

Bidding Zone Review Stakeholders' Workshop

21 April 2022



Agenda

1. General introduction
2. Introduction to the LMP model and the findings
 1. Continental Europe & Ireland
 2. Nordics
3. Next steps for the Bidding Zone Review
 1. Work planning and organisation:
 1. Presentation of the regions
 2. Pan-EU studies process for ENTSO-E
 1. Timeline
 2. Integration/inclusion of market parties
 3. Foreseen stakeholders involvement during the BZR
 1. [Stakeholders plan](#) as presented in MESC
 2. Terms of Reference for pan-European consultative group
4. General Q&A section

House keeping rules

- The workshop will be recorded
- Add your questions in the chat at any time (including your name, mail and organisation). All questions will be answered: either during the workshop in the chat by someone from the BZR team, or by mail after the workshop.
 - The presenter/moderator will pick 1 or 2 questions after each section of the workshop
 - There will be a general Q&A session at the end of the workshop. Please, use the function 'raise your hand' if you wish to ask any question in this part of the workshop.
- Please, mute yourself, unless you are presenting or asking any question.
- The slides will be published in ENTSO-E website.
- The ToR of the consultative group had been already published in ENTSO-E website. (final version will be published after this workshop)



General introduction

What is the Bidding zone review?

- **What:** an All-TSO study of alternative bidding zone configurations
- **Why:** Article 14 Regulation (EU) 2019/943 triggers a bidding zone review
- **How this BZR shall be done?**
 - General methodology: CACM art 32-33
 - Specific methodology/assumptions: approved by ACER in 24 November 2020
 - Specific configuration: pending approval - expected June 2022
- **Purpose:** investigate whether alternative bidding zone configurations increase the economic efficiency and cross-border trade opportunities, while maintaining the operational security of the electricity grid
- Year to be studied: 2025
- **Deliverables**
 - A final **report** with an assessment of 22 indicators
 - A joint **recommendation** to the governments of the involved Member States for the future configuration
- **Leading to:** Decision of Member States to maintain or amend the bidding zone configuration.



What is the Bidding Zone Review?

12 months process
lead by All TSOs and
the regions

Compare:

Year: 2025

Status quo BZ
configuration

Alternative BZ
configurations

Do alternative bidding zone configurations increase the economic efficiency and cross-border trade opportunities, while maintaining the operational security of the electricity grid?

Process as described in the Article 14 of Regulation (EU) 2019/943

Article 14 Regulation (EU) 2019/943 triggers a bidding zone review process

Methodology and assumptions and alternative configurations

- To be proposed by the TSOs (3 months: by 5 October 2019)
- To be approved by the NRAs (3 months)
- If no agreement ACER to decide (3 months)

Bidding Zone Review

- By the TSOs (1year)

MS unanimous decision to maintain or amend the BZ in 6 months. (EC last resource with ACER - 6 months)

Overview of the current process of the Bidding Zone review

The All TSOs proposal of methodology and configurations submitted in October 2019 ended in ACER's desk...

We are here



ACER methodology approved has 2 steps:

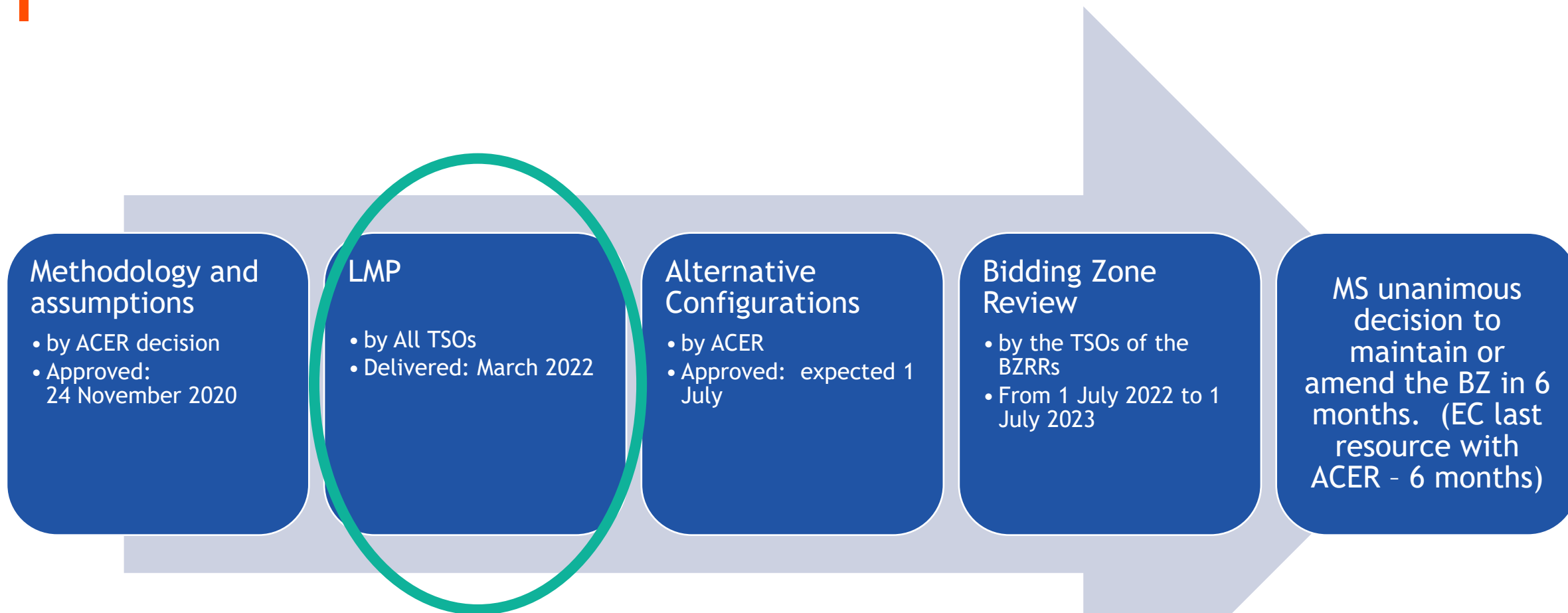
1. Methodology + request to TSOs to deliver LMP
2. Definition of alternative configurations



Questions and answers

Introduction to the LMP model and the findings

The LMP process: per synchronous area at least



- For the LMP calculations: All TSOs * worked together. The BZRR Nordics did a separate analysis due to confidentiality issues.






* TSOs of the Baltic BZRR postponed the study due to the upcoming synchronization

Introduction to the LMP model and the findings – Continental Europe + Ireland







The LMP simulation model (CE & Ireland) – Main Model







MODEL DIMENSION

-  25000 nodes
-  16000 generators
batteries
-  22000 lines
-  12000 trafos
-  25000 CNECs*

MAIN FEATURES

-  *Planned outage of generators*
-  *Optimized storages*
-  *All reserves modeled*
-  *Implicit & explicit DSR***
-  *DC Power Flow with N-1*
-  *Market-based RES model*

MAIN SIMPLIFICATIONS

-  *Linear Unit Commitment*
-  *2h granularity*
-  *Parallel daily optimization*
-  *No topological Remedial Actions*

- Simulations were performed for eight representative weeks of three climate years each (24 weeks in total)
- *Additional runs were carried out to assess the effect of topological remedial actions (TRA) as well as of other methodological simplifications (e.g. integer approach). Sensitivity tests on CO2 and/or fuel price assumptions has been also done.*

The LMP simulation model (CE & Ireland) – Input data

DECENTRALIZED DATA SOURCES



Dynamic Line Rating



Demand Side Response parameters



Reserve requirements

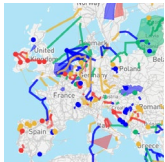


CNECs (validation)

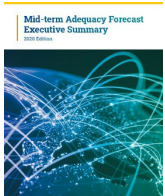


Topological Remedial actions

CENTRALIZED DATA SOURCES



TYNDP 20 grid model
Downgraded to June 2025*

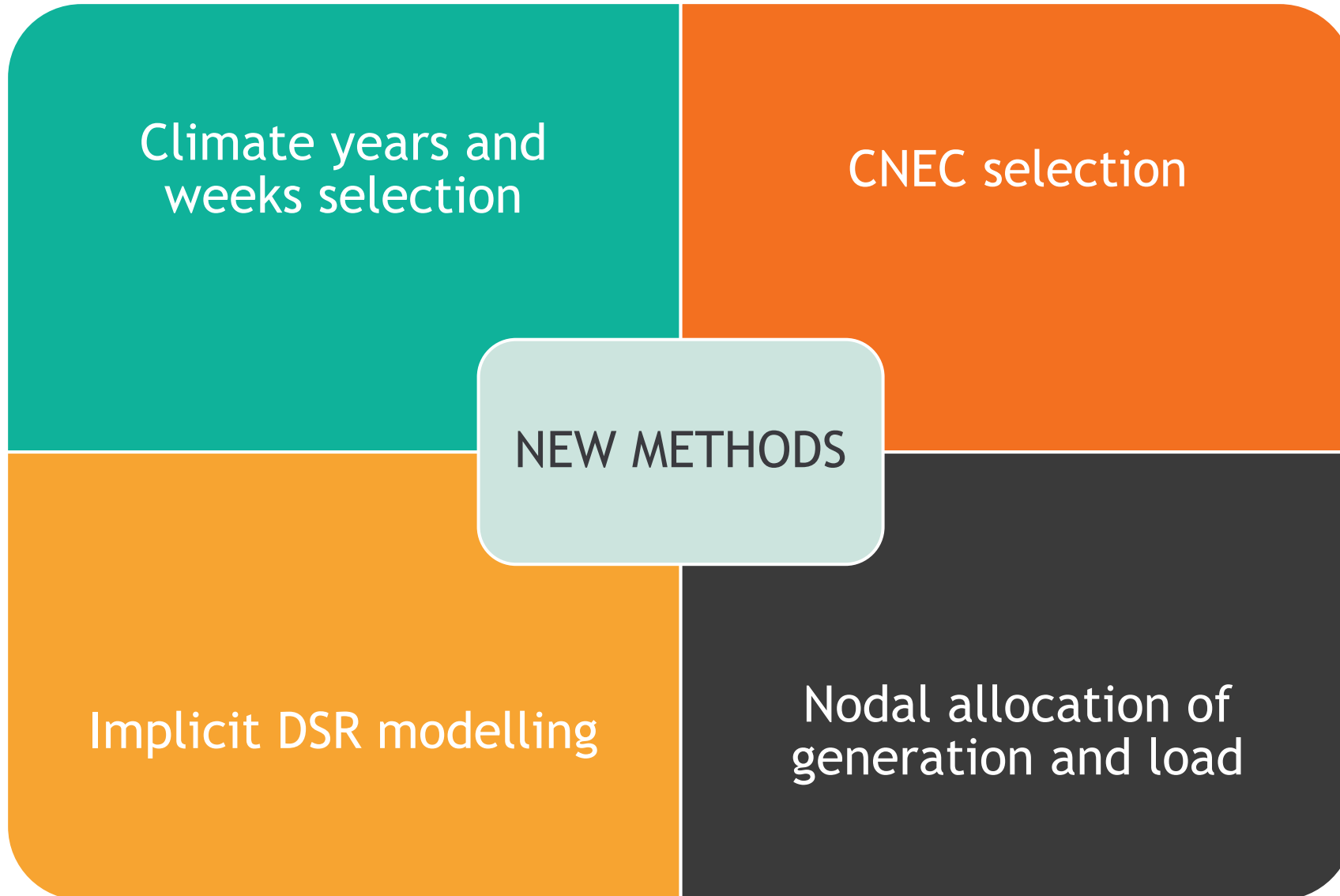


*PEMMDB**
MAF*** 2020 Scenarios*



A set of tools and a detailed model and simulation chain have been developed in the framework of the LMP study

The LMP simulation model (CE & Ireland) – methodologies



The LMP simulation chain (CE & Ireland) - main workstream

Planned outage scheduling

- Planned maintenances for thermal generation units are allocated to minimize the impacts on reserve margins
- The «PASA» model available in the Plexos software has been adopted for this scope

CNEC selection

- A **n-0 nodal market simulation** is performed to estimate the expected loading of each 380kV grid element. 380kV elements loaded more than 70% (50% in case of double circuit lines) are identified as Critical Network Element (CNE).
- Relevant contingencies for each CNE are identified using the influence computation method as defined in the «coordinated security assessment methodology*», obtaining the **initial CNEC list**
- The list is validated by TSOs

Final N-1 simulation chain

- A zonal simulation is run considering zonal elasticity values to derive demand curve parameters for modelling **implicit Demand Side Response** (slope and intercept).
- **Weekly storage targets** are derived running a yearly mid-term simulation
- **Daily targets for storages** are defined over the weekly time-horizon running a mid-term optimization, considering weekly initial and end values fixed
- The **final n-1 nodal market simulation** is performed, considering all the relevant features (e.g. DSR implicit and explicit, final CNEC list, storage targets).

* «Methodology for coordinating operational security analysis in accordance with Article 75 of Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation»

The LMP simulation chain (CE & Ireland) - TRA workstream

Final N-1 simulation chain

- A zonal simulation is run considering zonal elasticity values to derive demand curve parameters for modelling **implicit Demand Side Response** (slope and intercept).
- **Weekly storage targets** are derived running a yearly mid-term simulation.
- **Daily targets for storages** are defined over the weekly time-horizon running a mid-term optimization, considering weekly initial and end values fixed
- The **final n-1 nodal market simulation** is performed, considering all the relevant features (e.g. DSR implicit and explicit, final CNEC list, storage targets).

Identification of TRAs

- For a subset of (3) selected weeks, **TSOs identified relevant topological remedial actions (TRAs)** to be applied in order to relieve detected congestions in the "Final N-1 simulation"
- TRAs have been properly modeled.

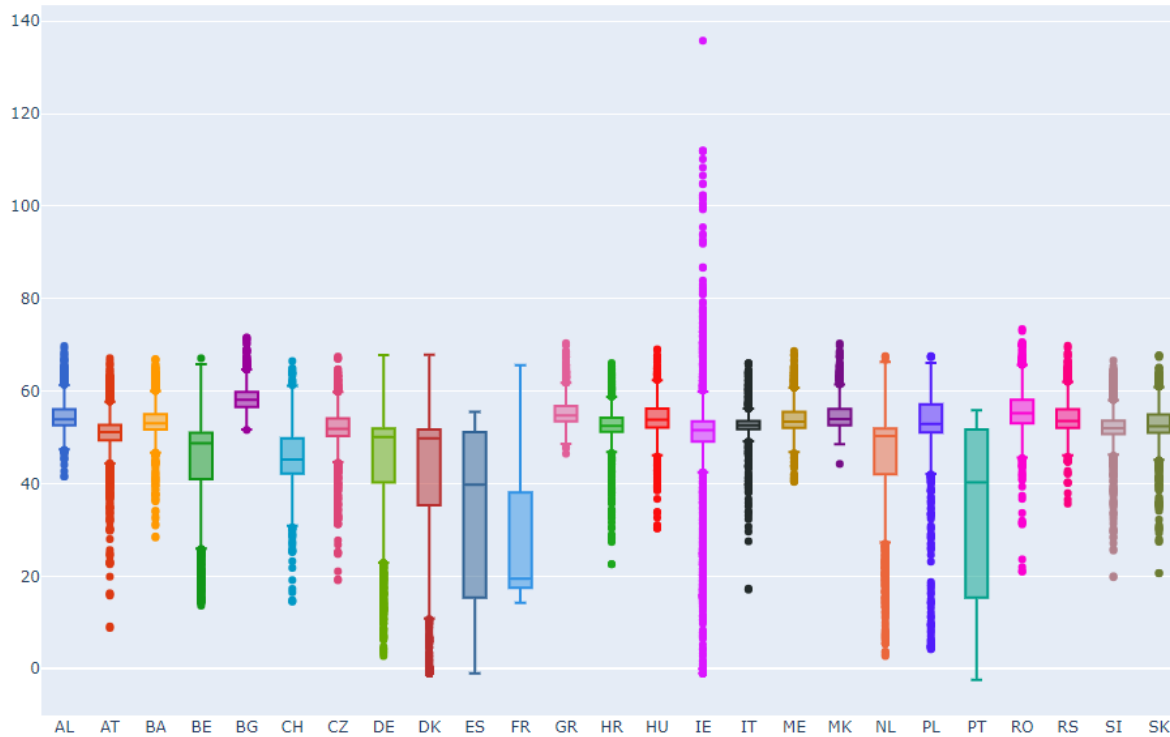
TRAs simulation

- The **final n-1 nodal market simulation chain** is re-run on the three selected weeks, considering all the relevant features (e.g. DSR implicit and explicit, final CNEC list, storage targets) and also topological remedial actions.

The LMP findings (CE & Ireland) - main workstream

Analysis of nodal prices time variation

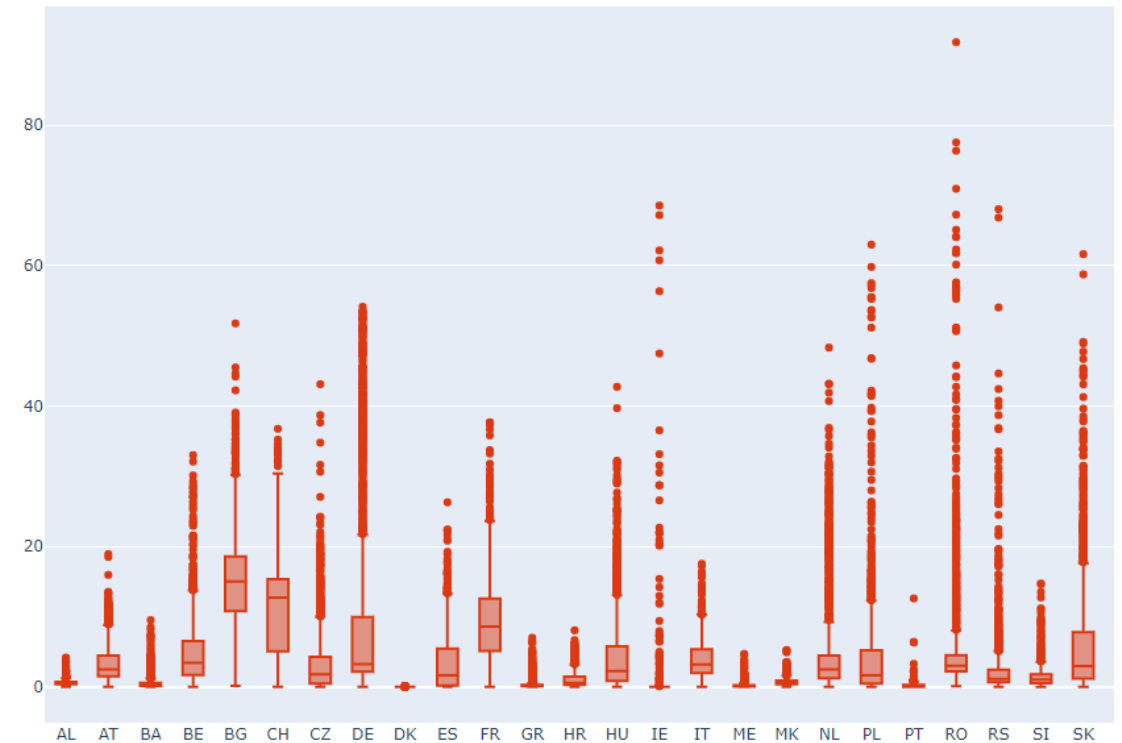
Hourly average prices per country [€/MWh]



➔ Graph shows volatility of average prices in a country

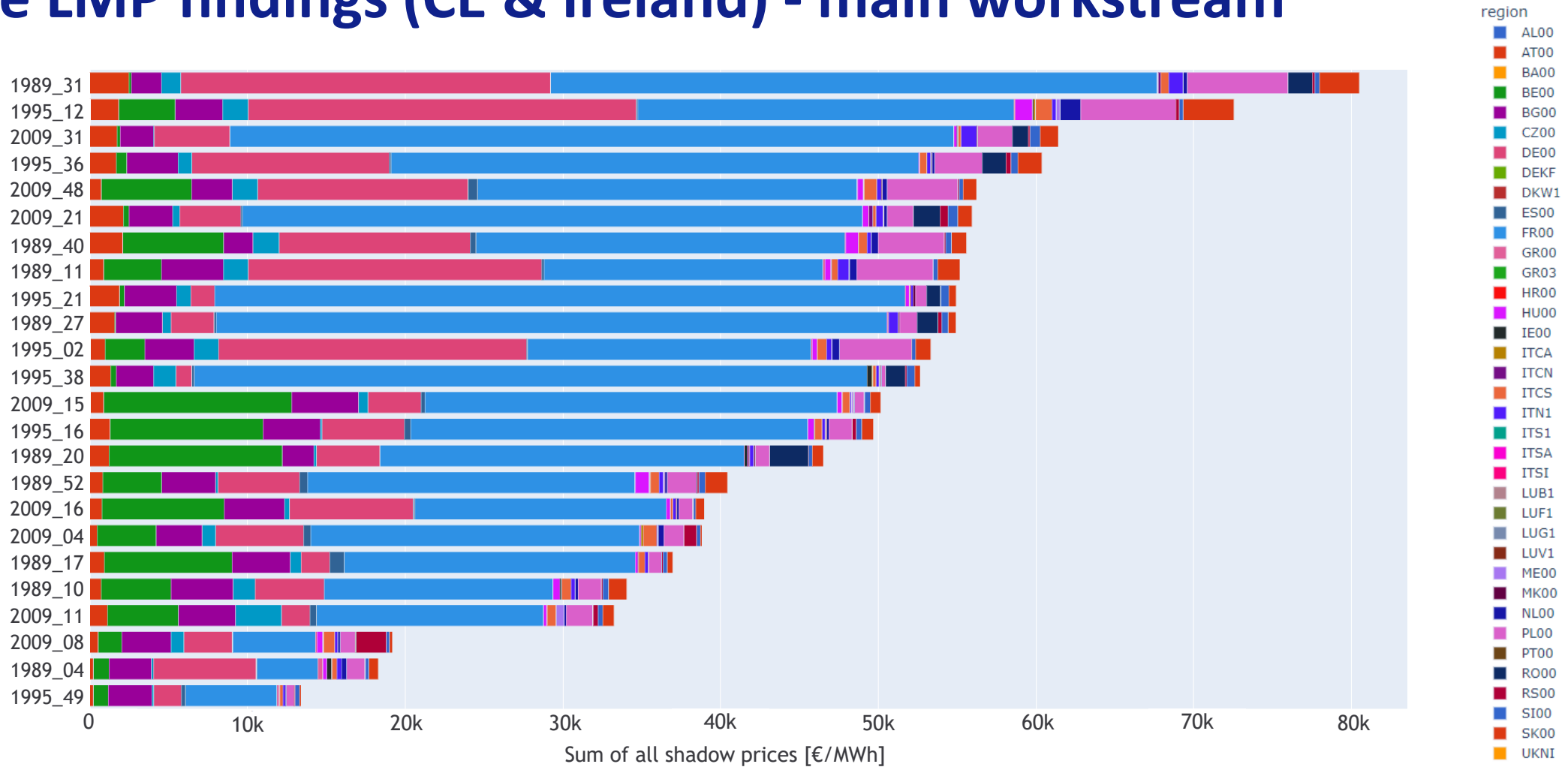
Analysis of nodal prices geographical variation

Hourly intraregional price spread for p05 - p95 [€/MWh]



➔ Graph shows volatility of absolute difference between the 5th & the 95th percentile of the hourly nodal prices in a country

The LMP findings (CE & Ireland) - main workstream



Amount of congested elements across geographical area depends on climatic conditions

Please note that LMP simulation results are not the only element to be considered as input for defining alternative configurations but also flow decomposition results

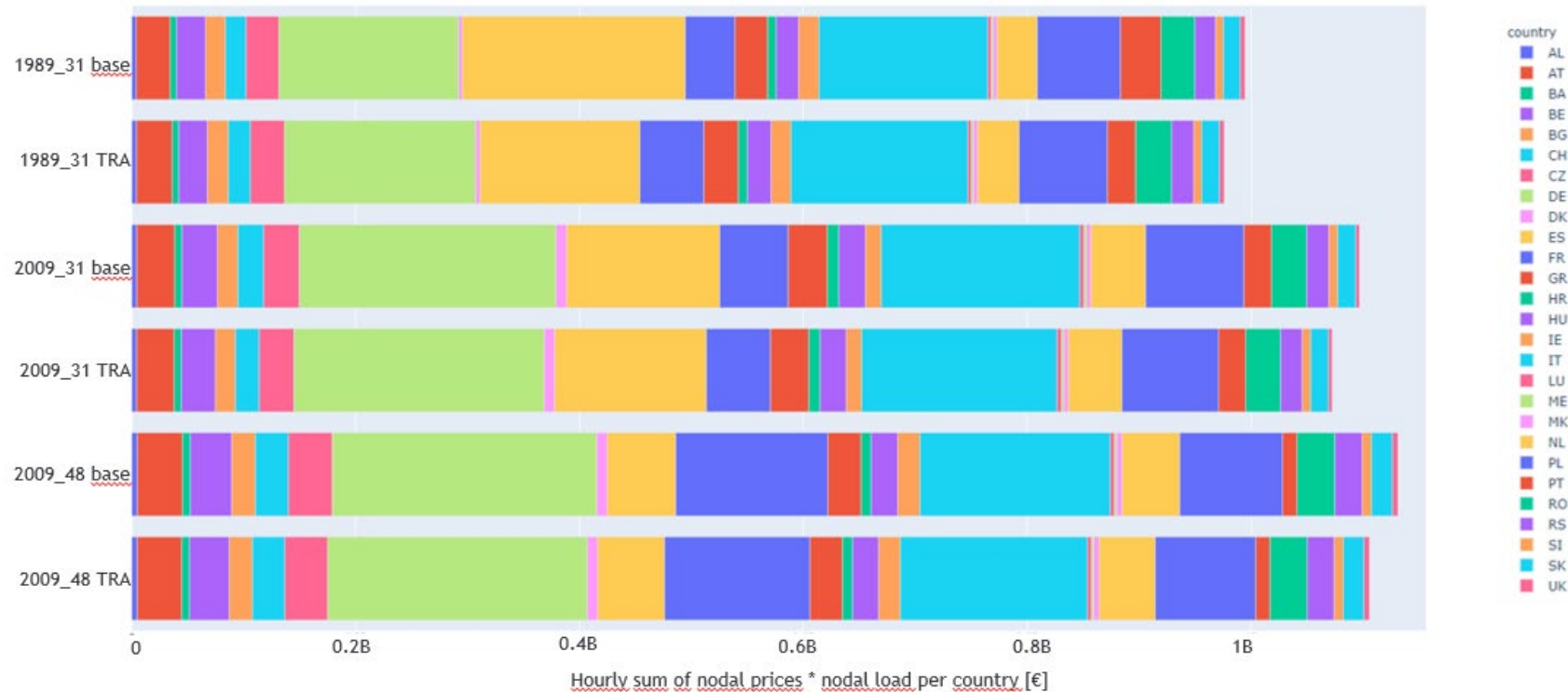
The LMP findings (CE & Ireland) - ex-post workstream

Weeks considered in the ex-post workstream:

- **Climate week 1989_31** → most congested for all the synchronous area
- **Climate week 2009_31** → most representative for CW1 & most congested for FR
- **Climate week 2009_48** → most congested for SWE

Topological remedial actions were applied for:

- **France** for all the 3 weeks
- **Czech Republic** for the climate weeks 1989_31 & 2009_31
- **Spain** and **Portugal** for climate week 2009_48



Application of topological remedial actions leads to an overall reduction of weighted nodal prices in all three weeks simulated 

The LMP findings (CE & Ireland) - sensitivity runs (without TRAs)

Case relative to base run	CO ₂ price of 90 EUR/t*	Higher fuel prices**
Hourly average price per country	↑	↑
Intraregional price spreads	↑	↑
Average hourly sum of shadow prices	↑	↑
Hourly shadow price sum distribution	↑	↑
Conclusion	Some new lines with shadow prices detected	Some new lines with shadow prices detected

* instead of 40 €/t used for the main workstream

** main CO₂ and fuel price assumptions

Fuel / CO ₂	Main simulations (€/GJ)	Sensitivity run (€/GJ)
Gas	5.57	26.39
Hard coal	2.30	2.68
Oil	10.6-12.9	12.9-15.8
Lignite	1.4-3.1	1,6-3.6
CO ₂	40	90

From the additional sensitivity runs performed it can be concluded that simulation results are sensitive to input data assumptions



Questions and answers

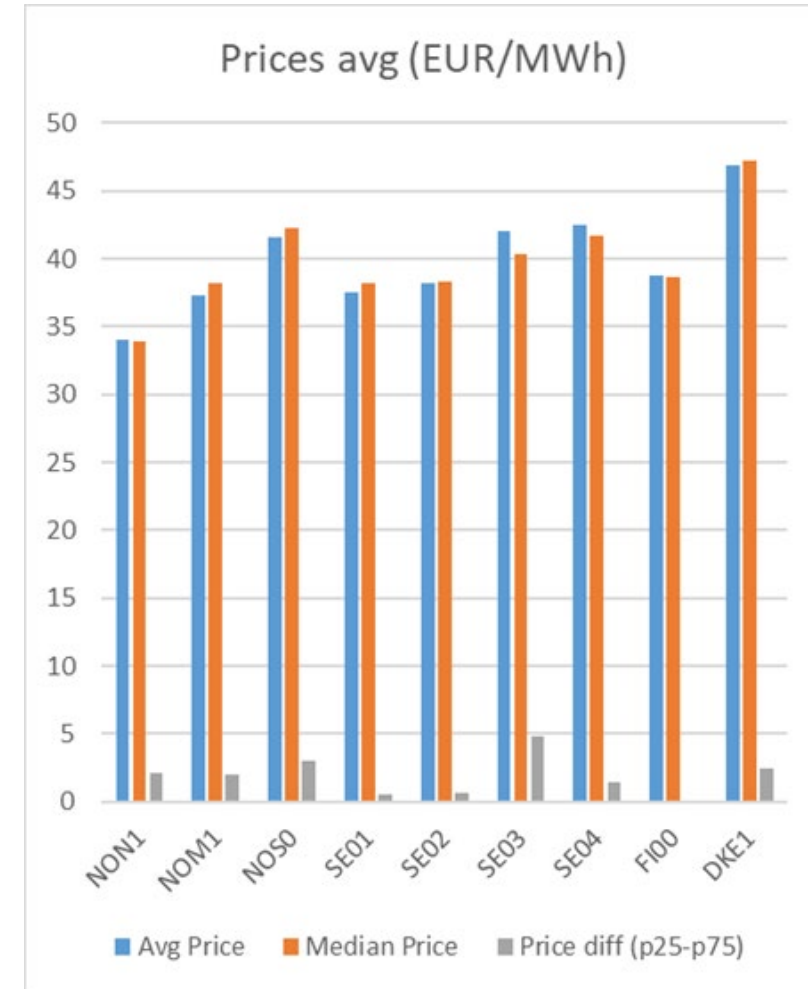
Introduction to the LMP model and the findings – Nordic region

The LMP process (Nordic)

- Simulations were performed using the tool BID3 in nodal version
- Nodal prices have been calculated for all nodes ≥ 200 kV in Norway, Sweden, Finland and Eastern Denmark
 - Based on full Nordic model with ~10 000 nodes
 - Flow on distribution network parallel to transmission network were taken into account while maintaining acceptable model run time
- Results for 3 different weather years with hourly time resolution
 - Especially important since the system is dominated by seasonal storage hydro reservoir → climate year must be run as a whole year
- The modelling work has been very challenging
 - Model tool has been continuously developed during the process
 - New methods to represent the market on a nodal level with enough details to yield good results as well as enough aggregation for reasonable calculation times

The LMP process and findings (Nordic)

- General price levels as expected with a clear north south price difference
- High price convergence within Finland and Denmark
- Significant price spreads within current Swedish BZ SE3 even if extreme values are excluded (p25-p75 diff)



The LMP (Nordic region) - comments on the results

Congestions- mostly in Norway and Sweden, and follow familiar intersections

- Finland and Denmark East (DK2) have practically no binding internal CNECs in the simulation results
- In Norway and Sweden there are more binding CNECs in different parts of the network
- The large congestions seem to follow existing bidding zone borders, e.g. SE2-SE3
- Congestion also inside SE3 - internal elements are limiting the flow in east-west direction
 - In line with current operational experience where elements inside SE3 often are boundary setting for capacities given to the market
 - The flow situation is expected to occur more often in the future due to a strengthened energy balance in Finland
- Some identified congestion also around Stockholm area but for limited number of hours

Prices- low in north, high in south

- Prices convergence is high within Finland and DK2 in line with the lack of binding CNECs
- Near the borders of the areas there are some nodes with deviating prices
- Average prices are highest in the south and lower further north



Publication of LMP results

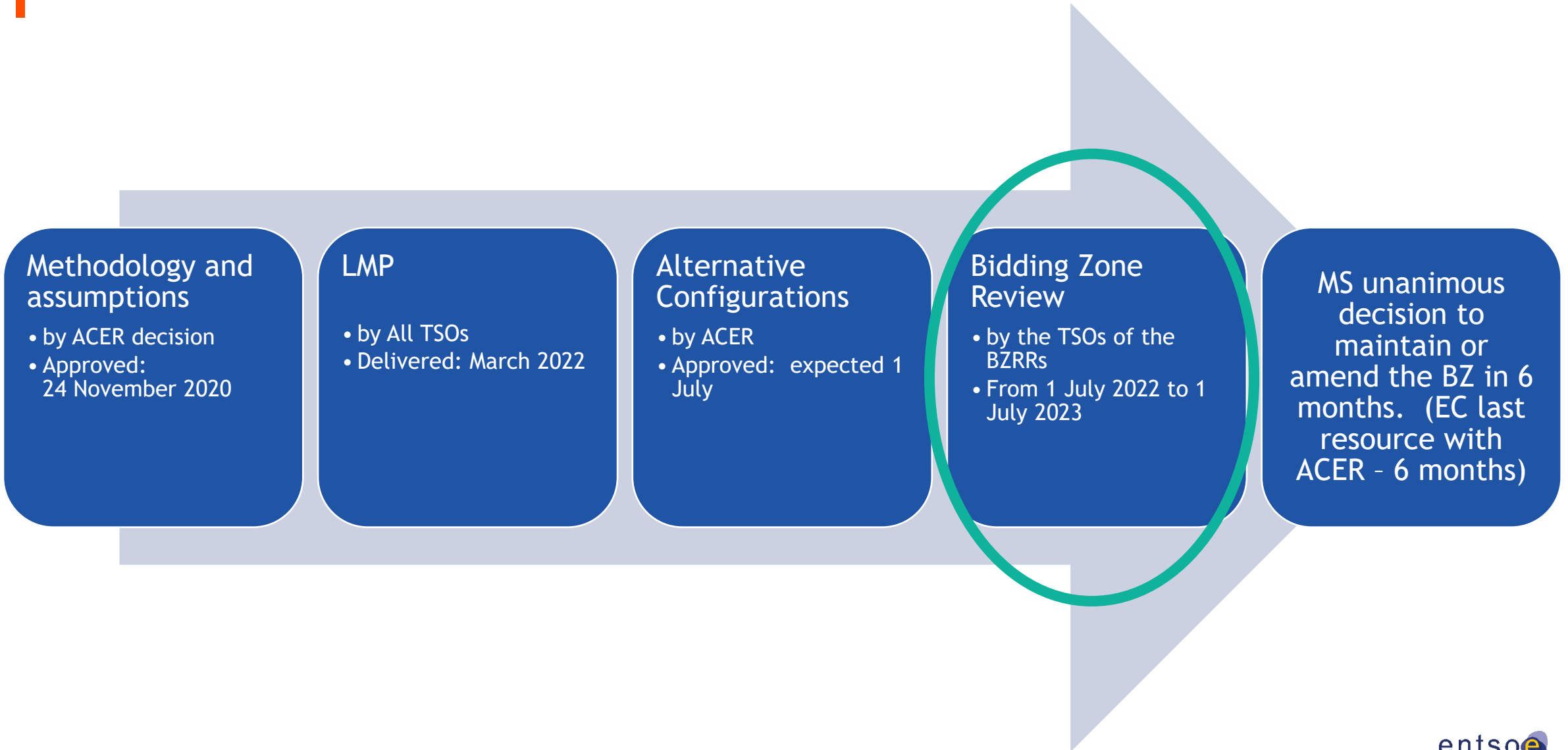
The LMP report and results will be published in ENTSO-E website by June/July 2022



Questions and answers

Next steps for the Bidding Zone Review

Overview of the Bidding Zone Review process

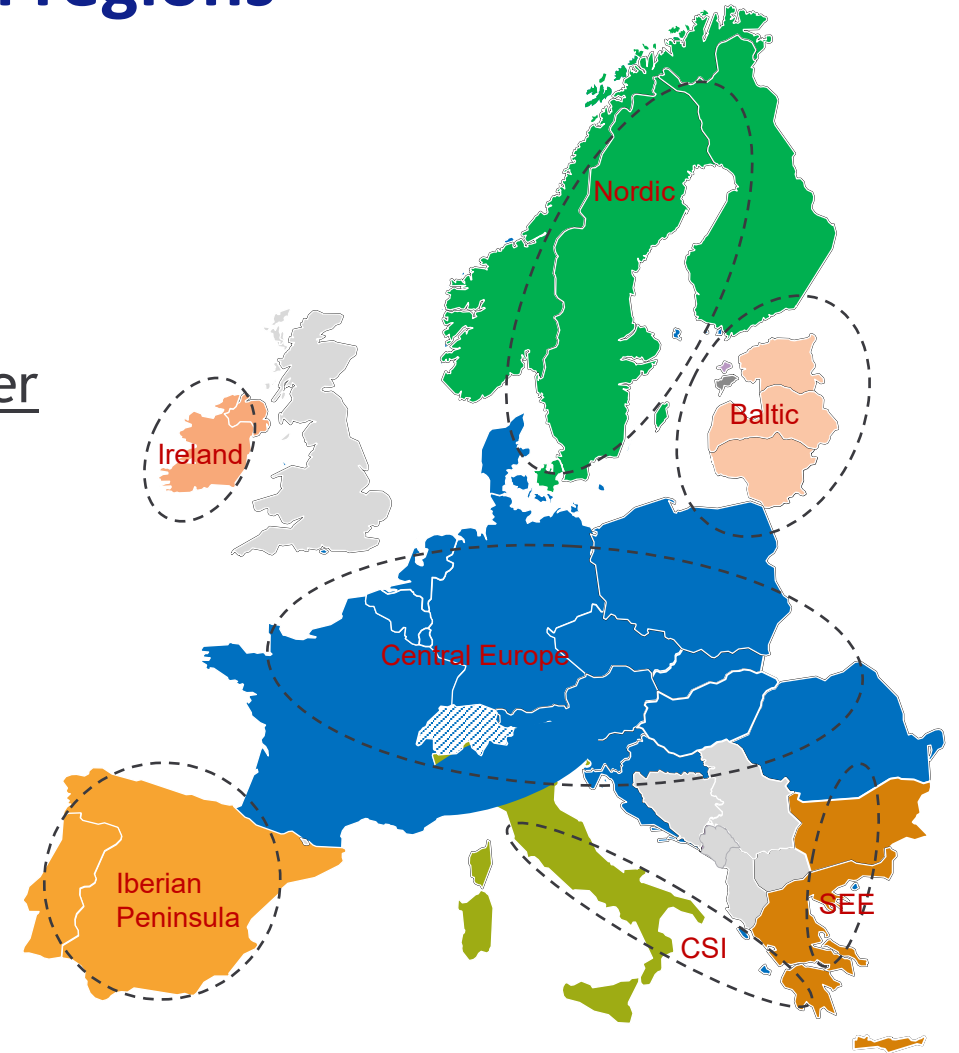


The Bidding Zone Review is organised in regions

Overview of Bidding Zone Review Regions (BZRRs)

- For the Bidding Zones Review
 - On all TSO level, for pan-EU studies and stakeholder management
 - On regional level, for modelling activities

→ The regional setup for modelling was chosen to reduce model complexity and to be able to consider regional specificities / sensitivities.



Overview of the 22 indicators which have to be assessed in the BZR

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

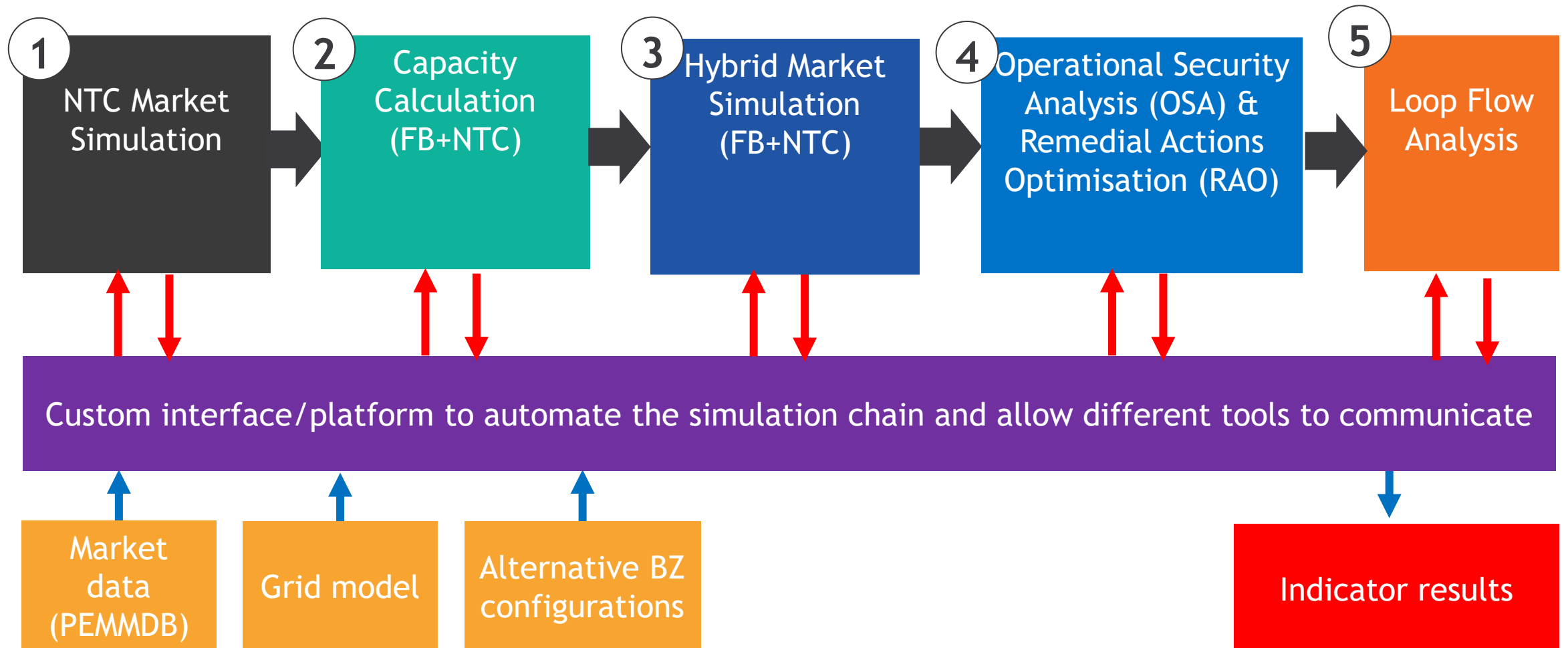
Key

Green: Assessed in pan-European study

Energy transition

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

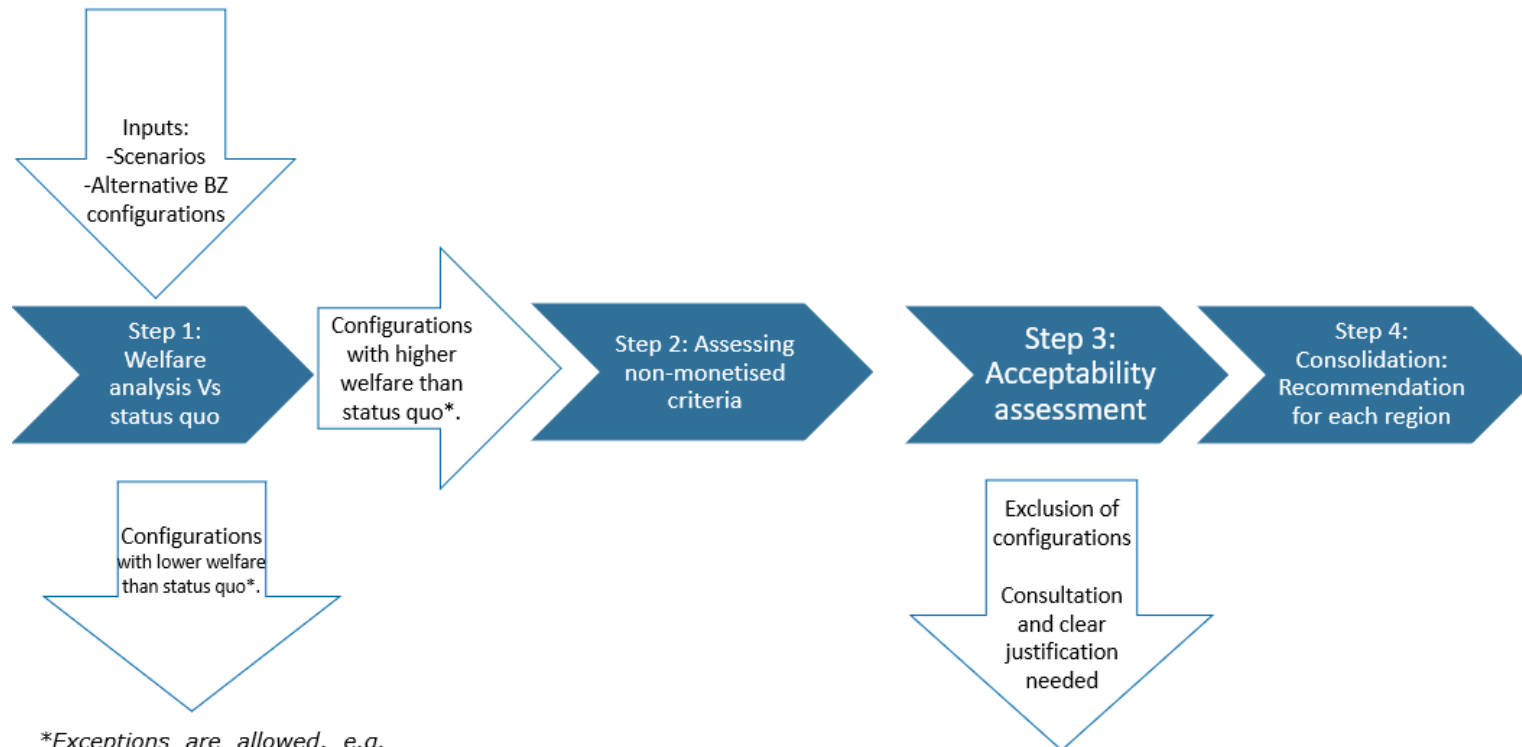
BZR Modelling and Calculations - Example of the Simulation Chain developed for BZRR Central Europe



The process for the assessment as defined by ACER

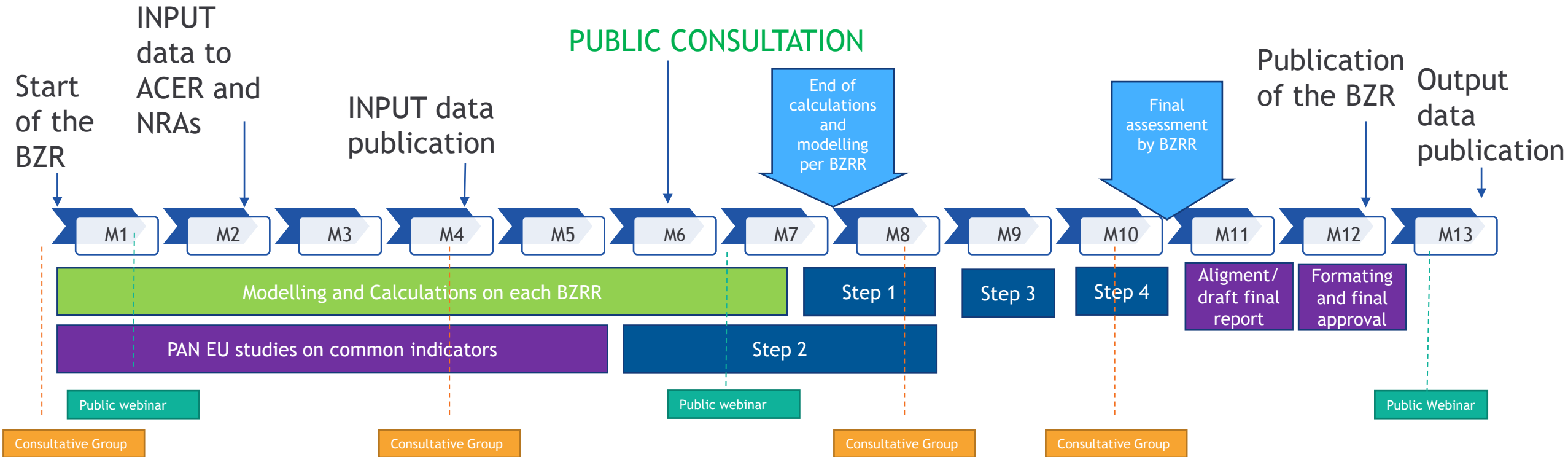


Steps of the BZR study



**Exceptions are allowed, e.g. TSOs may decide not to reject configurations at this stage*

General timeline



Further details on the modelling per BZRR in the next webinar!

MORE

COMING SOON



Questions and answers

The Bidding zone review: Pan-EU studies process for ENTSO-E

1. Pan-EU studies process for ENTSO-E
 1. Timeline
 2. Integration/inclusion of market parties

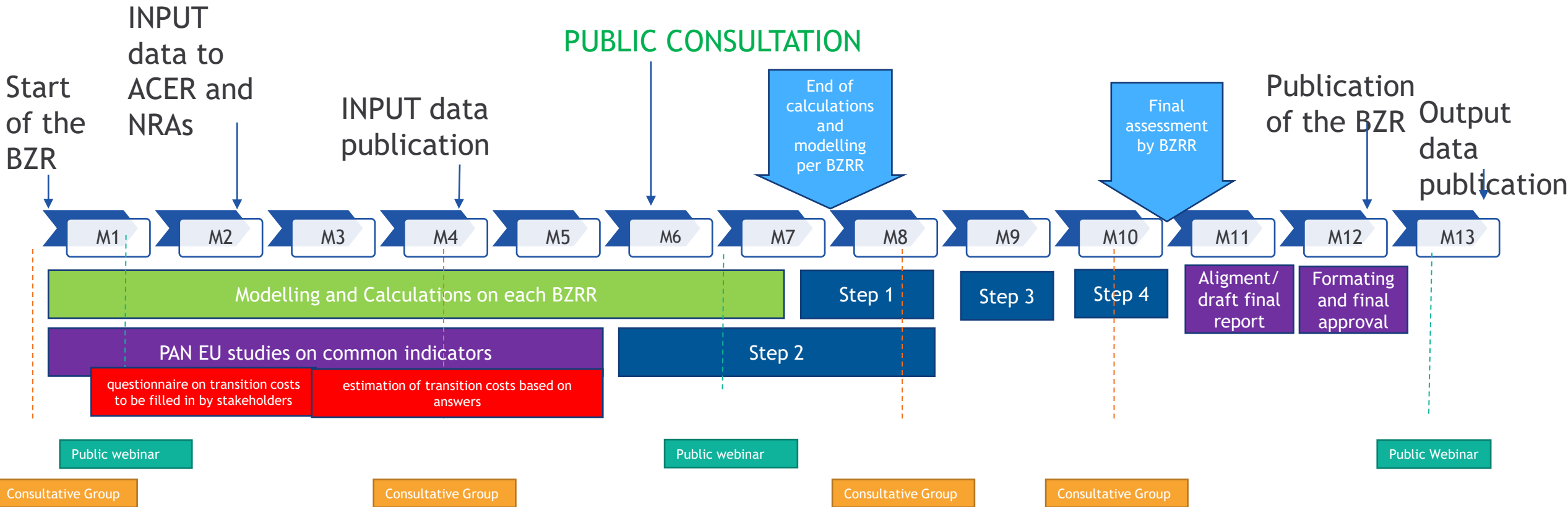
Study on transition costs

- The BZR methodology prescribes that transition costs is a criterion of the BZR methodology for which a study shall be jointly performed for all BZRRs in order to identify and possibly estimate transition costs.
- The minimum lifetime of a bidding zone configuration shall be calculated by comparing the transition costs with the monetised benefits compared to the status quo configuration.
- The TSOs, via ENTSO-E, have decided to contact Compass Lexecon to perform this study on their behalf.
- **Input from EU stakeholders is necessary to evaluate transition costs** and will be gathered through a dedicated questionnaire.
- Market parties will be involved through the BZR consultative group in the elaboration of the questionnaire (in June).
- **Soon after the start of the BZR**, the questionnaire will be communicated to EU stakeholders who will have approximatively **2 months to provide their answer**.
- Based on these inputs, the transition costs per BZRR and alternative configuration will be estimated.
- **Estimated figures will be consulted during the general public consultation** to be performed at the latest **6 months after the start of the BZR**.

Study on market liquidity and transaction costs

- The BZR considers market liquidity and transaction cost as a criterion to be studied as part of market efficiency.
- The approach of the study closely follows the steps as described in the ACER decision on BZR Methodology.
- The study consists of data analysis, considering historical data and future (simulated) data for BZ configurations.
- Analysed data shall be compiled into a report with preliminary findings.
- Report with preliminary findings shall be made public as part of the public consultation (before the end of the 6th month).
- **Stakeholders are invited** to provide input and comments on this preliminary report.
- Final conclusions on this topic will be based on the results from data analysis and **input from stakeholders**.
- Compass Lexecon has been contracted by ENTSO-E to perform this study.

General timeline





Questions and answers

The Bidding Zone Review: Foreseen stakeholder involvement

Approach to stakeholder management: Market Parties

ENTSO-E facilitator,
Regions to provide content
ACER, NRAs and EC invited to join
as observers
Flexibility to organise additional
regional meetings/public WS

MESC

- High-level updates of status and general planning
- 5 MESC meetings expected

Pan-European Consultative Group (BZR CG)

- Participants: closed group of representatives based on general ('MESC-like') criteria ('regional interest / pan European focus' etc.). Max 25 people.
- Extensive and open interaction with market parties on the pan-EU studies ('for discussion' with workshops)
- Updates on the progress of the simulations
- 3 to 5 meetings till the end of the BZR process

Public webinars

- Participants: anybody who is interested can sign up
- Combined workshops with one part PAN EU and next part regional specificities.
- 4 WS + 1 formal consultation:
 - Before the start: stakeholders plan, LMP results, etc
 - In the beginning: to set the work
 - In the middle of the process: general update before the public consultation
 - In the end: to present results

ENTSO-E website

- Main communication channel (for sharing presentations, minutes, announcements etc.) for both all-TSO and regional information
- Also foreseen to set out general explanation about the BZR (what is it, where do we stand), to provide a general explanation for non-experts looking for information on the BZR.

General timeline (for stakeholder interactions)

- Assumption. Start depends on ACER decision on configurations
- The dates proposed are estimated and may change



★ Start of the BZR : July 2022*

	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	Q3 2023
Main milestones	LMP results by TSOs (M-3) Alternative configurations by ACER (M-0)	Input Data to NRAs (M2) Input data publication (M4)	Public consultation (M5)		Publication of the BZR (M12)	Output data publication (M13)
BZR Consultative group		WS June/July	WS October	WS February	WS April	
Public Webinar - PAN EU with Regions	April (to explain the BZR process and present LMP results)	July (to explain inputs and assumptions)	Webinar before or during public consultation		Webinar after publication of the BZR	
MESC	June 1	September 14	December 7	TBD	TBD	TBD
Public consultation			December			
Regional meetings	TBD	TBD	TBD	TBD	TBD	TBD
PAN EU studies		Questionnaire on transition costs (mid July- mid september)				

The Bidding Zone Review Consultative Group – something for you?

Key take-aways from the Terms of Reference, available [here](#).

Objectives

- Advise ENTSO-E and its members on matters related to the Bidding Zone Review
- Provide a coordinated forum through which learning points are shared, and can be used by ENTSO-E and its members to get feedback on elements of the BZR

Composition

- Lead by ENTSO-E and TSOs of the BZRR (facilitated by ENTSO-E)
- Market parties and other stakeholders → Limited to 15 representatives
- Observers: ACER, EC and NRA
- Total-: 25 people

Candidate selection process

- If more candidatures than places are received, a selection process by ENTSO-E will be carried out based on:
 - Representation of European Stakeholder Organisations (maximum 2 representatives per organisation)
 - Geographical background of the concrete candidates (maximum 2 representatives per country)
 - European Research institutes (max 1 representative per institution)
- ENTSO-E's initial preference will be to involve candidates that represent European Associations and with specific knowledge related to different Bidding Zone Review Regions to assure broad geographical coverage by the group

Start of the work

- Aim is to have the consultative group in place by 31st May, and a first meeting mid June!

Candidates can notify their interest to take place as active member / observer towards ENTSO-E before 13/05/2022, by sending an email to Gjorgji.Shemov@entsoe.eu



Questions and answers



General Q&A section

1. General Q&A section

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