# Annex 2 - Assessment of the alpha parameter and proposal for re-calibration

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# Scope and objective

- Elia and stakeholders have engaged in workshop meetings to discuss the elevated system imbalance costs and possible solutions
- During the workshop of October 11, stakeholders have put forward the large contribution of the alpha in the system imbalance cost
- Several stakeholders requested an assessment and potential revision (or even suspension) of the alpha parameter

This slide deck presents an assessment of the alpha and a proposal for a re-calibration of the alpha parameter and is built up as follows:

1. Assessment of the alpha parameter
2. Proposal for a re-calibration of the alpha parameter
3. Assessment of the impact of simulations of the re-calibration
4. Next steps

Elia focused on a solution which :

- tackles the issues put forward by the market and which are confirmed in Elia’s assessment of the alpha parameter ;
- can be implemented on very short notice to maximize the effect for the market parties, considering the current market conditions.

# Context : history of the alpha parameter design

## Before 2020

- Objective was to provide an additional incentive to BRPs to balance their portfolio
- The formula was based on :
  - An exponential profile
  - Dampened with previous periods
  - Limited in value
- An assessment in 2018-19 revealed that the alpha increased too slowly in time and remained very low in case of long and large SI

If Abs(SI) >140 MW
Then $\alpha = \text{avg}\{(SI_{QH-t})^{P}, \ldots, (SI_{QH})^{P}\} / D$

- t = 7 (8 QHs)
- D = 15 000
- P = 2

## As from 2020

- Begin 2020, the alpha parameter was fundamentally revised after observing :
  - **General balancing risks** : observations on historic alpha reactions (too low and too late to have an adequate effect).
  - **Storm risks :** need to create strong incentives for BRPs with offshore wind to maintain their portfolio in balance during storms.
  - **Positive imbalance risks** : need to create strong incentives, in particular for BRPs with offshore wind during excess energy periods.
- The formula was refined based on a :
  - S-shaped curve (exponential effect that gradually fades out)
  - Reduced lagging effect to average current and previous qh
  - Increase price levels to a certain pre-defined level

If Abs(SI) >150 MW; $\alpha_1 = a_1 + \frac{b_1}{1 + \exp\left(\frac{c_1 - x}{d_1}\right)}$

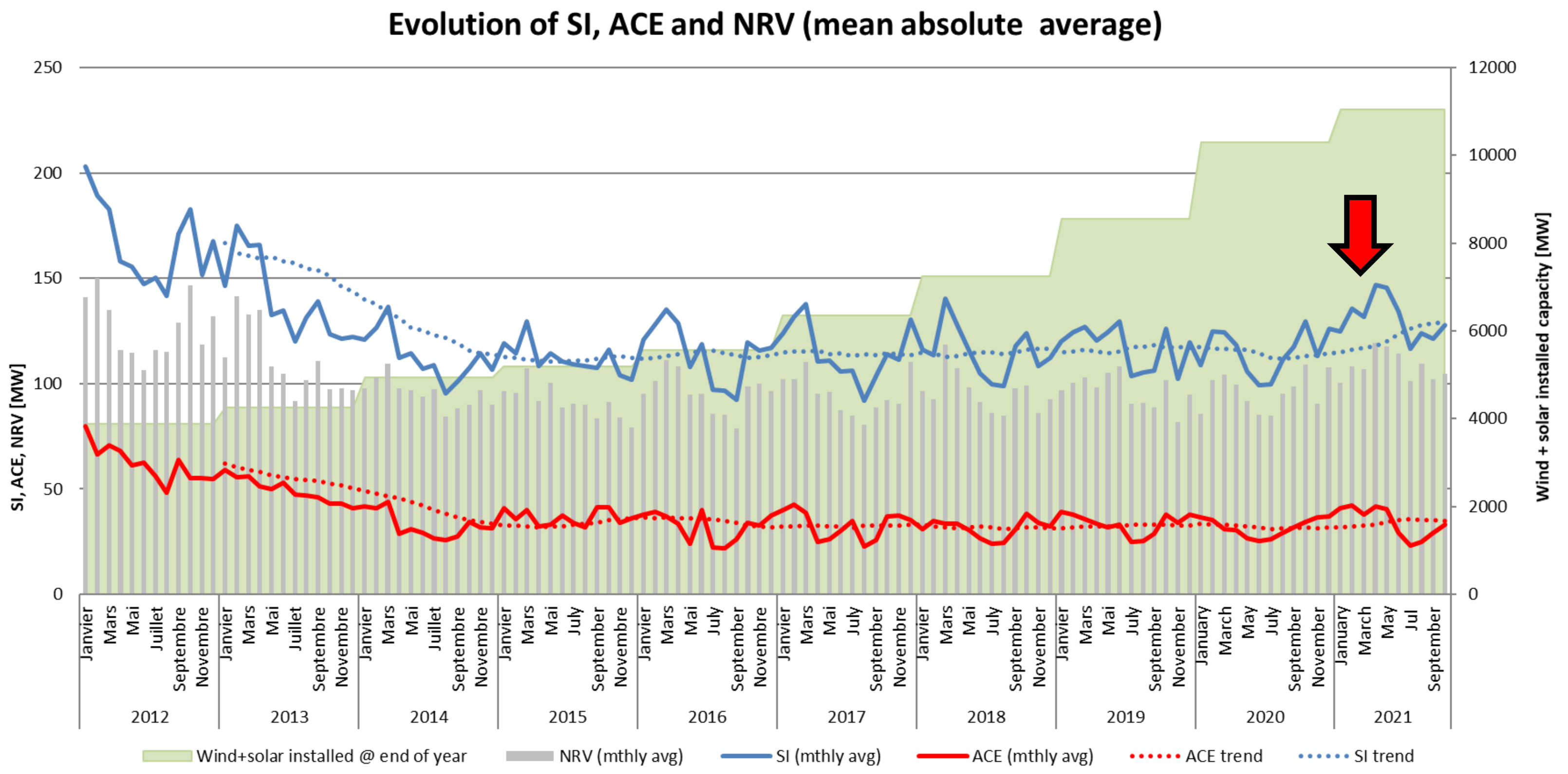
- a = 0
- b = 200
- c = 450
- d = 65
- X = AVG [(ABS (SI (t)); ABS (SI (t-1))]

# General system imbalance evolutions

| Estimated capacity installed at the end of the year [MW]* | Onshore wind | Offshore wind | PV |
|---|---|---|---|
| 2019 | 2320 | 1556 | 4550 |
| 2020 | 2471 | 2253 | 4788 |
| 2021 | 2726 | 2253 | 5430 |

**Adequacy and flexibility study 2021*

- **Stable system imbalance behavior since 2015 (introduction single marginal pricing).**
  - Stable SI indicates an improving market performance
  - Despite faster increase in renewable generation production since 2017-18
- **An increasing system imbalance is observed in 2021 (cf. presentations during 1st workshop).**
  - Note that it is expected that additional renewable generation impact the system imbalance, and reserve needs after 2023 (cf. MOG 2 system integration study)
  - However, the observed “trend” in 2021 seems to be highly relation by the maintenance period of Coo-Trois-Ponts.
  - Further observation in 2022 is needed to confirm if the higher system imbalance in 2021 was the start of trend or not.



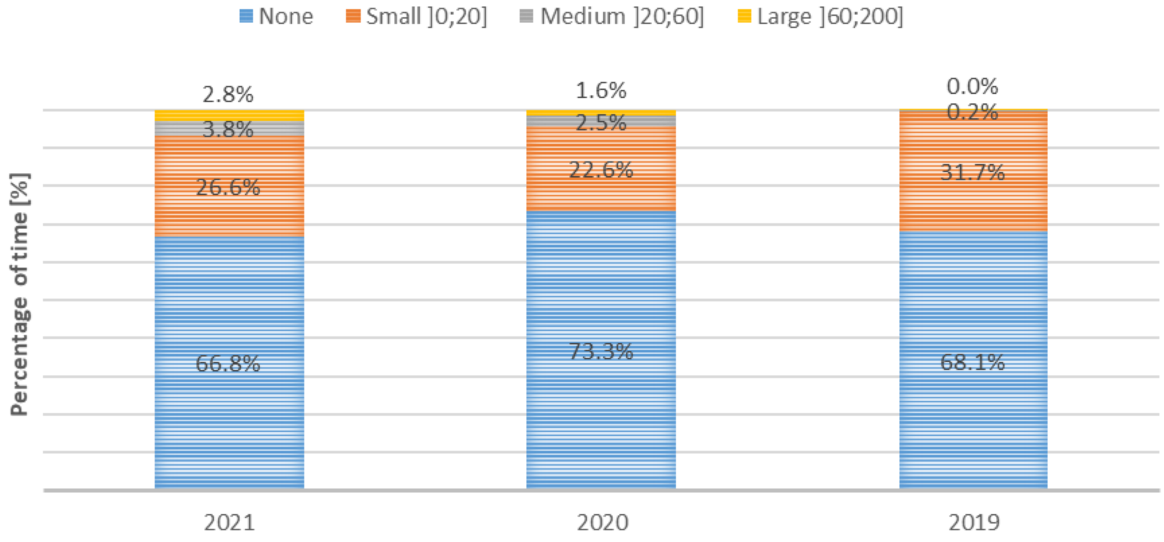
# 1. Assessment of the alpha parameter

# 1. Evolution of the impact of the alpha

Period 1/jan – Period 24/okt*

- As foreseen, the frequency of large alpha values substantially increased from 2019 to 2020
  - The total value of the alpha increased from 1.9 M€ to 11.0 M€ over the period 1/1 – 24/10
- The frequency of large alpha values further increased in 2021
  - The total value of the alpha further increased from 11.0 M€ to 19.2 M€ over the period considered
  - A few events with high imbalance volumes and alpha (at e.g. 200 €/MW) substantially impact the imbalance costs
  - **This effect is due to the increase in frequency of large negative system imbalance events (shortages).**

Occurrence of the alpha in 2019-2021 (% of time)




$$Value = SI^{+} * \frac{\propto}{4} + SI^{-} * \frac{\propto}{4}$$

| 2021 | 2020 | 2019 |
|---|---|---|
| 19.2 M€ | 11.0 M€ | 1.9 M€ |

When assessing the same periods in 2020 and 2021, observations confirm an increasing impact of the alpha-component in the total imbalance costs for BRPs.

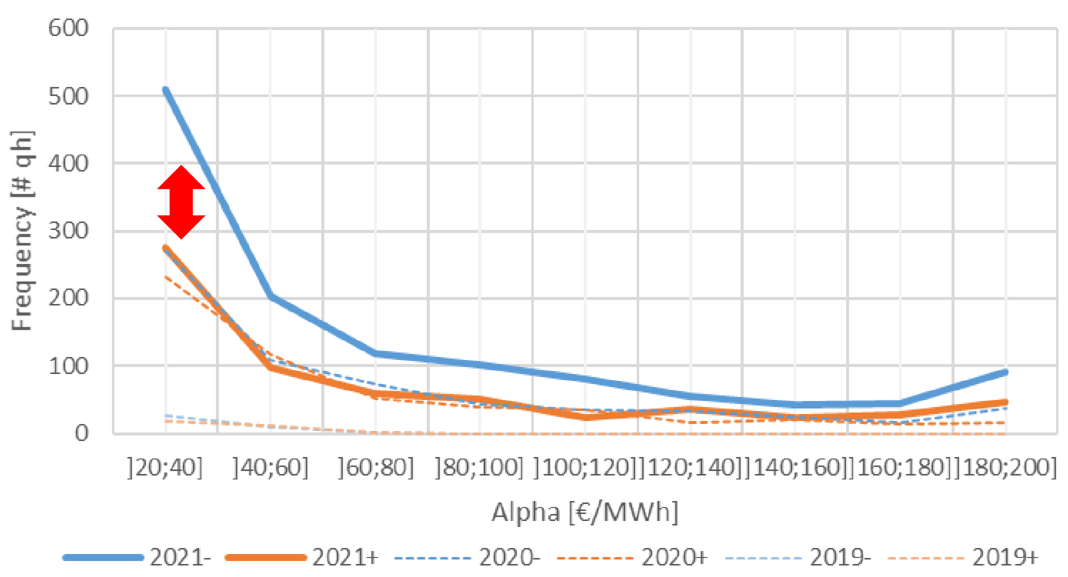


**Period limited to the availability of data for 2021 during the analysis*

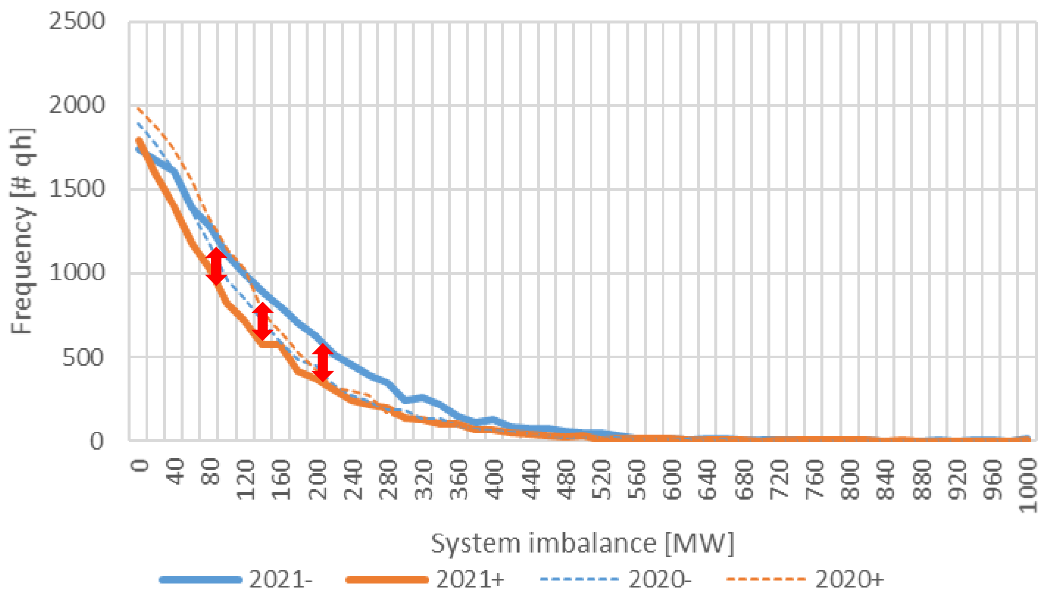
# In depth (1) : relation with the system imbalance

## Period 1/jan – Period 24/okt*

Occurrence of positive alpha values in 2020-2021 (% of time)




Distribution of system imbalances** in 2020-2021




The increasing frequency of high alpha periods seems mainly driven by negative system imbalance periods (shortages)

This trend is related to observed negative system imbalances which are higher in 2021 compared to 2020

*Period limited to the availability of data for 2021 during the analysis

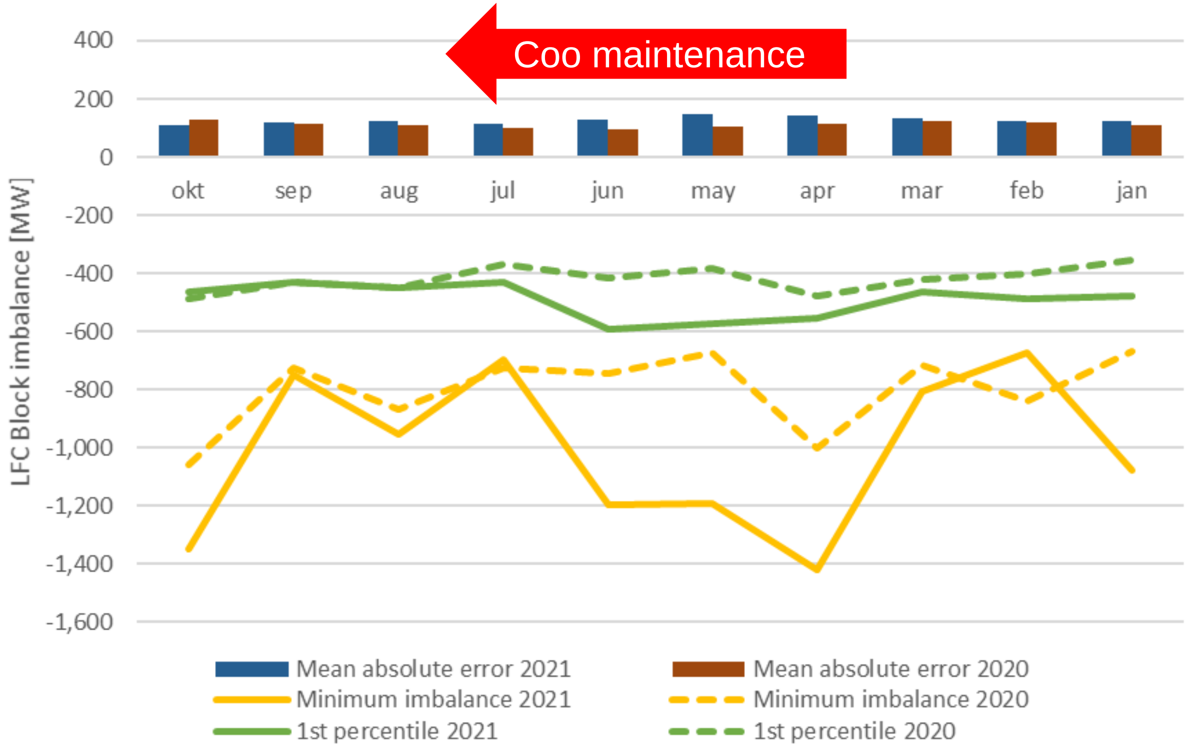
**Short system positions are expressed as negative values (-), long system positions are expressed as positive values (+)

# In depth (2) : relation with the system imbalance

Period 1/jan – Period 24/okt*

- **The increasing system imbalances in 2021 is strongly related to the period of the Coo-Trois-Ponts maintenance**.
- LFC block imbalance trend is to be further monitored in view of increasing renewable developments. An outlook of the system imbalances and reserve needs the MOG 2 system integration study expects an increasing trend and increasing reserve needs after 2023.

Comparison of average system imbalances and largest shortages between 2020 and 2021**




*Period limited to the availability of data for 2021 during the analysis

**Short system positions are expressed as negative values

## 2. Estimating the market reaction

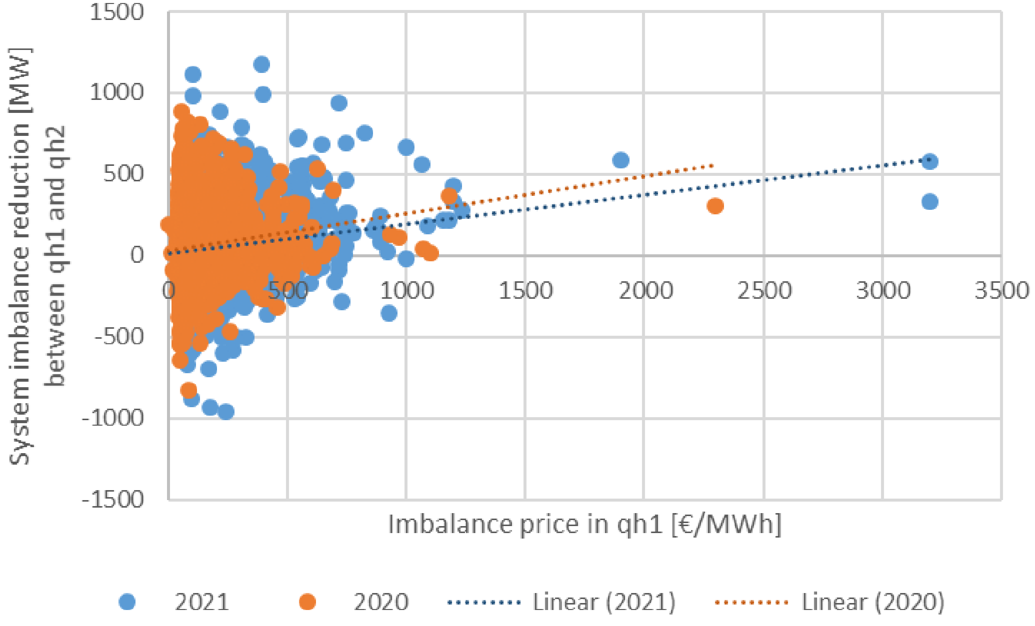
- It is not straightforward to isolate the effect of the alpha on the system imbalance as no meaningful comparison is possible with and without alpha parameter
  - Comparing system imbalances 2018-19 versus 2020-21 is not representative
  - **Evolutions do confirm maintaining a stable system imbalance in 2020 despite the additional renewables installed**

- It is not straightforward to study price elasticity in general i.e. the reaction of the market to the imbalance price levels, as Elia currently does not has full view of reactive balancing in the market. However, some proxy's can be used :
  1. System imbalance reduction compared to previous period
  2. Schedule deviations from the last nominations (only for CIPU)

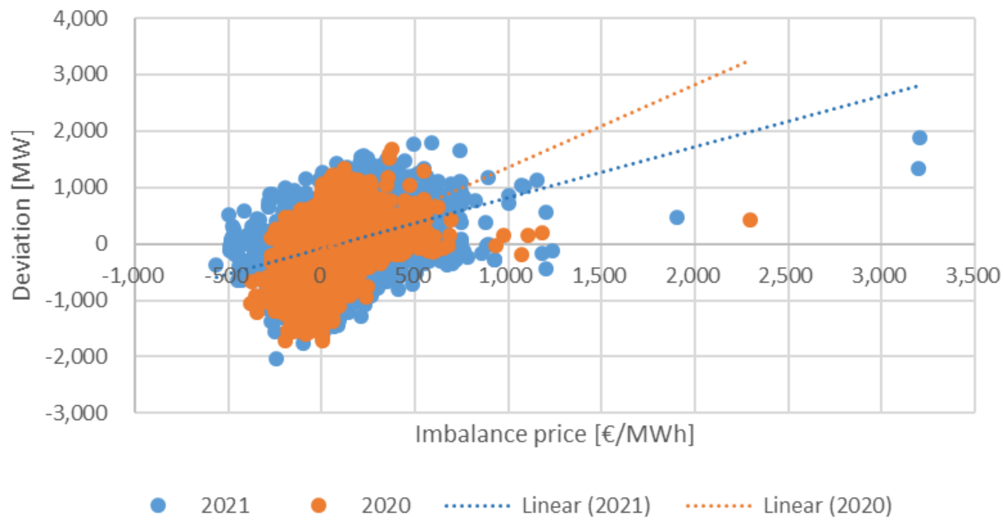
Observations over 2020 and 2021 confirm that higher prices tend to result in higher market reactions (and lower reactions in 2021, probably due to the maintenance of Coo-Trois-Ponts).

*Calculation conducted over the full period 1/1/2020 – 24/10/2021*

1 Comparison of the imbalance price in qh1 with the system imbalance reduction between qh1 and q2 *




2 Comparison of the imbalance price with the deviations between the last nominations and the real-time measurements (corrected for reserve activations)*



# In depth (1) : system imbalance reductions

- Expressing the evolution of the average market reaction (measured via the system imbalance reduction method) per imbalance price level allows to study price elasticity
- Results confirm for short positions that market reaction increase with higher prices. Most of the market reaction seems to be achieved around 400 €/MWh.
  - **Nuance 1** : high price levels are relatively rare and results above 400 €/MWh become less representative
  - **Nuance 2** : part of the correlation is probably explained by fact that market parties manage their risk by reacting directly on their portfolio imbalances instead of prices
  - **Nuance 3** : results seem vary between 2020 and 2021, probably following the maintenance period of Coo-Trois-Ponts.
- Surprisingly, results do not confirm for long positions that market reaction increase with lower prices.

**Calculation conducted over full period 1/1/2020 – 25/10/2021*

Evolution of the average market response (measured via the system imbalance reductions) per imbalance price level over 2020 and 2021*

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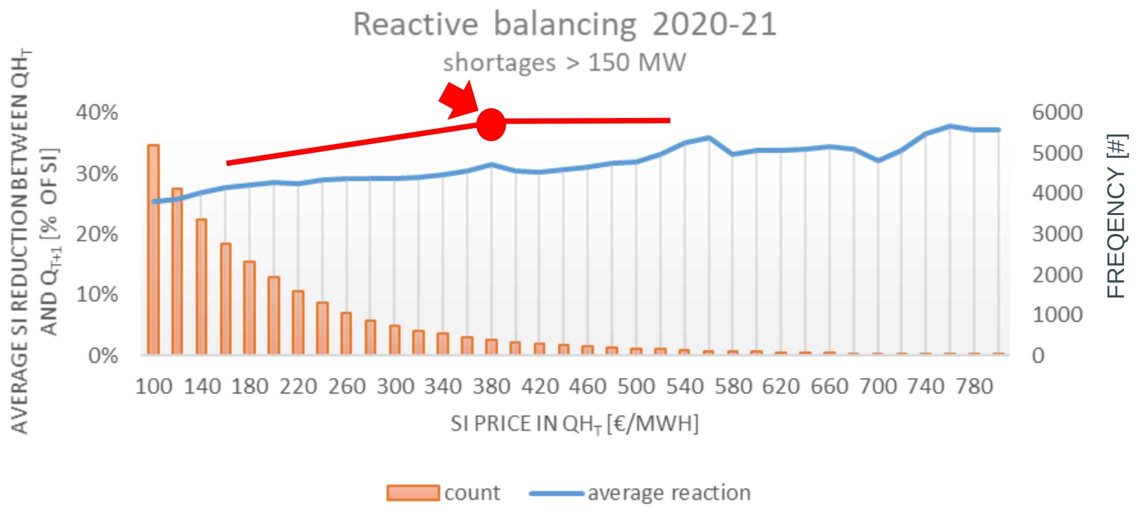
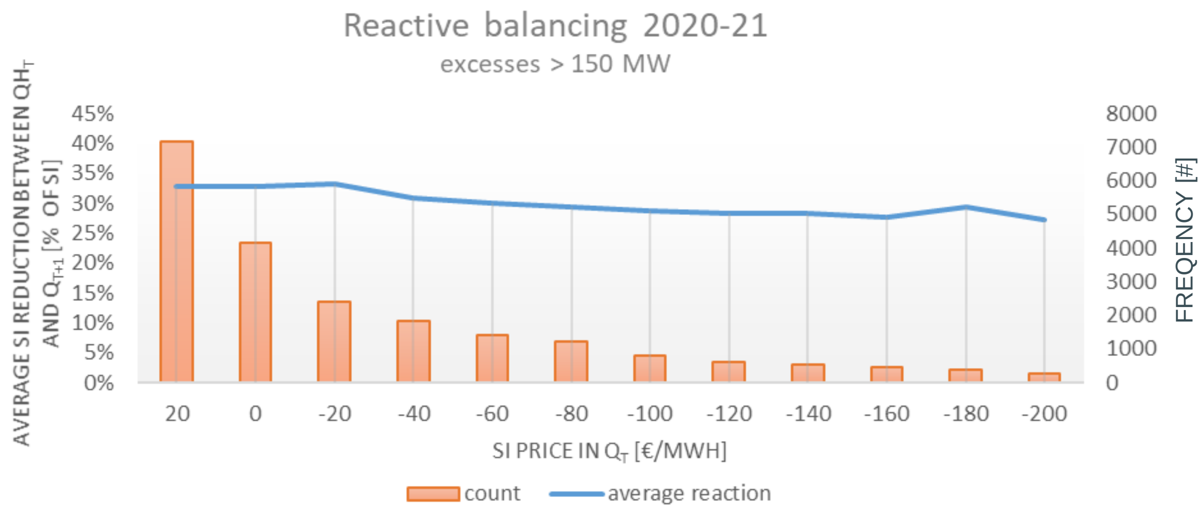
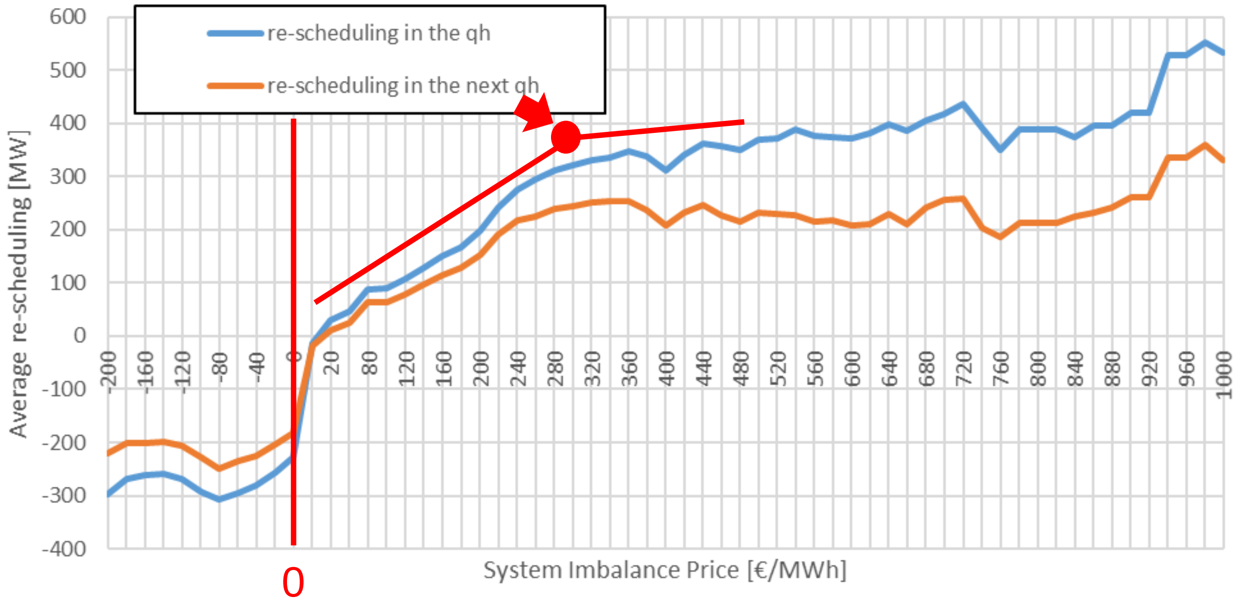


# In depth (2) : schedule deviations from the last nominations

- On average, most market reaction seems to be attainted after 300 €/MWh.
- Surprisingly, the additional market reaction at the downward side seems to already top off around 0 €/MWh

Evolution of the average market response (measured via the deviations from the last nominations of CIPU units) per imbalance price level *



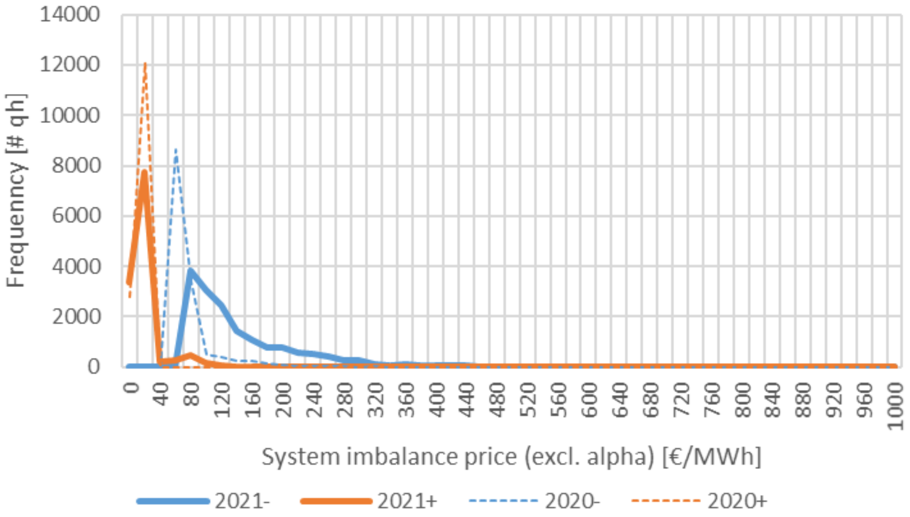



*Calculation conducted over full period 1/1/2020 – 25/10/2021

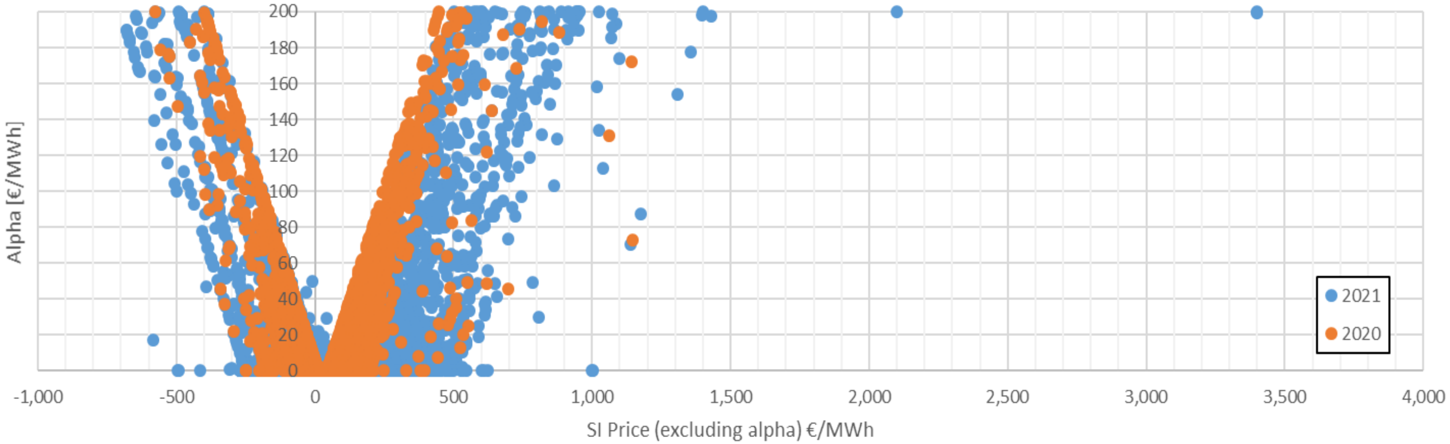
# 3. Relation with imbalance prices

Period 1/jan – Period 24/okt*

Comparison of imbalance price distribution between 2020 and 2021




Alpha value in relation of the system imbalance price without alpha in 2020 and 2021




Higher imbalance prices in 2021 compared to 2020 and this is particularly observed for short positions

This results in more periods where alpha is high while imbalance prices without alpha would have been high



**Short system positions are expressed as negative values (-), long system positions are expressed as positive values (+)*

# Conclusions of the assessment

- **When assessing a similar period in 2020 and 2021 (Jan 1 – Oct 24), observations confirm an increasing impact of the alpha-parameter on the imbalance costs for BRPs.**
    - The increasing frequency of high alpha periods is driven by negative system imbalance periods (shortages)
    - Higher imbalances in 2021 seem strongly related to the maintenance of Coo-Trois-Ponts
    - Too early to confirm trends, further monitoring on system imbalance trends is needed

- **Impact of the alpha on market reactions is difficult to quantify but observations over 2020 and 2021 confirm that higher prices do tend to result in higher market reactions which supports the use of the alpha.**
    - Observations confirm upward market reactions at higher prices (and increase seems to gradually top off above 400 €/MWh)
    - Observations confirm downward market reactions at lower prices (and surprisingly, no limited market reaction is observed below 0 €/MWh)

  + Stable system imbalances despite increasing renewables

- **In 2021, high alpha prices occur more frequently during periods with a high marginal incremental price. It can be questioned if an additional alpha at such moments is really effective…**

# 2. Proposal for re-calibration of the alpha parameter

# Re-calibration objectives

**Maintain alpha**

- Elia wants to maintain the alpha to :
  - Fortify incentives for portfolio balancing in order to manage system imbalances (and reserves)
  - Provide strong incentives during exceptional events (offshore) in order to avoid exceptional measures
  - After implementation of the EU balancing platforms, be able to maintain incentives during low (regional) imbalance prices while high (local) system imbalances (which should occur more frequently)

**Maintain general design**

- The alpha needs to be activated during elevated system imbalances :
  - Maintain the s-shaped curve providing an exponential behavior which fades out at very high system imbalances
  - Keep the lag effect limited to one period (alpha should not be dampened too much by previous periods)
  - Maintain sufficient elevated levels to have an impact (an increase of the price with only few percentages will not help)
  - Symmetric behavior for positive and negative system imbalances (to avoid a systematic bias)

**NEW**

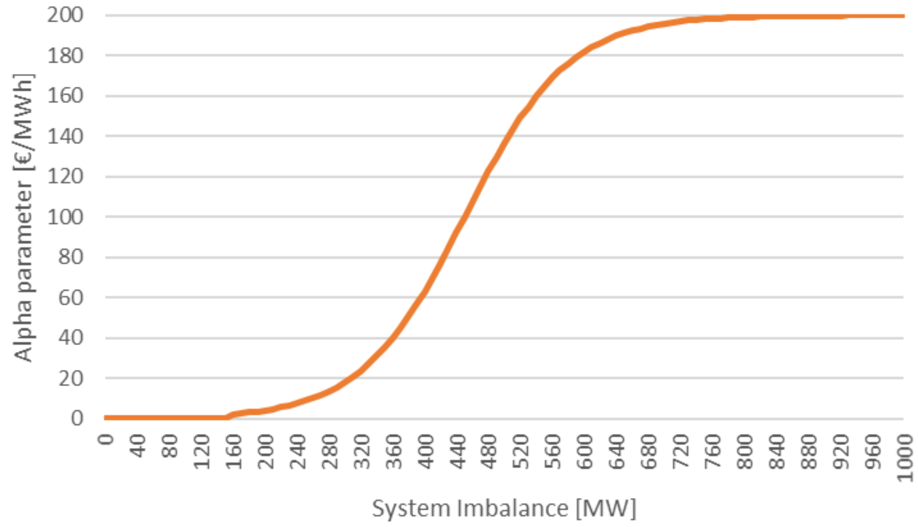
**Proposed improvement**

- **Implement a relation with the system imbalance price : phase out alpha at high imbalance prices**
  - When the SI price is too high (higher as the cost of the BRP to react), alpha does not trigger additional reactions

# Calibration parameter (CP)

$$\alpha_1 = a_1 + \frac{b_1}{1 + \exp(\frac{c_1 - x}{d_1})} * CP$$

Original alpha parameter




Calibration parameter


- Maintain the relation with the system imbalance in which the alpha increases with the system imbalance to a maximum of 200 €/MWh
- Multiply this with an additional relation with the total imbalance price which is gradually reduced when the total system imbalance price reaches a certain threshold
- The calibration is needed on :
  - At which price levels does the alpha starts decreasing (S1- ; S1+) ?
  - At which price levels is the alpha phased out (S2-; S2+) ?

  The slope of the curve has to ensure that the alpha is not phased out faster than the maximum increase in the imbalance cost

# Proposed calibration

**Up**

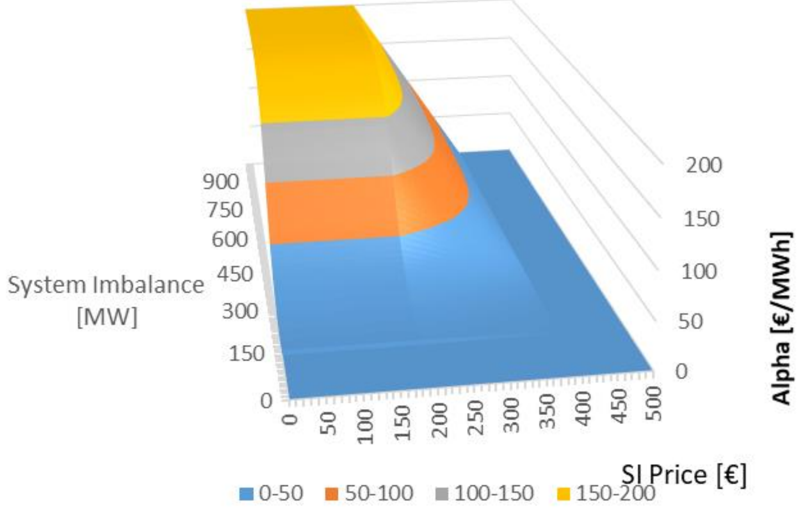
- S1+ : 200 €/MWh / S2+ : 400 €/MWh
- Observations indicate that most market reaction is obtainedaround 400 €/MWh
- This is in line with other analyses on market response (in framework of adequacy discussions) in the day-ahead market (cf. analysis of the strike price in the CRM)

**Down**

- S1- : 0 €/MWh / S2- : -200 €/MWh
- Observations indicate that the increase in market reaction slows down around 0 €/MWh
- Intuitively, no additional market response is expected below -200 €/MWh (cf. green certificate prices of wind)

This calibration brings back 2021 alpha cost to 2020 levels


*Illustration of 3-dimensioning relation of the alpha with the system imbalance and the imbalance price*



# 3. Impact assessment of the re-calibration

# Impact assessment

- The calibration of the parameters is validated in view of :
  - Impact on the total imbalance cost
  - Mitigating the effect during high price levels
  - Maintaining the effect on the low price levels

- Considering the time, a few simulation of the calibrated parameters should be conducted on 2020 (normal year) and 2021 (extreme year)

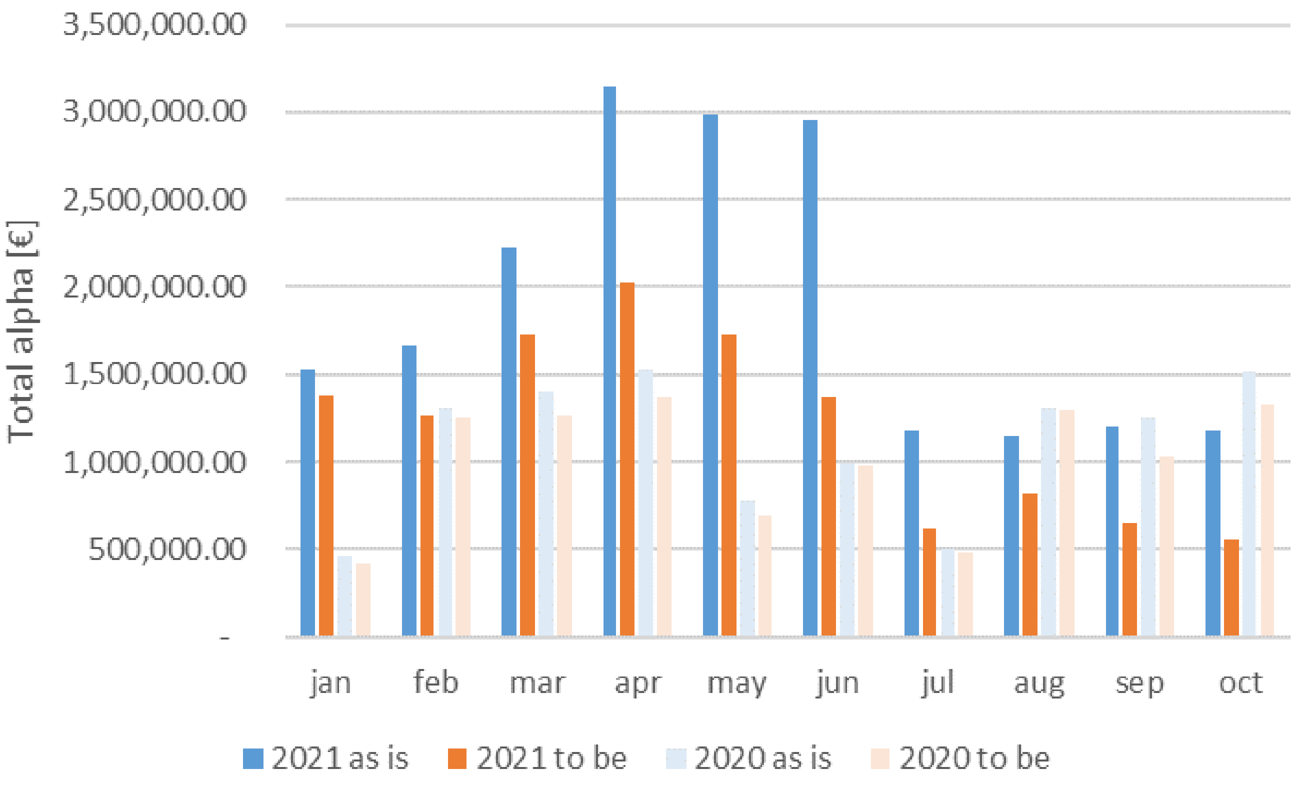
- Simulations confirm that the re-calibration mitigates the impact of high imbalance costs.

| Old Parameters | Value |
|---|---|
| a | 0 |
| b | 200 |
| c | 450 |
| d | 65 |
| T | 2 |
| Threshold | 140 |

| New Parameter | No cap | Lower | Mid | Higher |
|---|---|---|---|---|
| Start (S1+) | | 200 | 200 | 300 |
| Stop (S2+) | | 400 | 400 | 500 |
| Start (S1-) | | 0 | -100 | -100 |
| Stop (S2-) | | -200 | -300 | -300 |
| 2020 [M€] | 11,0 | 10,1 | 10,6 | 10,8 |
| 2021 [M€] | 19,2 | 12,2 | 13,9 | 15,4 |

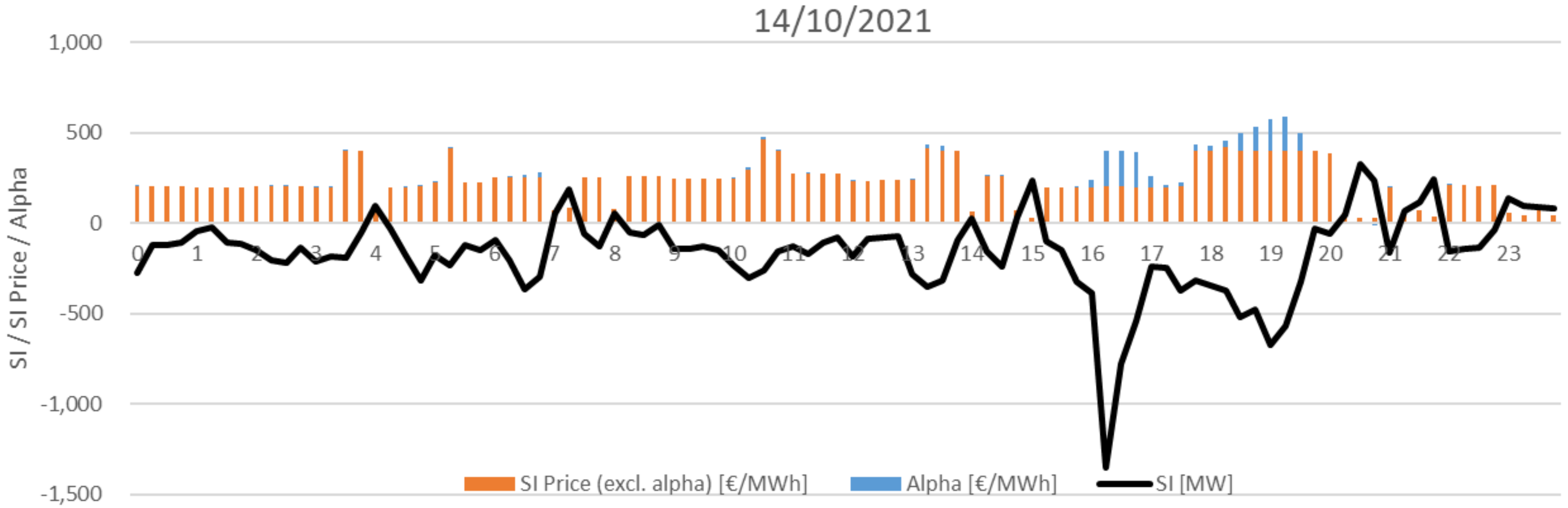
Proposal

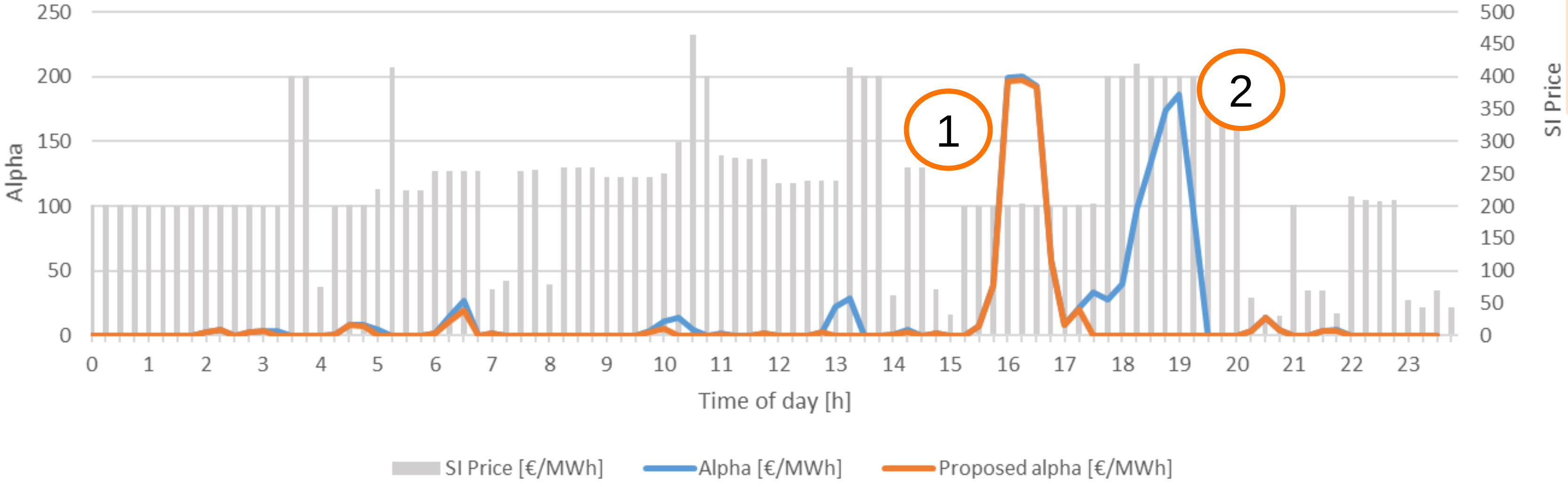
# Total costs of the alpha parameter per month




- In 2021, with high imbalance prices, the new alpha substantially cuts down the alpha costs, particularly during the high imbalance costs months.
- In 2020, with normal imbalance prices, the new alpha calibration has only a slight diminishing effect.

# Negative imbalance example




Maintains identical alpha when prices remain relatively low 1

Mitigates the alpha when prices are already sufficiently high 2

Total impact on the system imbalance cost on that day is reduced from 258 k€ to 148 k€

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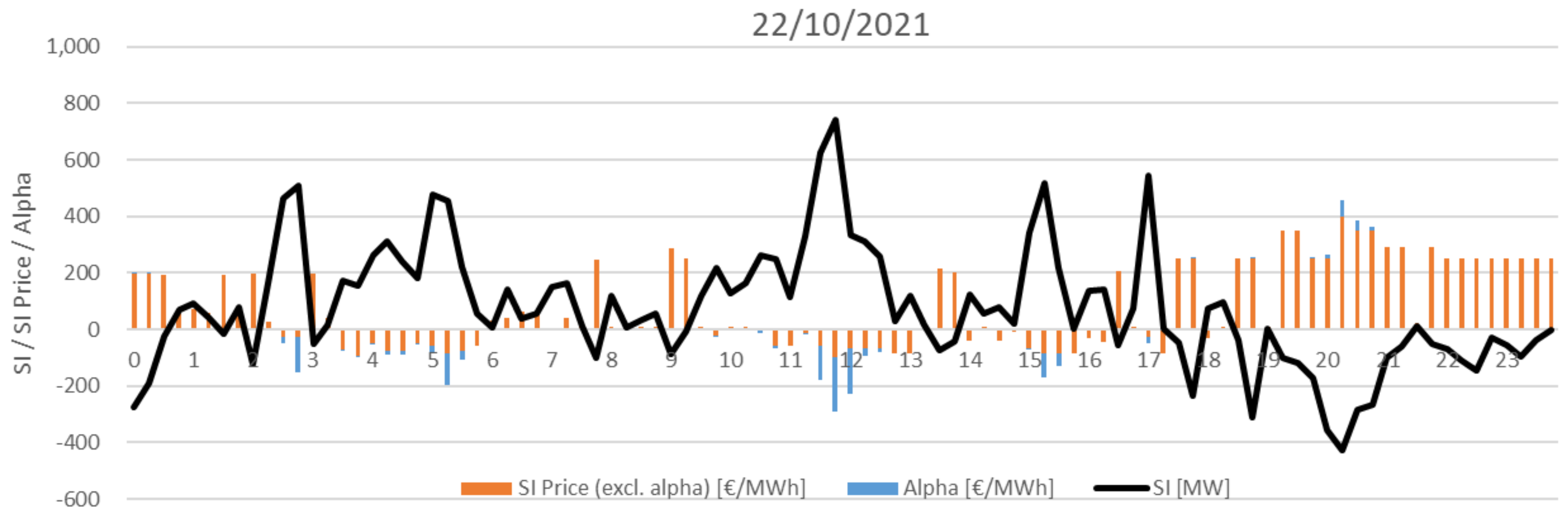
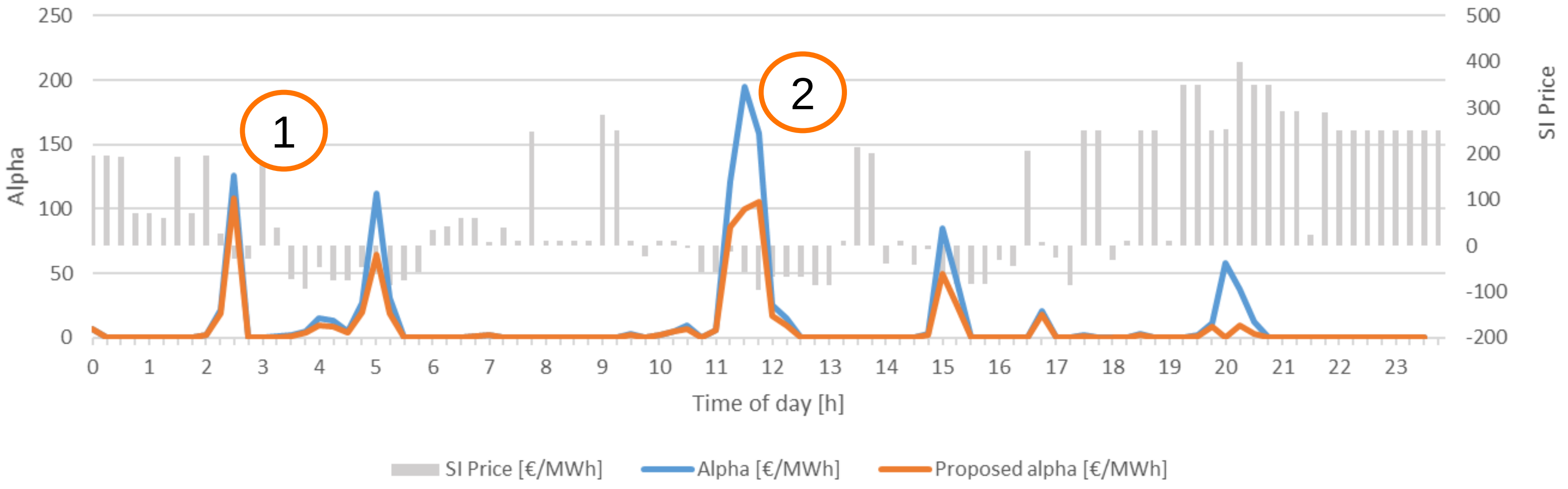
# Positive imbalance example



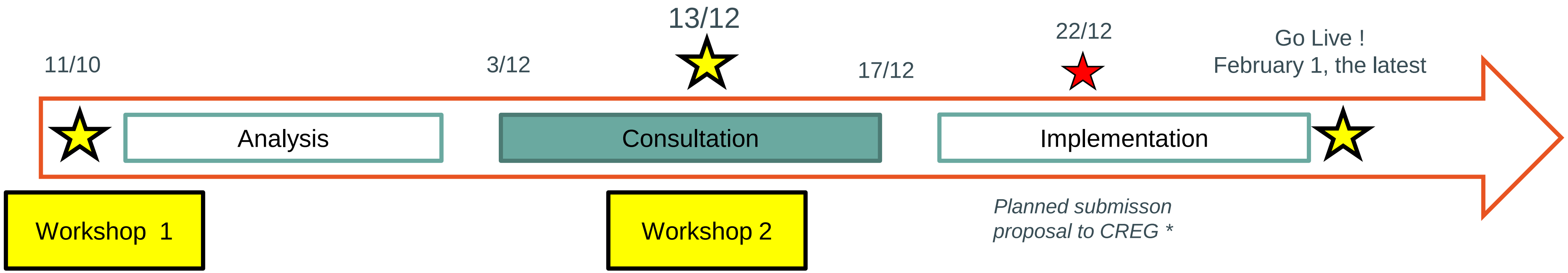

Maintains identical alpha when prices remain relatively low (1)

Reduces the alpha when prices are already sufficiently high (2)

System imbalance is reduced from 140 k€ to 85 k€

# Conclusions and next step

# Proposed implementation approach for a recalibrated alpha factor.




- Market parties indicated that the current alpha weighs on the total imbalance costs while imbalance prices are currently already very high, rendering the application of a price adder less relevant. The assessment of Elia confirmed this effect and Elia proposes to recalibrate the alpha to mitigate this issue. Simulations confirm the effect of the re-calibrated alpha on the total imbalance costs.

- It is clear that the shorter the implementation trajectory, the more positive the effect is for market parties. In that respect, Elia investigates the possibility to implement the “new alpha, as soon as possible in 2022 (aiming at February 1, the latest) :
  - A modification of the alpha parameter needs to follow the formal procedure for the introduction and approval of the tariff proposal - Decision(B)658E/62
  - Elia therefore planned / plans to :
    - Starting a shortened public consultation of two weeks, Friday December 3 to Friday December 17, 2021
    - Presenting and discussing the proposal during the workshop of Monday December 13, 2021
    - Submit its proposal to CREG on December 22, 2021



**Subject to sufficient market support and timely finalisation of the consultation report*