – analysis 26/11

Date	Step 2 (1st TCO)	Step 4 (2nd TCO)	Step 2 Volume UP	Step 2 Volume DOWN	Step 3 Volume UP	Step 3 Volume DOWN	Step 4 Volume UP	Step 4 Volume DOWN	TCO degradation	Corrected volume UP	Corrected volume DOWN	Final total cost	Corrected degradation	Delta VB UP	Delta VB DOWN
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Results – analysis 26/11

VB UP price & VB DOWN price

VB UP - reference cost 76.92 €/MW/h

VB DOWN - reference cost 76.07 €/MW/h

Next steps

- Elia will start drafting the proposal for amendment of the T&C BSP aFRR on this basis. The amendment will be strictly limited to Annex 7 of the Contract (cf. roadmap presented in WG Balancing on the 2nd of February)

- Public consultation is planned in Q2

- Implementation will take place this year, precise planning is being defined

Thank you.