

ENTSO-E Report

Bidding Zone Review of the 2025 Target Year

April 2025



ANNEX V

Transition Costs of Bidding Zone Reconfigurations

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1 Introduction

Context: Bidding Zone review process

The European electricity wholesale market is a zonal market organised by Bidding Zones (BZs) and cross-zonal capacities (interconnections) between BZs. BZs are defined in Regulation (EU) 2019/943 as the largest geographical area within which market participants can exchange energy without capacity allocation (European Commission, 2019). A uniform electricity price in wholesale markets can thus be determined for entire BZs. Trade between BZs is possible as long as cross-zonal capacities are available. As a result, the configuration of BZs strongly influences market functioning and the cross-border exchange of electricity.

According to Article 34 of Regulation (EU) 2015/1222, the BZ configuration of European electricity markets must be

regularly reviewed. Article 14 of Regulation (EU) 2019/943 states that the configuration of BZs should “maximise economic efficiency” and “cross-zonal trading opportunities” while “maintaining security of supply”. To achieve this, BZ borders should be defined based on long-term structural congestion and BZs should not contain structural congestion affecting neighbouring zones. According to Article 14 of Regulation (EU) 2019/943, a bidding zone review (BZR) should analyse different BZ configurations to define an optimal configuration. The Agency for the Cooperation of Energy Regulators (ACER) determined the BZR Methodology in its decision 29/2020 from 24.11.2020 (ACER, 2020). The BZR Methodology specifies 22 criteria that should be assessed, one of which is transition costs.

Study objectives and brief

ENTSO-E instructed Compass Lexecon to estimate the transition costs of amending the current BZ configurations.¹ As such, the definition of transition costs follows the BZR Methodology, specified as “one-off costs expected to be incurred in case the BZ configuration is amended” (ibid., p. 40). Estimated costs shall “reflect the expected implementation timeline for an eventual BZ change” (ibid.) and the study shall “be jointly performed for all BZRR” (ibid.).

The assignment pertains to the transition costs criterion as outlined in the BZR Methodology. Following our brief, and in agreement with ENTSO-E and the transmission system operators (TSOs), we collected cost data using online questionnaires and processed inputs on transition cost estimates from various market participants. Participation in the questionnaire was voluntary for all participants. Based on the data provided, we estimated transition costs for specific BZ reconfigurations and different stakeholder types. We discussed the results and methodological questions with ACER and the national regulatory authorities (NRAs) throughout the process.

Given that we had no mandate to compel stakeholders to provide data through the questionnaire, we relied on voluntary participation. Furthermore, we were not mandated to subject the data to an audit.

The results presented in this study consider the input received in the public consultation organised by the TSOs.

The estimation of transition costs presented in this study focuses on the alternative configurations proposed by ACER in its decision 11/2022 from 08.08.2022 on “alternative bidding zone configurations to be considered in the bidding zone review process” (ACER, 2022). The proposed configurations concern the BZs of France, Germany–Luxembourg, Italy, the Netherlands, and Sweden, as summarised in Table 1.1.

¹ This annex has been prepared by a group of experts comprising of Compass Lexecon, ENTSO-E and TSO professionals. The views expressed in this annex are those of this group of experts and do not necessarily represent the views of Compass Lexecon, its management, its subsidiaries, its affiliates, its employees or clients. The annex is based on information made available to the group of experts at the time of writing and as explained in the annex, it was not part of the scope to audit/verify the underlying data and information. We accept no responsibility for updating the annex or informing any recipient of the annex of any new information.

Configuration identifier according to ACER decision	Region	Member state	Number of bidding zones
2	Central Europe	Germany; Luxembourg	2
5	Central Europe	France	3
6	Central Europe	Italy	2
7	Central Europe	Netherlands	2
8	Nordic	Sweden	3
9	Nordic	Sweden	3
10	Nordic	Sweden	4
11	Nordic	Sweden	4
12	Central Europe	Germany; Luxembourg	3
13	Central Europe	Germany; Luxembourg	4
14	Central Europe	Germany; Luxembourg	5

Table 1.1: Summary of proposed and to-be-evaluated BZ configurations in Central Europe and the Nordics as presented in Annex I to the ACER decision (2022)

Definition of transition costs

Transition costs are estimated following the definition set by ACER (2020) in article 15.11 (a) of the BZR Methodology:

- › One-off costs that are expected to be incurred if the BZ configuration is amended.
- › Related to adaptations inherently and unambiguously related to a specific BZ configuration change.
- › Not related to adaptations that are in general necessary to ensure sufficient flexibility of the systems to cope with a variable number of BZs due to a potential amendment of the BZ configuration in the future.
- › Including an estimation of the cost of amending existing contractual obligations incurred by market participants, nominated electricity market operators (NEMOs), and TSOs. Such estimation should reflect the expected implementation timeline for an eventual BZ change. It should also consider the fact that when deciding on the implementation date, member states must balance the need for expeditiousness with practical considerations, including forward trade of electricity.

Transition costs arise due to various necessary adjustments following a new BZ configuration, such as changes to business processes, IT adaptations, or adjustments of private contracts. These changes and related transition costs are incurred by different types of market participants, including retailers, grid operators, traders, or power exchanges.

Approach

The assessment of transition cost estimates is based on three steps:

- › First, in discussions with ENTSO-E, the TSOs, ACER, the NRAs, and the BZR consultative group, we identified relevant types of stakeholders that might face transition costs as per the BZR Methodology definition.
- › Second, we used a questionnaire (in the form of two online surveys accessible to all EU stakeholders) to collect the necessary data.
- › Third, we processed the input provided by the questionnaire. This included harmonising units and cleaning the data based on the explanations of the estimates provided. This was undertaken in collaboration with ENTSO-E and the TSOs, and in consultation with ACER and the NRAs. We then adjusted the data for company size and scaled it to calculate the total transition costs for each BZ reconfiguration.

Chapter 2 describes the methodological approach applied and its inherent limitations.

Study outline

The study is structured as follows:

- › After the introduction, **chapter 2** explains the methodology used to estimate the transition costs. This includes the definition of necessary data, the data sample collection, and the data analysis approach.
- › **Chapter 3** analyses the cost data gathered in the public survey.
- › **Chapter 4** highlights the total cost estimates per bidding zone reconfiguration and places them into perspective.
- › **Chapter 5** concludes the study.



2 Methodology for Estimation of Transition Costs

In this chapter, we describe the methodology used to estimate transition costs for the different reconfigurations proposed. The description includes the outline of the study scope regarding:

- › who might face transition costs (chapter 2.1);
- › where transition costs might be incurred ([chapter 2.2](#));
- › how they are incurred ([chapter 2.3](#)); and
- › limitations of the methodology applied and the steps taken to reduce them ([chapter 2.4](#)).

The analysis builds on the definition of transition costs outlined in the BZR Methodology. The methodology applied to analyse the survey data was agreed upon among ENTSO-E, the TSOs (see also the description of our brief above), and Compass Lexecon, considering the requirements set in the BZR Methodology for analysing transition costs.

2.1 Delineation of the scope of the study of transition costs

The BZR Methodology requires estimating transition costs, defined as the one-off costs incurred by a change in BZ reconfiguration (ACER, 2020). This estimation should relate to the specific BZ changes considered in the BZ reconfiguration analysed rather than generic BZ changes.²

Moreover, the study of transition costs should sufficiently cover the following three aspects:

- › **Stakeholders:** Different types of stakeholders that a BZ change affects should be considered.
- › **Geographical scope:** Stakeholders directly affected by (at least) one change of BZ configuration shall be considered (i. e. from a BZ under review or from a neighbouring BZ).

Transition costs for each proposed alternative BZ configuration shall be included in the study.

- › **Cost categories:** The questionnaire presented an overview of the relevant cost categories, including examples, and allowed respondents to add costs that they considered relevant.

Through discussion with ENTSO-E, the TSOs, and the BZR consultative group, we derived a table setting out the list of stakeholders that we approached for the transition costs study. This table was presented to and aligned with ACER and the NRAs. Table 2.1 summarises the stakeholder groups and their characteristics.

² There exists literature, e.g. Neuhoff & Boyd 2011: International Experiences of Nodal Pricing Implementation – Frequently Asked Questions and FTI consulting 2022: Operation market design: Dispatch and Location, that quantify the transition costs to nodal pricing. It has been suggested that those could be used as an upper bound for the transition cost estimation of this study. However, comparability of the estimations and the expected transition costs for the bidding zone reconfigurations at hand could not be ensured. The latter study is available e.g. [here](#).

Stakeholder group	Explanation of characteristics
Wholesale/retail market participants	<ul style="list-style-type: none"> › Stakeholders that directly participate in the wholesale market by buying or selling electricity (energy traders, generators, retailers, large-scale industrial customers, storage operators). › Stakeholders that directly participate in the retail market by buying or selling electricity (retailers), in addition to participating in the wholesale market.
Market infrastructure providers	Stakeholders that provide services to enable or facilitate market access (NEMOs, derivative exchanges, clearing houses).
Network operators	TSOs and DSOs.
Others	Other stakeholders, in particular regulatory authorities and ministries.

Source: Compass Lexecon Analysis, with suggestions and discussions with ENTSO-E members

Table 2.1: Stakeholder groups addressed by the questionnaire

The project team (ENTSO-E, TSOs, and Compass Lexecon) aimed to collect answers from various entities within the defined stakeholder groups in the regions concerned. More specifically, the goal was to obtain a data sample capturing the perceptions of all relevant organisations of the defined stakeholder groups. For this purpose, the project team:

- › published the survey on the ENTSO-E website;
- › prolonged the timeframe for stakeholders to participate in the survey;
- › prepared a second survey to increase the number of survey participants, in particular from underrepresented regions and / or stakeholder groups;
- › encouraged sharing among stakeholders to further broaden the study sample ("snowball approach");
- › expanded the reach of the surveys in the industry by contacting industry associations and organisations;
- › defined a list of survey participants that were directly contacted and with whom the survey was shared to increase the number of survey participants, in particular from underrepresented regions and / or stakeholder groups;
- › organised and conducted interviews with selected survey participants; and
- › organised an online webinar to present and explain the initial questionnaire to interested parties.

Through these measures, the project team aimed for a sample that captured relevant stakeholder views and reflected differences among stakeholders (e.g., regional differences of the wholesale and retail markets concerned).

2.2 Data collection process

To collect stakeholder input on the defined scope of the transition cost study through a survey, together with the TSOs we developed two questionnaires that were discussed with the consultative group and later published by ENTSO-E on its website between September and November 2022 and March and April 2023.

Between the publication of the first and second questionnaire (see Appendix), no information was relayed by the project team that could have altered participants' assumptions of the first questionnaire on the BZ reconfigurations. Answers to both questionnaires were therefore considered in the analysis.

In addition to asking for individual cost estimates, the questionnaires also asked for two further aspects that could affect cost estimates:

- › We assumed a reference lead time of three years to implement changes to a BZ configuration. To study the impact of a different lead time, the questionnaires inquired how extending or shortening the lead time by one year might influence cost estimates.
- › We also asked whether the market participant had experienced previous BZ reconfigurations. This question intended to provide additional insights into how learning effects affect transition costs.

In line with the definition of transition costs as outlined in the BZR Methodology, the questionnaire stressed that transition costs must “inherently and unambiguously” relate to a specific change of the BZ configuration and not include general costs associated with a potential and indefinite reconfiguration of BZs in the future (ACER 2020, p. 40).

Accordingly, examples of transition costs provided in the survey included:

- › restructuring of teams responsible for specific BZs; and
- › renegotiation of ongoing contracts and costs associated with potentially arising litigations.

It was asked to exclude IT investments to adjust to potential future reconfigurations irrespective of the specific reconfigurations assessed in the BZR. In line with the definition of transition costs outlined in the BZR Methodology, asset devaluation was not considered a transition cost. Similarly, effects such as changes in consumer surplus were also not included.

In the questionnaires, transition costs were broken down into four main categories listed in Table 2.2 below. Respondents were also asked to differentiate between personnel and other costs and indicate whether they think that those costs vary with company size.

Cost category	Definition	Example
Changes to internal business processes and IT systems	Costs incurred by changes to organisation and coordination, specifically attributable to the BZ reconfiguration	<ul style="list-style-type: none"> › Adapting existing IT systems to specific BZ configurations › Costs associated with the efforts linked to changing of processes, for example: <ul style="list-style-type: none"> — Splitting or merging teams responsible for a specific BZ — Changing trading or algorithmic trading processes — Undergoing the process of revaluating assets — Adopting portfolio optimisation processes — Adopting processes around the payment of renewable subsidies such as feed-in-tariffs — Testing changed processes — Informing employees about the changed processes › Changes to other ongoing exchanges between market participants, TSOs, and public bodies, e. g. balancing and electricity balancing accounts
Adjustments to or the termination of contracts and regulation	Costs incurred by amending existing contracts to BZ reconfiguration, including legal costs	<ul style="list-style-type: none"> › Renegotiation or termination of contracts, depending on their complexity, particularly if the reference location of price changes or is no longer accepted by contract parties (including GOs, PPAs, legal arrangements) › Redrawing of legislation, i. e. contracts/legislation referring to a single BZ that no longer exists after a BZ reconfiguration › Possible costs, since electricity sold forward is affected (will mainly apply in the case of shorter lead times³)
Adjustments of processes with NEMOs, TSOs, and public bodies	Costs incurred by adapting interaction with NEMOs, TSOs, or public bodies	<ul style="list-style-type: none"> › Reporting obligations that must be adjusted to be specific for each new BZ
Additional costs	Any costs directly related to the BZ configuration not covered by any of the categories above	

Source: Compass Lexecon analysis; based on suggestions and discussions with ENTSO-E members

Table 2.2: Cost categories in the questionnaires and description

The questionnaires also asked about the absolute generated, consumed, or throughput energy quantities, revenues, and company sizes – in financial and energy terms – of each recipient. The two published questionnaires can be found in Appendices C and D.

3 “Lead time” is the time to adjust between the announcement of the reconfiguration and the actual adaptation of the reconfiguration.

2.3 Data treatment and estimation of total transition cost ranges

2.3.1 Responses in line with the definition of transition costs in the BZR Methodology

We analysed the cost estimates from the questionnaires by reviewing the submitted cost explanations for their compliance with the definition of transition costs as set out in the BZR Methodology:

- › In case the reasoning provided for cost estimates was unclear, we approached the respective stakeholder to clarify their cost estimate. The costs were then included unless they did not correspond to the transition cost definition from the BZR Methodology.
- › In case explanations for costs were clearly not in line with the definition of transition costs in the BZR Methodology, Compass Lexecon – in alignment with ENTSO-E and the

TSOs – excluded them from the dataset.⁴ For example, some stakeholders reported costs related to the hedging of price spreads across BZs or opportunity costs caused by delayed projects. Such cost estimates were excluded from the dataset because the costs were not transition costs as defined in the BZR Methodology.

- › In addition, ACER and the NRAs were also given the opportunity to review anonymised questionnaire responses and provide comments.

We note that an in-depth audit of the cost data beyond this was not in the scope of this study. We ultimately had to rely on the description of data provided by the respondents.

2.3.2 Overview of transition costs estimates by organisation type, cost type, and BZ configuration

We estimated total transition costs for each alternative BZ configuration based on the survey responses, in line with the definition of transition costs in the BZR Methodology. For each alternative BZ configuration, total transition costs were estimated using the sum of estimated transition costs across all organisation types and cost types.

If no entity of an organisation type provided estimates for an alternative BZ configuration, this organisation's transition costs could not be estimated for that alternative BZ configuration. Consequently, the total transition cost estimates do not include those stakeholder groups. Table 2.3 lists the stakeholder groups that were included in the total transition cost estimates ("Y") or had to be omitted due to a lack of data ("N") for each country.

	1. Wholesale/retail market participants	2. TSOs	3. DSOs	4. Market infrastructure providers	5. Public administrations
Italy	Y	N	N	Y	N
France	Y	Y	Y	Y	N
Germany	Y	Y	Y	Y	N
Sweden	Y	Y	N	Y	N
The Netherlands	Y	Y	N	Y	N

Source: Compass Lexecon Analysis.

Note: "Y" for yes, indicating that data is available for transition cost estimation. "N" for no, indicating that data is not available for transition cost estimation.

Table 2.3: Availability of data for transition cost estimation

⁴ ACER and the NRAs have been granted access to the anonymised versions of the dataset. ACER and the NRAs asked clarification questions on the data treatment and provided recommendations on whether or not to exclude specific observations. However, decisions to exclude or include specific observations were ultimately taken by the TSOs.

For each alternative BZ configuration, we estimated transition costs for all organisation types and cost categories. As outlined in Table 2.4, those estimates were aggregated into transition cost estimates for each organisation type and alternative BZ configuration. Given that transition costs of public administrations could not be assessed for any country (as described in Table 2.2), this organisation type was generally omitted in the total transition cost estimates.

The method for computing the transition cost estimates for an organisation type and cost type depended on the number of stakeholders in the respective organisation type (which can also differ per BZ reconfiguration).

	1. Wholesale/retail market participants	2. TSOs	3. DSOs	4. Market infrastructure providers	5. Public administrations
Cost type A: Business processes	Estimate(s) A1	Estimate(s) A2	Estimate(s) A3	Estimate(s) A4	<i>Not available</i>
Cost type B: IT systems	Estimate(s) B1	Estimate(s) B2	Estimate(s) B3	Estimate(s) B4	<i>Not available</i>
Cost type C: Reporting obligations	Estimate(s) C1	Estimate(s) C2	Estimate(s) C3	Estimate(s) C4	<i>Not available</i>
...
Cost type H: Any examples not covered above	Estimate(s) H1	Estimate(s) H2	Estimate(s) H3	Estimate(s) H4	<i>Not available</i>
Sub-totals per organisation type	Sums of estimates A1-H1	Sum of estimates A2-H2	Sums of estimates A3-H3	Sum of estimates A4-H4	Not available

Source: Compass Lexecon Analysis.

Table 2.4: Structure of transition cost estimates for a change in BZ configuration

2.3.3 Methodology for estimating total transition costs in segments with only a few direct stakeholders

If an organisation type comprises only a few direct stakeholders, the transition costs for that alternative BZ configuration and organisation type were approximated by the sum of all individual transition cost estimates. Consequently, for those organisation types, we report one estimate instead of a range of estimates. This method was used for TSOs and market infrastructure providers.

For market infrastructure providers, the sum of individual estimates received was considered the lower bound of total cost estimates since the lack of sufficient data points did not allow us to scale the estimates. All or none of the national TSOs reported transition costs for the respective countries. Consequently, total transition cost estimates either include all of the relevant TSOs or are missing entirely.

2.3.4 Methodology for estimating total transition cost in segments with many stakeholders

If only some entities and organisation types provided transition cost estimates, we scaled the individual transition cost estimates. This methodology was applied for distribution system operators (DSOs) and wholesale/retail market participants.

Specifically, from each individual survey response, transition costs for the entire alternative BZ configuration were estimated in three main steps:

- › First, we assessed the provided input for completeness. Individual estimates are complete if (i) cost estimates were divided into size-dependent and size-independent costs and (ii) there was information available on the relative size of the company.
- › Second, we scaled the individual cost estimates. As outlined below, this was undertaken separately for costs dependent on company size and costs independent of company size.

For all size-dependent and independent costs, we obtained ranges of total transition costs estimates per organisation type and alternative BZ configuration. The upper and lower bounds of these ranges were determined as follows:

- The lower end of the range followed from scaling the estimate with the lowest unit costs.
 - The upper end followed from scaling the estimate with the highest unit costs.
- › Third, we standardised costs that depend on company size to make size-dependent costs comparable across companies of different sizes. For the standardisation of costs, we compared the costs as if the company size represented 1 % of the total market size. Multiplying size-dependent costs per 1 % scaling factor by 100 yielded the estimate for total size-dependent transition costs.

Scaling of costs dependent on company size

We scaled the costs dependent on company size by using the estimated market share of a considered company:

- › For DSOs, the distribution network length of the respective DSO was used as a proxy for company size.
- › For retailers and wholesale market participants, the choice of a proxy to scale costs depended on data availability.⁵
 - If respondents provided data on generated or consumed volumes, those were compared to the countries' annual total load or total traded volumes to estimate scaling factors.
 - If no data was provided by the respondent, public data on the company size was used.
- For utilities that did not provide market information and where public sources were not obtainable, their thermal installed capacity was retrieved and compared to total thermal installed capacity from a Compass Lexecon internal database.

Due to the heterogeneity of companies in this segment, the use of these scaling factors constitutes a substantial assumption and limits the representativeness of the resulting cost estimates.

All of those scaling assumptions were agreed with ENTSO-E.

Scaling of costs independent of company size

Costs independent of company size should be incurred equally by all market participants. Consequently, we estimated total transition costs independent of company size by multiplying individual costs independent of company size with the number of market participants.

- › For the wholesale/retail sector, the number of market participants was approximated by the number of balance responsible parties in each country. These values were publicly available and published by the TSOs of each country.⁶
- › For DSOs, costs independent of company size were scaled by multiplying with the number of DSOs in the respective country (see [Chapter 4](#) for more details on the assumptions).⁷

5 Public sources included market size approximations from ENTSO-E (2023), the European Commission (2022b) on German traded volumes, the European Commission (2022a) for the Dutch retail market size, and others for company-specific details.

6 Public sources include the number of BRP from TSO websites: (50Hertz, 2023; Amprion, 2023; eSett, 2023; RTE, 2023; TenneT, 2023a, 2023b; Terna, 2023; Transnet bw, 2023).

7 For the scaling of independent costs, 880 DSOs are assumed for Germany. We assumed 143 French DSOs. See CEER (2022).

Hypothetical cost ranges as cross-check for the reliability of scaled costs

Scaling required that survey respondents categorised costs as being dependent on or independent of company size. To include those responses that did not differentiate costs by size dependence, we computed hypothetical total transition costs by making assumptions about size dependence. Specifically, we scaled the median cost observation assuming that costs were either fully dependent on or fully independent of company size.

The cross-checks complemented the total transition cost ranges obtained from scaling complete observations as follows:

- › Cross-checks allowed creating a range of total transition cost estimates if data availability was very limited.
- › Cross-checks enabled comparing and assessing the level and range of the estimates obtained from scaling complete data points.
- › Cross-checks offer the advantage that the estimates did not rely on the potentially inaccurate or missing estimation of size dependence of transition costs.

2.4 Limitations of the methodology

The methodology outlined above faces at least four limitations that should be taken into consideration when interpreting or using the results from the total transition cost estimation:

Limited representativeness due to a low number of responses and a small dataset

- › The representativeness of the dataset analysed is restricted. We received 42 answers overall, some of which were incomplete (see [Chapter 3](#) for a detailed overview of the data points received and explanation). Hence, the sample size for estimating total transition costs is limited.
- › Despite measures to increase the number of survey responses, data limitations remained. Measures to increase the number of data points included:
 - conducting a second questionnaire;
 - contacting industry associations and organisations to increase the reach of the survey;
 - conducting interviews with selected survey participants; and
 - using data points from incomplete questionnaires, with additional assumptions and checking for the plausibility of the results.

Inaccuracies from scaling and aggregating individual cost data

- › The estimated total transition costs should be only – if at all – considered as an approximate range. Due to the limited data availability, the estimation of total transition costs required scaling individual cost data to an entire market segment or country. Hence, the approximate ranges should not be interpreted as an error margin, but rather as differing estimates.
- › The aggregation of individual cost data might cause inaccurate total cost estimates. Given the limited number of responses for specific organisation types, costs were aggregated across organisation types in some cases.⁸ Consequently, cost data within a group of merged organisation types became less comparable. This inaccuracy might be further increased when applying market shares to scale individual cost data to an entire market segment.

⁸ More specifically, participants regularly stated being part of multiple organisation types in their responses. The TSOs and Compass Lexecon decided to aggregate cost estimates of selected organisation types based on the criterion that the company bears or might bear balancing responsibility. Hence, we combined generators, retailers, aggregators, traders, etc. into one group.

Deviating understanding of transition costs

- › Not all costs that stakeholders might expect from a change in BZ configuration were included in the study. Indeed, based on the BZR Methodology, the data and information collected were constrained to a specific definition of transition costs.
- › In the interviews conducted, some market participants questioned the definition of transition costs, arguing that it only covers a subset of costs emanating from a BZ reconfiguration. For example, the transition cost estimates do not include changes to asset value, uncertainty and regulatory risk for investment decisions, and opportunity costs, which some stakeholders consider relevant.⁹

Limited data quality across survey participants

- › The data collected through questionnaires might be subject to inaccuracies. The quality and accuracy of cost estimates submitted might differ across respondents; for example, due to different or limited internal resources to answer the survey, divergent understandings of the questions asked and interpretations of the cost definitions, or other unobserved biases.
- › Despite measures to improve data quality, inaccuracies in the data analysed cannot be ruled out. Measures taken by ENTSO-E, TSOs, and Compass Lexecon to improve data quality included:
 - conducting a public webinar on the first questionnaire;
 - for the second questionnaire, approaching selected market participants directly to explain the questionnaire and discuss the participant's individual transition costs; and
 - reaching out to participants in case of unclear cost estimate explanations provided in the survey.
- › Moreover, as we were limited in auditing the data, inaccuracies remain in the dataset used, which might limit the validity of the results.



⁹ This study cannot reconcile these differences in transition cost definitions.

3 Analysis of Cost Data gathered in Public Surveys

The descriptive analysis of cost estimates received through the questionnaires aims to develop a general understanding of the data. The analysis includes the data completeness and a comparative analysis of individual data points, including an explanation of the transition cost estimates provided by the survey respondents.

This analysis supports making total transition cost estimates by contextualising the total transition cost ranges and comparing the individual cost estimates that serve as the basis for the scaling (see [Chapter 2.3](#)).

This section is structured as follows:

- › We first provide an overview of the data points received at the individual cost estimate level and organisation level.
- › Subsequently, we assess individual data points by comparing them within organisation types, cost categories, and BZ reconfigurations.
- › We further elaborate on lead time considerations for the data points provided.
- › Finally, we draw conclusions based on the descriptive analysis.

3.1 Outline of data points received

Overall, 42 stakeholders answered at least one of the two questionnaires, with 23 and 24 stakeholders responding to the first and second questionnaires, respectively. Six stakeholders provided data in both questionnaires.

We restricted the analysis to those alternative BZ configurations and organisation types for which we received sufficient data, and excluded all others. For this purpose, we reviewed data availability based on:

- › the number of respondents and usable data per organisational type and country; and
- › the number of cost estimates and consideration of size-dependent and -independent costs per organisational type and cost type.

3.1.1 Review of data availability based on data provided per organisational type and country

Table 3.1 illustrates the distribution of respondents across organisation types and countries. Each respondent has a unique organisational type, meaning that it can only be counted once – for example, as “wholesale/retail” – although it can be active in multiple countries.

Wholesale/retail organisations – especially those active in Germany – provided the most responses to the questionnaires. By contrast, public administrations (e.g. NRAs) did not provide any answers.

Furthermore, data from stakeholders in Italy and Sweden was very limited. The number of TSOs expecting transition costs from a German BZ reconfiguration exceeded the number of TSOs with control area responsibility in Germany. This is the case as a TSO of a neighbouring country expects transition costs due to the German BZ reconfiguration and hence submitted estimates in the survey.

In order to scale the data, we required data on costs, the dependence of costs on company size, and market shares. This further constrained the size of the dataset analysed (see [chapter 2.3](#)). Table 3.2 shows the number of responses that are fully (before parenthesis) or partially (in parenthesis) usable to estimate transition costs.

Partially usable data is data provided by wholesale/retail market participants or DSOs that lack:

- › differentiation between company size-dependent costs (DEP costs) and company size-independent costs (IND costs); or
- › information on the company size.

For all countries, most responses could only be used for scaling partially and under additional assumptions, particularly for the wholesale/retail segment. By contrast, the data provided by TSOs was complete for all responses. Scaling was not needed for this organisation type because either all or none of the TSOs per country provided data (as described in [Chapter 2.3](#)). Hence, a differentiation regarding the size dependence of transition cost was not required.

	France	Germany	Italy	Netherlands	Sweden
Wholesale/retail	9	14	6	11	4
TSO	1	5	0	1	1
DSO	1	5	0	0	0
Market infrastructure providers*	2	2	0	2	3
Public administration	0	0	0	0	0

Source: Compass Lexecon analysis of stakeholder input provided in questionnaires

Note: *One company (excluded here) verbally provided preliminary cost estimates that are considered when discussing total transition cost range estimates for market infrastructure providers. They are otherwise excluded.

Table 3.1: Number of respondents per organisation type and country

	France	Germany	Italy	Netherlands	Sweden
Wholesale/retail	1 (8)	3 (10)	0 (6)	2 (9)	0 (4)
TSO	1 (0)	5 (0)	0 (0)	1 (0)	1 (0)
DSO	0 (1)	3 (2)	0 (0)	0 (0)	0 (0)
Market infrastructure providers*	1 (0)	1 (0)	0 (0)	1 (0)	2 (0)
Public administration	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Source: Compass Lexecon analysis of stakeholder input provided in questionnaires

Note: *One company (excluded here) verbally provided preliminary cost estimates that are considered when discussing total transition cost range estimates for market infrastructure providers. They are otherwise excluded.

Table 3.2: Number of respondents per organisation type and country with complete data (with partially usable data/data used as a check)

3.1.2 Review of data availability based on data provided per organisational type and cost type

We asked stakeholders to categorise their expected transition costs into the eight cost types listed in Table 3.3. Of the eight cost types, we received the most responses for:

- › IT system costs;
- › business process costs; and
- › costs associated with the renegotiation or termination of contracts.

There was considerable variation in the distribution of cost estimates across organisation types. Table 3.3 shows this variation, reporting the number of received cost estimates per cost category and organisation type.

For market infrastructure providers, the cost estimates provided mostly cover IT system costs. Conversely, cost estimates of DSOs were distributed more evenly across the eight cost categories. Finally, the categorisation of costs was imperfect for TSOs. Some TSOs provided cost estimates for combinations of cost categories or without differentiating between cost categories.

	Wholesale/retail	TSO	DSO	Market infrastructure provider*	Public Admin.	Sum
Business processes	93 (15.6%)	26 (23.2%)	29 (17.4%)	1 (7.1%)	No data received	149 (15.6%)
IT systems	104 (17.4%)	33 (29.5%)	29 (17.4%)	11 (76.6%)		177 (18.5%)
Reporting obligations	85 (14.2%)	11 (9.8%)	16 (9.6%)	0 (0%)		112 (11.7%)
Renegotiation/ termination of contracts	87 (14.6%)	33 (29.5%)	28 (16.8%)	1 (7.1%)		149 (15.6%)
Redrawing of legislation	50 (8.3%)		16 (9.6%)	0 (0%)		99 (10.3%)
Other: Adjustment to or termination of contracts and regulation	54 (9%)		16 (9.6%)	1 (7.1%)		104 (10.9%)
Other: Processes with TSOs and public bodies	70 (11.7%)	0 (0%)	16 (9.6%)	0 (0%)		86 (9%)
Any examples not covered above	55 (9.2%)	1 (0.9%)	17 (10.2%)	0 (0%)		73 (7.6%)
No cost type differentiation	0 (0%)	8 (7.1%)	0 (0%)	0 (0%)		8 (0.8%)

Source: Compass Lexecon analysis of stakeholder input provided in questionnaires

Note: *One company (excluded here) verbally provided preliminary cost estimates that are considered when discussing total transition cost range estimates for market infrastructure providers. They are otherwise excluded.

Table 3.3: Number of cost estimates as provided by stakeholders per organisation type and cost category (and as a percentage of the total number of cost estimates per organisation type)

It was necessary to split individual cost estimates into DEP costs and IND costs to apply the scaling methodology as described in Chapter 2.3. Table 3.4 depicts the number of cost estimates available in each of those two categories. By definition, this included only the subset of data provided by wholesale/retail market participants and DSOs that differentiate the costs by size dependence.

The number of size-adjusted DEP and IND cost estimates differed where information about the company's size (i.e. the scaling factor) was missing. In these cases, if public data on company size was unavailable, respondents differentiated the cost estimates into DEP and IND costs, although only IND costs could be scaled. Up to three-quarters of the relevant cost estimates in the retail/wholesale segment lacked the scaling factor. All relevant cost estimates of DSOs could be scaled to their respective size.

	Wholesale/ retail	TSO	DSO	Market infrastructure provider*	Public Admin.
Business processes	46 15	Not relevant for scaling	12 12	Not relevant for scaling	No data received
IT systems	51 15		12 12		
Reporting obligations	45 14		12 12		
Renegotiation/ termination of contracts	44 9		12 12		
Redrawing of legislation	24 6		12 12		
Other: Adjustment to or termination of contracts and regulation	38 6		12 12		
Other: Processes with TSOs and public bodies	31 10		12 12		
Any examples not covered above	31 10		12 12		
No cost type differentiation	0 0		0 0		

Source: Compass Lexecon analysis of stakeholder input provided in questionnaires

Table 3.4: Number of data points for cost independent of company size and size-adjusted cost dependent on company size
(size-independent | size-dependent)



3.2 Characteristics of data points received

Data points for a given BZ reconfiguration, organisation type, and cost type can vary along two dimensions:

- › the level of cost estimates provided; and
- › the share of these costs that are independent of company size. This is relevant to scale individual costs to total transition costs.

DSOs and the wholesale/retail segment provided estimates for the share of size-dependent transition costs. By contrast, most cost estimates provided by TSOs and market infrastructure providers did not differentiate for size dependence. Consequently, the comparison of data points of these organisation types could not consider size dependence and was analysed separately.

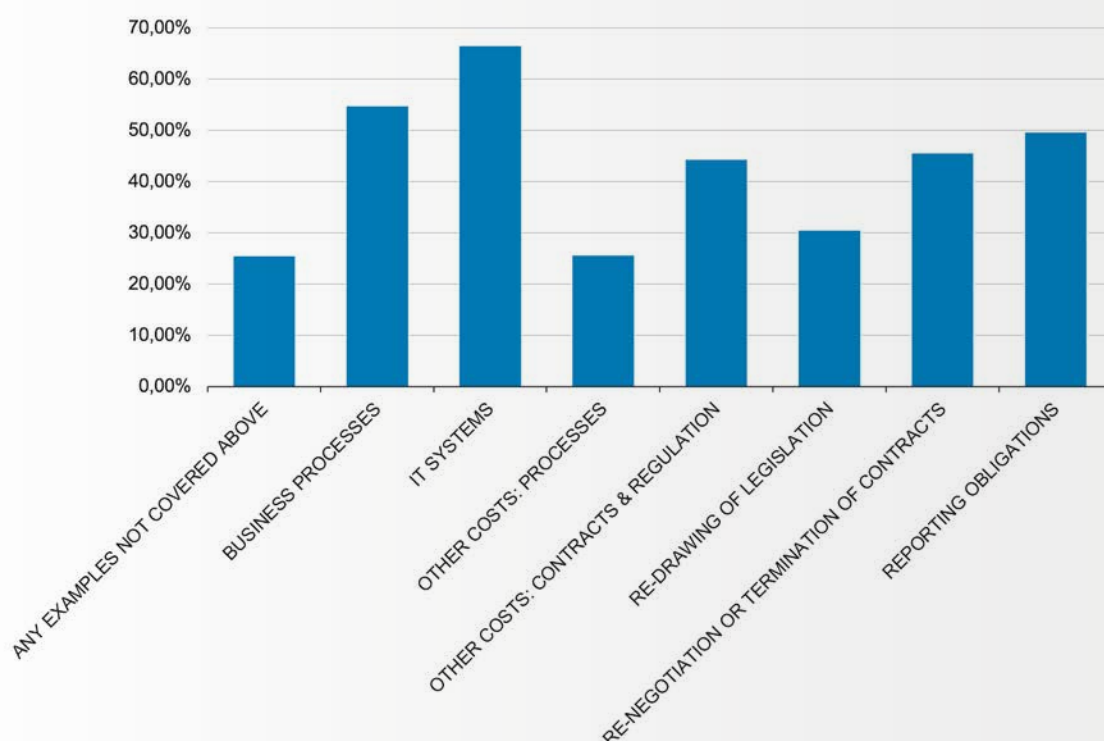
3.2.1 Cost estimates differentiating by size dependence

Quantitative description of size-independent costs

IND costs are those that any market participant in their market segment bears equally, independently of its size.¹⁰ Therefore, these costs can be compared directly within a market segment.

Figure 3.1 presents the average share of size-independent costs for each cost category. On average, respondents estimate most of their IT system costs and business process costs to be independent of company size. The average

reported share of costs independent of company size ranges between 25% and 67% for the different cost types. While IT system and business process costs are at the upper end of that range (meaning that they are deemed by more respondents to be independent of company size), stakeholders expect costs for adaptation to new legislation – in particular, legal advice on the impact of legislative changes – and the adjustment of processes with TSOs and other public bodies to be largely dependent on company size.



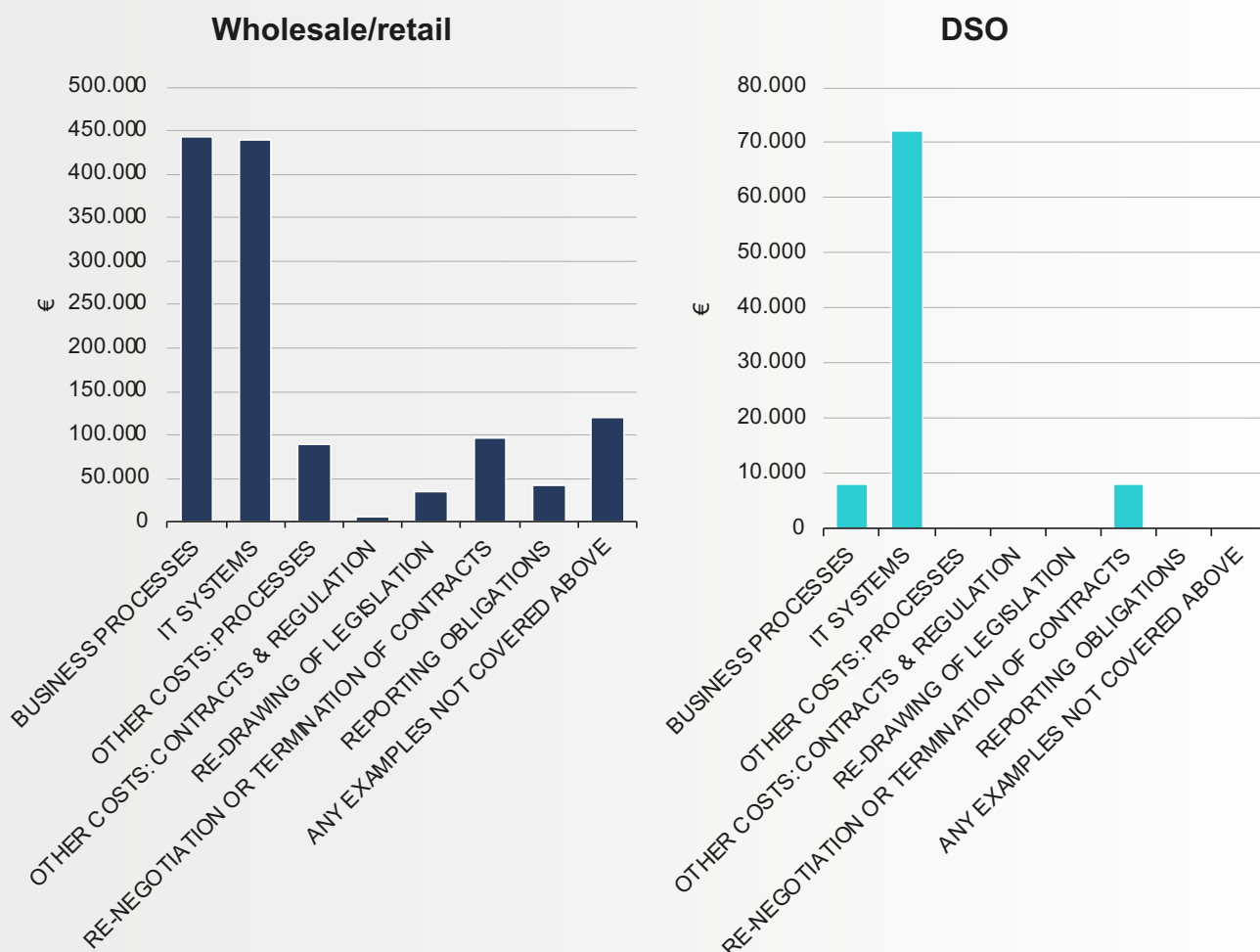
Source: Compass Lexecon analysis of stakeholder input provided in questionnaires.

Figure 3.1: Average share of transition costs reported as independent of company size (by cost type)

¹⁰ Note that market segments are approximated by organisation types.

Figure 3.2 shows the size-independent costs by cost category and organisation type. For the wholesale/retail segment, the adjustment of business processes and IT systems stands out as the cost categories with the highest expected IND costs. Stakeholders in the wholesale/retail segment expect more than 400,000 € of IT system cost and business process cost on average. Relatively lower costs (below 100,000 €) are expected for all other cost categories.

Similar to the wholesale/retail segment, DSOs expect size-independent transition costs primarily due to the adjustment of IT systems. Other transition costs are only expected to arise from the adjustment of business processes and the re-negotiation or termination of contracts. Figure 3.2 shows that DSOs on average expect size-independent IT system costs of around 70,000 €. Average cost estimates in the remaining categories are below 10,000 €.



Source: Compass Lexecon analysis of stakeholder input provided in questionnaires

Figure 3.2: Average size-independent costs by cost type and organisation type

Quantitative description of size-dependent costs

DEP costs are those that market participants bear depending on their company size. Hence, DEP costs had to be adjusted to the size of the respective respondent to ensure comparability. Therefore, we controlled for the company size by multiplying the stated DEP cost with the share of the company size over the market size, assuming linearity between DEP costs and company size.¹¹

Figure 3.3 shows average size-dependent costs per cost category for a 1 % scaling factor (see Chapter 2.3). Similar to IND costs, IT system costs and business process costs are among the largest cost items of DEP transition costs in the wholesale/retail segment. The figure shows that per 1 %

scaling factor, average IT system costs amount to more than 440,000 €, followed by business process costs, renegotiation or termination of contracts, and redrawing of legislation (all around 120,000 €). Compared to IND costs, the role of redrawing of legislation and renegotiation or termination of contracts is relatively larger for DEP costs.

DSOs only expect DEP costs in the adjustment of business processes, IT systems, and the renegotiation or termination of contracts. Average cost estimates for these three categories range between 9,000 € and 14,000 € per 1 % scaling factor. Hence, DEP costs are less concentrated on IT system costs than IND costs.



Source: Compass Lexecon analysis of stakeholder input provided in questionnaires

Figure 3.3: Average size-dependent cost by cost category (per 1% scaling factor)

¹¹ The linearity assumption follows from two opposing lines of argumentation for progressive and degressive relationships. On the one hand, the complexity of the systems that must be transitioned increases with company size. On the other hand, economies of scale might imply degressive transition costs with increasing company size. Therefore, the linearity assumption was communicated for the questionnaires. The data received and interviews did not refute this assumption.

Qualitative description of costs

Stakeholders in the wholesale/retail segment state a wide range of business processes that need to be adjusted to a new BZ configuration, including pricing strategies, trading strategies, dispatching, invoicing, forecasting, risk management, and consulting costs.

- › While stakeholders that highlight costs for forecasting and risk management tend to expect comparatively low transition costs, stakeholders focusing on dispatching, invoicing, and consulting expenses estimate substantially higher transition costs.
- › One stakeholder highlighted that business process costs depend on whether the company's assets would be split with a BZ reconfiguration. In this case, additional adjustments to IT systems would be required.

In the wholesale/retail segment, IT systems that would be affected by a change of BZ configurations include trading systems, settlement systems, customer relationship management, pricing systems, portfolio management, balancing systems, and invoicing. There is variation in how the stakeholders plan to implement these changes:

- › Some companies plan to hire additional employees,
- › Other companies plan to engage external providers or consultants to facilitate the implementation of IT system adjustments. If the implementations are undertaken externally, stakeholders are involved in testing the adjusted systems.

DSOs highlight general process testing as the driver of business process cost. IT system costs are related to upgrading portfolio management software and scheduling adjustments.

3.2.2 Cost estimates without the need for differentiation by size dependence

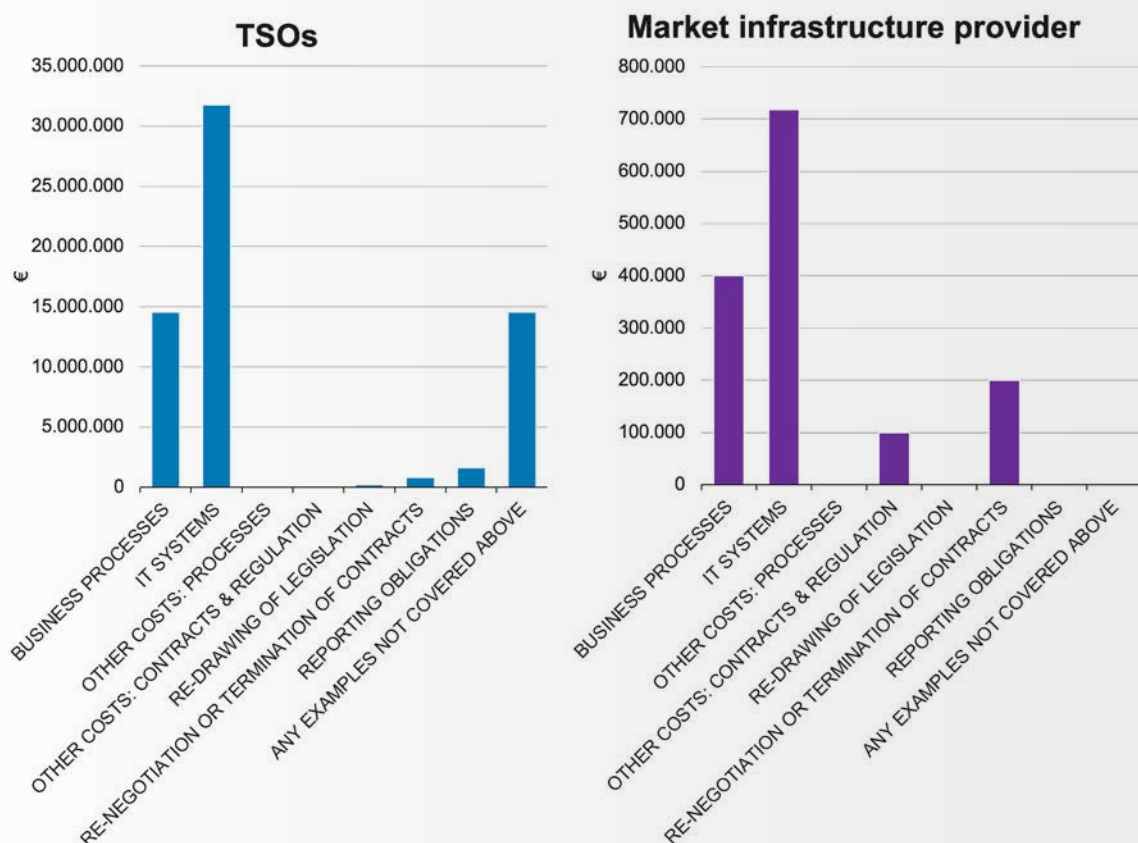
Quantitative description of costs

For TSOs and market infrastructure providers, the size dependence of costs was less relevant for scaling due to the limited number of stakeholders active in the respective segment. Hence, the comparison of data points focused on the total, size-undifferentiated transition costs.

Figure 3.4 presents average transition cost estimates of TSOs by cost category. TSOs expect transition costs primarily from the adjustment of business processes and IT systems. Moreover, cost estimates in the other categories are also high. On average, TSOs estimate IT system costs of around 30 € million. Business process costs and residual costs ("Any examples not covered above") amount to around 15 € million on average. According to the reasoning provided by the respondents, these costs cover necessary training and change management.

The general structure of transition costs expected by market infrastructure providers is similar to TSOs, although cost estimates are significantly lower. As shown in Figure 3.4, around 700,000 € of transition costs are expected in the adjustment of IT systems. For business processes, costs amount to 300,000 € for TSOs.¹² Other reported costs relate to contracts and regulation but are considerably smaller.

¹² The cost estimates provided verbally by the market infrastructure provider that has not submitted its estimates via the template are similar to the stated estimates here. The estimate was the incursion of above 2 € million in IT system change costs and above 2 € million in business process change costs, irrespective of the specific BZ reconfiguration and mostly irrespective of company size.



Source: Compass Lexecon analysis of stakeholder input provided in questionnaires

Figure 3.4: Average transition costs: TSOs and market infrastructure providers

Qualitative description of costs

The described changes in business processes and IT systems of TSOs arguably concern tools used for forecasting, redispatch, balancing, congestion management, grid operation/planning, and settlement of ancillary services. Furthermore, training of employees, configuration and integration of equipment and measuring devices, prospective modelling

(R&D software), capacity calculations, and the evaluation of new grid maps are expected to create transition costs.

One TSO noted that transition costs would be particularly high if the new BZ configuration splits 110 kV network groups.

3.2.3 Consideration of lead time in data points provided

About half of the respondents expect transition costs to increase if the lead time is to decrease (i.e. shorter than three years), while the other half expect costs to remain the same.

Furthermore, most respondents do not expect transition costs to change if they were granted more time until the implementation of the BZ reconfiguration. Only five of 23 respondents expect decreasing costs, and two participants indicate increasing costs with increasing lead time.

The main line of argumentation across the participants concerns the impact of contract duration and the need to re-negotiate, as well as the need for external resources if the adaptation was to be realised in a shortened timeframe.

In contrast to other organisation types, the market infrastructure providers highlighted that a longer lead time might lead to higher transition costs. Indeed, when introducing new products or mechanisms, market infrastructure providers might need to implement those changes in both systems, i.e. those with the old BZ and new configuration. Extending the lead time would multiply the occurrences of such situations and therefore the costs. Alternatively, market infrastructure providers could postpone the introduction of new mechanisms and products. This would incur opportunity costs that are not within the stated definition of transition costs, but which could be substantial.

3.3 Conclusion on the descriptive analysis of data received

The estimation of total transition costs is constrained by the scope and availability of the individual cost estimates provided by survey respondents. It was not possible to estimate total transition costs covering all relevant organisation types for all alternative BZ configurations of interest. The following bullet points summarise the situation:

- › Responses for Germany and France allowed aggregating or scaling up costs for system operators, market infrastructure providers, and the wholesale/retail segment. Public organisations did not provide data.
- › Responses for the Netherlands and Sweden allowed aggregating or scaling up costs for TSOs, market infrastructure providers, and the wholesale/retail market segment. Public organisations and DSOs did not provide data.
- › For Italy, the responses allowed for aggregating or scaling up costs for the wholesale/retail segment and market infrastructure providers. Public organisations, DSOs, and the TSO did not provide data.

Apart from this, the descriptive analysis highlights:

- › the heterogeneity of expected transition costs;
- › the difference in how respondents see different cost categories as being independent or dependent of company size;¹³ and
- › that shorter lead times – i.e. below three years – could increase transition costs (with market infrastructure providers as an exception).

The large variation of cost estimates within cost categories and organisation types underlines that estimating total transition costs is subject to a high level of uncertainty. Furthermore, the variation in expected size dependence prompts questions about the degree to which these discrepancies are related to differing company processes and operations, or general strong uncertainty when assessing size dependence.

¹³ Note that no clear indication was identified when differentiating between companies that have previously been affected by a bidding zone reconfiguration and those that have not. From the interviews, we follow that this is mainly due to the different impacts that BZ reconfigurations might have and the ability of market participants to anticipate potential BZ reconfigurations irrespective of having been affected by previous ones.

4 Results for the Estimation of total Transition Cost Ranges

This chapter presents estimated ranges of total transition costs for the proposed BZ reconfigurations in France, Germany, Italy, Sweden, and the Netherlands. These ranges aim to understand the order of magnitude of total transition costs that can be expected based on the available stakeholder input.

This section is structured as follows:

- › We first present estimates for total transition cost ranges per alternative BZ configuration.
- › Subsequently, we describe and interpret the transition cost ranges for different types of stakeholders and per alternative BZ configuration in greater detail.

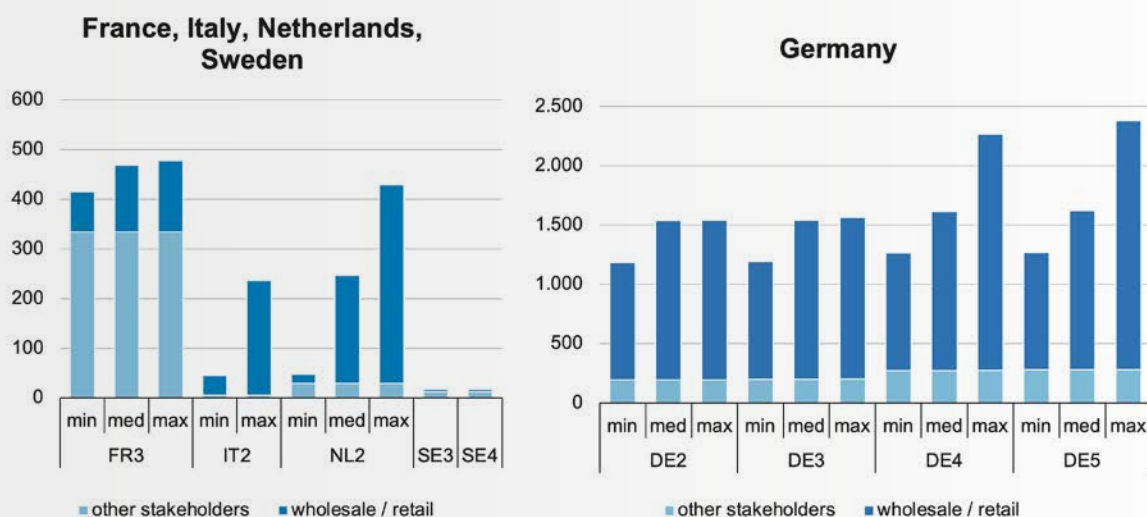
4.1 Ranges of total transition cost estimates per alternative BZ configuration

As described in [Chapter 2.3](#), total transition cost ranges were estimated based on the sum of scaled or aggregated transition costs of DSOs, TSOs, market infrastructure providers, and stakeholders in the wholesale/retail segment.

The magnitude and ranges of scaled total transition costs differ across countries. For Germany, the Netherlands, and Sweden, we observe wide transition cost ranges. By contrast, the difference between the minimum and maximum estimates is small or zero for France and Sweden. Moreover, the magnitude of estimated total transition costs for German BZ reconfigurations exceeds that of the other countries.

These differences across countries follow from the available cost data and the respective countries' segment sizes and structures. Figure 4.1 presents total transition cost ranges based on the minimum, median, and maximum observations of individual transition cost estimates (or in case of lacking data, based on checks as described in [Chapter 2.3](#)) per alternative BZ configuration.¹⁴

¹⁴ If one or less scaled observations were available for an organisation type, checks were included to create a range of estimates. This was the case for French DSOs, and the wholesale/retail segment of France, Italy and Sweden.



Source: Compass Lexecon analysis of stakeholder input provided in questionnaires

Note: The "min" costs are based on the scaled cost of the relatively lowest cost estimate, "med" costs are based on the scaled costs of the median cost estimate, and "max" costs are the scaled costs of the relatively highest cost estimate. For Germany, they are highest costs apart from the outlier. Each estimate is subdivided into the wholesale/retail segment and the sum of other stakeholders. For Germany and France, these other stakeholders include DSOs, TSOs, and market infrastructure providers. Other stakeholders in the Netherlands and Sweden include TSOs and market infrastructure providers. For Italy, other stakeholders include only market infrastructure providers.

Figure 4.1: Total transition cost ranges per number of zones in a country (in million €)

Estimates for German BZ reconfigurations are substantially higher than those for reconfigurations in the remaining countries. For German BZ reconfigurations, values range from 1 € billion to 2.5 € billion, while the values for the other countries remain below 500 € million. In addition, considering one outlier observation would result in maximum estimates for Germany of 7 € billion to 18 € billion. Apart from this outlier, costs are relatively stable across the different reconfigurations for Germany.

The high estimates for Germany can be partially explained by the fact that the number of wholesale/retail companies – approximated by the number of balance responsible parties – is about 10 – 30 times higher in Germany than in other countries. Further, market participants in Sweden and Italy might expect lower costs because they are experienced in handling multiple BZs, given that both countries already comprise multiple BZs.¹⁵ To a lesser degree, the high total transition cost estimates can also be explained by the data available to the relevant stakeholders. For example, data on the Italian TSOs and DSOs is missing, meaning that a comparison of total transition cost estimates across countries is generally difficult.

¹⁵ The number of balance responsible parties considered are 1,400 for Germany, 190 for France, 151 for Italy, 121 for the Netherlands, and 41 for Sweden. BRP in Germany have not been counted twice if they are active for more than one TSO. The data has been derived from the TSO websites and eSett.

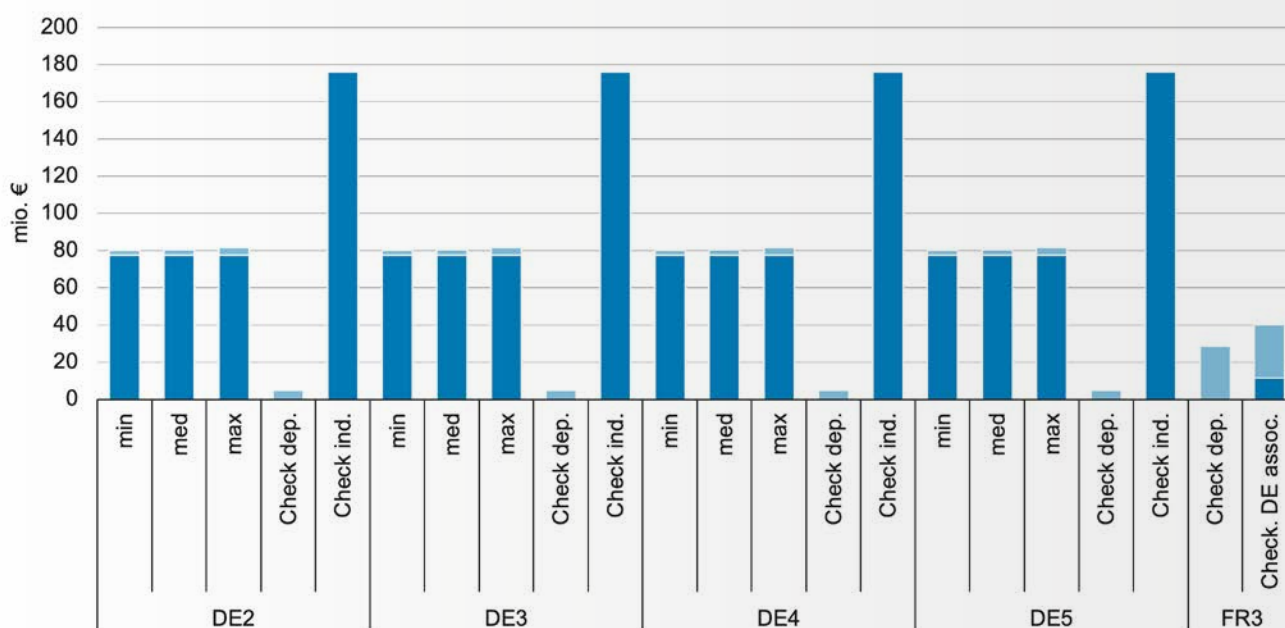
4.2 Transition cost ranges per organisation type and alternative BZ configuration

4.2.1 Distribution system operators

Figure 4.2 presents the estimated costs for all available scenarios and BZ reconfigurations.

For the German DSO segment, estimated total transition costs amount to around 80 € million in all German BZ reconfigurations.¹⁶ The majority of the estimated total transition costs are independent of company size. The variation in total transition costs between the minimum and the maximum scenario is very small due to the identical cost estimates provided by all German DSOs participating in the survey. Hence, variation within a given BZ configuration only arises in IND costs as these costs are adjusted by the individual size of the respective companies. Notably, cost estimates are also identical across BZ reconfigurations with varying numbers of BZ for the same region.

The data provided for the French DSO segment does not differentiate cost estimates by size dependence. Consequently, assumptions are necessary to calculate estimated total transition costs. When assuming the full size dependence of transition costs, the resulting estimate for the French DSO segment is smaller than the estimates for the German segment, but within the range of the checks for German DSOs. Under the assumption that French DSOs face the same IND cost as German DSOs, the estimated total transition cost estimate for the French DSO segment would be around 40 € million.¹⁷ A cross-check assuming full size independence yields an extremely high result (around 4 € billion), which is therefore omitted in Figure 4.2.



Source: Compass Lexecon analysis of stakeholder input provided in questionnaires

Note: The "min" costs are based on the scaled cost of the relatively lowest cost estimate, "med" costs are based on the scaled costs of the median cost estimate, and "max" costs are the scaled costs of the relatively highest cost estimate, "Check dep" ("check ind.") costs are scaled median costs assuming that all cost estimates provided are 100% dependent (independent) on company size. "Check. DE assoc." assumes that individual size-independent costs are the same in France as in Germany.

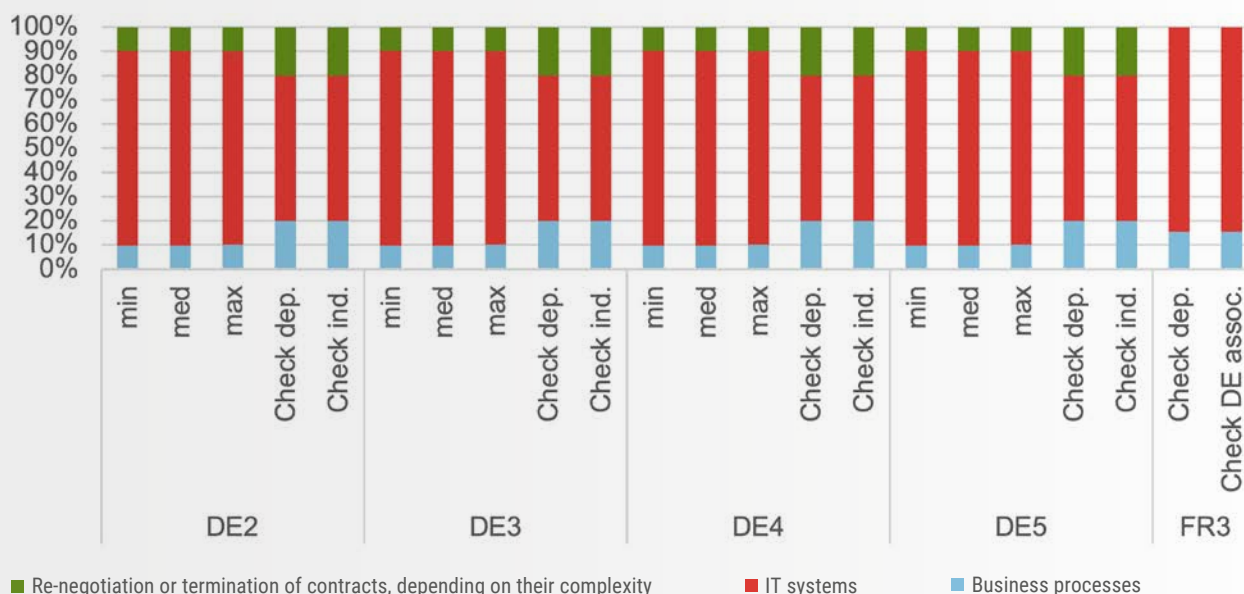
Figure 4.2: Total transition cost estimates for DSOs (in million €)

¹⁶ German DSOs provided data suitable for scaling. For these observations, the DSOs' reported individual shares of the German distribution grid length are used as scaling factors. For the scaling of IND costs, 880 DSOs are assumed for Germany (see CEER, 2022).

¹⁷ We assumed 143 French DSOs and scaled DEP cost based on the market share stated by the DSO who submitted estimates.

Figure 4.3 illustrates the distribution of costs across cost types for all BZ reconfigurations. For both Germany and France, estimated transition costs are mostly related to IT systems (between 60% and 85%). Only 10% to 20% of estimated

transition costs are business process costs. In contrast to the French DSO segment, some of the transition costs in the German DSO segment are related to renegotiation or termination of contracts.



Source: Compass Lexecon analysis of stakeholder input provided in questionnaires

Note: The "min" costs are based on the scaled cost of the relatively lowest cost estimate, "med" costs are based on the scaled costs of the median cost estimate, and "max" costs are the scaled costs of the relatively highest cost estimate, "Check dep" ("check ind.") costs are scaled median costs assuming that all cost estimates provided are 100% dependent (independent) on company size.

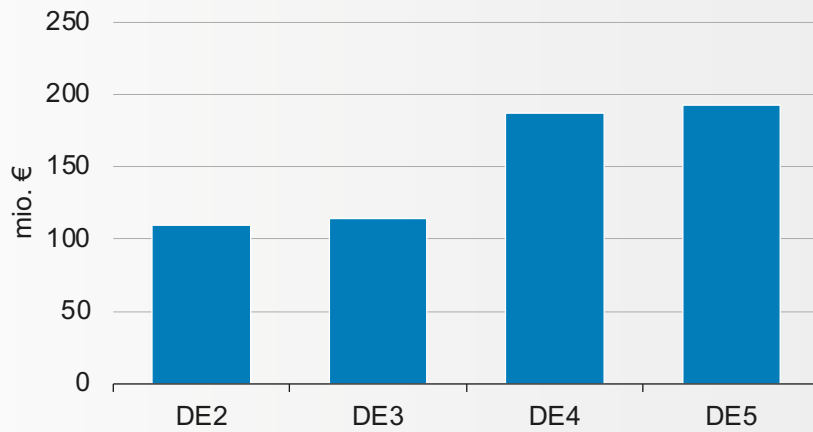
Figure 4.3: Share of total transition costs per cost type: DSOs

4.2.2 Transmission system operators

Total transition cost estimates of TSOs were approximated by the sum of individual transition cost estimates within an alternative BZ configuration across cost types. These estimates carry less uncertainty than transition cost estimates for other organisation types because the data points do not require scaling. In contrast to Germany, total cost estimates for France, the Netherlands, and Sweden include only one TSO per country.¹⁸

Figure 4.4 presents the estimated total transition costs for TSOs in the German BZ reconfigurations. Total transition costs range between 100 € million and 200 € million, increasing with the number of BZs per reconfiguration. The sharp rising costs for an increasing number of BZs is not equally driven by all TSOs. Indeed, all but one TSO report stable or only slightly increasing transition costs for an increasing number of zones. The reasoning for the high-cost estimates from one TSO relates to the individual configuration of borders between zones. Specifically, the stakeholder states that configurations that split 110 kV network groups cause exceptionally high implementation costs.

¹⁸ To keep these individual company responses confidential, this section focusses only on the relative importance of the cost types (i.e. shares of cost types in total costs) for France, the Netherlands and Sweden. We did not receive transition cost estimates of the Italian TSO.

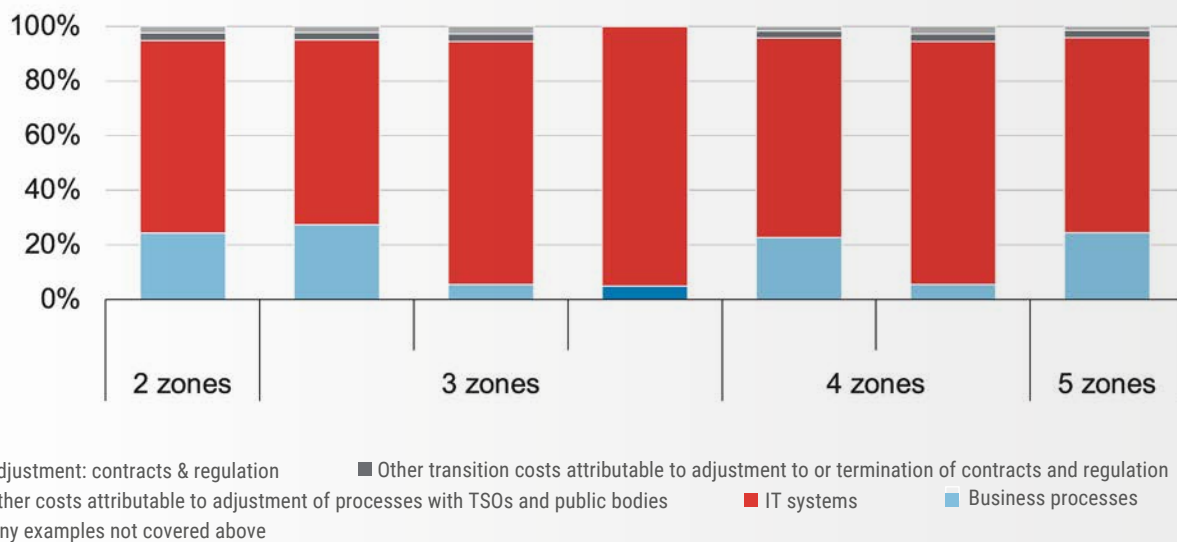


Source: Compass Lexecon analysis of stakeholder input provided in questionnaires

Figure 4.4: Total transition costs per BZ configuration: German TSOs (in million €)

Figure 4.5 reports the share of transition costs per cost category for all the alternative BZ configurations. Across all BZ reconfigurations, there is a consensus that changes to IT systems drive the transition costs of TSOs. Between 67% and 95% of the transition costs of TSOs are expected to be related to IT systems. The remaining costs are mostly associated with the adjustment of business processes. Only

small shares of the total estimated transition costs result from adjustments of reporting and contracts, or adjustment to regulations. There is no apparent relationship between the relative importance of cost types (i. e. share of cost types in total costs) and the number of BZs per alternative BZ configuration.



Source: Compass Lexecon analysis of stakeholder input provided in questionnaires

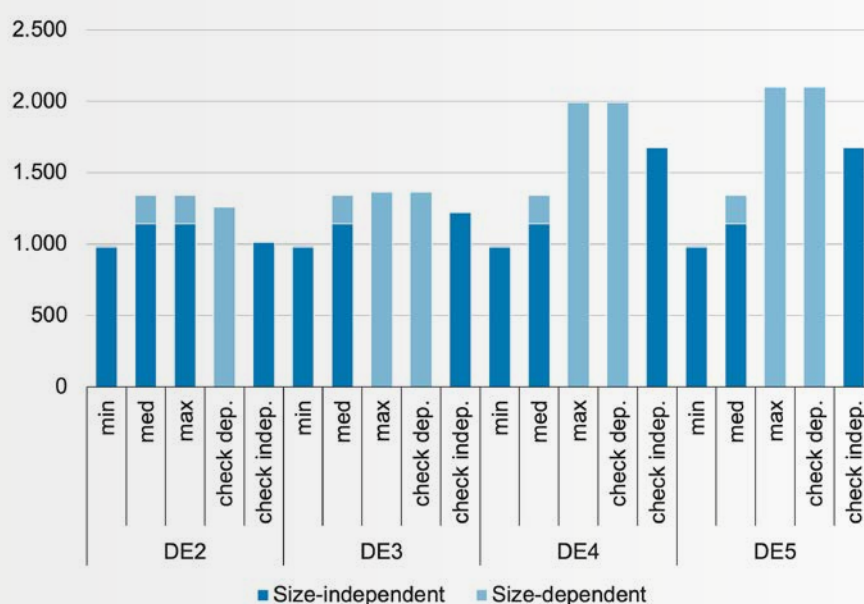
Figure 4.5: Share of total transition costs per cost type: TSOs

4.2.3 Wholesale/retail market participants

Total transition costs in the wholesale/retail segment were estimated for all countries of interest based on the number of market participants and scaling factors (see Chapter 2.3).

For all countries, data availability was limited. Only a fraction of the size-dependent and -independent cost estimates explored in Chapter 3 could be used because company sizes were unavailable. Aside from the checks, total transition cost estimates could only be estimated from companies that report their individual costs with differentiation by size dependency.

Figure 4.6 depicts all available estimates for the alternative German BZ configurations. When excluding one outlier observation, transition cost estimates for the German wholesale/retail market are around 1 € billion.¹⁹ Including the extreme outlier observation would result in maximum estimates between around 400 % and 1,200 % higher than the median estimate of the respective reconfiguration. This relative difference between median and maximum estimates would be substantially higher than that of the other countries (up to around 70 %).



Note: The "min" costs are based on the scaled cost of the relatively lowest cost estimate, "med" costs are based on the scaled costs of the median cost estimate, and "max" costs are the highest cost estimate (from checks or complete estimates) net of the outlier. "Check dep" ("check indep.") costs are scaled median costs, assuming that all cost estimates provided are 100 % dependent (independent) on company size.

Source: Compass Lexecon analysis of stakeholder input provided in questionnaires

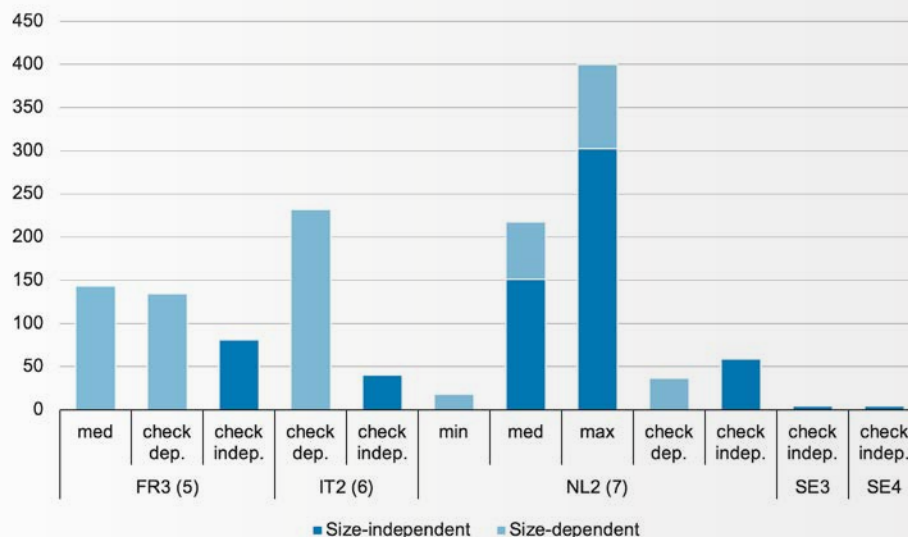
Figure 4.6: Transition cost estimates for the German wholesale/retail market (in million €)

Figure 4.7 shows all available total transition cost estimates for the wholesale/retail segments in France, Italy, the Netherlands, and Sweden. The order of magnitude of the total transition cost estimates in these countries is substantially lower than for Germany. The values for France, Italy, and the Netherlands are relatively similar. The results for Sweden are noticeably lower than estimates for the other countries. It is possible that the previous experience with multi-zone configurations in Sweden limits the expected transition costs of market participants.

However, for Italy (also already split into multiple BZs), estimated transition costs are substantially higher compared to Sweden. Overall, these observations should be carefully assessed for several reasons: first, due to data limitations for Italy and Sweden, only checks²⁰ are presented; and second, for France, there is only one observation that can be scaled in its size-dependent and -independent components. The estimate is complemented by the two checks that make assumptions on the size dependence of cost estimates.

¹⁹ We exclude the outlier for two reasons: first, the individual cost estimates (across cost types) are the highest estimates reported in the wholesale/retail segment, and second, the outlier assumes that transition costs are independent of company size. Therefore, total transition would be estimated by multiplying 100 % of the already high individual costs by the number of balance responsible parties in Germany.

²⁰ Checks are calculated as hypothetical total transition costs when assuming 100 % and 0 % cost dependence on company size for all available observations (see Chapter 2.3.2).



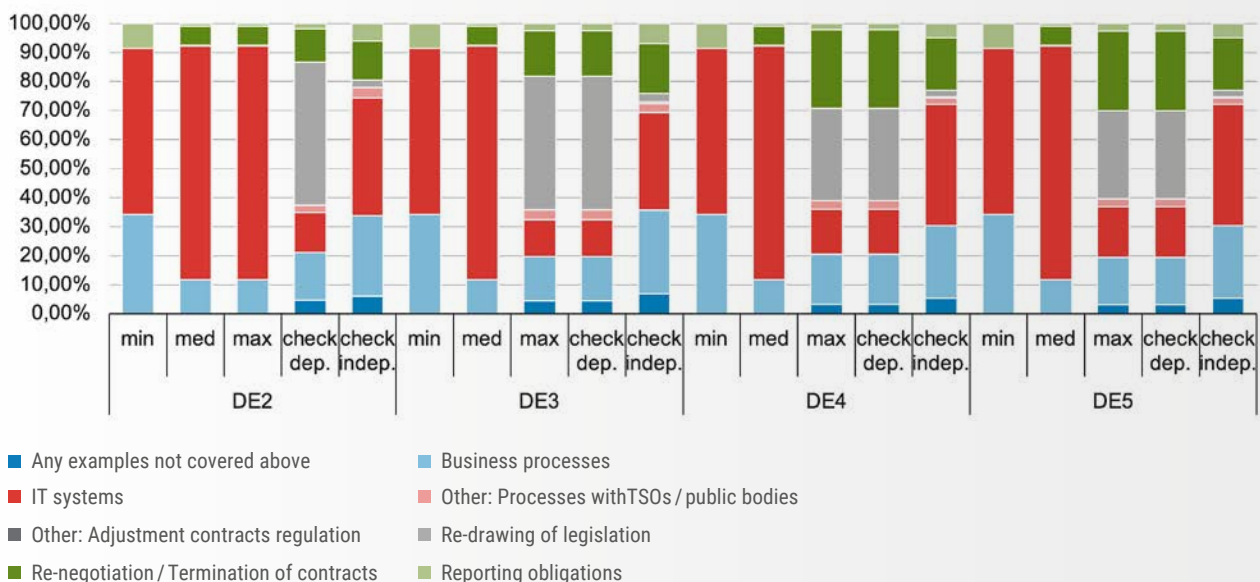
Source: Compass Lexecon analysis of stakeholder input provided in questionnaires

Note: The "min" costs are based on the scaled cost of the relatively lowest cost estimate, "med" costs are based on the scaled costs of the median cost estimate, and "max" costs are the scaled costs of the relatively highest cost estimate, "Check dep" ("check indep.") costs are scaled median costs assuming that all cost estimates provided are 100% dependent (independent) on company size.

Figure 4.7: Transition cost estimates for the French, Italian, Dutch, and Swedish wholesale/retail market (in € million)

Figure 4.8 shows the composition of total transition cost estimates for the German wholesale/retail segment by cost type. The cost types that drive transition costs are IT system costs, business process costs, and – to a lesser extent – costs associated with the renegotiation or termination of contracts.

Companies that estimate low or medium transition costs expect to primarily incur costs from changes to the IT system, followed by adjustments of business processes.²¹ Other cost categories such as the adjustment to reporting obligations or the redrawing of legislation only comprise a small part of the total transition cost estimates.



Source: Compass Lexecon analysis of stakeholder input provided in questionnaires

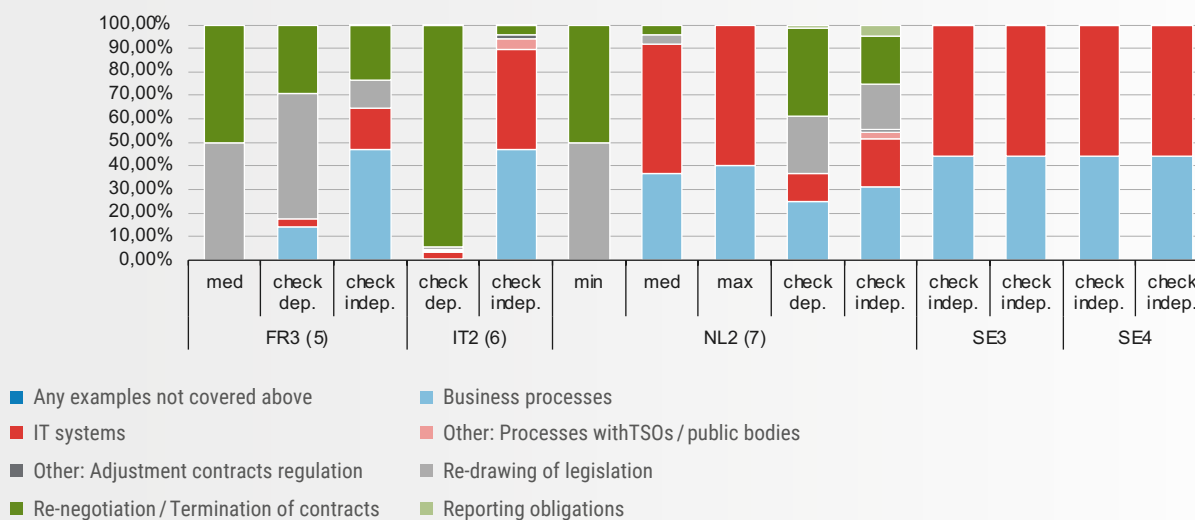
Note: The "min" costs are based on the scaled cost of the relatively lowest cost estimate, "med" costs are based on the scaled costs of the median cost estimate, and "max" costs are the scaled costs of the relatively highest cost estimate, unless the max estimate related to the output. In this case, it relates to the second-highest overall estimate. "Check dep" ("check indep.") costs are scaled median costs, assuming that all cost estimates provided are 100% dependent (independent) on company size.

Figure 4.8: Composition of transition cost estimates for the German wholesale/retail market by cost type

²¹ By contrast, the company that estimates the highest costs (the outlier) primarily expects costs for business process adjustments, and generally expects costs in more categories than the other survey participants. This further supports the exclusion of the provided estimate as an outlier, as it might not be representative for the entire market segment.

Figure 4.9 plots the shares of cost types for all calculated total transition cost estimates in France, Italy, the Netherlands, and Sweden. While there is little to no regularity in the composition of total transition cost estimates by cost type, renegotiation or termination of contracts, redrawing of legislation, adjustment of IT systems, and adjustment of business processes

tend to be the most important cost categories. However, the distribution between these cost types is inconsistent within or across countries. For example, the size-dependent check of Italy primarily comprises costs relating to the renegotiation or termination of contracts. Nonetheless, this cost type does not seem to be relevant for the size-independent check.



Source: Compass Lexecon analysis of stakeholder input provided in questionnaires

Note: The "min" costs are based on the scaled cost of the relatively lowest cost estimate, "med" costs are based on the scaled costs of the median cost estimate, and "max" costs are the scaled costs of the relatively highest cost estimate, "Check dep" ("check indep.") costs are scaled median costs, assuming that all cost estimates provided are 100% dependent (independent) on company size.

Figure 4.9: Composition of transition cost estimates for the French, Italian, Dutch and Swedish wholesale/retail markets by cost type

4.2.4 Market infrastructure providers

The segment of market infrastructure providers is not scaled because:

- › the number of directly affected companies (i. e. NEMOs, the main derivative exchanges and brokers) is limited;
- › secondarily affected companies (i. e. data providers) are manifold but not included in the collected data; and
- › the available cost estimates cannot represent the heterogeneity between these providers.

Hence, the estimated cost range – given by the sum of cost estimates provided – should be considered a minimum total cost estimate.

When including the written and verbally provided data from stakeholder interviews, total minimum transition costs for market infrastructure providers range from 3 € million to 7 € million. Notably, cost estimates were provided by directly affected stakeholders. Hence, the minimum cost range covers substantial parts of the total transition costs. The bulk of costs can be attributed to adjustments in IT systems and business processes. Renegotiation and termination of contracts is the third largest transition cost type.

5 Conclusion on Transition Costs

In the context of the BZ review of the EU power markets, ENTSO-E instructed Compass Lexecon to assess transition costs as set out in the BZR Methodology.

The assessment of transition cost estimates is based on three steps (see Chapter 2 for a more detailed explanation of the approach):

- › First, in discussions with ENTSO-E, the TSOs, ACER, the NRAs, and the BZR consultative group, we identified relevant types of stakeholders that might face transition costs as per the BZR Methodology definition.
- › Second, we used two online questionnaires accessible to all EU stakeholders to collect the necessary data.
- › Third, we processed the input provided from the questionnaire by conducting a general sense check (note that performing a full audit was beyond the scope of this study). This included harmonising units and cleaning the input based on the explanations of the estimates provided. This was undertaken in collaboration with ENTSO-E and the TSOs, and in consultation with ACER and the NRAs. We then adjusted the data for company size and scaled it to calculate the total transition costs for each BZ reconfiguration.

Main findings

Given the restricted dataset available and the uncertainty in cost inputs, the resulting transition cost estimates are subject to significant limitations, as explained in [Chapter 2.4](#).

From the data obtained, we estimated total transition costs for the different alternative BZ configurations. As such, the provided ranges of estimated transition costs are not completely conclusive and must be considered as approximate. Due to the relatively limited number of data points and how the ranges were derived (scaling), they should not be interpreted as an error margin but rather as the actual range of estimates we have with our limited sample, without them being upper or lower boundaries.

Significant uncertainty persists concerning the level of expected transition cost and about the role of the driving factors. While most respondents expect to incur most costs in changing IT systems and adjusting business processes, there is no consensus whether these costs are borne to a similar level by all market participants or if they are proportional to the company size. This uncertainty underlines that the transition costs – once realised – might significantly deviate from the ranges estimated here.

The reconfigurations in Germany show the highest transition cost estimates in the range of 1 € billion to 2.5 € billion. This range is based on the lower estimate of potential transition costs since a data point submitted for Germany shows very high transition costs and was considered an outlier. If we took into account those outlier costs and considered them

as representative of all market participants, then the upper estimate would be significantly higher.

No consensus exists on whether costs increase with an increase in the number of zones. While most respondents estimate constant costs across all reconfigurations, others expect that costs would increase with an increasing number of BZs in Germany.

The transition cost ranges estimated based on the data provided differ from one country to another. Estimated costs across all included stakeholders in France rank second with total estimated costs between 400 € million and 500 € million. The potential reconfigurations in the Netherlands and Italy could lead to a large range of transition costs, with estimates spanning between 50 € million and 450 € million for the Dutch reconfiguration and 50 € million and 250 € million for Italy. The transition costs estimated for reconfigurations in Sweden are the lowest among all reconfigurations, with total costs of about 15 – 20 € million. The cost variations across the different reconfigurations are also relatively small in Sweden.

Note that we could not estimate transition costs for all organisation types in some countries due to data limitations.²²

Concerning lead times, our results indicate that increasing the lead time before implementing a BZ reconfiguration to more than three years would have little effect on transition costs. However, 50% of the survey respondents indicated that a shorter lead time would increase their transition costs.

²² The Dutch, Swedish, and Italian estimates do not contain DSO transition costs, and the Italian estimate further does not contain TSO transition costs due to a lack of data.

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A Appendix: Public Consultation Responses

In accordance with the ACER decision 29/2020 of 24 November 2020 on the methodology and assumptions that are to be used in the BZR process and for the alternative bidding zone configurations to be considered (BZR Methodology), TSOs of all BZRRs jointly held a public consultation (19 July to 4 September 2024) to gather stakeholder feedback on the following subjects:

- › Market liquidity and transaction costs
- › Transition costs
- › Measures to mitigate negative impacts
- › Practical implementation considerations

The questions in the public consultation related to the reports on:

- › The report on liquidity and transaction costs (version for public consultation, 17 July 2024)
 - › The report on transition costs (version for public consultation, 6 December 2023)
- The responses to the public consultation were used to finalise both reports, assess the acceptability of alternative BZ configurations, and as an input for TSOs to identify practical considerations when deciding on a BZ configuration change.

A.1 Statements addressing the study itself

The methodology applied for determining the transition costs has raised three sets of questions and remarks:

First, the methodology itself concerning the scaling applied has been questioned:

- › According to some stakeholders, the study should have assumed a decreasing non-linear relationship between company size and size-dependent costs.
 - a. Further, the complexity of IT infrastructure is linked to the company size and should be treated as such.
 - b. It has also been highlighted that some aspects such as submitting schedules and providing metering data will not change.
 - c. Finally, it was suggested not to evaluate transition costs based on market participant information, but rather on established models with standardised costs, e.g. standard costs for renegotiating PPAs. Market participant input could have then been used to compare the results from the different methodologies.
- a. We also noted that costs might have a non-linear relationship with company size. However, noting that this relationship might be defended as either increasing, e.g. due to increasing costs due to interdependent processes, or decreasing, e.g. due to economies of scale, we – together with the TSOs – considered it reasonable to remain agnostic regarding which direction would outweigh the other.
- b. The fact that some complexity associated with IT infrastructure is directly linked to the company size is acknowledged by differentiating between size-dependent and -independent costs. Thereby, questionnaire respondents could specify which share of costs – including IT costs – apply to all similar stakeholders and which depend on the company's size.
- c. We agree that some aspects are not affected by a transition. Therefore, we asked the respondents to only provide costs that are transition costs within the narrow definition.

While we agree that the methodology is caveated through several constraints, the four suggestions provided are either accounted for in the applied methodology or dismissed due to conflicting lines of argumentation. In particular:

- d. Finally, we did not apply a different model with standardised costs as such a model would be subject to the same limitations as the one applied. It would have been necessary to adopt a similar approach to identify “standardised costs” and identify the scaling

factor. Noting that the number of market participants is relatively small compared to the number of processes that might need to be adapted – we chose, in alignment with the TSOs – the approach as stated in the study.

Second, the data basis has been addressed by stakeholders similarly to the limitations highlighted in the study itself:

- › It was reiterated that only relevant costs should be included. Accordingly, costs should be further broken down by type of FTE, assumptions should be clarified, and the objectivity and reasonableness of the costs should be assessed. Included costs should be aligned between the BZR and other grid infrastructure investments. Furthermore, it was questioned that the IT costs included are indeed transition costs as per the definition.
- › Regarding data collection, it was suggested that a bias for overestimating the costs exists in member states with a uniform BZ. Highlighting the diversity of types and roles of market participants, it was also noted that the number of responses is too small. To counter this, it was suggested that all market parties should be requested to provide input.

We agree that the data basis necessitates significant caveats and a qualified interpretation of the results. The feedback received mirrors the trade-off between comprehensive data and a broad dataset. To find a middle ground, the data collection process included two rounds of questionnaires that were open to all, as well as a webinar and interviews to explain the data needs and transition cost definition. In discussions with market participants, we understood that identifying the transition costs is complex and time-consuming. We therefore decided to use the data obtained and acknowledge the limitations.

Third, some feedback concerns the transparency of the methodology and clarity of the results. It has been noted that:

- › the description falls short of demonstrating how the data quality is checked and which data has been discarded;
- › the unscaled and scaled values for each configuration and each type of respondent should be provided, and the scaling process should be better explained; and

- › the results in terms of differences among BZs should be better explained.

We appreciate the feedback received and have updated the report accordingly. Due to the limited number and confidentiality of responses, it was necessary to uphold a certain level of aggregation.

Fourth, specific comments were received concerning the study results:

- › The results have been questioned, noting the limited dataset. It was therefore suggested that the results should be treated very cautiously, and it should be explained that no judgement could be made concerning the reasonableness of the results.
- › Some feedback stated that all TSOs participated in the survey, which indicates that the costs for TSOs might be more reliable.
- › Other feedback indicated that the costs are reasonable, underestimated (e.g. due to the narrow definition of transition costs or due to increasing complexity of single day-ahead coupling (SDAC) and single intra-day coupling (SIDC), or overestimated (e.g. due to incorrectly high estimated IT costs).
- › Finally, it was highlighted that costs negatively affect industry competitiveness, reconfigurations affect neighbouring countries, and costs should be similar across countries on a per capita basis.

With reference to the limitations and caveats stated in the study, we acknowledge and agree with the feedback and the suggestion to treat the results very cautiously.

Regarding the over- or under-estimation of results, we note that the increasing system complexity is – in theory – considered in the market participants’ input, and that the allegedly excessive IT costs for Germany–Luxembourg, France, and the Netherlands compared with the costs in Italy and Sweden might directly follow from the current existence of uniform vs multiple BZs within the countries.

Considering the expected similarity of costs on a per capita basis, we believe that the stipulated similarity might disregard country-specific factors, including the number of market participants and the currently existing number of BZs within a country.

Finally, some feedback is more general in nature, including statements that:

- › any transition costs are (1) not justifiable, (2) should be seen in relation to benefits and (3) in with perspective to the likelihood of recurring transitions, or (4) should be compared to earlier implementations of BZ changes;
 - › the BZ process should contribute to market integration, including the benefit for industrial consumers; and
- › the reconfiguring of BZ is placing the ongoing energy transition at risk.

We appreciate this feedback and agree that additional analyses and considerations for a decision on a BZ reconfiguration are warranted.

A.2 Statements on mitigation measures, lead time, and implementation time

Respondents commented on perceived mitigation measures to limit transition costs in the public consultation. Table A.1 summarises mitigation measures given a BZ reconfiguration, while Table A.2 summarises mitigation measures as alternatives to a BZ reconfiguration.

Acknowledging stakeholders’ concern that this report includes mitigation measures without having investigated, communicated, and discussed them, please note that this display of mitigation measures does not constitute recommendations or suggestions.

Summary of stakeholder comments
Transparency and regulatory certainty regarding the future market design and BZ reconfiguration are necessary.
The earlier TSO, regulators, policymakers, and NEMOs communicate changes and the longer time for implementation the improve the situation for market participants. A longer lead time for implementation is appreciated.
The most important information is whether the transition will take place, whereas finer details can wait.
A decision should consider whether the creation of OBZs [(Offshore Bidding Zone)] should follow their own process aside from the current regulation on BZ splits.
Standardisation regarding implementing the necessary measures could ensure cost efficacy. For example, this includes the standardisation of IT solutions, etc.
It might be least costly to implement nodal pricing directly.
Measures to prevent significant declines in liquidity and mitigate higher spreads can reduce overall transition costs.
Clear criteria for a BZ failure should ensure that decision-makers are fully aware of the risks and challenges that their society might face whether and when they decide to implement a new BZ.
Market participants suffering from contracts or portfolios spread over multiple BZs should receive a dedicated allocation of LTR.
Transition cost levels should not be underestimated.

Source: Compass Lexecon analysis of public consultation input

Table A.1: Feedback on mitigation measures

Only the path of adhering to existing capacities and accelerating network expansion is a reliable and predictable solution.

The work carried out according to the German grid plan will considerably address the situation.

BZ reconfigurations are not a measure serving the superior goal of fostering the energy transition at acceptable costs.

Better congestion management should be implemented, including alternative coordination measures and remedial actions instead of a BZ reconfiguration.

Locational criteria in renewable auctions at grid-compatible locations could be used.

Capacity mechanisms could be introduced or improved to reduce congestion management needs and enhance security of supply.

A fast storage roll-out, more demand response, and a better use of existing infrastructures could increase system flexibility.

Grid usage could be enhanced through improved TSO-TSO and TSO-DSO cooperation, cross-border redispatch and cost-sharing arrangements, and advanced cross-capacity calculation processes.

Source: Compass Lexecon analysis of public consultation input

Table A.2: Feedback stating positions and measures alternative to BZ reconfigurations

Regarding mitigation measures to reduce costs associated with specific lead time, respondents stated that:

- › the number of BZs should be limited;
- › lead time should be expanded;
- › the frequency of reconfigurations should be reduced; and
- › implementation timelines should be harmonised.

No respondent specified expected changes in costs from a change in lead time.

When asked about the minimum lead implementation time, responses varied from being as short as possible to ensure that benefits from a reconfiguration are realised as quickly as possible to minimum implementation times of 15–20 years to account for PPA contract duration. A midpoint from the various statements might be identified as a lead time of least three years.

It has also been noted that:

- › excellent preparation and communication and a correspondingly long test phase for the market participants are essential;
- › alignment with transmission development plans and the offshore BZ considerations are seen as beneficial;
- › the implementation time required also depends on the depth of the futures market; and
- › the lead time should correspond to the implementation and adaptation needs of all market parties.

A.3 Statements on costs not covered

Stakeholder responses to the question “Do you expect other types of transition costs that are not covered by the definition used in the study, which was based on the bidding zone review methodology?” can be classified into three segments:

First, participants referred to costs that are indeed included in the definition and hence are likely included in the survey responses:

- › Transition costs should cover costs from the required renegotiation, reformulation, and re-evaluation of existing PPA contracts. Costs might also follow from adapting the long-term hedging positions.
- › Cost of informing the public about the changes should be included.
- › Parallel run simulation costs to anticipate the price spread should be included.
- › Costs resulting from wider bid-ask spreads related to a position transfer are also one-off costs.
- › Effects on all grid users, including consumers – whether industrial consumers as well as private end consumers – should be considered.

Second, stakeholders highlighted costs beyond the narrow definition of transition costs:

- › Costs arising from changes in the value of assets, including:
 - Costs for assets that rely on specific market characteristics, e.g. established clean energy provision via a PPA for electrolyzers.
 - Non-cash costs in cases in which flexibility becomes less valuable in areas with competition. For completeness, this might also result in value increases for assets in areas with less flexible assets.
 - Costs related to asset stranding.

- › Wider socio-economic costs, which accrue from incentives for RES, including costs for subsidies.
- › Increases in uncertainty and regulatory risks that might lead to increased risks and costs for investments.
- › The costs and benefits of congestion are not considered.
- › Changes to opportunity costs.
- › Indirect costs for a delaying effect on other (regulatory) projects.
- › Balancing costs faced by BRPs would increase in smaller BZs.
- › Costs from adverse effects of increasing market concentration: The respondent stipulates that due to constantly increasing cost components, there will be considerable market concentration in the medium term. The number of market participants will significantly decline, and the market influence of the top five will have undesirable competitive consequences.

Third, some stakeholders noted aspects that are not costs but other potentially important aspects to consider. In this regard, respondents noted a risk and increased probability of anti-EU movements if BZ reconfigurations are enacted and claim that it has been proven that a BZ division cannot lead to the same renewable expansion or flexibility levels as in a uniform electricity price zone.

A.4 Statements on practical considerations for implementation

When asked about practical considerations for implementation, respondents answered along three discernible categories, namely considerations regarding complexity, adaptations, and adverse incentives for grids.

Regarding complexity, the responses included statements such as:

- › Good documentation and communication of the central bodies is needed.
- › Clarity on when and how to engage in proper stakeholder involvement should be provided.
- › Real or imagined impact on consumers and legacy generation investments will have to be addressed.
- › Stability holds the utmost importance as it is a key to limit financial risk.
- › Any implementation at short notice could also result in halting internal projects and innovations and thus endanger the economic viability of investments (e.g. PPA).

- › Market participants could stop selling fixed prices longer than two years to reduce the risk and costs of changed BZ and the associated implementation risks and costs. Naturally, these uncertainties already influence the business and customers.
- › A “big bang approach” could be used to limit the number of necessary adaptations.
- › Regarding Germany, it was stated that the high degree of regulation does not allow for quick solutions.

Regarding adaptations, respondents note that:

- › Appropriate lead time should be considered.
- › The go-live should respect the trading calendar, i.e. a reconfiguration should be made preferably from 1 January.
- › Support schemes using market reference prices must be adapted.
- › Fee and levy systems might need to be adapted.
- › Market arrangements and processes in the physical market (spot and AS) might need to be adapted.

Finally, some respondents highlighted adverse incentives for grids, including:

- › A risk exists that the German transmission grid will significantly change between decision and implementation dates such that the previously planned division will no longer correspond with the actual circumstances.
- › Another risk is the statement noting that TSO incentives for grid enforcements might be affected by smaller zones.

A.5 Statements on previous experience

As explained in the study, previous BZ reconfigurations were excluded from the analysis. Irrespective of this, the public consultation asked for the experience from past reconfigurations. The stated experience can be summarised as follows:

The Austrian zone split from German – Luxembourg was experienced as follows:

- › It was stated to be very stressful, costly and labour-intensive, with the documentation of the necessary changes published too late. For instance, a strong degree of uncertainty revolved around the future cross-border capacity and future prices. Immediate outcomes were surprising, and some implications were only realised after the split.
- › Significant complaints by several players were witnessed, stating that it was impossible to properly react to and adapt within the lead time. Participants scrambled to re-arrange their hedging strategies at short notice. This partly led to compromise of the quality of adaptations, e.g. regarding IT solutions.
- › Furthermore, numerous disputes over previously concluded supply contracts were experienced.
- › Others highlighted that the process was more challenging than anticipated due to the split across national and control area borders.
- › Contrary experiences stated that the split was relatively simple. Accordingly, a BZ split within the German BZ is not comparable to the Germany–Austria split. Furthermore, the split preserved a dominant market, which does not need to be the case for other splits.

- › In terms of market consequences, respondents experienced a lack of robust forward market signals and misguided short-term signals, which led to incorrect pricing of long-term storage. Arguably, the lack of liquidity also prevails today in the Austrian BZ. Finally, financial transmission rights do not overcome this issue due to a lack of a secondary market and product granularity.

Few respondents shared their experience with the Swedish reconfiguration or an Italian split:

- › The Swedish split has been experienced as costly and increasing risks until today. The implementation time was too short (but better than expected) and scepticism increased in society against the EU. No major impacts on the regulatory and market framework were experienced. A liquidity reduction has arguably been witnessed.
- › No major impacts on the regulatory and market framework were experienced from the Italian split from six to seven BZs.
- › A general comment noted that creating a new BZ compared to adjusting the borders of an existing BZ comes with increased computational challenges. Reconfigurations could be more challenging for smaller companies operating in single BZs.

A.6 Statements on other potential changes

The public consultation further asked about changes – irrespective of the BZ reconfiguration process – that could affect the transition costs.

Respondents answered with a perspective on costs and risks, other changes, and recommendations. Further, general comments were provided, which will be summarised in Appendix 7.

Regarding costs and risks, the respondents stated:

- › Additional costs might arise from balancing group management, depending on how the BZs are configured and which generation / consumption plants remain in the respective bidding zone.
- › The impact on the hedging ability and the settlement mechanism is the most important cost factor.
- › It was cautioned that higher financing risks cannot be borne by all market players. Financing risk might also lead to a different renewable expansion and flexibility levels.
- › Further risk exists regarding time-unequal capacity and commodity hedging.
- › Uncertainties regarding flexibility, energy sharing, and subsidies are significant.
- › The implementation of flow-based capacity allocation in Sweden might risk reliability and imply non-intuitive flows.

Regarding other changes, respondents noted:

- › Changes resulting from the electricity market design (EMD) might have an influence.
 - › Alignment with transmission development and offshore bidding zone considerations should be targeted.
 - › National developments regarding subsidy schemes might also have an influence.
 - › Other changes within the European energy policy landscape might have inter-acting effects.
 - › The BZ review does not take into account expected market developments from the market reform and the German action plan.
 - › Changes in the energy landscape, the integration of RES, and changes in market design rules have an impact.
- These changes and standalone statements imply recommendations, including:
- › The analysis should include a long-term analysis.
 - › Transparency should be ensured and provided on time.
 - › A virtual trading hub should be rejected.
 - › A parallel run should be mandatory before any effective bidding zone split.
 - › A framework for the renegotiation of contracts should be provided.

A.7 Other comments

Finally, respondents were asked to provide any other comment regarding transition costs, including questions of an administrative nature, individual views on a BZ reconfiguration, and pointers to specific aspects and topics.

Administrative questions included the following:

- › It is unclear how the conclusions of the transition cost study are incorporated into the broader BZR process or how the transition costs are weighted against the 21 other parameters investigated.
 - › It is remarkable that no cross-national BZs were considered.
 - › It would have been interesting to describe how the inputs provided were cleaned by ENTSO-E, the TSOs and how they scaled. Furthermore, the role of discussions with ACER and the NRAs would be interesting.
 - › The entire bidding zone complex combats the symptoms, although the causes of the problems – inflexible renewable generation plants – remain untouched.
- Note that we describe the data treatment process in the final report in section 2.3.

Individual views include:

- › A reconfiguration of the BZs of Germany or other countries has no advantage.
- › Depending on the design, a BZ reconfiguration will imply significant work to restructure the affected networks at the transmission and distribution network level.
- › A reconfiguration would risk decarbonisation efforts.
- › A split of the German BZ would have negative effects beyond the energy market.
- › Given that uncertainty has a negative impact on liquidity, predictability and legal certainty are necessary.
- › A zonal European market design should be kept but complemented with locational price signals from local flexibility markets. Nodal markets are not advisable.
- › Nodal pricing would bring the most significant net benefit.
- › Today's market design does not take into account that the export capacity is dependent on the import capacity of the bidding zone.
- › New power lines taken into operation do not increase cross-border capacity.

Finally, pointers concerning specific aspects were provided:

- › Litigation should be avoided to keep costs low. For instance, clear and fair rules on reimbursement could be provided.
- › The modernisation and expansion of the grid will render some reasons for a BZ reconfiguration obsolete.
- › BZs should be defined by the actual bottlenecks in the transmission system.
- › Information from external parallel runs for flow-based capacity allocation in the Nordic market should be used to define the BZs in the Nordic area.
- › The current study does not provide a solid basis and sufficiently reliable quantitative estimates and qualitative supplements to properly assess the impact of a BZR on transition costs.
- › A reconfiguration might require new trading products, at least in the forward market.

B Questionnaire for the Public Consultation

B.1 Transition cost study

1. On costs

- a. Do you consider the estimated range of transition costs reasonable and feasible? Please indicate why or which part of the estimate of transition costs you consider to (not) be reasonable. Please specify in your answer if you are referring to all configurations or a specific one.
- b. Which mitigation measures, e. g. by TSOs, regulators, policymakers or NEMOs, could reduce transition costs in general? Do you have experiences from previous bidding zone reconfigurations?
- c. Considering the impact of the lead time on the transition costs, what mitigation measures to reduce these costs do you consider reasonable and feasible, and by how much do you estimate that they would reduce the costs (in %)?
- d. Do you expect other types of transition costs that are not covered by the definition used in the study, which was based on the bidding zone review methodology?

2. Implementation and timeline

- e. What do you consider an appropriate minimum implementation lead time for a new bidding zone configuration? Please explain why you consider this to be a minimum.
- f. What are practical considerations that affect the minimum implementation lead time?
- g. What is your experience of previous bidding zone reconfigurations regarding their implementation and timeline?
- h. Are there any other potential changes in the market design that could affect the transition costs of a bidding zone reconfiguration or its implementation and timeline? Why and how would they affect the transition costs and the implementation and timeline?

3. Please provide any other practical considerations on transition costs and implementation and timeline and comments that you might have on the transition cost study.

B.2 Liquidity and transaction cost study

1. On the impact of bidding zone reconfigurations on liquidity and transaction costs

- a. What do you perceive to be the impact of the proposed bidding zone reconfigurations on liquidity and transaction costs compared to the status quo configuration?
- b. Do you agree with the conclusions on the liquidity and transaction costs in alternative bidding zone configurations? Please indicate why you consider the conclusions to (not) be reasonable. Please specify if you are referring to all configurations or a specific one.
 - i. Remarks to the conclusions on the short-term timeframe
 - ii. Remarks to the conclusions on the long-term timeframe
- c. What is your experience of previous bidding zone reconfigurations concerning their impact on liquidity and transaction costs?
- d. What effects on intra-company transactions do you expect from a bidding zone reconfiguration?
- e. Do you think that the hedging opportunities would suffice in certain alternative configuration(s) after a reconfiguration? Please specify the respective alternative configuration(s) you are referring to and explain how you reached this conclusion. Does it differ under the current market design or with mitigation measures in place? If so, please specify.
- f. Do you expect additional impacts of the proposed bidding zone reconfigurations on liquidity and transaction costs that were not addressed in the draft report?

2. On mitigation measures

- a. What risks or adverse impacts on liquidity and transaction costs do you anticipate with the bidding zone reconfigurations?
 - i. On short-term markets
 - ii. On long-term markets
- b. Which mitigation measures to reduce risk or an adverse impact on liquidity and transaction costs do you consider reasonable and feasible?
 - i. On short-term markets
 - ii. On long-term markets
- c. Liquidity risk is not necessarily distributed equally among market participants.
 - i. What changes in the distribution of liquidity risk do you expect to result from a change in bidding zone configuration, and how would it affect different market participants? Please give an example.
 - ii. Do you think that there are risk exposure shifts that need to be mitigated? If so, which mitigation measures do you consider to be reasonable and feasible?
- d. Which mitigation measures both generally and against shifts of risk exposure do you consider to not be reasonable or feasible?

3. Practical considerations:

- a. Which practical considerations could affect the impact of a bidding zone reconfiguration on liquidity and transaction costs?

4. Please provide any other comments that you might have on the liquidity and transaction cost study.

B.3 Further questions

1. In the course of the BZR, as foreseen in ACER decision 11-2022, TSOs will also investigate two combinations of bidding zone reconfigurations for central Europe. What do you consider to be the impacts of more than a single bidding zone reconfigured at the same time in terms of:

- a. Liquidity and transaction costs
- b. Transition costs
- c. Lead time
- d. Any additional practical considerations

The following questions might not necessarily arise from the BZR Methodology and might be incorporated in an annex of the BZR report.

- 2. Considering the different potential reconfigurations: Do you believe that any implementation of a reconfiguration assessed in this bidding zone review should be undertaken simultaneously or stepwise? If stepwise, then how should the steps be defined?**
- 3. Please share any additional practical considerations that you might have (apart from the timeline and liquidity and transition costs, which are covered by previous questions).**
- 4. What effects on power purchase agreements (PPAs) and other contractual arrangements not covered by the report on liquidity and transaction costs do you expect from a bidding zone reconfiguration?**
- 5. What alternative policy measures could be implemented to achieve the potential benefits of a bidding zone reconfiguration?**

C First Questionnaires on Transition Costs

Introduction

The methodology for the bidding zone review process²³ asks to evaluate the transition costs occurring from a bidding zone reconfiguration. This questionnaire establishes a quantitative basis for estimating the market participants' transition costs. As set out in the Methodology, it does so for each bidding zone and bidding zone reconfiguration. As such, it informs the bidding zone review transition cost criteria.

Relevant bidding zone configurations

As established in the ACER decision 11-2022²⁴ on the alternative bidding zone configurations from 8 August 2022, the following reconfigurations must be evaluated²⁵ for the first step:

Identifier	BZRR	Number of BZs per member state	Source (ACER's algorithm/TSOs)	Reference in ACER decision 2022-11 (Annex I)
1	CE	DE2	k-means	p. 4
2	CE	DE2	Modified version of Spectral P1	p. 5
3	CE	DE3	Spectral P1	p. 6
4	CE	DE4	Modified version of Spectral P1	p. 7
5	CE	FR3	Spectral P1	p. 8
6	CE	IT2	k-means	p. 9
7	CE	NL2	Spectral DIRC	p. 10
8	Nordic	SE3	Spectral P1	p. 11
9	Nordic	SE3	Modified version of Spectral P1	p. 12
10	Nordic	SE4	Spectral P1	p. 13
11	Nordic	SE4	Modified version of Spectral P1	p. 14
12	CE	DE3	Fallback configuration for configuration 3	p. 15
13	CE	DE4	Fallback configuration for configuration 4	p. 16
14	CE	DE5	Fallback configuration for configuration 1	p. 17

Those fourteen different BZ configurations can be found in the cost table to be filled out on page 4 of this questionnaire.

The combinations for central Europe to be analysed in a second step as set forth in ACER decision 11-2022 are not known yet and cannot be found in the cost table to be filled out.

²³ ACER 2020: Methodology and assumptions that are to be used in the bidding zone review process in accordance with Article 14(5) of the Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity

²⁴ ACER 2022: ACER's Decision on the alternative bidding zone configurations to be considered in the bidding zone review process

²⁵ [Please see here for a detailed depiction of the reconfigurations](#)

What do we mean by transition costs?

The definition of transition costs is set forth in Article 15.11 (a) of the methodology. Transition costs:

- › Are one-off costs, expected to be incurred in case the BZ configuration is amended.
- › Shall relate to adaptations that are inherently and unambiguously related to a specific BZ configuration change.
- › Shall not relate to adaptations that are, in general, necessary to ensure sufficient flexibility of the systems to cope with a variable number of BZs due to a potential amendment of the BZ configuration in the future.
- › Shall include an estimation of the cost of amending existing contractual obligations incurred by market participants, NEMOs and TSOs. Such estimation shall reflect the expected implementation timeline for an eventual BZ change, and the fact that when deciding on the implementation date, Member States are required to balance the need for expeditiousness with practical considerations, including forward trade of electricity.

Transition costs arise for different reasons, such as changes to business processes or adjustment of private contracts, and they are incurred by different actors, such as retailers, grid

operators, traders, or power exchanges. The purpose of this questionnaire is to gather empirical estimates of the different transition costs from different stakeholders. In subsequent steps, these estimates will be analysed and extrapolated based on the information received to quantify transition costs for the reconfiguration of bidding zones.

Examples of transition costs include:

- › re-structuring of teams responsible for specific bidding zones;
- › renegotiation of ongoing contracts; and
- › costs of adapting existing IT processes to specific BZ configurations.

Transition costs do **not include**:

- › IT investments necessary to introduce flexibility of the IT systems in general; or
- › a devaluation of assets due to price changes.

Why are we asking for different lead times?

The level of transition costs – in particular costs of amending contracts – will likely depend on the lead time between the legally binding announcement of a reconfiguration and its full implementation. For estimates in this questionnaire, we assume a lead time of three years as a reference point, unless otherwise mentioned, meaning that recipients have three

years between the decision of BZ reconfiguration and the reconfiguration itself for adjusting their operations. In order to estimate the impact of lead times on the transition costs, estimations for a lead time of two and four years are also gathered through the questionnaire.

How are we going to treat and process the data?

The transition cost evaluation used in the assessment of BZ configurations will strongly depend on the results of this questionnaire as the cost estimates are based on the cleaned data from this questionnaire. Specifically, the data from the questionnaire is checked for robustness by standard methods such as benchmark comparisons, matching techniques, and statistical techniques. Please note that some of the questions are included to control for and test confounding factors and are not included as transition costs themselves. The total cost per market participant group, bidding zone, and bidding zone reconfiguration is then extrapolated by scaling the cost estimates using market share and revenue data. Due to the remaining uncertainty following from this approach, the cost estimates are depicted as a range. In addition, the relative importance of the different transition cost categories is evaluated and the impact of a change in lead time for the different market participants is analysed. Therefore, all responses are highly appreciated, and additional written remarks are requested.

We would like to make the respondents aware that the **data submitted will not be shared with any market participant**. However, **anonymised versions** of this questionnaire might be shared with the responsible national regulatory authorities and/or ACER.

The next section will provide an overview of the cost categories used for the questionnaire. Afterwards, the first subsection of the questionnaire enquires about the background and market role of the recipient, before the second section covers the actual cost estimates. The final section addresses the effects of intra-company transactions on liquidity, as a topic that is not directly related to transition costs but relevant for the overall BZ review.

In case of questions, please contact Gjorgji Shemov (gjorgji.shemov@entsoe.eu).

Cost Categories

The table below provides an overview of the different cost categories assessed and several practical examples to facilitate filling in the questionnaire.

You can also open this table to a new tab to facilitate filling in the questionnaire on the following pages.

Cost category	Definition	Transition cost examples
Changes to internal business processes and IT systems	Costs incurred by changes to organisation and coordination specifically attributable to BZ reconfiguration	<ul style="list-style-type: none"> › Adapting existing IT systems to specific BZ configurations › Costs associated with the efforts (FTE) linked to changing processes such as: <ul style="list-style-type: none"> — splitting or merging teams that are responsible for a specific BZ — changing trading or algorithmic trading processes — undergoing the process of revaluating assets — adopting portfolio optimisation processes — adopting processes around the payment of renewable subsidies such as feed-in-tariffs — testing changed processes — informing employees about the changed processes › Changes to other ongoing exchanges between market participants and TSOs and public bodies, such as balancing and electricity balancing accounts
Adjustment to or termination of contracts and regulation	Costs incurred by amending existing contracts to BZ reconfiguration, including legal costs	<ul style="list-style-type: none"> › Renegotiation or termination of contracts, depending on their complexity, particularly if the reference location of price changes or is no longer accepted by contract parties (including GOs, PPAs, legal arrangements) › Redrawing of legislation; for instance, contracts/legislation referring to a single bidding zone that no longer exists after a BZ reconfiguration › Possible costs because electricity sold forward is affected (will mainly apply in the case of shorter lead times)
Adjustments of processes with NEMOs, TSOs and public bodies	Costs incurred by adapting interaction with NEMOs, TSOs, or public bodies	<ul style="list-style-type: none"> › Reporting obligations that must be adjusted to be specific for each new BZ
Additional costs	Any costs directly related to the BZ configuration not covered by any of the categories above	<ul style="list-style-type: none"> › Any examples not covered above

Questionnaire

GENERAL QUESTIONS

1. Please provide your company name, address, and contact details for questions (e-mail and telephone number).

Name:

Company name:

Address:

Contact details, e-mail:

Contact details, phone:

2. As what kind of organisation do you qualify?

☐ Generator or storage operator

☐ Large-scale industrial consumer

☐ Energy trader

☐ Retailer

☐ Aggregator

☐ NEMO, derivative exchange, or delegated operator

☐ Clearing house

☐ Ministries or national regulatory authority

☐ TSO

☐ DSO

Other:

- a. In case you qualify as a generator or storage operator, consumer, energy trader or retailer / aggregator, what are your generated, consumed, or throughput quantities in 2021 in TWh per BZ?

.....

- b. In case you qualify as a generator, consumer, energy trader or retailer / aggregator, what is your annual turnover per BZ?

.....

- c. In case you qualify as a generator or storage operator, what is your installed capacity per BZ?

.....

3. Have you been affected by a past BZ reconfiguration in a way that incurred transition costs?

☐ Yes

☐ No

- a. If yes, please note the specific reconfiguration that affected you:

.....

- b. If yes, was your main area (the area where you are most active in in terms of generated / traded / throughput / consumed / overseen volume) of business subject to reconfiguration or have you been affected by a reconfiguration outside your main business area?

.....

- c. If yes, what was the lead time for this reconfiguration and how did it affect your transition costs?

4. How large is your market share, differentiated by BZ, business activity, and market share metric (e.g. energy, capacity, or revenue), if applicable? (response should be based on question 2; relevant for scaling-up individual results to entire BZ in subsequent steps)

.....

ESTIMATES OF TRANSITION COSTS FOR BZ RECONFIGURATION

In the file below, please share your estimates of the transition costs per cost category that you expect to incur in case of a BZ reconfiguration. You will see that the template contains a separate table for all fourteen BZ reconfigurations. **Please fill in the tables for the BZ reconfigurations that are relevant to you** (e.g. in which you are active and for which you wish to provide an estimate). In case you only fill in one sheet, we will assume that your costs are the same for different BZ reconfigurations in your country.

Please specify these **transition costs in terms of full-time equivalents (FTEs)** for new and existing staff conditional on the lead time (2, 3, or 4 years until reconfiguration). Please further estimate the **average FTE** cost for the respective cost category. In case no FTE cost is provided, a country standard rate will be assumed. In case you are unable to split the costs into FTEs, please provide a **lump-sum cost estimate** in the **“personnel costs”** column. Transition costs that are not personnel costs shall be included in the **“other cost”** column.

In the column on the estimate of the share of transition costs independent of company size, please insert your estimation of which share of those costs are **“fixed” costs of a BZ split** that are not dependent on company size.

Please provide a clear description of the cost items and corresponding cost estimates in the **“description of the cost”** cell for both personnel costs and other costs.

Any cost item for which a clear description is not provided might be disregarded.

As an **optional addition to transition costs** as defined, which only cover the costs of the actual transition, and not costs that you incur as a consequence of making your systems and processes flexible, you can provide information on what the **costs of making your systems and processes** flexible are (or were, if you have already had a BZ reconfiguration).

Please fill in the cost estimates in terms of **“2022 Euros”**, meaning that you estimate what your costs would be based on the prices of goods and services in 2022. This means that you do not need to make your own estimation regarding what the prices of e.g. IT services will be in the future. Compass Lexecon will then use consistent inflation assumptions for the different cost estimates.

Please do not forget to fill in the **“company information”** sheet in the file before uploading it.

PLEASE DOWNLOAD THE FILE HERE.



EFFECTS OF INTRA-COMPANY TRANSACTIONS ON LIQUIDITY

This section specifically applies to market participants with generation and retail positions that are currently within a single BZ but that will be spread across different zones after the BZ reconfiguration is implemented.

1. Do you have generation assets or hold retail positions that will be spread across different zones after the BZ reconfiguration?

☐ Yes ☐ No

a. If yes, assuming no changes to today's market and portfolio landscape, how are the shares of generation or retail distributed across reconfigured zones in TWh per year?

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2. Please consider the three exemplary market cases below and briefly explain what kind of decision-making you would expect in each example. For your answers, consider a short to medium term of 4 to 5 years and a market without implicit BZ third-party access.

b. After the BZ reconfiguration, 60 MWh of generation is in a bidding zone without a retail position. Will the market participant/you go through the market – which would increase market liquidity – adjust physical production or retail positions, or approach the reconfiguration through other means (such as buying cross-border transmission rights)?

Positions in BZ 1 and 2 after reconfiguration		
	BZ 1	BZ 2
Physical production position	20 MWh	80 MWh
Retail position	80 MWh	20 MWh

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c. After the BZ reconfiguration, a retail position of 20 MWh has no physical production position in the same BZ. Would the market participant/you withdraw the retail position from BZ 2, rely on the market (and your own physical position in BZ 1) to supply the retail position, or approach the reconfiguration through other means (such as buying cross-border transmission rights)?

Positions in BZ 1 and 2 after reconfiguration		
	BZ 1	BZ 2
Physical production position	100 MWh	0 MWh
Retail position	80 MWh	20 MWh

.....

.....

.....

d. After the BZ reconfiguration, a production position of 20 MWh has no corresponding retail position in the same BZ. Would the market participant/you withdraw the production position, sell the generated electricity through the market, or approach the reconfiguration through other means (such as buying cross-border transmission rights)?

Positions in BZ 1 and 2 after reconfiguration		
	BZ 1	BZ 2
Production position	20 MWh	80 MWh
Retail position	0 MWh	100 MWh

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ADDITIONAL REMARKS

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D Second Questionnaire on Transition Costs

Introduction

The methodology for the bidding zone review process²⁶ asks for evaluating the transition costs occurring from a bidding zone reconfiguration. This questionnaire supplements the first questionnaire (conducted from 6 September 2022 to 14 November 2022) to collect more data to establish a quantitative basis for estimating transition costs. As set out in the Methodology, it does so for each bidding zone and bidding zone reconfiguration. As such, it informs the bidding zone review *transition cost* criteria.

Relevant bidding zone configurations

As established in the ACER decision 11-2022²⁷ on the alternative bidding zone (BZ) configurations from 8 August 2022 and the subsequent decision for the BZ review central Europe region to analyse the fallback configurations for Germany, the following reconfigurations will be evaluated²⁸ for the first step of the BZ review:

Identifier (according to ACER decision)	BZRR	Number of BZs per Member State	Source (ACER's algorithm/TSOs)	Reference in ACER decision 2022-11 (Annex I)
2	CE	DE2	Modified version of Spectral P1	p. 5
5	CE	FR3	Spectral P1	p. 8
6	CE	IT2	k-means	p. 9
7	CE	NL2	Spectral DIRC	p. 10
8	Nordic	SE3	Spectral P1	p. 11
9	Nordic	SE3	Modified version of Spectral P1	p. 12
10	Nordic	SE4	Spectral P1	p. 13
11	Nordic	SE4	Modified version of Spectral P1	p. 14
12	CE	DE3	Fallback configuration for configuration 3	p. 15
13	CE	DE4	Fallback configuration for configuration 4	p. 16
14	CE	DE5	Fallback configuration for configuration 1	p. 17

The combinations for central Europe to be analysed in a second step as set forth in ACER decision 11-2022 are not known yet and cannot be found in the cost table to be filled in.

You can also open this table to a new tab to facilitate filling in the questionnaire on the following pages.

²⁶ ACER 29 – 2020: Methodology and assumptions that are to be used in the bidding zone review process in accordance with Article 14(5) of the Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity

²⁷ ACER 11 – 2022: ACER's Decision on the alternative bidding zone configurations to be considered in the bidding zone review process

²⁸ Please see [here](#) for a detailed depiction of the reconfigurations

What do we mean by transition costs?

The definition of transition costs is set forth in article 15.11 (a) of the Methodology. Transition costs:

- › Are one-off costs, expected to be incurred in case the BZ configuration is amended;
- › Shall relate to adaptations that are inherently and unambiguously related to a specific BZ configuration change;
- › Shall not relate to adaptations that are, in general, necessary to ensure sufficient flexibility of the systems to cope with a variable number of BZs due to a potential amendment of the BZ configuration in the future;
- › Shall include an estimation of the cost of amending existing contractual obligations incurred by market participants, NEMOs and TSOs. Such estimation shall reflect the expected implementation timeline for an eventual BZ change, and the fact that when deciding on the implementation date, Member States are required to balance the need for expeditiousness with practical considerations, including forward trade of electricity.

Transition costs arise for different reasons, such as changes to business processes or adjustment of private contracts, and they are incurred by different actors, such as retailers, grid operators, traders, or power exchanges. The purpose of this questionnaire is to gather empirical estimates of the different transition costs from different stakeholders. In subsequent steps, these estimates will be analysed and extrapolated based on the received information to quantify transition costs for reconfiguring BZs.

Examples of transition costs include:

- › re-structuring of teams responsible for specific BZs;
- › renegotiation of ongoing contracts; and
- › costs of adapting existing IT processes to specific BZ configurations.

Transition costs do **not include**:

- › IT investments necessary to introduce flexibility of the IT systems in general; or
- › a devaluation of assets due to price changes.

How are we going to treat and process the data?

The transition cost evaluation used in assessing BZ configurations will strongly depend on the results of the two questionnaires on transition costs. Cost estimates are based on the cleaned data from the previous questionnaire, complemented – as the case may be – with the additional responses received with this second questionnaire. Specifically, the data from both questionnaires is checked for robustness by standard methods such as comparing with benchmarks, matching techniques, and statistical techniques. Please note that some of the questions are included to control for and test confounding factors and are not included as transition costs themselves. The total cost per market participant group, BZ, and BZ reconfiguration is then extrapolated by scaling the cost estimates based on various market metrics. Due to the remaining uncertainty following this approach, the cost estimates are depicted as a range. In addition, the relative importance of the different transition cost categories is evaluated, and the impact of a change in lead time for the different market participants is analysed. Therefore, all responses are highly appreciated, and additional written remarks are requested.

We would like to make the respondents aware that the **data submitted will not be shared with any market participant**. However, **anonymised versions** of this questionnaire might be shared with the responsible national regulatory authorities and/or ACER.

The next section will provide an overview of the cost categories used for the questionnaire. Afterwards, the first sub-section of the questionnaire enquires about the background and market role of the recipient, before the second section covers the actual cost estimates. The final section addresses the effects of intra-company transactions on liquidity, a topic that is not directly related to transition costs but is relevant for the overall BZ review.

In case of questions, please contact
Gjorgji Shemov (gjorgji.shemov@entsoe.eu).

Cost Categories

The table below provides an overview of the different cost categories assessed and several practical examples to facilitate filling in the questionnaire.

You can also open this table to a new tab to facilitate filling out the questionnaire on the following pages.

Cost category	Definition	Transition cost examples
Changes to internal business processes and IT systems	Costs incurred by changes to organisation and coordination specifically attributable to BZ reconfiguration	<ul style="list-style-type: none"> › Adapting existing IT systems to specific BZ configurations › Costs associated with the efforts (FTE) linked to changing processes such as: <ul style="list-style-type: none"> — splitting or merging teams that are responsible for a specific BZ — changing trading or algorithmic trading processes — going through the process of revaluating assets — adopting portfolio optimisation processes — adopting processes around the payment of renewable subsidies like feed-in-tariffs — testing changed processes — informing employees about the changed processes › Changes to other ongoing exchanges between market participants and TSOs and public bodies, e.g. balancing and electricity balancing accounts
Adjustment to or termination of contracts and regulation	Costs incurred by amending existing contracts to BZ reconfiguration including legal costs	<ul style="list-style-type: none"> › Renegotiation or termination of contracts depending on their complexity, particularly if the reference location of price changes or is no longer accepted by contract parties (including GOs, PPAs, legal arrangements) › Redrawing of legislation; for instance, contracts/legislation that refer to a single bidding zone that no longer exists after a BZ reconfiguration › Possible costs because electricity sold forward is affected (will mainly apply in case of shorter lead times)
Adjustments of processes with NEMOs, TSOs and public bodies	Costs incurred by adapting interaction with NEMOs, TSOs or public bodies	<ul style="list-style-type: none"> › Reporting obligations that must be adjusted to be specific for each new BZ
Additional costs	Any costs directly related to the BZ configuration not covered by any of the categories above	<ul style="list-style-type: none"> › Any examples not covered above

Questionnaire

GENERAL QUESTIONS

1. Please provide your company name, address, and contact details for questions (e-mail and telephone number).

Name:

Company name:

Address:

Contact details, e-mail:

Contact details, phone:

2. As what kind of organisation do you qualify?

- ☐ Generator or storage operator
☐ Large-scale industrial consumer
☐ Energy trader
☐ Retailer
☐ Aggregator

- ☐ NEMO, derivative exchange, or delegated operator
☐ Clearing house
☐ Ministries or national regulatory authority
☐ TSO
☐ DSO

Other:

- a. In case you qualify as a generator or storage operator, consumer, energy trader or retailer / aggregator, what are your generated, consumed, or throughput quantities in 2021 in TWh per BZ?

.....

- b. In case you qualify as a generator, consumer, energy trader or retailer / aggregator, what is your annual turnover per BZ?

.....

- c. In case you qualify as a generator or storage operator, what is your installed capacity per BZ?

.....

3. Have you been affected by a past BZ reconfiguration in a way that incurred transition costs?

- ☐ Yes ☐ No

- a. If yes, please note the specific reconfiguration that affected you:

.....

- b. If yes, was your main area (the area where you are most active in in terms of generated / traded / throughput / consumed / overseen volume) of business subject to reconfiguration or have you been affected by a reconfiguration outside your main business area?

.....

- c. If yes, what was the lead time for this reconfiguration and how did it affect your transition costs?

.....

ESTIMATES OF TRANSITION COSTS FOR BZ RECONFIGURATION

In the file below, please share your estimates of the transition costs per cost category you expect to incur in case of a BZ reconfiguration. Please indicate whether you expect your costs to vary across countries and the proposed BZ reconfigurations. If this is the case, please provide your cost estimates for each proposed BZ configuration in the Excel file provided for download further below on this page.

Please provide a **lump-sum cost estimate** in the **“total personnel costs”** column/field. Please specify additionally – if possible – these **transition costs in terms of full-time equivalents (FTEs)** for new and existing staff. Please further estimate – if possible – the average FTE cost for the respective cost category. In case no FTE cost is provided, a country standard rate will be assumed. Transition costs that are not personnel costs shall be included in the **“other cost”** column/field.

In the column/field on the estimate of the share of transition costs independent of company size, please insert your estimation of the share of costs that are **“fixed” costs of a BZ split**, i. e. which are not dependent on company size.

For your cost estimates, please assume a **lead time of three years**, meaning that affected entities will have three years between the announcement of the BZ reconfiguration and the actual reconfiguration to adjust their operations.

Please provide a clear description of the cost items and corresponding cost estimates in the **“description of the cost”** cell/field for both personnel costs and other costs.

Any cost item for which a clear description is not provided might be disregarded.

Please fill in the cost estimates in terms of **“2022 Euros”**, meaning that you estimate what your costs would be based on the prices of goods and services in 2022. This means that you do not need to make your own estimation regarding what the prices of e.g. IT services will be in the future. Compass Lexecon will then use consistent inflation assumptions for the different cost estimates.



Please see below an overview of all cost estimates and further information that you will be asked to provide below on this page.

You can also open this table to a new tab to facilitate filling out the questionnaire in the following sections.

		Personnel costs				Other	Estimated share of transition costs independent of company size	Description of the cost
Transition cost category:	Transition cost subcategory:	Total personnel costs [€]	FTE (existing staff) [total #] *	FTE (new staff) [total #] *	Cost per FTE [€/#] *	Other cost (in total during lead time) [€]	[%]	[text]
Changes to internal and external business processes and IT systems	IT systems							
	Business processes							
Adjustment to or termination of contracts and regulation	Renegotiation or termination of contracts, depending on their complexity							
	Redrawing of legislation							
	Other transition costs attributable to adjustment to or termination of contracts and regulation							
Adjustments of processes with TSOs and public bodies	Reporting obligations that must be adjusted to be specific for each new BZ							
	Other costs attributable to adjustments of processes with TSOs and public bodies							
Additional costs	Any examples not covered above							

Notes: *The columns on existing and new number of FTE [#] and cost per FTE [€/#] are optional and can be given in addition to total personnel costs [€].
 In case the cost subcategory is not applicable to you, please insert "NA".
 Please explain the exact costs in the "description of the cost" column.
 FTE = Full-time equivalents
 BZ = Bidding zone

PLEASE ANSWER THE FOLLOWING QUESTIONS

Note: For questions that allow you to provide different information per BZ, please download the Excel file [here](#) to provide your answers.

1. Please indicate which of the following proposed BZ reconfigurations (as listed in ACER decision 11-2022 Annex 1) would affect you.

- ☐ DE2(2)
- ☐ NL2(7)
- ☐ SE4(10)
- ☐ DE4(13)
- ☐ FR3(5)
- ☐ SE3(8)
- ☐ SE4(11)
- ☐ DE5(14)
- ☐ IT2(6)
- ☐ SE3(9)
- ☐ DE3(12)

2. If you were affected by proposed BZ changes in more than one country, do you expect to incur different costs across countries?

- ☐ Yes
- ☐ No

a. If yes, please provide reasoning why costs would or would not be different depending on the country:

.....

b. If yes, please fill in the Excel file, enter your cost estimates for each relevant BZ reconfiguration in a separate tab in the file, and upload the file again at the end of this section.

c. If no, please give your cost estimates for a BZ reconfiguration in questions 4–11.

3. If you were affected by more than one proposed BZ reconfiguration within one country, do you expect to incur different costs depending on the specific BZ reconfiguration?

- ☐ Yes
- ☐ No

a. If yes, please provide reasoning why costs would or would not be different depending on the BZ configuration:

.....

b. If yes, please fill in the Excel file, enter your cost estimates for each relevant BZ reconfiguration in a separate tab in the file, and upload the file again at the end of this section.

c. If no, please give your cost estimates for a BZ reconfiguration in questions 4–11.

4. Please indicate your estimated costs and further information for **IT systems** per proposed BZ configuration

a. I expect to bear total personnel costs in the amount of [€]

Total personnel costs under (a.) are broken down into (i, ii, iii); to be answered if possible:

- i. number of existing staff [FTEs] (total number)
- ii. number of new staff [FTEs] (total number)
- iii. costs in the amount of [€ per FTE]

b. I expect to bear other costs in the amount of [€]

c. I expect a share of transition costs for IT systems to be independent of company size [%]

d. Please provide reasoning for the indicated personnel and other costs:

.....

.....

5. Please indicate your estimated costs and further information for **business processes** per proposed BZ configuration

a. I expect to bear total personnel costs in the amount of [€]

Total personnel costs under (a.) are broken down into (i, ii, iii), to be answered if possible:

- i. number of existing staff [FTEs] (total number)
- ii. number of new staff [FTEs] (total number)
- iii. costs in the amount of [€ per FTE]

b. I expect to bear other costs in the amount of [€]

c. I expect a share of transition costs for business processes to be independent of company size [%]

d. Please provide reasoning for the indicated personnel and other costs:

.....

.....

6. Please indicate your estimated costs and further information for **renegotiation or termination of contracts, depending on their complexity**, per proposed BZ configuration

a. I expect to bear total personnel costs in the amount of [€]

Total personnel costs under (a.) are broken down into (i, ii, iii), to be answered if possible:

- i. number of existing staff [FTEs] (total number)
- ii. number of new staff [FTEs] (total number)
- iii. costs in the amount of [€ per FTE]

b. I expect to bear other costs in the amount of [€]

c. I expect a share of transition costs for renegotiation or termination of contracts to be independent of company size [%]

d. Please provide reasoning for the indicated numbers of personnel and other costs:

.....

.....

7. Please indicate your estimated costs and further information for **redrawing of legislation** per proposed BZ configuration (note: questions i, ii, iii are optional)

a. I expect to bear total personnel costs in the amount of [€]

Total personnel costs under (a.) are broken down into (i, ii, iii), to be answered if possible:

- i. number of existing staff [FTEs] (total number)
- ii. number of new staff [FTEs] (total number)
- iii. costs in the amount of [€ per FTE]

b. I expect to bear other costs in the amount of [€]

c. I expect a share of transition costs for redrawing of legislation to be independent of company size [%]

d. Please provide reasoning for the indicated numbers of personnel and other costs:

.....

.....

8. Please indicate your estimated costs and further information for **other transition costs attributable to adjustment to or termination of contracts and regulation** per proposed BZ configuration (note: questions i, ii, iii are optional)

a. I expect to bear total personnel costs in the amount of [€]

Total personnel costs under (a.) are broken down into (i, ii, iii), to be answered if possible:

- i. number of existing staff [FTEs] (total number)
- ii. number of new staff [FTEs] (total number)
- iii. costs in the amount of [€ per FTE]

b. I expect to bear other costs in the amount of [€]

c. I expect a share of transition costs for other transition costs attributable to adjustment to or termination of contracts and regulation to be independent of company size [%]

d. Please provide reasoning for the indicated numbers of personnel and other costs:

.....
.....

9. Please indicate your estimated costs and further information for **reporting obligations that must be adjusted to be specific for each new BZ** per proposed BZ configuration

a. I expect to bear total personnel costs in the amount of [€]

Total personnel costs under (a.) are broken down into (i, ii, iii), to be answered if possible:

- i. number of existing staff [FTEs] (total number)
- ii. number of new staff [FTEs] (total number)
- iii. costs in the amount of [€ per FTE]

b. I expect to bear other costs in the amount of [€]

c. I expect a share of transition costs for reporting obligations that must be adjusted to be specific for each new BZ to be independent of company size [%]

d. Please provide reasoning for the indicated numbers of personnel and other costs:

.....
.....

10. Please indicate your estimated costs and further information for other **costs attributable to adjustment of processes with TSOs and public bodies** per proposed BZ configuration

a. I expect to bear total personnel costs in the amount of [€]

Total personnel costs under (a.) are broken down into (i, ii, iii) to be answered if possible:

- i. number of existing staff [FTEs] (total number)
- ii. number of new staff [FTEs] (total number)
- iii. costs in the amount of [€ per FTE]

b. I expect to bear other costs in the amount of [€]

c. I expect a share of transition costs for other costs attributable to adjustment of processes with TSOs and public bodies to be independent of company size [%]

d. Please provide reasoning for the indicated numbers of personnel and other costs:

.....
.....

11. Please indicate your estimated costs and further information for **any examples not covered above** per proposed BZ configuration

a. I expect to bear total personnel costs in the amount of [€]

Total personnel costs under (a.) are broken down into (i, ii, iii), to be answered if possible:

- i. number of existing staff [FTEs] (total number)
- ii. number of new staff [FTEs] (total number)
- iii. costs in the amount of [€ per FTE]

b. I expect to bear other costs in the amount of [€]

c. I expect a share of transition costs for any examples not covered above to be independent of company size [%]

Please provide reasoning for the indicated numbers of personnel and other costs:

.....

.....

12. Please indicate which of the following cost developments you would expect from a lead time of more than three years until the BZ reconfiguration?

☐ Same costs ☐ Lower costs ☐ Higher costs

a. If you expect higher or lower costs, please provide reasoning why this would be the case:

.....

.....

13. Please indicate which of the following cost developments you would expect from a lead time of less than three years until the BZ reconfiguration?

☐ Same costs ☐ Lower costs ☐ Higher costs

a. If you expect higher or lower costs, please provide reasoning why this would be the case:

.....

.....

EFFECTS OF INTRA-COMPANY TRANSACTIONS ON LIQUIDITY

— This section specifically applies to market participants with generation and retail positions that are currently within a single BZ but that will be spread across different zones after the BZ reconfiguration is implemented.

1. Do you have generation assets or hold retail positions that will be spread across different zones after the BZ reconfiguration?

☐ Yes ☐ No

a. If yes, assuming no changes to today's market and portfolio landscape, how are the shares of generation or retail distributed across reconfigured zones in TWh per year?

.....

2. Please consider the three exemplary market cases below and briefly explain what kind of decision-making you would expect in each example. For your answers, consider a short to medium term of 4 to 5 years and a market without implicit BZ third-party access.

a. After the BZ reconfiguration, 60 MWh of generation is in a bidding zone without a retail position. Will the market participant/you go through the market – which would increase market liquidity – adjust physical production or retail positions, or approach the reconfiguration through other means (such as buying cross-border transmission rights)?

Positions in BZ 1 and 2 after reconfiguration		
	BZ 1	BZ 2
Physical production position	20 MWh	80 MWh
Retail position	80 MWh	20 MWh

.....

.....

.....

b. After the BZ reconfiguration, a retail position of 20 MWh has no physical production position in the same BZ. Would the market participant/you withdraw the retail position from BZ 2, rely on the market (and own physical position in BZ 1) to supply the retail position, or approach the reconfiguration through other means (such as buying cross-border transmission rights)?

Positions in BZ 1 and 2 after reconfiguration		
	BZ 1	BZ 2
Physical production position	100 MWh	0 MWh
Retail position	80 MWh	20 MWh

.....

.....

.....

c. After the BZ reconfiguration, a production position of 20 MWh has no corresponding retail position in the same BZ. Would the market participant/you withdraw the production position, sell the generated electricity through the market, or approach the reconfiguration through other means (such as buying cross-border transmission rights)?

Positions in BZ 1 and 2 after reconfiguration		
	BZ 1	BZ 2
Production position	20 MWh	80 MWh
Retail position	0 MWh	100 MWh

.....

.....

.....

ADDITIONAL REMARKS

[illegible]

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Acronyms

ACER	Agency for the Cooperation of Energy Regulators
BZ	Bidding zone
BZR	Bidding zone review
BZRR	Bidding zone review region
DA	Day-ahead
EEX	European Energy Exchange
EPAD	Electricity price area differential
ESMA	European Securities and Markets Authority
FTR	Financial transmission rights
HHI	Herfindahl-Hirschman index
HVDC	High voltage direct current
ID	Intraday
LEBA	London Energy Broker Association
NEMO	Nominated electricity market operator
NRA	National regulatory authority
NTC	Net transfer capacity
OTC	Over-the-counter
PPA	Power purchase agreement
PSI	Pivotal supplier index
PUN	Prezzo Unico Nazionale
RSI	Residual supply index
SD	Standard deviation
SDAC	Single day-ahead coupling
SIDC	Single intraday coupling
TSO	Transmission system operator

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