

# BZR CG meeting

14 December 2022, online meeting



# Agenda

- 1. Pan-EU studies (20 minutes):**
  1. Market liquidity and transaction cost: data collection status (10 minutes)
  2. Transition costs: update on questionnaire (10 minutes)
- 2. Indicators to be assessed in BZR (60 minutes)**
- 3. Coffee break (10 minutes)**
- 4. Updated timeline (15 minutes)**
- 5. Public consultation (15 minutes)**
- 6. BZRRs update (45 minutes)**
  1. Fallback configurations for Germany (20 minutes)
  2. BZRR updates (25 minutes)
- 7. Next steps and general Q&A (15 minutes)**

# Market liquidity and transaction cost

## Data collection process

Feedback from the consultative group suggests additional areas of analysis to better cover the study – TSOs try to address and incorporate the feedback in data analysis.

### Stakeholder comments

- Lack of data representativity for intra-company transactions on short term market liquidity
- Correlation analysis does not correspond to real practice of cross-border hedging practices

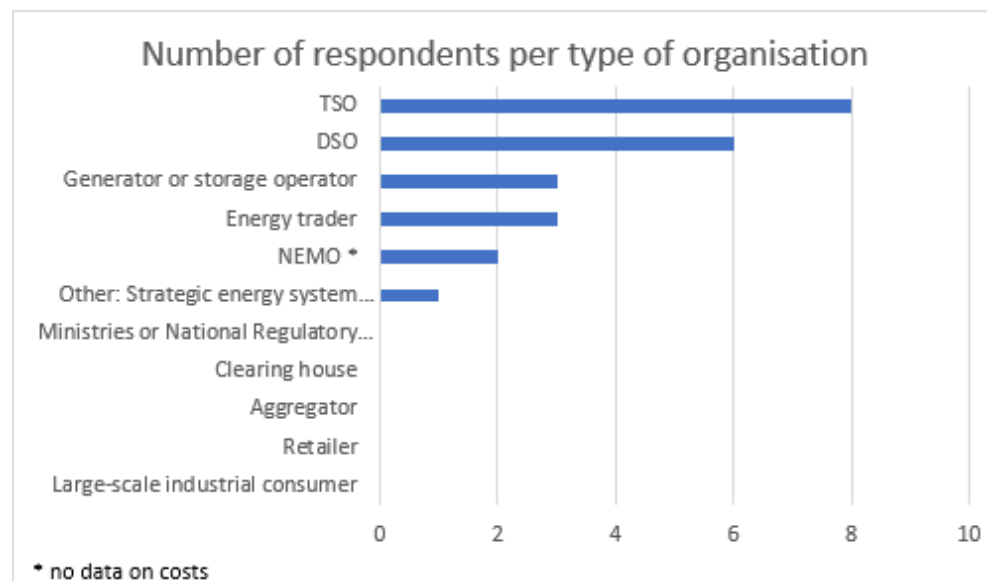
### Specifications from the Methodology

- The Methodology does not specify all details of the study approach
- It differentiates between short term and long term market liquidity but shies away from an exhaustive list of markets and products to be considered
- Forward markets: It calls for minimum elements [Article 15.6] (such as volume, churn ratio, **average of lowest B-A spread**, impacts caused by changes in competition) and includes further elements that may be analysed
- *A descriptive analysis of liquidity aiming to describe the starting point of market liquidity in the concerned BZs. The analysis shall at least include the following indicators:*
  - 1. the volume of trade in organised and non-organised markets; and
  - 2. average of the lowest bid-ask spread per period that is relevant for market
- participants with hedging needs, for the most frequently traded product(s).

	churn rates / traded volumes	retail risk premium	B/A spread	Market depth indicators: bid curve analysis / order book analysis	Data provider
Intraday market	✓		✗	✗	ACER 2019-2021
Day-ahead market	✓	✓		✗	NEMOs (& ACER) 2014-2021
Forward markets	EEX (2016-2021) ✓ NASDAQ (2016-2021) ✓		ICE (2016-2021): ✓ full tick data for CE and Nordic	✗	EEX/NASDAQ/ICE
Timeframe	Add 2016 and 2021				
Legend	<span style="display:inline-block; width:15px; height:15px; background-color:teal; border:1px solid black;"></span> Additional analysis requested <span style="display:inline-block; width:15px; height:15px; background-color:orange; border:1px solid black;"></span> Analysis included		<span style="display:inline-block; width:15px; height:15px; background-color:lightgray; border:1px solid black;"></span> Analysis neither requested nor included <span style="display:inline-block; width:15px; height:15px; background-color:lightgreen; border:1px solid black;"></span> Adjusted scope		

# Transition cost study

## General overview of the answers received (data existence)



BZ reconfiguration	Number of responses per cost category
DE1	20
DE2	19
DE3	38
DE4	38
DE5	19
FR3	18
IT2	17
NL2	18
SE3	34
SE4	34
Total	255

Overall 24 companies/organisations participated in the questionnaire.

There are no responses from Ministries/NRAs, Clearing houses, Aggregators, and Retailers and Large-scale industrial consumers.

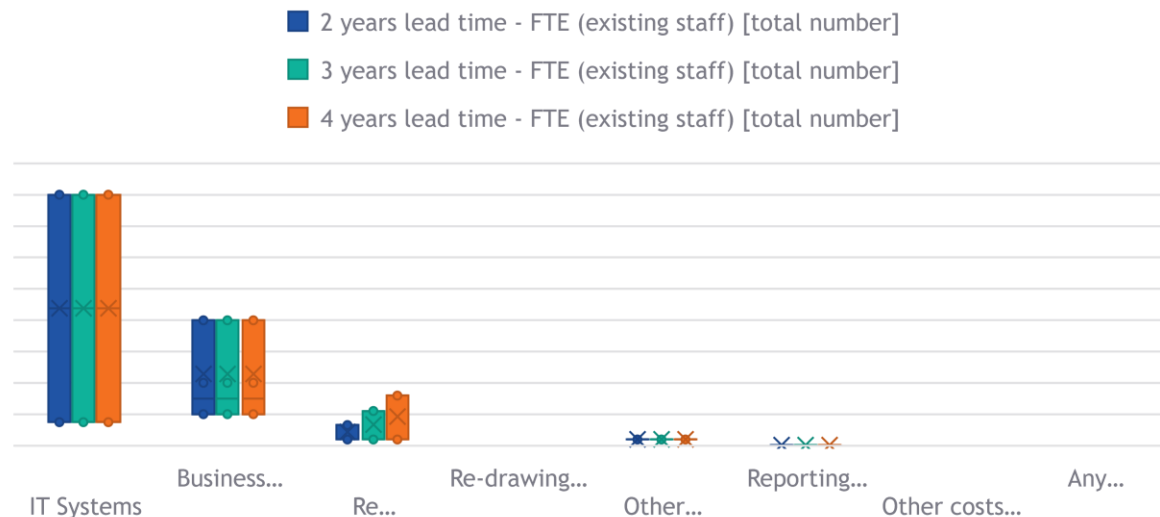
For the organisations who responded, there is little or no variation in the estimated cost data.

Most responses were given for the proposed BZ reconfigurations in Germany and Sweden, less for Italy, the Netherlands and France

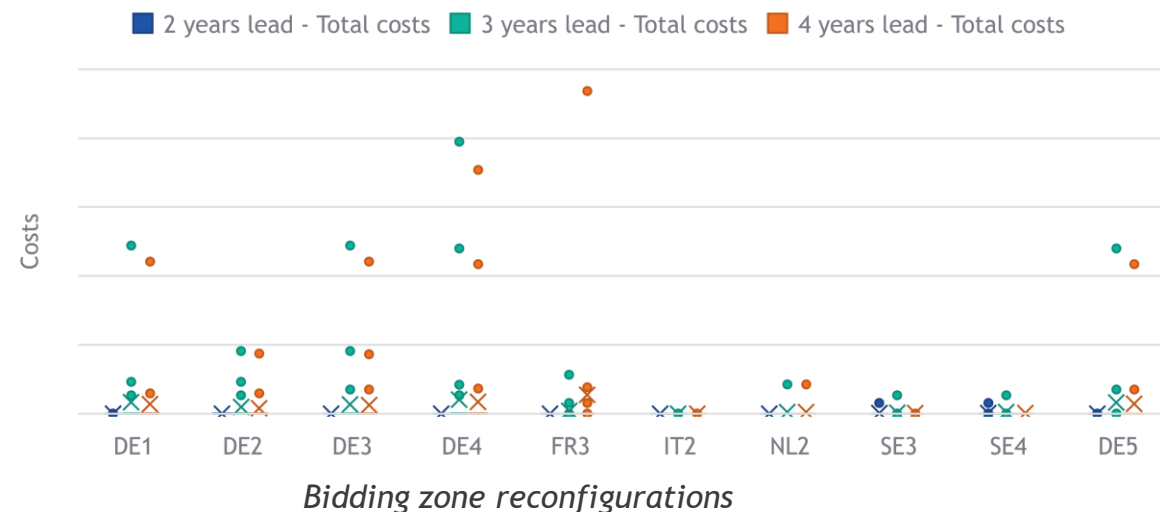
# Transition cost study

## General overview of the answers received (data quality)

Example: cost category assessment



Example: Bidding zone reconfiguration assessment



- **Because of the data situation, we expect to have 3 different groups:**

- Cost estimates with low uncertainty (mainly TSOs)
- Cost estimates with significant uncertainty (mainly DSOs, generators, energy traders)
- No data for cost estimates (large industrial consumers, retailers, aggregators, clearing houses, NRAs)

# Indicators to be assessed in BZR



# Indicators: background and scope of the presentation

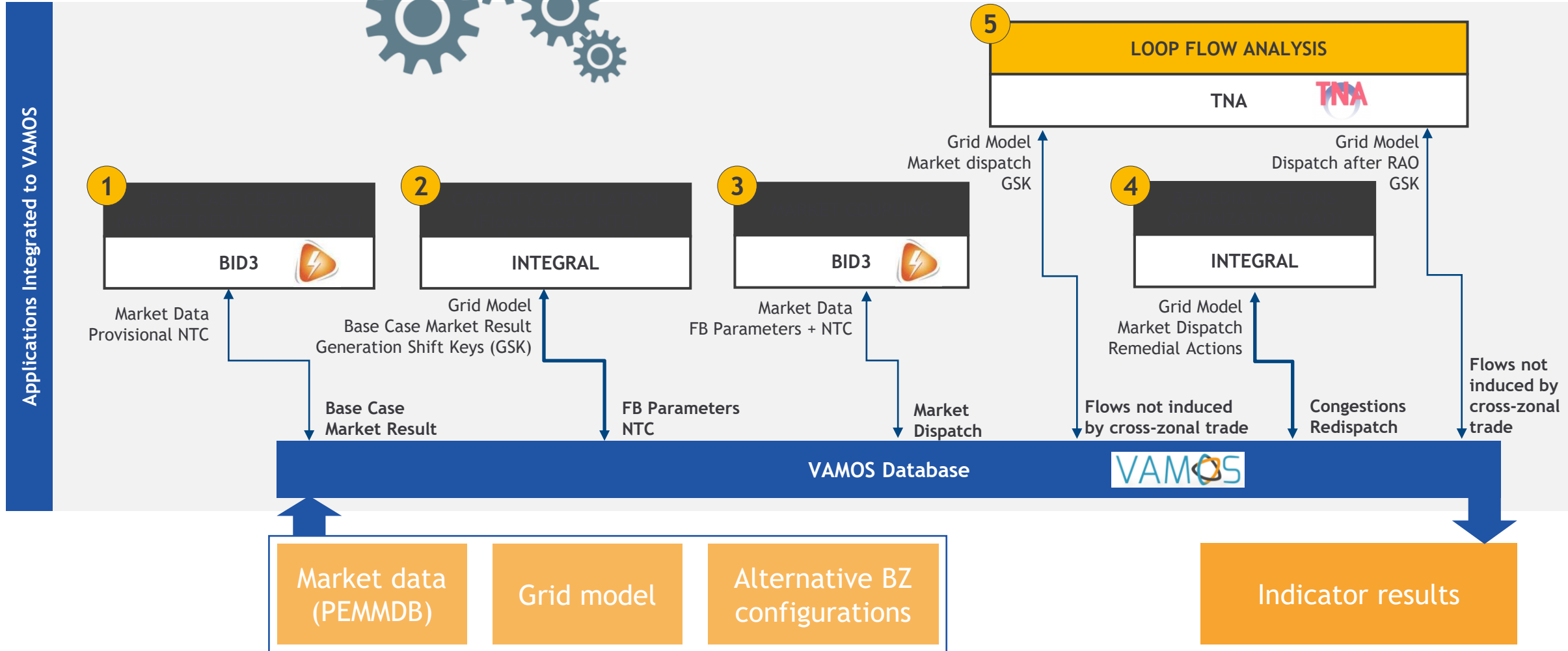
## Background

- CE region and Nordic region aligned on the common understanding of the methodologies and developed common descriptions for each indicator.
- Despite using different tool chains in the two regions, the objective is to assess all indicators in an aligned way. The assessment will be done in a quantitative way, if feasible. If this is not feasible, a qualitative assessment **will be done**.

## Scope

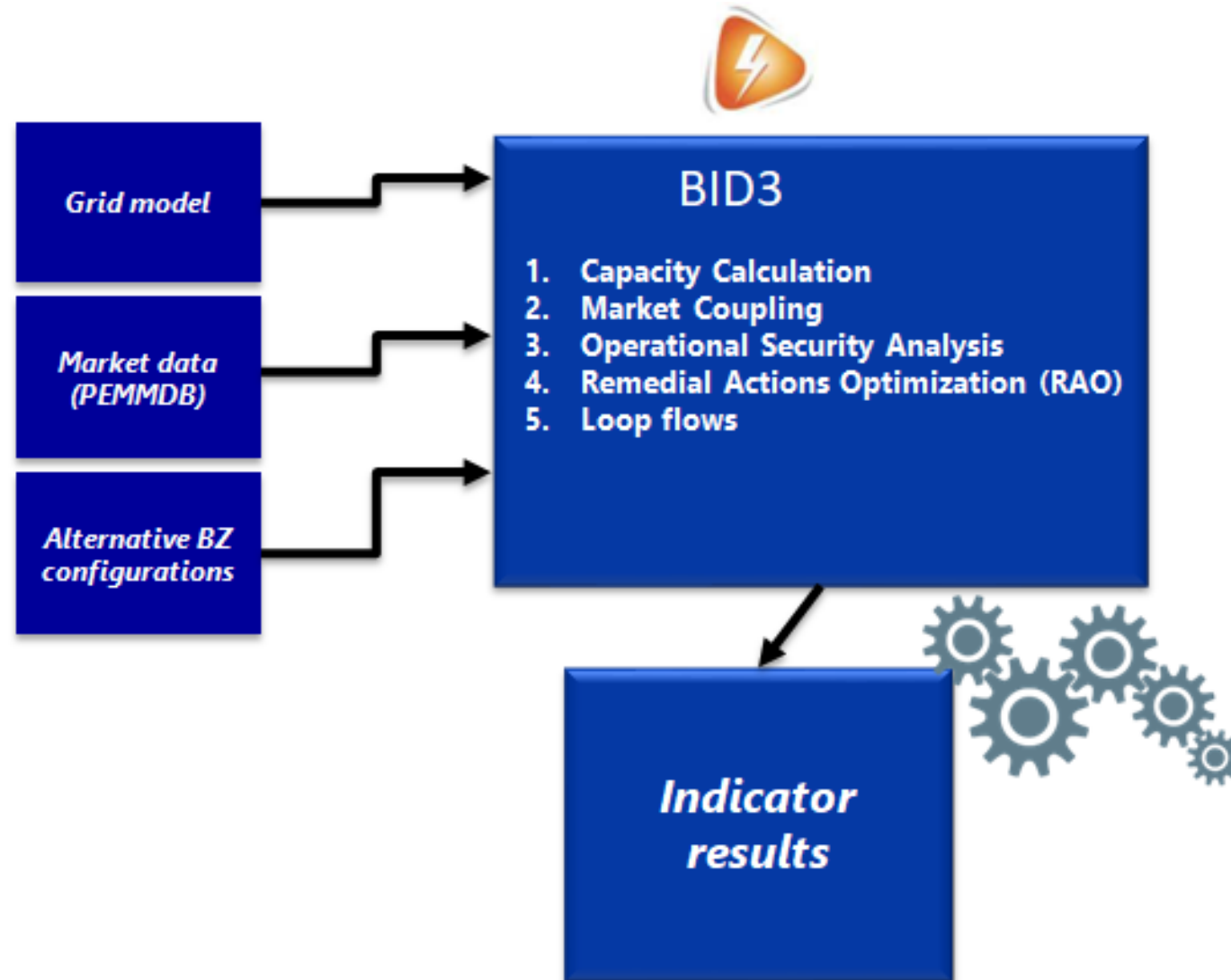
- A high-level overview of the indicator assessment
  - With this introductory presentation we would like to invite you to formulate any questions you might have on specific indicators before the end of this year (2022), as input for our next CG meeting.
- We would like to underline the limitations that the TSOs are facing, given that there are not many degrees of freedom in the methodology regarding the assessment of the indicators.
- We are open to your reflections; potentially some guidance can be incorporated in the review easily without violating the methodology.

# CE tool chain





# Nordic BZRR modelling chain

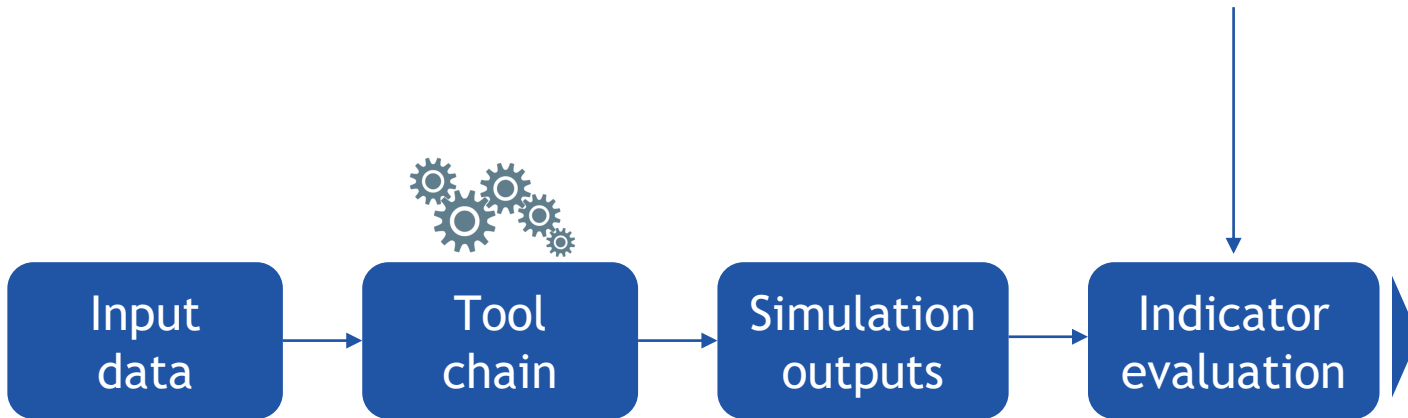


# The process for the assessment as defined by the methodology



# Indicator assessment

- TSOs need to follow the BZR methodology
- Please note that there are not many degrees of freedom in the methodology, i.e. a “mechanical exercise”
- This holds to a large extent for the Article 15. Evaluation approach per criterion as well



1.1. Table I – Ranking and acceptability of BZ configurations

BZ configuration	Monetised benefits [€/year]	Transition costs [€]	Minimum lifetime [years]	Accepted/Rejected	Justification
1	10	20	2	Accepted	
2	15	30	2	Rejected	
...					
n					

1.2. Table II – Short-term effects

BZ configuration	Operational security		Market liquidity and transaction costs		Short-term integration of RES	
	Performance	Justification (or reference to it)	Performance	Justification (or reference to it)	Performance	Justification (or reference to it)
1	+/- or a more detailed scale					
2						
...						
n						

1.3. Table III – Long-term effects

BZ configuration	Facilitation of effective competition (long-term)		Facilitation of effective competition (relative access to cross-zonal capacity)		Long-term integration of RES	
	Performance	Justification (or reference to it)	Performance	Justification (or reference to it)	Performance	Justification (or reference to it)
1	+/- or a more detailed scale					
2						
...						
n						

## 22 indicators to be assessed

### Network security

1. Operational security
2. Security of supply
3. Uncertainty in cross-zonal capacity calculation

### Market efficiency

4. Economic efficiency
5. Firmness costs
6. Market liquidity & transaction costs
7. Market concentration & market power
8. Effective competition
9. Price signals for building infrastructure
10. Accuracy & robustness of price signals
11. Transition costs
12. Infrastructure costs
13. Market outcomes in comparison to corrective measures
14. Adverse effects of internal transactions on other BZs
15. Impact on operation and efficiency of balancing

### Stability & robustness of BZs

16. Stability & robustness of price signals over time
17. Consistency across capacity calculation time frames
18. Assignment of generation and load units to BZs
19. Location and frequency of congestion, market and grid

### Energy transition

20. Short-term effects on carbon emissions
21. Short-term effects on RES integration
22. Long-term effects on low-carbon investments

# Indicators to be assessed

Network security	Market efficiency	Stability & robustness of BZs	Energy transition
<ol style="list-style-type: none"> <li>1. Operational security</li> <li>2. Security of supply</li> <li>3. Uncertainty in cross-zonal capacity calculation</li> </ol>	<ol style="list-style-type: none"> <li>4. Economic efficiency</li> <li>5. Firmness costs</li> <li>6. Market liquidity &amp; transaction costs</li> <li>7. Market concentration &amp; market power</li> <li>8. Effective competition</li> <li>9. Price signals for building infrastructure</li> <li>10. Accuracy &amp; robustness of price signals</li> <li>11. Transition costs</li> <li>12. Infrastructure costs</li> <li>13. Market outcomes in comparison to corrective measures</li> <li>14. Adverse effects of internal transactions on other BZs</li> <li>15. Impact on operation and efficiency of balancing</li> </ol>	<ol style="list-style-type: none"> <li>16. Stability &amp; robustness of price signals over time</li> <li>17. Consistency across capacity calculation time frames</li> <li>18. Assignment of generation and load units to BZs</li> <li>19. Location and frequency of congestion, market and grid</li> </ol>	<ol style="list-style-type: none"> <li>20. Short-term effects on carbon emissions</li> <li>21. Short-term effects on RES integration</li> <li>22. Long-term effects on low-carbon investments</li> </ol>

A table with further information will be shown in the Consultative Group meeting. Questions on specific indicators can be formulated, before the end of this year (2022), so that we can address them in our next CG meeting.

# Indicator overview

Indicator	Assessed? (yes/no)	If not assessed, justification	If assessed, quantitative or qualitative
1. Operational security	Yes		Quantitative - according to the BZR methodology
2. Security of supply	No	BZR methodology requests assessment of probabilistic indicators (LOLE, EENS) though application of ERAA methodology considering network within and between BZs; not possible within the available time and resources	
3. Uncertainty in cross-zonal capacity calculation	Yes - Implicitly		Implicitly - according to the BZR methodology, relates to FRMs of CNECs used in capacity calculation; considered implicitly monetized by “Economic Efficiency” criterion.
4. Economic efficiency	Yes		Quantitative - according to BZR Methodology, based on change of socio-economic welfare (SEW) at EU level, as sum of: <ul style="list-style-type: none"> <li>- Market SEW change by market dispatch module</li> <li>- Additional costs change derived by RAO module</li> </ul>

# Indicator overview

Indicator	Assessed? (yes/no)	If not assessed, justification	If assessed, quantitative or qualitative
5. Firmness costs	Yes - Implicitly		According to the BZR methodology - RAO assumes that the allocated cross-zonal capacity is always guaranteed by applying the necessary remedial actions; indirectly monetized as part of the “Economic efficiency” criterion
6. Liquidity and transaction costs	Yes		Quantitative - according to the BZR methodology, based on a study, conducted for the whole EU
7. Market concentration and market power, i) in wholesale markets, ii) in TSOs’ mechanisms to resolve physical congestions	Yes i. Quantitative ii. Implicitly		i) Quantitative - according to the BZR methodology, based on the RSI/PSI and/or HHI indicator. ii) Implicitly, based on ACER's feedback: from a decrease in market power in wholesale markets, an increase in market power in congestion management markets will be concluded and vice versa.



# Indicator overview

Indicator	Assessed? (yes/no)	If not assessed, justification	If assessed, quantitative or qualitative
8. Facilitation of effective competition i. 'Short-term competition', ii. 'Long-term competition' iii. 'Competition for cross-zonal capacity'	Yes i. Implicitly ii. Implicitly iii. Quantitative		i. Implicitly, based on indicators #6 (market liquidity) and #7 (market concentration and market power). ii. Implicitly, based on indicators #10 (accuracy and robustness of price signals) and #9 (price signals for building infrastructure) iii. Quantitative, according to BZR Methodology, based on the analysis of structural differences in zonal PTDFs
9. Price signals for building infrastructure i. Generation or demand assets; and ii. Network infrastructure.	Yes i. Implicitly ii. Quantitative		i. Implicitly, based on indicator #10 (accuracy and robustness of price signals) ii. Quantitative, according to BZR Methodology, based on the percentage of time when the physical congestion was not previously detected in the DAM
10. Accuracy and robustness of price signals	Yes		Quantitative -correlation between volume-weighted average nodal prices and the zonal day-ahead market prices

# Indicator overview

Indicator	Assessed? (yes/no)	If not assessed, justification	If assessed, quantitative or qualitative
11. Transition costs	Yes		Quantitative - according to the BZR methodology, based on a study, conducted for the whole EU
12. Infrastructure cost	Yes - Implicitly		Implicitly - according to the BZR methodology, based on the comparison of the results of indicator #10 (Accuracy and robustness of price signals) and #9 (Price signals for building infrastructure).
13. Market outcomes in comparison to corrective measures	Yes - Implicitly		Implicitly - according to the BZR methodology, relates to the total remedial action costs; monetized in indicator #4 "Economic Efficiency".
14. Adverse effects on internal transactions on other BZs i. Flows not induced by cross-zonal trade ii. Impacts derived from inaccurate price signals	Yes		i. Quantitative - assessed by means of two loop flows indicators a) Average share of loop flows on network elements and b) Number of occurrences (hours) with loop flows ii. Implicitly, based on the comparison of the results of indicator #10 (Accuracy and robustness of price signals) and #9 (Price signals for building infrastructure).
15. Impact on the operation and efficiency on i) the balancing mechanisms and ii) imbalance settlement processes	No - Implicitly	i. BZR methodology requests assessment of a) balancing reservation costs, b) co-optimisation, c) activation costs, d) effects of remedial actions; not possible within the available time and resources. Partially included in indicator #4 (Economic Efficiency)	ii. Implicitly - based indicator #10 (Accuracy and robustness of price signals).

# Indicator overview

Indicator	Assessed? (yes/no)	If not assessed, justification	If assessed, quantitative or qualitative
16. Stability & robustness of price signals over time	Yes		Quantitative - based on the assessment of indicator #4 “Economic Efficiency” for the majority of sensitivity scenarios
17. Consistency across capacity calculation time frames	No	According to the BZR Methodology, “the impact of alternative BZ configurations on this criterion shall not be considered as dependant on the BZ configuration since the consistency across capacity calculation timeframes is a regulatory requirement.”	
18. Assignment of generation and load units to BZs	Yes - as prerequisite		Qualitative - all alternative BZ configurations should meet this prerequisite; in case this prerequisite is not met, then the alternative BZ configuration may be 'rejected'
19. Location and frequency of congestion, market and grid	Yes		Quantitative - percentage of time when the physical congestion was not previously detected in the day-ahead market, and the share of market congestions which occurred on cross-zonal network elements over the total market congestions on internal and cross-zonal network elements according to the indicator

# Indicator overview

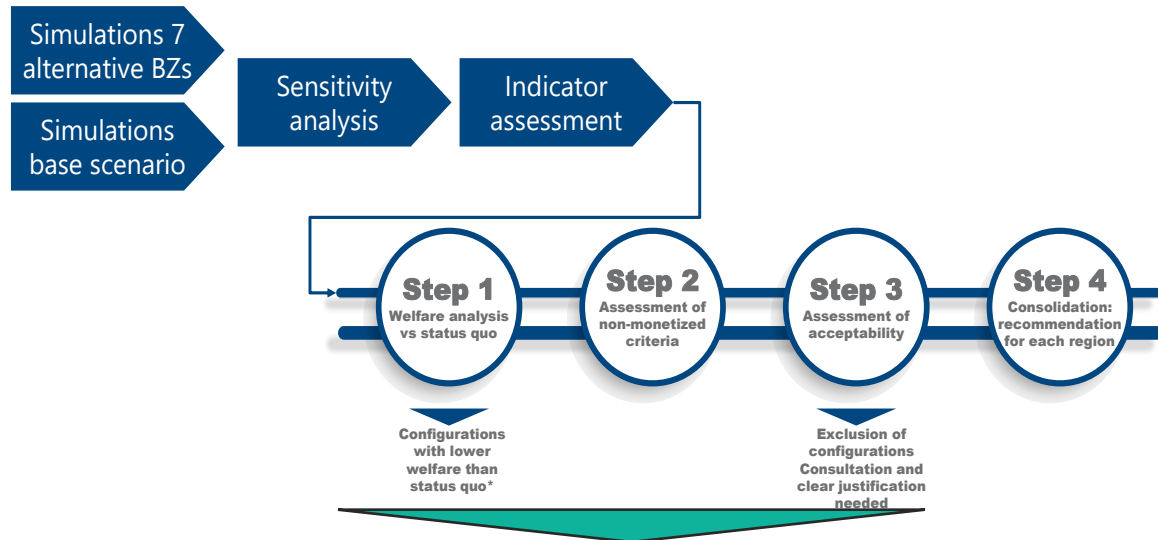
Indicator	Assessed? (yes/no)	If not assessed, justification	If assessed, quantitative or qualitative
20. Short-term effects on carbon emissions	Yes		Quantitative - based on the simulated overall volume of CO2 emissions, after optimisation of remedial actions, for the different BZ configurations under investigation.
21. Short-term effects on RES integration	Yes		Quantitative - based on the total amount of simulated fed-in energy from RES, after optimisation of remedial actions, for the different BZ configurations under investigation.
22. Long-term effects on low-carbon investments	Yes - as derivative		Quantitative - based on the comparison of the results of two other criteria: 'Accuracy and robustness of price signals' (#10) and 'Price signals for building infrastructure' (#9)



## BZR Timeline: update

# Updated timeline BZR: 6 additional months

Additions in ACER's decision on alternative BZ configurations and modelling complexity experienced by the BZRRs triggers TSOs to request a six-month delay to ACER.

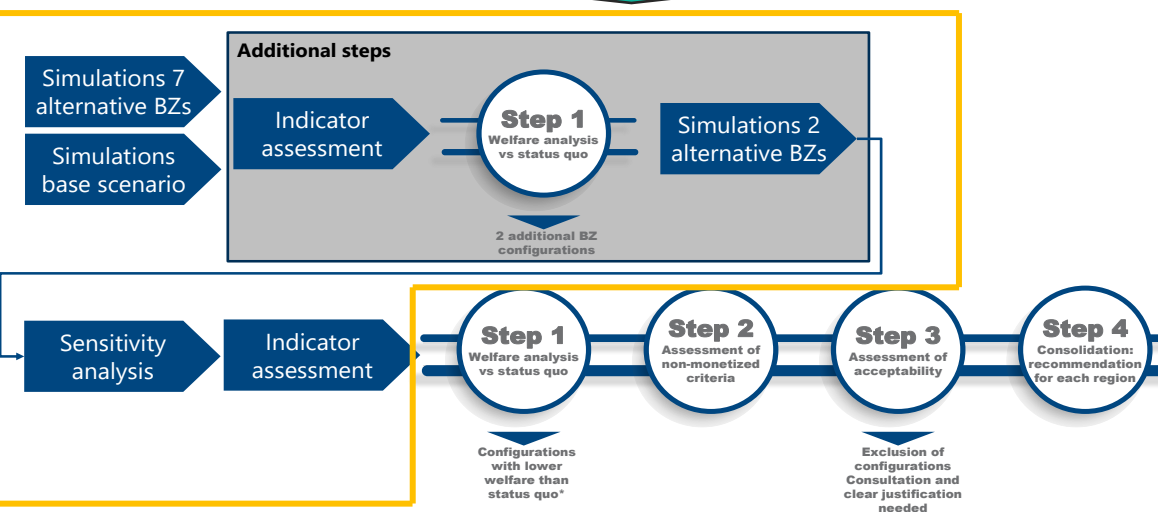


## Why are TSOs asking for a six-month delay? Explanation

- ACER's decision on alternative BZ configurations introduced a two-step approach for CE BZRR;
- ACER acknowledged this addition may involve a risk of delay for the BZR study (acknowledged by Board of Regulators on 13 July 2022);
- Complexity involved with simulation toolchain of several modules:
  - degree of freedom to distribute and prioritise computations is compromised with selection of two alternative configurations,
  - Efficiency loss encountered in the process.
- Intermediate monetary assessment of the 7 BZ configurations is followed by the determination of the 2 new BZ configurations (CE SC decision needed before next steps);
- Sensitivity analysis can be run only after the selection and configuration, followed by the indicator assessment and 4 evaluation steps.

## Benefits of 6 additional months to performing BZR:

- BZRR Nordic may perform an additional sensitivity on the influence of dry years;
- An additional consultation on preliminary results may be launched (under assessment), after the public consultation, fulfilling BZR CG request;
- Increase the scope of liquidity study (under assessment), by including additional years, considering feedback from BZR CG and ACER;
- Delay in start of the public consultation to May, allowing TSOs to include a two-week alignment time with ACER/NRAs on the preliminary report on pan-EU studies as requested by ACER and NRAs before the public consultation.



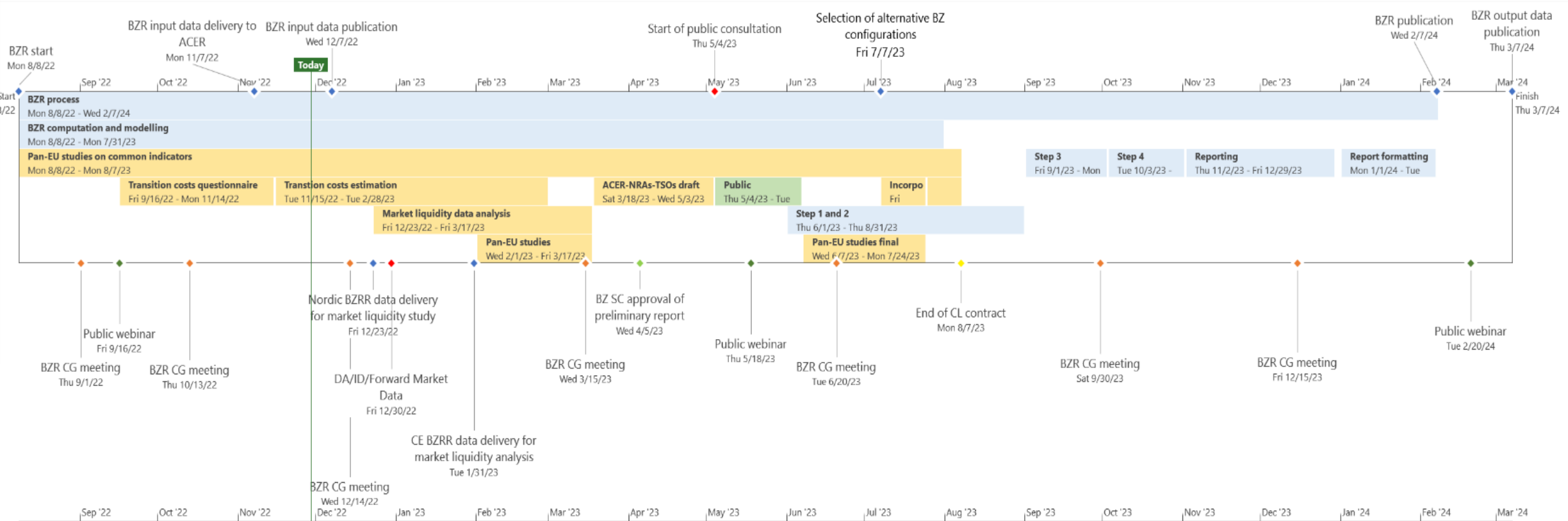
Visual representation of two-step approach

# BZR updated timeline: six-month delay

Preliminary overview of updated timeline with the six-month delay depicted below.

Public consultation will be in May 2023

Work in progress







# Public consultation

# Update on public consultation

- In the consultative group physical meeting on 13/10, TSOs presented the methodological requirements for the public consultation.
- Some consultative group members expressed their wishes towards TSOs to go beyond the requirements of the methodology:
  - TSOs are willing to consider proposals from the BZR CG, primarily in line with the categories set by the BZR Methodology; proposals outside these categories might not be analyzed but accounted for in an annex.
  - TSOs intend to share the draft of the questionnaire with the consultative group and ACER for comments prior to the launch of the public consultation.
- Independently of the formal public consultation, both BZRR express their intention to share and discuss preliminary simulation results with the consultative group.

## Pan-EU studies: Content of the public consultation

### Requirements according to Art. 17 the methodology

No later than six months after the start of the BZR, TSOs of a BZRR shall hold a public consultation regarding at least the following aspects of the BZR: the impacts of alternative BZ configurations on at least the following criteria:

Pan-EU Studies	Measures to mitigate negative impacts	Practical implementation considerations
<p>a) <i>Market liquidity and transaction costs' and 'Transition costs</i></p> <p>Identified risk: As part of the liquidity study, a correlation analysis is carried out which needs market simulation data as an input. Due to the two-step approach in determining the combinations, the market simulation results for the combinations may not be there in time for meeting the 6 months deadline of the public consultation. Possible solution: Placeholder in the draft liquidity study report for combinations</p>	<p>b) <i>possible measures to mitigate negative impacts of specific alternative BZ configurations with regard to at least the criteria listed in point 4(a) of this article (market liquidity and transaction costs and transition costs</i></p>	<p>c) <i>identification of practical considerations which may need to be considered in case of a possible BZ configuration change as set forth in Article 14(10)* of the Electricity Regulation, including possible timescales for implementation of alternative BZ configurations</i></p>
<p>Get stakeholders' feedback on the Pan-EU studies. Hence, this requires the (draft) report of the Pan-EU studies that is accessible for stakeholders</p>	<p>Get stakeholders' feedback on (policy) measures that can help overcome negative liquidity effects of BZ splits</p>	<p>Get stakeholders' feedback on practical considerations, particularly on implementation dates</p>

*Italicized font = text of the methodology*

\*Article 14(10): Any decision adopted under this Article shall specify the date of implementation of any changes. That implementation date shall balance the need for expeditiousness with practical considerations, including forward trade of electricity. The decision may establish appropriate transitional arrangements.

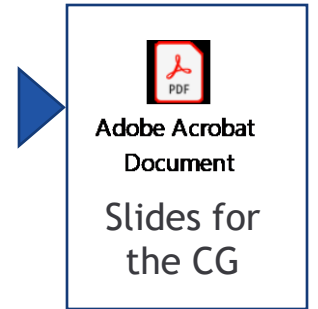
# Update from BZRRs

# Update from BZRR Central EU

## Fallback configurations

- The following slides have been prepared for the discussion with the CG on Dec 14.

**→ Please click the file to open it for presentation purposes**



# Update from BZRR Central EU

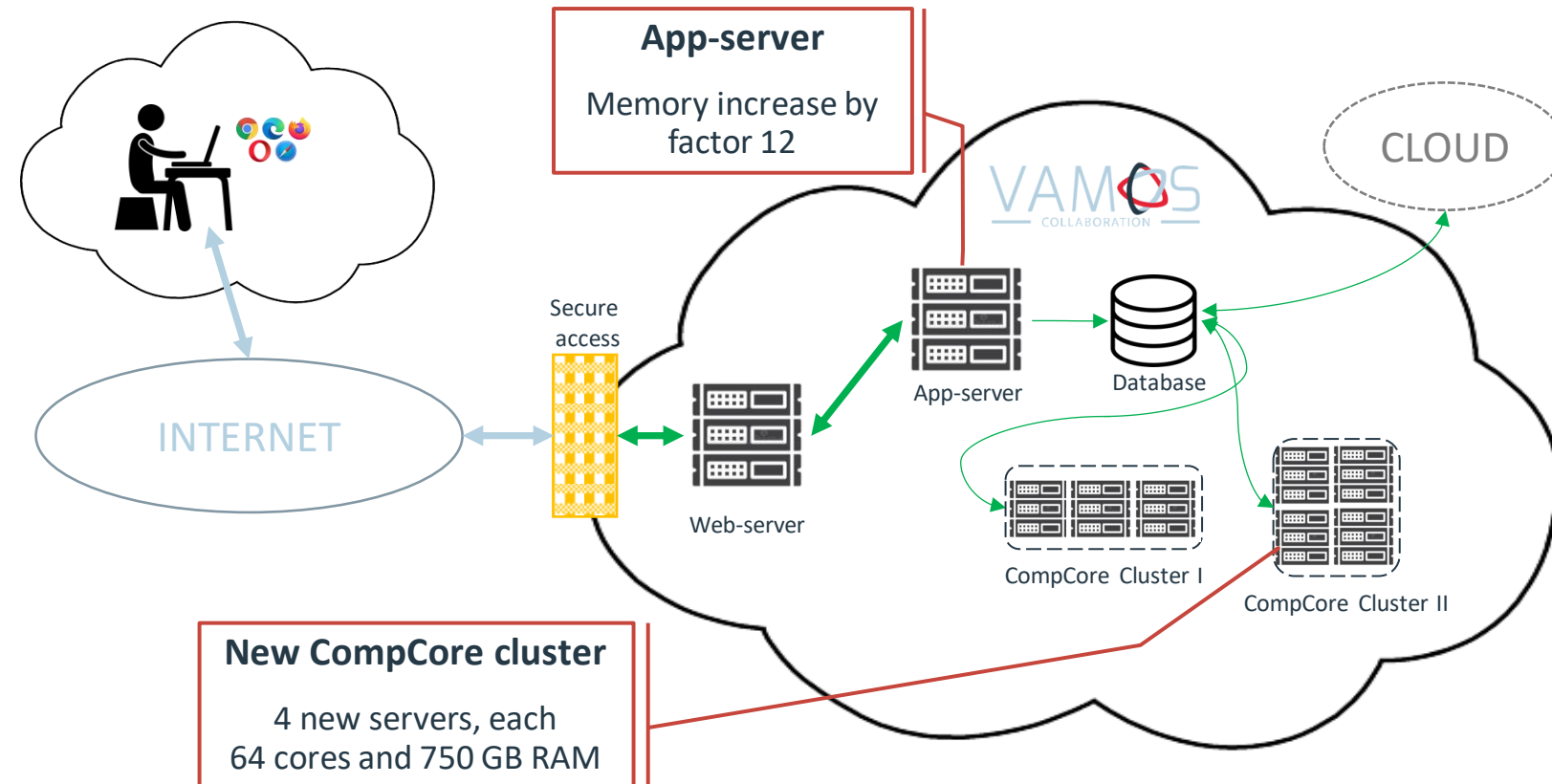
## Update on grid models and modelling chain

- **As presented earlier, the CE is facing computational challenges and the following solution directions were presented**
  - Simplifications / improvements to be applied in the modelling approach
    - a large computational improvement is being implemented in the RAO module (which is the most computationally-expensive module in the tool chain)
    - The loop flow analysis tool is being developed further to exploit the multiple parallel processors available
  - Simulation prioritization
    - Hardly any degrees of freedom, given:
      - the tight deadline for delivery of results to the pan-EU liquidity study
      - the 2-step approach, where 2 combinations of BZ configurations need to be assessed based on the monetary results of the first 7 alternative BZ configurations
  - Computational performance: hardware improvement
    - → see next slide

# Update from BZRR Central EU

Update on grid models and modelling chain

- Hardware improvements have been realized



Status Quo ( <i>new</i> ) VAMOS Hardware	
<b>App-Server</b> <i>Web-Interface, Background Jobs, Scheduling, ...</i>	
AppServer 1 16 cores + 64 <b>192</b> GB RAM	
<b>CompCore</b> <i>Performing the simulations</i>	
CompCore 1 64 cores + 762GB RAM	CompCore 4 64 cores + 762 GB RAM
CompCore 2 64 cores + 762 GB RAM	CompCore 5 64 cores + 762 GB RAM
CompCore3 64 cores + 762 GB RAM	CompCore 6 64 cores + 762 GB RAM
	CompCore 7 64 cores + 762 GB RAM

# Update from BZRR Nordic

## Modelling update, updated values in LMP study and update of input data

- Modelling optimization and improvement in order to run the first simulation of the base scenario are ongoing. Results of the simulations are improving, but still need to be further reviewed and analyzed, and improvements needed.
- ACER has been informed that some updated values for fuel prices and water were applied in the LMP study.
- The Nordics provided an update on the input data to be published to ACER before the data publication on 8/12, including the word document describing the input data in more detail and on additional aspects that have been updated in the input data compared to what has been provided to ACER before.
- The datasets regarding Nordic grid data (CGMs and CNECS) are confidential with very high protection value and some country's legislation does not allow the publication of grid data. Therefore, publishing and sharing with the public common Nordic grid model is not possible, as if one country's legislation does not allow the publication.



# ENTSO-E Mission Statement

## Who we are

ENTSO-E, the European Network of Transmission System Operators for Electricity, is the **association for the cooperation of the European transmission system operators (TSOs)**. The 42 member TSOs, representing 35 countries, are responsible for the secure and coordinated operation of Europe's electricity system, the largest interconnected electrical grid in the world. In addition to its core, historical role in technical cooperation, ENTSO-E is also the common voice of TSOs.

ENTSO-E **brings together the unique expertise of TSOs for the benefit of European citizens** by keeping the lights on, enabling the energy transition, and promoting the completion and optimal functioning of the internal electricity market, including via the fulfilment of the mandates given to ENTSO-E based on EU legislation.

## Our mission

ENTSO-E and its members, as the European TSO community, fulfil a common mission: Ensuring the **security of the interconnected power system in all time frames at pan-European level and the optimal functioning and development of the European interconnected electricity markets**, while enabling the integration of electricity generated from renewable energy sources and of emerging technologies.

## Our vision

ENTSO-E plays a central role in enabling Europe to become the first **climate-neutral continent by 2050** by creating a system that is secure, sustainable and affordable, and that integrates the expected amount of renewable energy, thereby offering an essential contribution to the European Green Deal. This endeavour requires sector integration and close cooperation among all actors.

Europe is moving towards a sustainable, digitalised, integrated and electrified energy system with a combination of centralised and distributed resources. ENTSO-E acts to ensure that this energy system **keeps consumers at its centre** and is operated and developed with **climate objectives** and **social welfare** in mind.

ENTSO-E is committed to use its unique expertise and system-wide view – supported by a responsibility to maintain the system's security – to deliver a comprehensive roadmap of how a climate-neutral Europe looks.

# ENTSO-E Mission Statement

## Our values

ENTSO-E acts in solidarity as a community of TSOs united by a shared responsibility.

As the professional association of independent and neutral regulated entities acting under a clear legal mandate, ENTSO-E serves the interests of society by optimising social welfare in its dimensions of safety, economy, environment, and performance.

ENTSO-E is committed to working with the highest technical rigour as well as developing sustainable and innovative responses to prepare for the future and overcoming the challenges of keeping the power system secure in a climate-neutral Europe. In all its activities, ENTSO-E acts with transparency and in a trustworthy dialogue with legislative and regulatory decision makers and stakeholders.

## Our contributions

ENTSO-E **supports the cooperation** among its members at European and regional levels. Over the past decades, TSOs have undertaken initiatives to increase their cooperation in network planning, operation and market integration, thereby successfully contributing to meeting EU climate and energy targets.

To carry out its **legally mandated tasks**, ENTSO-E's key responsibilities include the following:

- Development and implementation of standards, network codes, platforms and tools to ensure secure system and market operation as well as integration of renewable energy;
- Assessment of the adequacy of the system in different timeframes;
- Coordination of the planning and development of infrastructures at the European level (Ten-Year Network Development Plans, TYNDPs);
- Coordination of research, development and innovation activities of TSOs;
- Development of platforms to enable the transparent sharing of data with market participants.

ENTSO-E supports its members in **the implementation and monitoring** of the agreed common rules.

**ENTSO-E is the common voice of European TSOs** and provides expert contributions and a constructive view to energy debates to support policymakers in making informed decisions.

Our values define who we are, what we stand for and how we behave.  
We all play a part in bringing them to life.



## EXCELLENCE

We deliver to the highest standards.  
We provide an environment in which people can develop to their full potential.



## TRUST

We trust each other, we are transparent and we empower people.  
We respect diversity.



## INTEGRITY

We act in the interest of  
ENTSO-E



## TEAM

We care about people. We work transversal and we support each other.  
We celebrate success.



## FUTURE THINKING

We are a learning organisation.  
We explore new paths and solutions.

**We are ENTSO-E**