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# ACER Report on the implementation of the Balancing Network Code

SECOND EDITION

Volume I

16 November 2017

ACER - Agency for the Cooperation of Energy Regulators
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# Executive summary

The first (2016) Report on the implementation of the Balancing Network Code covered a wide range of critical design elements of balancing implementation and found major differences in the extent to which different Member States had implemented the Balancing Network Code.

For the second (2017) Report, the Agency developed a ***Balancing Analytical Framework***, which can be applied to all balancing regimes to measure their performance. The *Balancing Analytical Framework* derives several indicators and charts illustrating the functioning of individual regimes, and then compares them across. The key objective of the analysis is to assess to which **extent balancing regimes are functioning effectively**, given the local circumstances. When drawing conclusions - using the indicators and charts - the characteristics of each balancing regime is taken into account.

The Report applied this *Framework* to seven selected balancing zones: National Grid Group (UK-GB), the H-Cal Zone Fluxys (BeLux), NCG (Germany), Energinet.dk (Denmark), GRTgaz Nord (France-N), Plinovodi (Slovenia) and Enagas (Spain). This was done to provide **valuable lessons and insights** that may inform **whether and if so, how, balancing regimes should evolve**. Additionally, the Report updated and **enhanced the assessment review for all 26 EU balancing zones**.

**Main conclusions from the Report…**

1. The implementation of the Code is still patchy: some regimes are in a well-developed stage, while others have made some progress, there is still work to be done before full implementation is achieved.
2. The *Balancing Analytical Framework* should become an integral part of regime performance monitoring. The *Framework* uses both commercial (such as basic neutrality) and physical indicators (linepack data) for assessing wider regime performance.
3. Discrepancies across the normalised values of country indicators and between the physical and commercial indicators should be assessed by all actors to help improve the effectiveness of regimes.
4. The necessary data limit the application of the framework. The Agency looks forward to getting good information for all the indicators used in its Report to enable broader future monitoring.

**…and its recommendations:**

1. The less or undeveloped regimes need to develop and enact plans aimed at achieving efficient outcomes, instead of merely looking at compliance.
2. NRAs and TSOs should work together with market players to progress the implementation of the Code or the evolution of the balancing design, as the case may be.
3. The Agency promotes the use of the *Balancing Analytical Framework*, where the relevant data is available.
4. Given that this framework could be used by many, the Agency would welcome feedback from industry stakeholders on the merits of the *Framework*.

This Report is divided in two volumes. The first volume includes the introductory chapters (including recommendations), the newly developed *Balancing Analytical Framework* and its application to seven balancing regimes and two overview chapters on Operational balancing and Information provision.

The second volume includes the revisited country assessments using the same methodology the Agency developed in its first Report.

# VOLUME I

# Part I – Overview of the Report

# 1. Purpose and Structure of the Report

## 1.1 Purpose of the Report

(1) In November 2016, the Agency completed its first Balancing Implementation Monitoring Report ('the first Report').

(2) The Report found major differences in the extent to which different countries had implemented the Balancing Network Code ('the Code') and made a tentative assessment of the effectiveness of some of the implementations. Making such assessments is always challenging, given the differing environments in which the balancing regimes function. These differences may derive from varied network topologies and their physical capabilities, physical supply and demand variations, differences in transit versus domestic requirements, availability of flexible gas resources and the state of local short-term wholesale market development. Indeed, this is why the Code allows flexibility so that fit-for-purpose regimes can be implemented to deliver efficient outcomes within each balancing zone.

(3) For this second Report, a specific aim was to develop a n*ew Balancing Analytical Framework,* which measures the performance of balancing regimes. Against this aspiration, the Agency recognises that currently not all the countries will be able to provide the necessary data to implement the analytical framework. However, even with a small number of countries, it is envisaged that the datasets, summary statistics and graphics will provide valuable information and insights on regime performance. The framework is designed to promote an understanding of the effectiveness of the regime implemented in each balancing zone. Additionally, the framework compares the regimes to provide valuable lessons and insights that may inform whether, and if so how, balancing regimes should evolve.

(4) Implementation design can have a significant impact on how the short-term balancing market functions. Furthermore, the short-term market may be heavily influenced by changing circumstances (for example network topologies, supply and demand levels, the extent of competition in both retail and wholesale markets) and therefore the evolution of balancing regimes may be desirable to ensure that the balancing and wider network access rules deliver the best outcomes in the interests of gas consumers.

(5) Given the diversity described above, defining a set of performance benchmarks applicable to all balancing zones is not an obvious, or achievable, aspiration. However, this year's Report provides an analysis of several regimes by developing a single methodology and reports on the findings in a comparable way.

(6) It is anticipated that the framework might be enhanced in future years and could be applied to a wider set of balancing zones.

## 1.2 Structure

(7) The Report consists of two volumes. The first volume has three parts.

- Part I provides the context and a detailed exploration of the analytical framework - *Balancing Analytical Framework* - together with the main conclusions and recommendations. This part comprises five chapters.

- Part II introduces and applies the *Balancing Analytical Framework* in seven selected Member States It comprises two chapters, one is dedicated to country descriptions and the other one offers a cross-country comparison. Each chapter provides specific observations and conclusions. Part II is supported by multiple annexes, available at the end of the first volume.

- Part III gives an update on Operational balancing and Information provisions. In particular, the Information provision updates rely on an ENTSOG questionnaire.

(8) The second volume assesses the status of the Code implementation on a country-by-country basis, detailing the results of national implementation based on the country assessment sheets developed in the first Report of the Agency. The country assessment methodology was provided in the Technical Annexes of the first Report.[1]

## 1.3 How to read the Report

(9) The Report contains a large amount of information on the evolution and level of development of balancing regimes in the European Union.

(10) Depending on which of the below groups a reader belongs to, s/he could explore different strategies to absorb the main findings of the Report:

- **Primary Audience:** balancing experts - network users, TSOs, NRAs - familiar with the balancing regimes across the European Union. This audience may read the Report as is, screening for additional information and mainly focus on the parts relating to the *Balancing Analytical Framework*. Chapter 5 contains the main definitions of the *Balancing Analytical Framework* followed by chapters on country analyses and cross-regional comparisons (Chapter 6 and Chapter 7). Some of the Annexes support the methodology and readers with a deeper analytical interest could check out those for more information. Chapter 8 and 9 and the second volume of the Report could be skim-read again for further updates.

- **Secondary Audience**: an executive person, journalist or a reader with limited time. S/he should skim the table of contents looking for the parts s/he is most interested in, read the introductory and recommendation chapters of the Report (Chapter 2, 3, 4), skim the Final comments section from the country analyses (Chapter 6) and look at the charts in the cross-country comparison (Chapter 7).

[1] http://www.acer.europa.eu/en/Gas/Framework%20guidelines_and_network%20codes/Documents/Annex%20II-IV_2016_11_07_for_publication.pdf

# 2. Intent of Code

(11) This section recalls the intent of the Code. It presents the steps towards improved balancing design.

## 2.1 Main balancing design features recalled

(12) The aspiration of the Code was to have a well-functioning short-term balancing market, where network users do most of the balancing and TSOs are assigned to a residual role while active in the same market.

(13) The Code and in more detail the Agency's previous Report discussed what the key enablers are for network users to balance their gas portfolio properly. These were access to information, access to gas flexibility (specifically getting access to physical gas and trading platforms) and access to system flexibility (renomination regimes as relaxed as possible and the easiest and most timely access to entry and exit capacities).

(14) The Code imposed appropriate incentives on network users to balance, particularly through daily cash-out, and only where necessary modest within-day restrictions/incentives were foreseen.

(15) The previous Report also emphasised how important the role of the TSO as a market enabler is. The process towards market-based balancing is facilitated if the TSO plays an active role in changing the balancing regime and takes into account network users' needs when facilitating the short-term trading environment, including designing and providing the necessary information to users.

(16) With the necessary enablers, an appropriate cash-out pricing regime and TSO willingness to play a residual role in balancing, a user-friendly market can be designed. NRAs have a critical role to ensure that the chosen balancing regime design is coherent and delivers the best possible outcomes for consumers.

(17) The NRAs have a key role to ensure an economic and efficient balancing implementation taking account of both visible costs (via "neutrality"[2]) and those that might be buried within network users' businesses. With the new quantitative analytical framework, the Agency wishes to facilitate the efforts the NRAs may need to take in this direction.

## 2.2 Code optionality and commitment to implement market-friendly regimes

(18) The Code sets limited harmonised rules. For example, it sets rules on the Gas Day, and on nomination and renomination timelines.

(19) The Code offers various implementation options. These options allow TSOs to manage differing national contexts[3]. They ease the initial development of local gas balancing markets. The options should pave the way for effective implementation taking into consideration different system characteristics and accelerate progress towards proper market functioning. TSOs must take into account stakeholders' input when designing their balancing systems. National regulatory authorities must approve such designs. This ensures

[2] See Section 5.2 for a description of the concept of "neutrality".

[3] These differences may result from i) network topologies and their physical capabilities, ii) physical supply and demand variations, iii) differences in transit versus domestic requirements, iv) availability of flexible gas resources and v) the state of local short-term wholesale market development. The Code does not describe network topology but as a principle allows options when those are necessary to ensure operational security.

that national implementation results in a *coherent set of rules.* These coherent rules must provide for the critical enablers of the short-term market[4] and pave the way for its development.

(20) The Code facilitates short-term market development. In many countries, forward liquidity is limited or non-existent. Delivering a short-term market will be the first step in building up a liquidity curve fairly to value gas products. The Code is not the only instrument to build up such a curve, but a good implementation provides the necessary ingredients for a successful market.

## 2.3 Challenges in Code implementation: enabling instruments are missing

(21) The first step towards implementing the Code is the creation of title transfer at the Virtual Trading Point ('the VTP')[5]. Title transfer allows network users to exchange gas ownership and the design must accommodate gas and capacity products with short timeframes. The creation of title transfer implies the creation of the necessary contractual framework and a corresponding IT infrastructure.

(22) Currently, the use of title transfer is not fully accessible to all network users, especially paper traders, in all the Member States. In some Member States, the implementation is severely delayed and short-term contracts are missing. This impedes the ability of network users to balance their portfolio and limits the participation of network users to develop the short-term market.

(23) Following the creation of title transfers, the second step concerns market access and offer. Platforms must have transparent and simple access rules. Platforms must offer suitable products. In smaller markets, platform should first adopt a simple design. Where workable, as a second step, platforms could merge or coordinate activities with other platforms either across the border (Pegas platforms), or serving both the gas and the electricity sector (ICE ENDEX). Daily and within-day capacity products must be available to all market players. Where necessary, balancing services will support the first phase of market development, until the TSO can rely on the short-term market. The Code foresees the gradual decrease of balancing services in favour of the short-term market.

## 2.4 Strengthening Code implementation requires coherent balancing market design and confidence in balancing markets

(24) The Code established a daily balancing regime. The regime must be without within-day restrictions beyond the operational constraints of the network.

(25) Appropriate information is essential to enable network users to manage their risks and opportunities. NRAs must assess information on linepack volumes and user's portfolio balancing statuses. These are critical elements for network user's risk management. *The Code states that information forecast accuracy must be reviewed at least every two years*[6].

(26) Imbalance cash-out prices are based on daily imbalance trades. VTP title trades are the trades that might normally be used to determine imbalance prices. The cash-out pricing provides a price differential between sell and buy price. The goal is to incentivise users to keep their balancing accounts close to zero. As interim

[4] See for further information Chapter 6 of the First ACER Report on the implementation of the Balancing Network Code. http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER%20Report%20on%20the%20implementation%20of%20the%20Balancing%20Network%20Code.pdf.

[5] Historical contracts limiting delivery to the VTP must be tracked and relevant volumes made transparent.

[6] Article 41(3) of the Code and Chapter 9 of the Report.

measures, the Code allows proxy pricing or trade-based pricing with tolerances. The ultimate goal is market-based pricing to produce adequate and fair incentives to balance. The small adjustment used to ensure a minimum spread between the buy and sell price needs to be carefully set; it must not push players to reduce or avoid trading, but rather incentivise them to balance themselves. These elements should be under regular review, particularly where the difference between the marginal sell and buy prices is due to large adjustments[7] or interim measures are in use.

(27) To give confidence to the market, the TSO should become a residual player. It should develop its balancing policy to avoid taking extremely priced balancing actions. The neutrality account monitors the TSOs' and network users' cumulated cash flow positions. The account allows to monitor the development of the market and to verify that the TSOs plays a residual role. The net financial position should stay small and not lead to the accumulation of large amounts throughout a year. TSOs must distribute the costs or revenues of the neutrality account back to users through the neutrality charge.

(28) The regular review of the balancing regimes and appropriate refinement of rules should deliver a coherent design and efficient balancing regime operation. In the current Report, the Agency provides analytical tools to assist NRAs and TSOs in assessing the performance of local regimes. The goal is to improve market designs and conditions for the development of short-term markets throughout the European Union.

## 2.5 Ahead of us: expanding short-term markets, cross-border trade and market integration

(29) Balancing and capacity rules need to facilitate the development of liquidity and short-term markets. Major elements of the balancing and capacity regimes have not been implemented in some countries and so the creation of Trading Platforms could not follow absent basic enabling rules.

(30) Illiquid markets must start implementing the Code and other elements of the European Union's law including the implementation of entry-exit zones and capacity rules. Furthermore, to deliver any prospect of short-term market functioning they must use the enabling measures. Basic transactions at VTP and simple trading services will contribute to more transactions, hence to the development of market liquidity. As the number of transactions builds up price signals will improve.

(31) The development of local balancing markets supports cross-border trading. Already now, local markets use regional hub pricing to build proxy interim prices for their own markets or rely on regional hub pricing to derive prices for balancing services.

(32) The harmonised nomination and renomination timeframes and Gas Day facilitate cross-border trading. They allow network users to bring in gas from neighbouring markets and have positions in both markets. Opening hours of VTPs or platforms must not unduly limit the prospect of trades in adjacent zones, which might inhibit the optimisation of cross-border gas flows. Neighbouring countries must cooperate to make trading across borders seamless.

(33) The relevant institutions – regulators and competition authorities –shall address market design issues, which are hampering the implementation of the Code in currently illiquid markets.

(34) Countries that have made limited or no progress should consider progress in some other parts of the European Union as successful examples of cross-border market arrangements. The market merger of the two balancing zones of Belgium and Luxemburg supported the implementation of the Code in Luxembourg. Another example is the integration of the Swedish balancing zone to the Danish zone, where both countries

[7] See Article 22(6) of the Code.

would be sharing the same trading venue. This project will be fully functional in April 2019. It is worrying that the Portuguese balancing products still await to join Mibgas, despite the fact that the completion of this step was foreseen by October 2016.

# 3. From the first to the second edition of the Report

(35) This section recalls the conclusions from the first Report and refers to the balancing market developments since its publication. It offers conclusions that are relevant for the approach followed in the current Report.

## 3.1 Learning from the first Implementation Monitoring Report

(36) The Agency published the first Report on 7 November 2016. Earlier reports compiled TSO and NRA declarations about the state of implementation of the Code. The first Report delivered the first objective assessment of the national implementations. It assessed compliance and effectiveness of national implementations based on evidence available to the Agency. It covered a wide range of critical design elements, which were captured and published in individual country assessment sheets. This approach was adapted to account for and respect the optionality included in the Code[8].

(37) This analysis led to country recommendations. Even for the best scoring countries (France-N, BeLux, Denmark, Germany and the Netherlands), the Agency proposed closely to follow implementation. The Agency recommended to improve neutrality provisions in more than half of the regimes analysed (e.g. Austria, Czech Republic, Hungary, Slovenia and Spain). The Agency urged Bulgaria, Greece and Romania to close the implementation gap by introducing basic design features - VTP, renominations and trade notifications. The front-runner interim measures countries (Poland H-cal zone, Ireland, Lithuania, Slovakia) were requested to follow up their interim measures and become fully aligned with the Code by April 2019.

(38) These country recommendations led to further discussions at the ACER-ENTSOG joint workshop in Warsaw in November 2016 and contributed to discussions within the NRA community.

(39) One of the topics under discussion was how to interpret the Code and whether different interpretations of the letter of Code could hinder reaching its main objectives. These implementations might be technically compliant but are unlikely to lead to effective outcomes. In many countries, implementation optionality in practice undermined the intent of the Code. It contributed to delays in implementation. This was particularly the case in some countries opting for transitional or interim measures[9].The delays jeopardise the prospects of having well-functioning short-term markets by 2019. In particular, several Member States using the five-year period available for interim measures have made limited efforts to take early steps towards better market functioning.

(40) The first Report concluded that NRAs and stakeholders should continuously monitor the compliance and effectiveness of the implementation. The balancing regime may need to evolve to deliver the most efficient short-term markets as local circumstances change. No specific balancing regime is likely to last forever. An informed dialogue across the EU is critical to ensure that best practices in creating liquid short-term markets and well-functioning balancing regimes are shared.

## 3.2 Updates following the first Report: delivered implementations and remaining gaps

(41) Following the first Report, some Member States followed the recommendations of the Agency. This section gives an update on the major implementation developments and, in some cases, the lack of it. The section

[8] See previous footnote above.

[9] Subject to NRA approval countries could make use of interim measures to define a transitional path towards a fully functioning short term market by April 2019

aims to highlight the countries where major implementation steps occurred and encourages others to follow the example.

(42) Croatia completed the implementation of the Code in April 2017. With some delays, the Croatian regime delivered title transfer, VTP, trading platform, standard products and reasonable information schemes for the users. There are information provision aspects that still need to be further developed. In its next Report the Agency will follow up how the regime progressed.

(43) The preparation of certain platforms further progressed, but at a slow pace. The Trading Platform in Ireland - Energy Broking Ireland (EBI) - will be fully functional before the end of 2017, when GNI, the TSO, will join the platform. The promoters anticipate the go live by the start of Gas year 2017/18, but the NRA anticipates that the TSO will only join the platform in December, after the contractual processes are fully completed.

(44) Greece could deliver the Balancing Platform by the end of this year, if real progress in information provision is made, in particular concerning the forecasting of non-daily metered ('NDM') load. The review of the information model has been continuously postponed over the last half year, as the topic seems to be contentious.

(45) Bulgaria has made some progress since last year. Given the accumulation of major delays in implementation, well beyond the scope of balancing, the TSO took steps to close this gap. Once the entry-exit regime is delivered by defining appropriate tariffication and the VTP design understood by network users, short-term products can be contracted at the VTP. A basic balancing regime may also require a simple Bulletin Board, which is not foreseen yet. The long-term challenge to merge the two VTPs – the transit one and the domestic one – will remain critical to turn Bulgaria into a more liquid market place. With respect to balancing, the Agency recommends that Bulgaria follows simple design options, avoids within-day obligations and corrects the error in its cash-out price formula, which should be based on trades alone[10].

(46) Romania made no real progress, but outlined how to start an appropriate implementation in the presence of the European Commission this June. The critical step remains the creation of an entry-exit system with appropriate short-term products, functioning VTP that includes paper traders and an agreement to use a Trading platform. Establishing portfolio balancing is still in the making. The Agency recommends that the Romanian TSO take leadership in designing the major elements of the balancing regime, consulting stakeholders. The Romanian NRA should facilitate this process and help arbitrate difficult discussions.

(47) In Italy, the TSO and network users rely on the Trading Platform as first gas source, but the TSO is still the major counterparty for the balancing trades (up to 70% of the volumes). Cash-out prices function and the small adjustment is minimal (less than 0.6%). Storage is used as a balancing source, but is kept outside of the balancing regime. The NRA intends to improve the situation with a new TSO incentive scheme.

(48) The publication of data and the quality of information improved since last year. For example, some TSOs published linepack information (NCG is now publishing aggregated linepack covering the pipeline networks of its members), while others systems improved data quality (Czech Republic, Hungary).

## 3.3 Drivers for the second Implementation Monitoring Report

(49) This Report aims to continue the assessment of the various balancing regimes across the EU. In this context, the Report presents the results of the following three approaches.

[10] More details are available in Volume II of this Report, under the country assessment sheet describing Bulgaria, box "Cash out prices set using TP trades".

*First approach: updating the country assessments*[11]

(50) In a separate volume, the Agency presents the updates of the country assessments from the previous year using the same evaluation framework. These updates resulted from information supplied by NRAs and TSOs. The understanding of the terminology, and the implications of design choices are improving amongst the NRAs/TSOs since the first Report.

(51) These new assessments provide an update on the current implementation status in the Member States. They offer a good overview of whether the measures have been implemented and what the effects associated with certain design choices are. They support NRAs and TSOs in implementing the Code and point into directions where further progress could be made.

*Second approach: developing a Balancing Analytical Framework*

(52) Secondly and more importantly, the Agency designed a *Balancing Analytical Framework*, which can be applied to all regimes. From daily data associated with the operation of the regime, it derives several indicators and graphics illustrating the functioning of individual regimes. This Report reviews a sample of seven balancing regimes. The selection was based on data availability, quality and the willingness of the NRAs to support data verification process with the Agency.

(53) The *Balancing Analytical Framework* may also help stakeholders to assess the comparative performance of the different regimes. The framework sheds light on the different features of balancing design and brings them together in a comprehensive assessment. It can be used to understand whether individual regimes and their associated parameters are optimal in the local context.

(54) The framework does not determine a preferred design; rather it analyses and reflects on the outcomes the regimes deliver.

(55) Balancing regimes must be carefully designed and periodically reviewed. It is unlikely that regimes will stay optimal as local circumstances change. The *Balancing Analytical Framework* should help taking care of the evolution of local circumstances and support justification for changes in the regimes.

(56) Given that this framework could be used by many, the Agency would welcome feedback from industry stakeholders as to the merits of the framework and how it might be applied more extensively and evolve. The Agency would also welcome inputs from those that delivered the necessary data, or who might want to participate in the future.

(57) Finally, the Agency thanks the NRAs who helped apply the *Balancing Analytical Framework* and supported the Agency to develop the quantitative analyses for this Report.

*Third approach: focus on information provision and operational balancing*

(58) Thirdly, this Report provides limited updates on the developments in operational balancing and offers some insight on information provision, which the previous Report did not cover. These shorter reviews complement both the country assessment review and support cross-regional comparisons.

[11] See updated country assessments in Vol II.

# 4. Recommendations

## 4.1 High-level conclusions:

(59) The implementation of the Code is still patchy: some regimes are in a well-developed stage, while others have made some progress, but there is still work to be done before full implementation is achieved. In addition, no progress at all was recorded in some Member States.

(60) This year, the Agency has reviewed the balancing regimes in all Member States and better understood the laggard group of Member States. The Agency experienced that implementation processes were delayed due to either lacking leadership or disputes over it, or the lack of initiative to apply the Code in practice. As a result, activities that could have been performed from a technical perspective have also been delayed. Some regulators have done a reasonable job and sustained better the political pressure they faced.

(61) Due to this, the benefits that the Code should be delivering to consumers are not realised. The lack of development of short-term wholesale markets restricts access to broader commercial opportunities. The Agency also took note from its discussions with NRAs that certain difficulties arose because the legal text of the Code does not clearly articulate its principles and its intent. This posed problems in the countries that did not, or only sporadically, followed the Code development process and the comitology discussions on balancing.

(62) The less or undeveloped regimes need to develop and enact plans aimed at efficient outcomes instead of merely looking at compliance as an objective. While challenges are not the same in all the Member States, in those where more work needs to be done the commitment to change needs to be stronger. The Agency is open to support the more challenging change processes, but it is in no position to take leadership of the project, which is placed in the hands of the relevant Member State. The Country visits to Bulgaria and Romania under the leadership of the European Commission (DG Energy) allowed for a technical dialogue, but the success of the implementation of the Code in these two countries depends on the commitment of the Member State to apply the right design within appropriate timeframes.

(63) NRAs and TSOs should work together with market players to progress the implementation of the Code. The issue of transit and limited access to transit infrastructure also frustrates the implementation of the Code. The right political and economic instruments should be deployed in order to change the access regimes to transit pipelines that currently frustrate the implementation of this Code.

(64) Consumer benefits could be reaped in regimes where markets work effectively. The focus of Code implementation needs to take account of both the compliance with the Code and its efficient application. The Agency promotes the use of the *Balancing Analytical Framework*, where data is available, to assess the efficiency and the potential evolution of the regime, as appropriate. The Agency found basic neutrality to be a key indicator for wider regime performance and a tool for appropriate gas accounting.

(65) The *Balancing Analytical Framework* allows not only looking at indicators with a commercial perspective, but also at ones that allow comparisons with the underlying physical network. The commercial interactions trigger changes in the physical network. Acceptable discrepancies between the physical and commercial indicators should be understood by all actors to help improve the effectiveness of the operational regime.

(66) The Agency promotes the application of the *Balancing Analytical Framework* to become an integral part of regime performance monitoring. The Agency believes that the *Framework* could facilitate discussion, bring greater attention on the importance of regime comparisons and help policy makers when designing or reviewing their balancing regimes.

(67) The Agency looks forward to getting good information for all the indicators used in its Report to enable future monitoring, including better linepack information, where considered beneficial to market functioning. The data would further support analyses of the origins of differences in the performance of balancing regimes.

## 4.2 Actions

(68) The Agency invites NRAs to work together to provide fora to explain and explore the *Balancing Analytical Framework* and to interpret individual regime performance results and cross-regime comparisons. Knowledge sharing and exchanges are still necessary and shall be encouraged. Open debates on regime performance and concerns around them would lead to an improved understanding of how well defined balancing regimes can contribute to short-term market functioning and market development.

(69) ENTSOG/TSOs could join the initiatives of knowledge sharing on key elements, including operational balancing and information provision. The Agency is well aware that, in particular in the field on NDM forecasts, the regimes differ considerably and some offer more limited potentials for network users to predict their imbalances. A close follow-up on the models and their outcomes is necessary. Sharing forecasting methodologies and supporting improvements in this area is important to create effective balancing regimes throughout the European Union. A deep insight and appropriate discussions within ENTSOG about the information models would be useful.

(70) The Agency specifically requests ENTSOG closely to follow in its next implementation report cycle the cost and benefit analyses of TSOs about increasing frequency of information provision, timeline reductions concerning information provision and improved accuracy offered to users, which are key features to assess the effectiveness of the existing information models.

(71) The Agency also points out that linepack data is not made available in many countries. The Agency would encourage TSOs to discuss this issue within ENTSOG and find ways to support the Agency in getting access to linepack information. Others could follow the exemplary approach of the Danish TSO to release linepack information at least for data analysis, if not published otherwise. Beyond that, the Agency encourages transparency on linepack data, because it could contribute better to understand TSO actions. This data should be made accessible to network users, should they deem it useful. The Agency notes that there is also insufficient knowledge on linepack definition and methodology, which should improve in the coming years with the technical support provided by ENTSOG/TSOs.

(72) Network users have indicated that information about actual physical linepack and linepack projections has been helpful during both the development and mature phases of balancing regime implementation. The example of NGG (Great Britain) organising sessions with network users explaining TSO balancing actions in the light of linepack data changes could be a practice for consideration. Furthermore, the Agency recommends that NRAs/TSOs work with network users to establish the information requirements that are appropriate in each regime at each stage in its development. Appropriate information should be considered in the context of the benefits to market functioning against the costs of information processing and publication.

(73) The Agency commits to participate in dedicated sessions devoted to knowledge transfer on interim measures and the transition towards a properly functioning short-term market. The Agency invites the European Commission and ENTSOG to join efforts to assist laggard countries to develop realistic implementation plans. This could be a preliminary step before the European Commission takes enforcement action on the non-delivery of the Code.

(74) The Agency found the data collected by ENTSOG and used in this Report helpful. For the next year however, the Agency suggests that the collection of information take care of regime differences and that additional data is collected, where regimes differ from the standard daily balancing regimes (within-day clearances,

linepack service) and tolerances is included or accounted for separately. The Agency recommends that marginal imbalance prices become part of the ENTSOG data collection, given that they form a key part of a detailed assessment. Proper data definitions should not only be established, but carefully followed through. The Agency would like to open a dialogue with ENTSOG and propose to collect the data for the *Balancing Analytical Framework* through the Transparency Platform in the future.

## 4.3 The Agency's focus for the next Report

(75) For the next Report, the Agency's aspiration is to apply the *Balancing Analytical Framework* to countries belonging to the South-South East Gas Region - most notably Austria, the Czech Republic, Hungary, Italy and the Polish H-cal - along with a balancing zone the Agency analysed this year, to maintain comparability of data.

(76) The Agency encourages the Member States included in this year's Report to repeat the analysis on their own and share results with the stakeholder community and in cooperation with the Agency. Such an approach could allow cross-comparison across more countries and enhance the understanding of the trade-offs embedded in the balancing designs by using the same framework and by interpreting its outputs together.

# Part II: Applying the *Balancing Analytical Framework*[12]

# 5. *Balancing Analytical Framework* to explore regime functioning and effectiveness

(77) This Chapter introduces the *Balancing Analytical Framework* built to assess the performance of individual balancing regimes. Annexes to the first volume provide detailed explanations concerning analytics, data collection and data processing.

## 5.1 Goals

(78) This Report introduces a *Balancing Analytical Framework* to assess the effectiveness and allow a periodic review of the performance of all balancing regimes[13]. The goal of setting up the *Balancing Analytical Framework* was to create a flexible tool that allows a balancing regime analysis across the European Union. The Report presents the results of an analysis of several regimes where the data necessary to perform this assessment was made available and where regulators elected to try this framework.

(79) The framework should be viewed as an assessment tool for all stakeholders. It is not an attempt to determine a preferred design. The analytical framework provides insights about the operation of the individual balancing regimes[14].

(80) The analysis output includes measures i) based on absolute values or ii) expressed as proportions of market volume. These measures enable both the assessment of individual regime performance and comparison across balancing zones. The framework could be also used for the periodic review of the same balancing regime to measure the progress the regime achieved over time.

## 5.2 Basic concepts used throughout the analysis

(81) This section outlines the basic concepts used in the *Balancing Analytical Framework*. Beyond the information provided here, the annexes provide detailed information on the calculations, data treatment, and methodology applied[15]. Furthermore, Section 7.2.3.1 provides for the calculations of the neutrality measures listed below.

(82) **TSO balancing action.** The TSO's balancing actions are measured in energy units and can be buy or sell actions. TSO balancing actions mean that the TSO is buying or selling on behalf of the system. TSO buying actions should be associated with actions to get more gas onto a short system. TSO selling actions are associated with addressing a gas surplus in the system that is a long system.

(83) **Sell and Buy System/TSO actions**. A sell action from a TSO decreases the quantity of gas in the network, via either turning down the entry or turning up the exit points of the balancing zone though network users' renominations. On the other hand, a buy action from a TSO has the intention of increasing the quantity of

[12] This chapter utilises the analytical framework described in Annex 2 and applies it to seven balancing zones.

[13] See Chapter 6.

[14] See further in Annex 2.

[15] See Annexes 2, 3, 4 and 5.

gas in the network, via either turning up the entry or turning down the exit points of the balancing zone through network users' renominations. The TSO will sell gas when the system is long, or expected to be unacceptably long and it will buy gas in the opposite case, in its role of system balancer. Hence, a TSO Buy for balancing purposes can be referred to as a System Buy. Similarly, a TSO Sell for balancing purposes can be referred to as a System Sell.

(84) **Network Users' Imbalances.** The difference between each network user's injections into and withdrawals from the transmission network, plus the net gas exchanged at the VTP, defines the network user's imbalance. Imbalances are aggregated according to the sign of the imbalance, yielding an aggregated network users' over-delivery (sum of all "long" accounts on the day) and, separately, aggregated network users' under-delivery (sum of all "short" accounts on the day). The network users' imbalances, for each day within the analysis period, are plotted into dedicated graphics in Chapter 6. The individual network users' imbalances are not publicly available. The Report analyses their aggregated behaviour.

(85) **Long and Short Imbalance Positions.** The aggregated network users' imbalance is labelled as "long" for those network users that inject, individually, more gas into their daily balance account than the gas they withdraw. In the Report convention, "long" imbalances have a negative sign and therefore occupy the negative area of the respective chart. On the other hand, the network users' imbalance is labelled as "short" for those network users that, individually, inject less gas than the gas they withdraw. In the Report convention, "short" imbalances have a positive sign and therefore occupy the positive area of the respective chart. The inversed convention is used to show how these positions affect the neutrality account. If the network users are short, the TSO in its role of settlement agent sells gas via imbalance cash-out to network user. If the network users are long, the TSO in its role as settlement agent buys gas via imbalance cash-out from network users[16].

(86) **Cumulative Commercial Imbalances.** It is the combined commercial effect of network users and TSO balancing actions. The accumulation takes account of all the balances up to and including a given Gas Day. The imbalances could have either a positive or a negative sign.

(87) **Neutrality Energy Flows or Transactions.** As explained through the definitions above (**Sell and Buy System/TSO actions** and **Long and Short Imbalance Positions**), there are four energy transactions associated with neutrality. In this Report, energy and their related cashfows are considered on both a daily and (gas) yearly basis.

(88) **Net energy**. The quantities of energy purchased and sold via the four energy flows are unlikely to net to zero. The net energy represents the difference between energy sales and purchases originating from the four neutrality energy flows. For example, when energy sales are greater than purchases neutrality has made a **net energy sale**. Furthermore, when purchases are greater than sales then neutrality has made a **net energy purchase**.

(89) **Net financial neutrality**. The financial effects of the four energy flows are also unlikely to net to zero. Net financial neutrality is the sum of financial inflows to neutrality less financial outflows. In other words, it is the net amount of money associated with TSO/System Sells and Network User Imbalance Short Positions less the amount of money associated with TSO/System Buys and Network User Imbalance Long Positions.

[16] This is because all transactions are viewed from the perspective of financial neutrality. Thus, when acting as the residual network balancer: if the TSO buys gas this creates costs to the system; on the other hand, if the TSO sells gas, this creates revenues to the system.

Similar to that, when a network user is long and injects more gas into the network, this constitute a cost for neutrality; on the other hand, if a network user is short and injects less gas into the network than it withdraws, this constitutes a revenue to neutrality .

Where net financial neutrality is positive (cashflow), surplus cash is available for redistribution to network users. Where net financial neutrality is negative (cashflow), the deficit will be recovered from network users.

(90) **The interaction between net energy and net financial neutrality.** The net financial neutrality indicates whether the operation of the balancing regime is generating a cash surplus or cash deficit associated with the four energy transactions. The net energy position influences the net financial neutrality. For example, if the net energy position represents a net sell, the associated quantity of net gas sale will have contributed a revenue to the cashflows. Similarly, if the net energy position is a buy, then this should be associated with a cost in the net financial neutrality. These revenues and costs, in the end, are distributed back to the network users via the neutrality charge. For avoidance of doubt, the net energy and net financial will not necessarily have the same sign.

(91) **Net adjusted financial neutrality.** The net adjusted financial neutrality is a measure designed to remove the effect of the net energy from the net financial neutrality. Where net energy is positive the likely cost of the net purchase will have contributed to net financial neutrality. Similarly, where net energy is negative the likely revenue will have contributed to net financial neutrality. The approach applies an estimated gas price to the net energy and then adjusts the net financial neutrality to remove the net energy's contributory value. The adjusted value is distributed back to the network users. The idea is to deliver an estimate of the overall financial effect of neutrality that is energy neutral and can be used for comparative purposes. This provides a better indication of the overall cost or revenue generated in individual regimes.

(92) **Principles concerning neutrality based on the Code.** TSOs/Market Area Managers ('MAMs') should be financially neutral in respect of costs and revenues associated with its balancing activities. Neutrality should represent an additional cost or revenue that is recovered from a large base of users and not on individual ones. Net neutrality charges are levied on or paid to the network users (as debits or credits) and should remain small. The neutrality charge and the associated neutrality cashflows may indicate how large the adjustments and the additional financial burden borne by network users are. Ultimately, the components of neutrality analysis inform about whether the balancing regime delivers appropriate incentives to the network users or rather puts an unacceptable cost on them. Consequently, neutrality analysis gives insights about balancing regime performance.

(93) **Linepack.** The volume of gas in the system at a given point in time is referred to as inventory, stock, or linepack. The linepack is the cumulative difference of total inputs less total offtakes[17]. Typically, linepack levels are calculated by multiplying the physical volume of the network[18] by the pressure levels observed or derived[19].

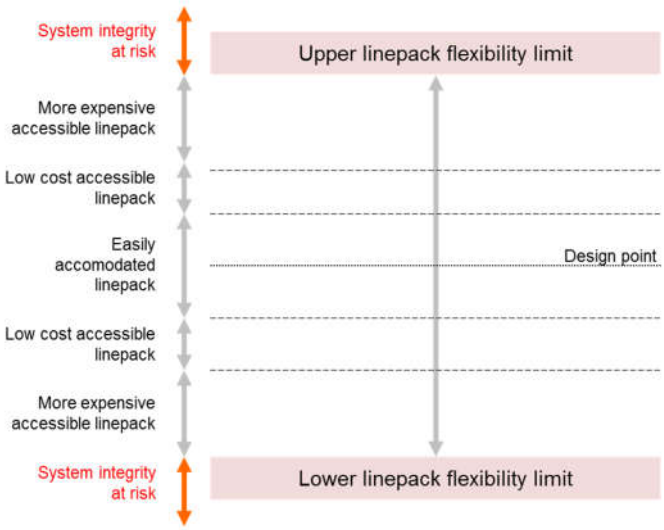
(94) **Linepack flexibility**. Gas systems can be safely operated within a certain pressure range. A range of linepack levels corresponds to this pressure range. This is the linepack flexibility acceptable for the system. Efficient gas turbine utilisation requires optimisation over narrow operational scenarios, which correspond to other, narrower pressure ranges.

[17] Including TSO's own use e.g. compressor fuel usage and losses.

[18] Derived from network pipeline lengths and diameters.

[19] Because gas pressures in the system vary, it is usual practice to calculate the amount of gas in the system under standardised conditions.

Figure 5-1: Simplified and illustrative view of access to linepack flexibility



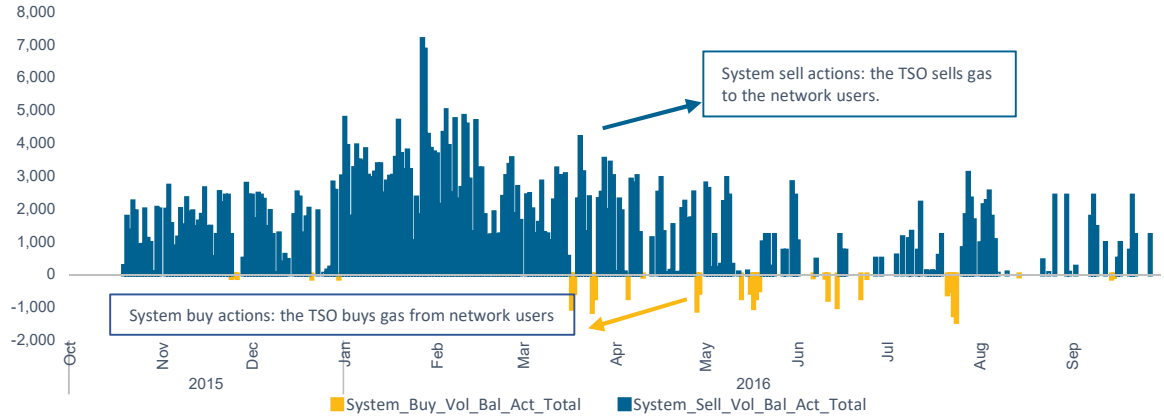

*Source: SEC, Presentation at ACER's WDO Workshop in May 2017.*

## 5.3 The graphics used in the Report

(95) In this Section, the charts used to present the result of the assessment of the balancing mechanisms in the selected Member States are presented and illustrated.

(96) The chart below shows the **TSO/system buy and sell actions** for the Gas year 2015/16 with daily granularity. Different balancing systems foresee different merit orders. The different products in the merit order that the TSO uses over different timeframes, as the case may be, are integrated in the graphic representing all TSO actions.

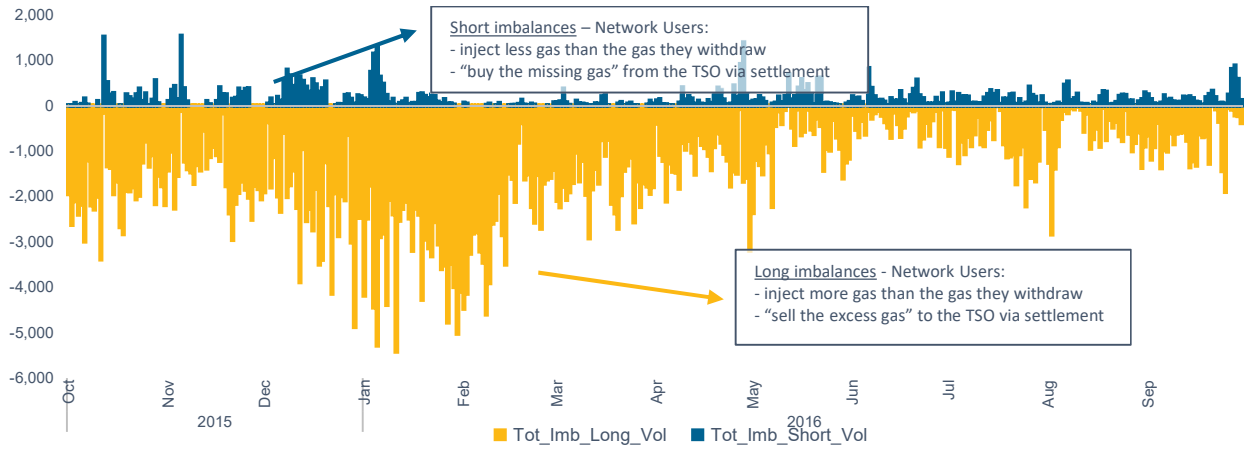
Figure 5-2: TSO's Balancing Actions




(97) On a Gas Day, some users will face negative imbalances and others positive ones. The net effect of all network users' activity is unlikely to be balanced. If the net effect is small, then the TSO may be able to absorb the variation in its linepack and so may choose not to take a balancing action. If this is necessary, the TSO's action will typically offset the net effect of the network users.

(98) The chart below focuses on the **Imbalance position of all network users**. It shows the aggregated daily imbalances for all **long** network users below the zero line, and the aggregated daily imbalance of all **short** network users above the zero line.

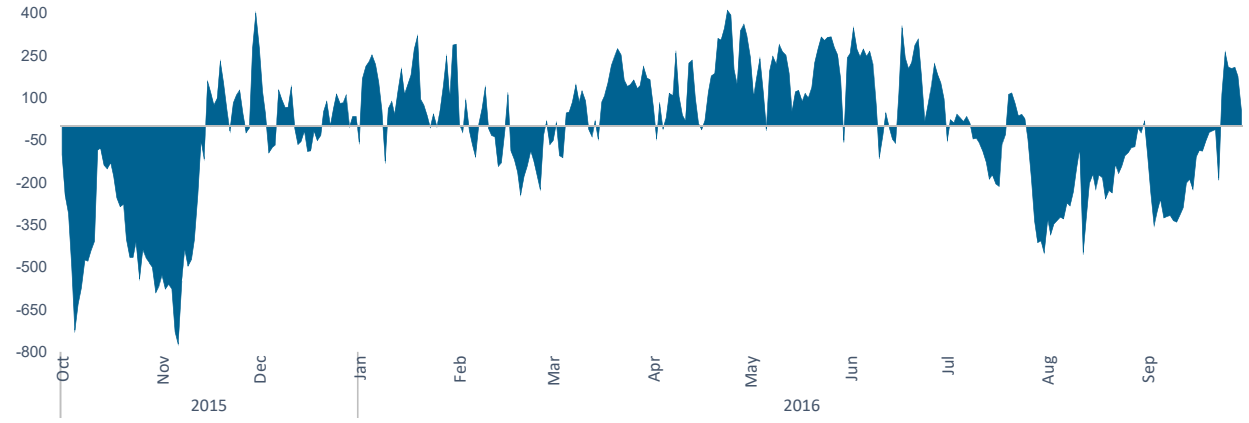
Figure 5-3: Network Users' Imbalance volume (MWh)




(99) The chart below presents the daily total net sum of revenues and costs the system collects associated with the four basic **neutrality energy transactions,** cumulated over the period of analysis: System Buy/Sells and Network User Imbalance Long/Short Positions. More detailed explanation on how these transactions are accounted for and represented in the graphic is contained in Annex 2 ('Balancing Analytical Framework') and Annex 3 ('Understanding the neutrality regimes').

(100) In particular, the chart shows the development of the net financial neutrality cumulating the daily values over the analysis period. Calculations in Chapter 7 of the Report offer further indicators for accounting neutrality, in line with the basic concepts presented in this chapter.

Figure 5-4: Cumulative Neutrality financial position (thousand EUR)



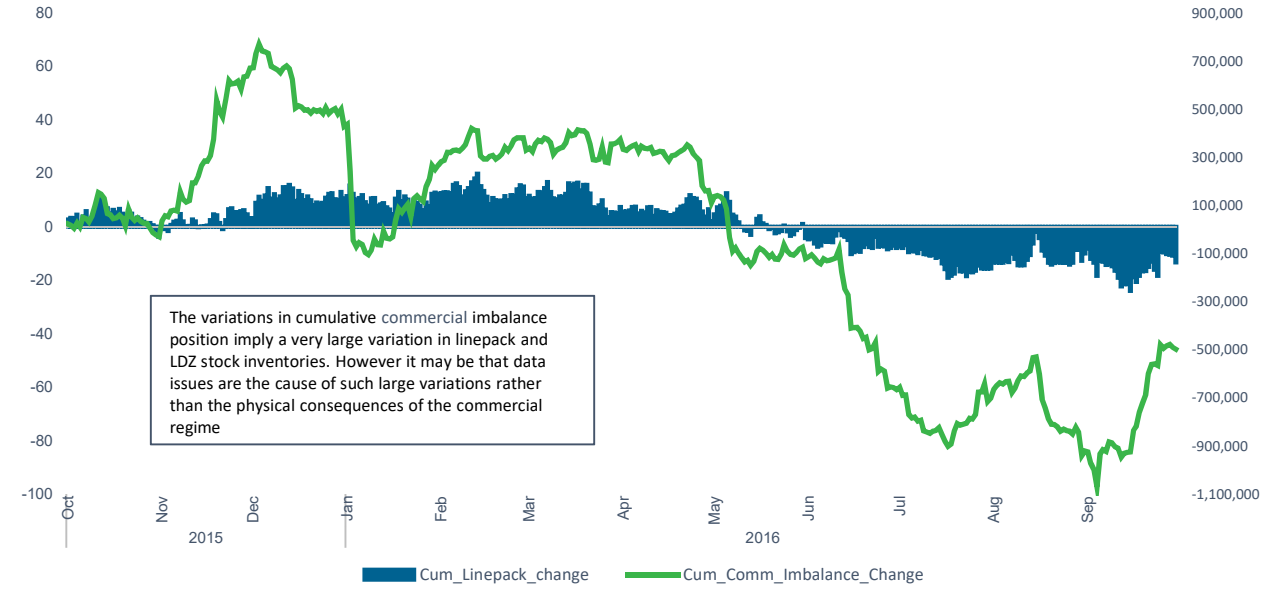

(101) In a well-functioning balancing regime, network users access an appropriate proportion of linepack flexibility. Economically efficient access to existing system flexibility should be provided without creating unduly excessive costs to users. Inappropriate costs to the TSO associated with excessive linepack level variation should also be avoided. The Report plots, where available, two graphics: one on **Cumulative Commercial**

**Imbalances** and another on **physical linepack data**. Bilateral meetings and discussions facilitated the presentation of these features fully for four balancing zones.

(102) The combined effect of commercial actions of network users and any balancing actions taken by the TSO will have an effect on the physical linepack position. Changes in the linepack position, i.e. the difference between the opening and closing linepack position, should at least partly reflect the net daily commercial imbalance position changes.

(103) Where day-on-day physical linepack changes are not close to the anticipated effect arising from the day's commercial imbalances, the reasons should be investigated and explained to ensure confidence in the operation of the regime. Reasons behind such differences may be i) errors arising as a result of a persistent bias in metering ii) the illustration that commercial balancing actions are not driven by physical balancing needs[20]; (iii) other TSO actions, effectively outside of the Code's jurisdiction.

Figure 5-5: Cumulative physical linepack position (left axis, MWh) and cumulative commercial imbalance position (right axis, MWh)




[20] Some regimes operate with commercial imbalance tolerances referred to as "green zones". If the net imbalance position of network users in aggregate exceeds a given threshold the TSO will intervene in its residual balancing role. TSOs either perform a balancing action or effectively force trades between network users. Where the physical linepack levels in the system are observed to vary far more widely than the commercial imbalances might indicate, this may illustrate an undue restriction of network users' access to linepack.

# 6. Balancing analyses for seven Member States

(104) The selection of the seven Member States/balancing zones included in this analysis is based on data availability, quality, and the willingness of the NRA to support the data verification process with the Agency.

## 6.1 Great Britain – National Grid Group (Gas)

### 6.1.1 Short description of the balancing regime

(105) The Great Britain regime was the first daily balancing regime implemented in the European Union. It evolved to a relatively mature state over the period 1996 to 2002. It features a simple daily balancing regime with no within-day obligations and a two-price cash-out mechanism. The small adjustment is refined each year based on calculations defined in a methodology. The balancing zone effectively comprises the transmission system and the distribution zones.

(106) The British regime utilised tolerances and a balancing platform in its early evolution. Furthermore, the TSO's balancing decision-making process initially focussed on prescriptive approaches based on balancing action quantities determined relative to predetermined and relatively narrow acceptable linepack bandwidths.

(107) Evolution took place in all key areas of the balancing regime: tolerances were progressively reduced; a Trading Platform (the OCM[21]) on which both network users and the TSO could trade replaced the balancing platform; cash-out prices were determined to reflect all OCM transactions; the TSO moved from more physical and locational products to, in practical terms, an exclusive use of title products, in a far less mechanical balancing action decision process. The migration took place in a phased, but aggressive, period with maturity achieved in six years[22].

### 6.1.2 Regime performance

(108) In the data on which the following analysis is based, there are data errors and inconsistencies[23]. Nevertheless, the Agency believes these do not materially impact the evidence and observations below.

#### *6.1.2.1 TSO Balancing Actions*

(109) The balancing actions were assessed as residual and represented approximately 0.3% of system entry quantities. Balancing actions were taken on 102 days of the Gas year and the TSO never acted on both sides of the market on the same day.

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[21] On-the-day Commodity Market.

[22] The UK-GB experience heavily influenced the choice of a maximum five years for the Interim Measures to apply in the Code. The view of many market actors that both UK-GB, and later migratory experiences in countries like Netherlands and France, suggested that robust planning and timely steps could enable the creation of a short-term market over a five-year period.

[23] National Grid have indicated that there are some errors in the data supplied via ENTSOG, most notably in respect of the network users' imbalance quantities and in respect of the market volumes. These errors arise from the introduction of a new Gas Control System. Problems with implementation have meant that a series of reconciliations have been applied to billing data which is not reflected in the source data associated with the submission or inaccessible data via MIPI Data Explorer. The data used in this analysis is therefore known to be flawed.

(110) Balancing action quantities were close to symmetric over the year (52% System Buys, 48% System Sells), although some seasonality was apparent with typically more System Sells (than System Buys) in the summer and more System Buys (than System Sells) in the winter.

(111) The average prices over the year were reasonably close (System Buys 11.55 GBP/MWh and System Sells 10.7 GBP/MWh) particularly given the above seasonality in the TSO's balancing action quantities.

#### *6.1.2.2 Network Users' Imbalance Cash-out*

(112) Network user imbalances represented approximately 2.5% of system entry quantities. This is approximately nine times the volume of TSO balancing actions.

(113) Network user imbalances over the year were symmetric (51% representing imbalance cash-out of network user short positions, 49% representing network user long positions).

(114) The price differential associated with the average purchase and sale price of imbalance gas was small (10.62 GBP/MWh for Long position cash-out price and 11.37 GBP/MWh for Short position cash-out price).

#### *6.1.2.3 Neutrality*

(115) Overall, the basic neutrality measure implied an average credit of 0.0014 GBp/kWh for gas entered into the system.

(116) Across the year, neutrality has sold a net 498 GWh of gas and in the process has generated a cash surplus of GBP 13 million (net financial neutrality). The net energy of the 498 GWh of gas might be in the region of GBP 5.6 million. Effectively, therefore, the regime might be considered to have generated an income beyond GBP 7.4 million of net adjusted financial neutrality.

(117) The cumulative neutrality measure revealed significant within year effects with cumulative neutrality reaching a maximum cost of more than GBP 8 million on 3 December 2015 and a maximum credit of GBP 18.4 million on 4 September 2016.

(118) Overall, the net costs/revenues were small and translated into small credit or cost rates when aggregated over the analysed period, despite redistributive effects might occur, because of the seasonality associated with the daily neutrality cost/revenue attribution. In Great Britain, neutrality redistributions are calculated separately for every day. Each monthly invoice includes separate neutrality charges/credits for each day. The approach is that the net neutrality cashflow is calculated separately for every single day. The net cost/revenue is then distributed to all users in proportion to their utilisation of the system on that day (i.e. in proportion to their total entry and exit gas allocations).

#### *6.1.2.4 Overall commercial imbalance position and linepack*

(119) The average opening linepack was 3.8 TWh, with minimum and maximum values reaching respectively 3.5 TWh and 4.0 TWh (13% range with respect of the average). The average daily linepack variation was 19 GWh/day, while the maximum was 99 GWh/day.

(120) The commercial imbalance arising from the aggregate of network user imbalances and TSO balancing actions reached 286 GWh, with a daily average of 25 GWh.

(121) The cumulative daily commercial imbalance position should approximate to the day-on-day opening linepack position differences. This did not appear to be the case in the Great Britain with the stock[24] of the Local

[24] In many systems, linepack relates to the transmission system only and does not include distribution gas stock.

Distribution Zone ('LDZ stock') being one of the contributory factors to the apparent inconsistency between net commercial.

(122) The cumulative net commercial imbalance appeared to cover an extraordinary wide range of more than 1,800 GWh. It was difficult to know whether the total gas in the system (linepack and LDZ stock) could reasonably vary by so much. Some of this might be attributable to data errors.

### 6.1.3 Final comments

(123) The TSO performed a residual role with balancing actions designed to influence cash-out pricing (rather than to secure physical quantities of gas) on less than a third of days.

(124) Prices of balancing gas were, generally, very close to the market, which meant that the TSO was typically not disruptive or distortive of the market.

(125) Overall, the regime appears to be functioning reasonably well, particularly with regard to price efficiency associated with both TSO balancing actions and imbalance cash-out pricing. Having said that, Great Britain seems to be demonstrating a modest upward trend (over a number of years) in overall neutrality revenues, which may indicate that the small adjustments might be larger than needed.

(126) The methodology used to determine the cash-out small adjustment was increasing the cash-out price differentials so, unless that delivers a reduction in imbalance quantities, then the surplus generated by neutrality might be expected to increase.

(127) There may be some merit in giving consideration to whether the cumulative financial neutrality built during the summer might be a systematic feature of regime operation, in which case the regime may need some fine-tuning, or whether it arises as a one-off outcome associated with this analysis period.

### 6.1.4 Graphics and Charts for Great Britain – National Grid Group (Gas)

Figure 6-1: TSO's balancing actions, Great Britain (MWh)

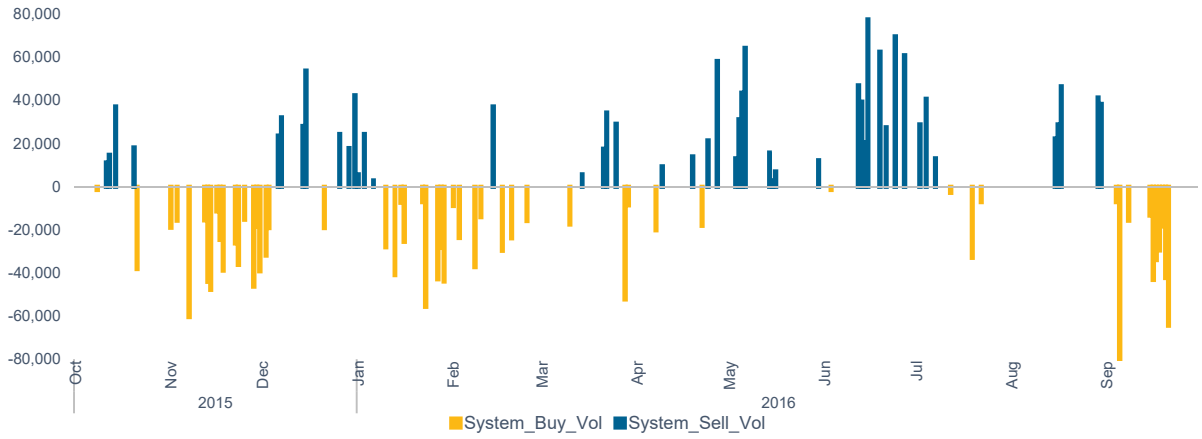



Table 6-1: TSO's balancing actions statistics, Great Britain

| | Annual quantity | Share of annual market | Number of days | Average daily quantity | Max daily quantity | Share of activity | Average price |
|---|---|---|---|---|---|---|---|
| | MWh | % | n° | MWh | MWh | % | GBP/MWh |
| System Buys | 1,517,932 | 0.16 | 55 | 27,599 | 80,272 | 51.6 | 11.55 |
| System Sells | 1,421,717 | 0.15 | 47 | 30,249 | 77,488 | 48.4 | 10.70 |
| Total | **2,939,649** | **0.31** | **102** | | | | |

Figure 6-2: Network users' imbalance quantities, Great Britain (MWh)

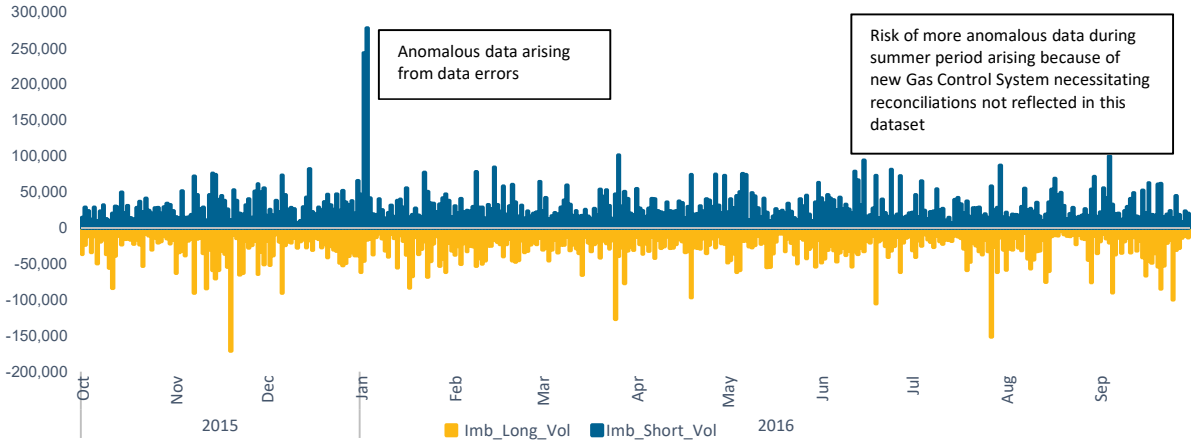
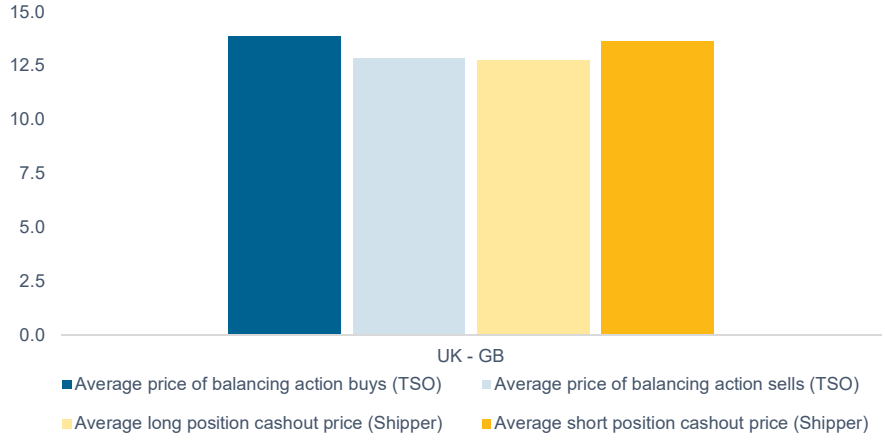



Table 6-2: Network users' imbalance statistics, Great Britain

| | Annual quantity | Share of annual market | Min daily quantity | Average daily quantity | Max daily quantity | Share of activity | Average price |
|---|---|---|---|---|---|---|---|
| | MWh | % | MWh | MWh | MWh | % | GBP/MWh |
| Network User Long | 11,450,927 | 1.20 | 4,158 | 31,287 | 170,919 | 48.7 | 10.62 |
| Network User Short | 12,044,924 | 1.26 | 6,623 | 32,910 | 277,873 | 51.3 | 11.37 |
| Total | **23,495,851** | **2.47** | | | | | |

Figure 6-3: Price differentials, Great Britain (EUR/MWh*)




*The exchange rate 1 GBP = 1.2 EUR has been adopted*

Figure 6-4: Cumulative neutrality financial position, Great Britain (million GBP)

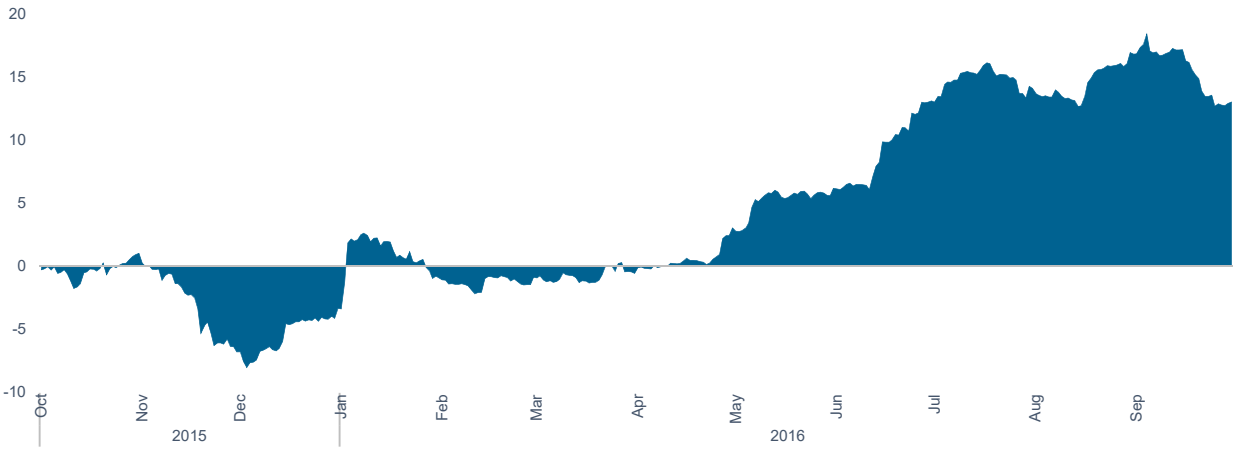
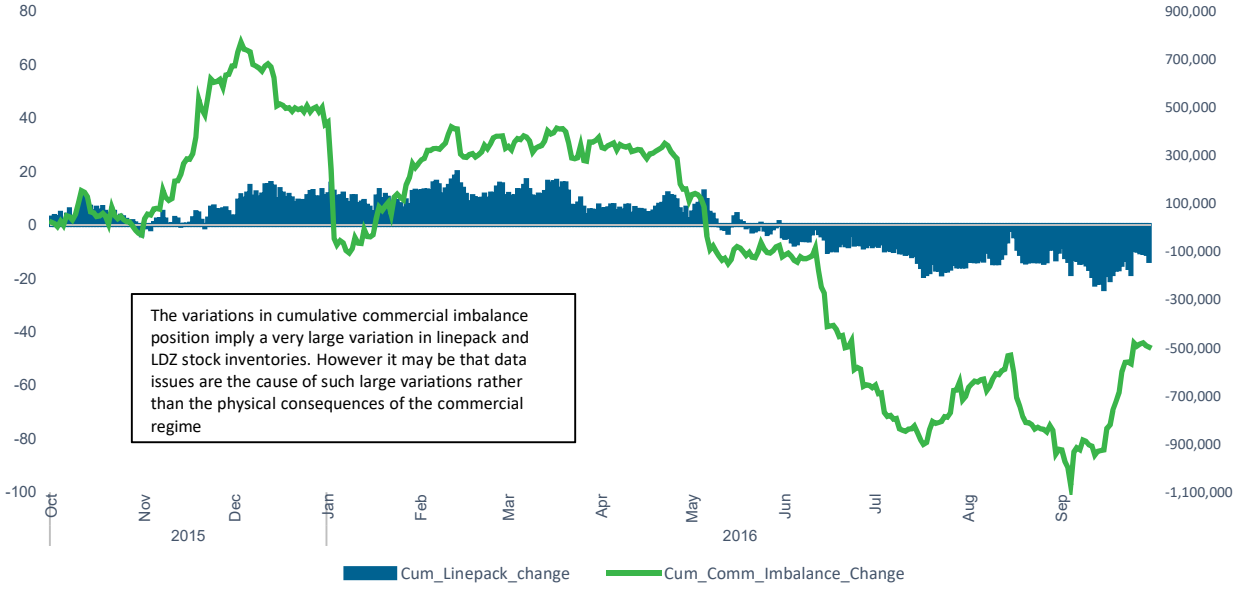



Table 6-3: Cumulative neutrality position statistics, Great Britain

| | Quantities (MWh) | Cashflows (thousand GBP) | Relative share (%) |
|---|---|---|---|
| **Financial credits to neutrality** | | | |
| **TSO System Sells** | 1,421,717 | 15,214 | 10% |
| **Network Users' Imbalance Shorts** | 12,044,924 | 136,920 | 90% |
| **Sub-total** | | **152,134** | |
| **Financial debits to neutrality** | | | |
| **TSO System Buys** | 1,517,932 | 17,535 | 3% |
| **Network Users' Imbalance Longs** | 11,450,927 | 121,600 | 97% |
| **Sub-total** | | **139,135** | |
| **Net** | 497,782 | 12,999 | |
| **Net neutrality per unit of market volume 0.0014 GBp/kWh** | | | |

Figure 6-5: Overall commercial imbalance position (right axis) and linepack (left axis), Great Britain (MWh)



## 6.2 BeLux – The H-cal Zone (Fluxys)

### 6.2.1 Short description of the balancing regime

(129) The BeLux H-cal zone is the largest and most important balancing zone in Belgium. The balancing regime is designed to allow the TSO to take both within-day and end-of-the-day actions ('EOD actions'). The EOD actions are taken every day to correct the network users' aggregate imbalance for each day via a balancing action taken during the next day. Within-day actions take place only if the network users deviate from the *green zone*[25], the zone where network users' imbalances do not trigger TSO balancing action. The green zone is made public each day and network users can follow hourly their position to avoid these deviations to happen.

(130) Technically, the quantity corrections delivered by the EOD actions are taken in respect of the previous Gas Day, but their physical effect will be manifest on the Gas Day in which they are taken and are captured against this day in this analysis. Within-day balancing actions take place on the Trading Platform on the same Gas Day and only in case when, in aggregate, an excursion beyond the green zone has taken place. Subsequently, the TSO forces a series of title trades to target the balancing action costs to the causers.

### 6.2.2 Regime performance

(131) This analysis covers the Belgian within-day regime[26]. The direct and visible effects of the within-day regime are limited. Actions for deviations outside of the *green zone* were only taken on seven days during the first half of the year and all representing actions to address a system shortfall. The financial effects of these transactions were reflected in the calculations, although they were so small as to be barely discernible.

#### *6.2.2.1 TSO Balancing Actions*

(132) Balancing actions in total represented about 0.25% of total entry quantities, which means that the TSO plays a residual role in the market. Balancing actions took place every day for EOD actions on one side of the market. Very occasionally, within-day actions occurred, but typically only on the buy side of the market.

(133) System EOD actions usually involved selling twice as frequently as buying. System Sell quantities represented 74% of the total balancing action quantities.

(134) A reasonably small difference existed between the average Buy price (14.81 EUR/MWh) and the Sell price (13.39 EUR/GWh).

---

[25] The Belgian system sets minimum and maximum levels of commercial imbalance (positive and negative) that trigger a TSO balancing (orange zone) or emergency action (red zone). If imbalances are in the green zone, no balancing action from the TSO is expected. Once the imbalances go upper or lower than the *green zone* thresholds the TSO takes balancing actions to restore the balance by selling/buying the quantity of market excess or shortfall.

[26] No data is available for the causers' within-day cash-out price. The Report applies the average price of within-day actions. This will slightly understate the financial consequences to causers, but the error coming from this assumption will be very small and not distortive to the interpretation in any way.
The data for EOD balancing taken on 1/10/2015 (in respect of aggregate system balance on 30/9/2015) was not available, as it related to the system in a pre-BeLux configuration.
EOD balancing action data was missing in respect of 8 and 9 July 2016. Apparently, no balancing actions took place in respect of these days but the cumulative effect of 8, 9 and 10 July was addressed in a single action.

#### 6.2.2.2 Network Users' Imbalance Cash-out

(135) Imbalance quantities were about 0.7% of total entry quantities.

(136) The imbalance quantities were 59% for the Long and 41% for the Short positions. This led to an asymmetric distribution over the year.

(137) There was a modest difference between the average network user's Short Position and Long Position average prices (14.58 and 13.48 EUR/MWh respectively).

#### 6.2.2.3 Neutrality

(138) Overall, net neutrality position had a credit of 0.002 EUR/MWh for the unit of gas entered into the system.

(139) The net energy position was approximately 0.5 GWh. This position was very small and reflects the design of the regime whereby the net network user imbalance associated with each day is addressed by a compensating balancing action the next day. The net energy position was therefore very close to zero on a perpetual basis because of the regime design.

(140) The net financial effect over the year generated a revenue of approximately EUR 0.7 million.

(141) Overall, the balancing design delivered a small credit, close to zero in the BeLux H-cal zone. The regime was close to self-correcting due to its design.

(142) The regime includes a within-day obligation which may generate some costs for network user's risk management, although this cannot be quantified based on the available data.

#### 6.2.2.4 Overall commercial imbalance position and linepack

(143) No linepack data was available for the analysis.

(144) The commercial regime operated to limit significant commercial variations arising from the aggregate of network user imbalances and TSO balancing actions.

(145) The highest commercial imbalance on the day was less than 20 GWh. The cumulative position was maintained around a very limited range of +11 GWh and -15 GWh.

### 6.2.3 Final comments

(146) Network User imbalance quantities represented approximately 2.5 times TSO balancing quantities.

(147) Cash-out prices for Gas Day D may be influenced by EOD actions that will be taken during Gas Day D+1. This, on the one hand, ensures that network users have imbalance exposures that may reflect the consequences of their imbalance position during the relevant Gas Day; on the other hand, it does mean that the network users cannot be aware of the evolution of the cash-out price within day because the cash-out price may actually be set by an action that takes place the next day[27]. Therefore, the regime may fall short

[27] In other regimes, the cash-out prices are determined as a function of TSO balancing actions taken within the Gas Day and the weighted average cost of gas traded on relevant platforms associated with that Gas Day. The effect of these contributors are therefore visible to network users as the Gas Day progresses. In the BeLux approach, network users can assess the within-day development of the average price of all trades on the trading platform; on the other hand, the TSO's balancing actions' effect cannot be assessed within that Gas Day: this happens because the corrective action, whose price influences the cash-out price determination, is taken the next Gas Day.

of the aspiration that network users should see the evolution of cash-out price exposures as a stimulus to their risk management.

(148) The basic neutrality depicted here for the H-cal zone differs significantly to that actually applied. BeLux uses a single neutrality account that covers both H and L-cal zones. In addition, the account has some additional cost elements besides the basic transactions reflected in this analysis.

(149) The balancing regime includes smoothing that may require network users to profile, or structure their gas deliveries on the day to avoid within day causer exposures. Thus, the regime may place more stringent requirements on network users, when compared with other regimes that use the simple daily balancing concept.

### 6.2.4 Graph and charts for BeLux – The H-cal Zone (Fluxys)

Figure 6-6: TSO's balancing actions, BeLux (MWh)

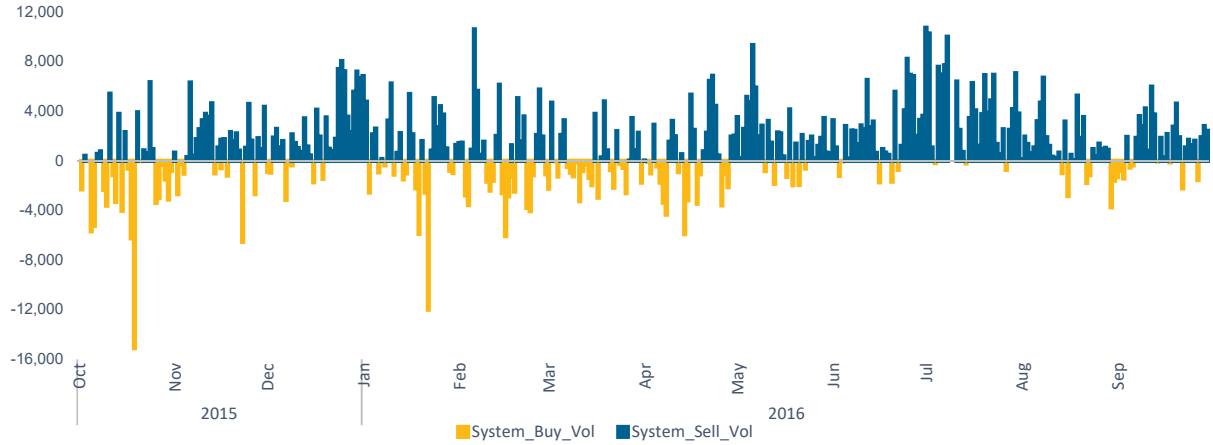



Table 6-4: TSO's balancing actions statistics, BeLux

| | Annual Quantity | Share of annual market | Number of days | Average daily Quantity | Max Daily Quantity | Share of activity | Average Price |
|---|---|---|---|---|---|---|---|
| | MWh | % | n° | MWh | MWh | % | EUR/MWh |
| **System Buys** | 249,658 | 0.07 | 122 | 2,046 | 15,104 | 26.2 | 14.81 |
| **System Sells** | 703,385 | 0.20 | 244 | 2,883 | 10,752 | 73.8 | 13.39 |
| **Total** | **953,043** | **0.27** | **363** | | | | |

Figure 6-7: Network users' imbalance quantities, BeLux (MWh)

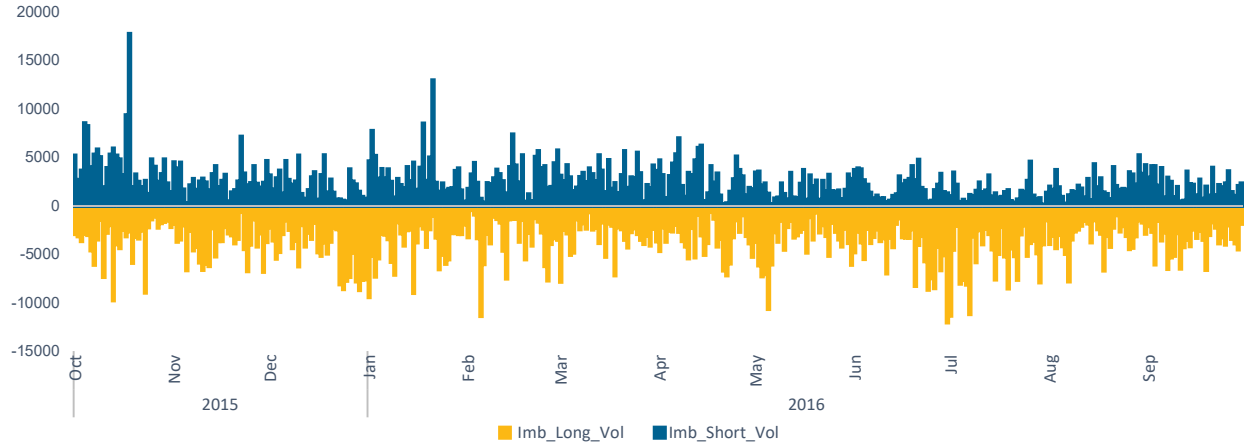



Table 6-5: Network users' imbalance statistics, BeLux

| | Annual quantity | Share of annual market | Min daily quantity | Average daily quantity | Max daily quantity | Share of activity | Average price |
|---|---|---|---|---|---|---|---|
| | MWh | % | MWh | MWh | MWh | % | EUR/MWh |
| **Network User Long** | 1,425,724 | 0.41 | 416 | 3,895 | 12,051 | 59.4 | 13.48 |
| **Network User Short** | 972,505 | 0.28 | 146 | 2,657 | 17,766 | 40.6 | 14.58 |
| **Total** | **2,398,229** | **0.69** | | | | | |

Figure 6-8: Price differentials, BeLux H-gas (EUR/MWh)

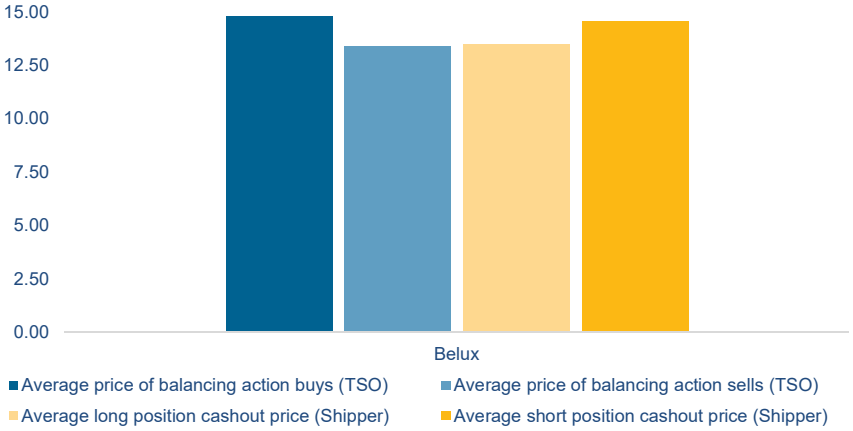



Figure 6-9: Cumulative neutrality financial position, BeLux H-gas (thousand EUR)

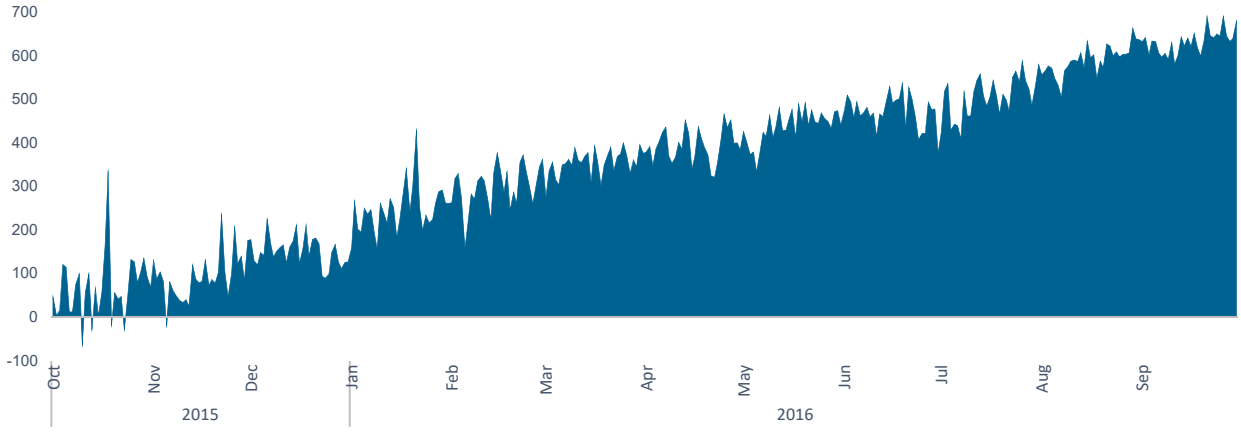
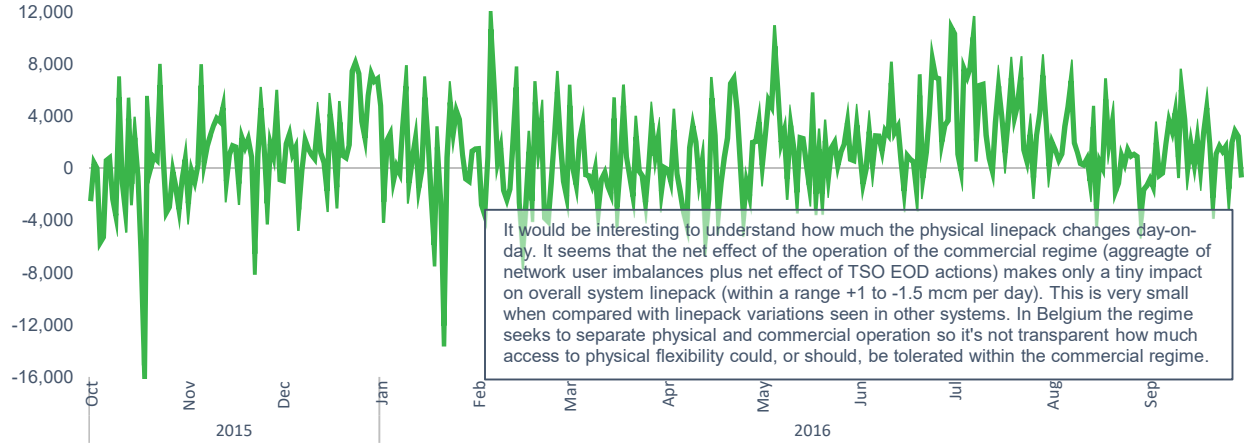



Table 6-6: Cumulative neutrality position statistics, BeLux

| | Quantities (MWh) | Cashflows (thousand EUR) | Relative share (%) |
|---|---|---|---|
| **Financial credits to neutrality** | | | |
| **TSO System Sells** | 703,385 | 9,419 | 40% |
| **Network Users' Imbalance Shorts** | 972,505 | 14,184 | 60% |
| **Sub-total** | | **23,602** | |
| **Financial debits to neutrality** | | | |
| **TSO System Buys** | 249,658 | 3,698 | 16% |
| **Network Users' Imbalance Longs** | 1,425,724 | 19,224 | 84% |
| **Sub-total** | | **22,922** | |
| **Net** | **-508** | **680** | |
| **Net neutrality per unit of market volume 0.0020 €/MWh** | | | |

Figure 6-10: Overall commercial imbalance position (MWh)



## 6.3 Germany - NCG

### 6.3.1 Short description of the balancing regime

(150) In Germany, there are two zones, each of which comprises distinct H-cal and L-cal systems. Each of the zones corresponds to the network owned and operated by a range of German TSOs. The zone analysed here is the zone where NetConnect Germany ('NCG') acts as the Market Area Manager ('MAM'), which effectively fulfils the TSO's roles defined in the Code. The multi-TSO transmission grid enables indigenous gas, gas from storage and imported gas to enter the zone and to exit the zone via delivery into storage facilities, for export, for directly connected load and into many hundreds of gas distribution zones in Germany.

(151) The balancing regime effectively delivers a single balancing zone comprising H-cal and L-cal gas with network users having some subsidiary incentives to manage imbalances in each of the H-cal and L-cal areas. The MAM takes actions for gas quality reasons, although these are typically outside of the balancing regime functioning and the costs of such actions are addressed outside of balancing neutrality. However, some of the costs might influence balancing neutrality costs because of the treatment of actions taken to address quality issues and the attribution of such costs.

(152) The Code features the variant 2-information option that was included in the Code to meet German requirements. The approach is designed to make it easy for German retailers supplying information on NDM loads. Under the variant 2 option, the day-ahead forecasts of NDM are used as daily gas allocations for imbalance cash-out settlement purposes. NDM day-ahead forecasts will be inaccurate but the TSO will take balancing actions as necessary to ensure the system remains acceptably close to the desired positions. The German regime splits costs between intra-daily and non-daily metered loads via a split reconciliation approach that aims to target costs and revenues appropriately. The costs/revenues associated with the difference between the NDM allocations and actual consumptions (determined after periodic actual consumptions based on meter readings) are determined. These cashflows also feed into the non-daily metered neutrality arrangements.

### 6.3.2 Regime performance

(153) The German regime[28] features within-day obligations associated with intra-daily metered load. The within-day regime is less stringent today, than it was in previous periods of the balancing regime. Overall, the German regime does not place a major responsibility on individual network users to structure their gas deliveries into the system in line with system requirements. Where within-day structuring is necessary, the MAM will take balancing actions.

#### *6.3.2.1 MAM Balancing Actions*

(154) The MAM took balancing actions on both sides of the market every day.

(155) Balancing action quantities represented approximately 5.2% of the total quantity of gas entering the system. The MAM purchased slightly more gas via System Buys (26.5 TWh) than it sold via System Sells (24.4 TWh).

[28] Most of the data used in the analysis was obtained via ENTSOG. Some additional information was sought (e.g. in respect of the fixed costs of some balancing services) that were essential to ensure that all costs and prices were recognised in the analysis. The fixed costs associated with the use of balancing services in the early part of the analysis period (EUR 41.9 million) were derived from data downloaded from NCG's website and feature as a separate line in the neutrality analysis. Where EUR/MWh prices were used (e.g. in respect of TSO balancing action) they define the variable component of balancing tool utilisation and do not reflect any cost component derived from the fixed cost.
Necessary information to complete the requirements, e.g. cash-outprices were supplied via NCG/NRA.

(156) The prices of balancing action gas often differed, perhaps because of very exacting locational and/or temporal requirements. For example, to meet a specific requirement a gas price of more than 46 EUR/MWh was paid, whilst other network users were paid less than 10 EUR/MWh to remove gas from other parts of the system on another occasion.

(157) Balancing action quantities were high because the MAM was effectively transacting to:

- account for the difference between the day-ahead forecast of NDM load and the actual NDM demand seen on the day; this design choice means that network users have no incentive to track their NDM customers demand changes after the day-ahead demand forecast is determined;
- structure gas flows entering the system; this is particularly evident in the L-cal system which is considered to have very little linepack flexibility to accommodate within day supply/demand mismatch. No demand smoothing is applied (as in NL and BE), so balancing actions are used instead.[29]

(158) The average price of System Buys was 13.14 EUR/MWh against 10.20 EUR/MWh for System Sells, implying a considerable cost of regime operation associated with the price spread for balancing transactions.

#### *6.3.2.2 Network Users' Imbalance Cash-out*

(159) Network users' imbalances were small and represented only 0.6% of system entry quantities. However, network users were balancing against the day-ahead NDM forecast. The German position is that no part of the imbalance is attributable to the NDM demand[30].

(160) Network users' Short Positions represent approximately 58% of the imbalance cash-out quantities, with around 42% being associated with network user Long Positions. This is still relatively symmetric.

(161) The weighted average price associated with over delivered gas is 11.73 EUR/MWh, whereas the weighted average price of network user Short Positions was 19.32 EUR/MWh (out-of-balance network users appear to face the largest differentials of all the seven cases studied[31]. This may be the natural consequence of more extreme prices taken in the balancing actions, which fed through into the marginal price setting.

#### *6.3.2.3 Neutrality*

(162) The overall cost of net financial neutrality analysed within this framework was around EUR 63 million, equivalent to a cost of 0.065 EUR/MWh for each unit of gas entered onto the system. The net energy position was about 1.18 GWh.

(163) The gross cashflows associated with basic neutrality were close to EUR 700 million, by far the highest anywhere in the sample. Over the year, the cumulative neutrality position varied over a range between EUR 5 million surplus to more than EUR 97 million deficit.

---

[29] DE applies no demand smoothing (as in NL and BE) so balancing actions may be used to rather than burden network users with within-day flow requirements

[30] Given that network users know their NDM allocations, the German perspective is that all imbalances can be considered to be associated with the intra-day load alone.

[31] The quoted averages are based on total revenues or payments divided by the relevant quantities. The Agency prefers to use the weighted average in its analysis as opposed to the arithmetic approach proposed by BNetzA. The Agency's approach better reflects the fact that more imbalance gas was brought from the systems during periods of high price.

(164) Overall, the neutrality mechanism (that is all System balancing plus Network User Imbalance transactions) purchased a net quantity of nearly 1.2 TWh of gas. Thus, this gas will have been, or will need to be, paid by the network user community. This might represent about EUR 15 million of EUR 63 million deficit recognised in this analysis.

(165) This substantial volume of gas may have been accumulated somewhere within the system and so its value might be realised later. For example, the build-up might correspond to a build-up of linepack in the system, the value of which might subsequently be returned to users should the gas be sold off the system. However, it is unlikely that such large quantities of gas can be absorbed by within-day balancing. It is possible that a substantial proportion of this cost will effectively be returned via NDM purchases of gas under the reconciliation process, which in Germany is included in the Standard Load Profile ('SLP') neutrality arrangement[32].

#### *6.3.2.4 Overall commercial imbalance position and linepack*

(166) No linepack data was made available in Germany during the analysis period[33], and so it is not possible to perform any analysis on the consistency of the physical position compared with that implied by the commercial outcomes on the day.

(167) The cumulative commercial imbalance positions were far more extreme than in any other country analysed. It is understood that the NDM load profiles have a tendency to under-predict consumption at lower temperatures and to over-predict at higher temperatures, leading to predominantly Buy actions in the winter and Sell actions in the summer, as observed in the graph at the end of this section.

(168) The cumulative commercial position cannot be interpreted in the same way as in other systems because the German balancing regime makes no attempt to allocate the aggregated gas consumptions on the day to network users' accounts. Instead, the day-ahead NDM forecast is used and where there are errors or periods of bias in the aggregate NDM forecasts, the cumulative commercial imbalance position might be expected to trend up or down.

### 6.3.3 Final comments

(169) The TSO balancing actions were nine times larger than the Network Users' Imbalances.

(170) The costs of the NCG balancing regime appear to be considerable, although it is essential to consider this in the context of the regime design. The German regime is based on network user balancing against a day-ahead NDM forecast, which offers a much easier balancing regime for network users. However, the consequence is that the TSO has a much larger balancing role, and that the level of competition in the balancing wholesale market may be reduced given the predominance of the MAM. Ultimately any cost associated with the larger balancing role for the MAM manifests itself in the neutrality charges applicable in the regime, where NDM load is effectively surcharged (compared with daily-metered demand) for the service provided.

(171) Balancing action data supplied by NCG via ENTSOG did not include any transactions associated with gas quality conversion. This is consistent with the fact that the cost treatment of quality conversion is entirely outside of the balancing regime. However, this means that the full costs of the operation of the single H-cal

[32] Standard Load Profiles ('SLP') on the basis of day-ahead forecast are relevant for exit points within the non-daily metered offtakes.

[33] Germany elected to use the aggregated system balance as an alternative to providing linepack. However, since May 2017 NCG has also provided some linepack information to aid transparency https://www.net-connect-germany.de/en-gb/Transparency-information/Linepack .

and L-cal zone were not reflected in the data used in this analytical framework. Furthermore, there may be indirect effects of the quality regime on the balancing regime, including that the quality regime impacts the prices for gas balancing.

(172) The German policy choice of utilising variant 2 makes it very easy to balance an NDM portfolio given that NDM demands for imbalance cash-out purposes are known at day-ahead. Thus, it is argued that this promotes competition in retail supply. Therefore, the trade-off between the benefits of retail market competition need to be assessed against the detriment to the efficiency of the balancing market.

(173) NCG is the only regime analysed that involves taking balancing actions on both sides of the market every day. This does raise the question of whether such actions might be physically necessary or are being taken to manage the overall multi-TSO system within preferred, but perhaps non-essential, operational conditions. Comparative data from other regimes might provide some insights[34].

[34] For example, an operational comparison with Great Britain and France-N might be useful. In earlier periods these networks would have been operated within very tight tolerances but experience has indicated that it is operationally acceptable and commercially efficient to operate the system in more flexible manner to enable better functioning of the market.

### 6.3.4 Graphics and Charts for Germany - NCG

Figure 6-11: MAM's[35] balancing actions, Germany - NCG (MWh)

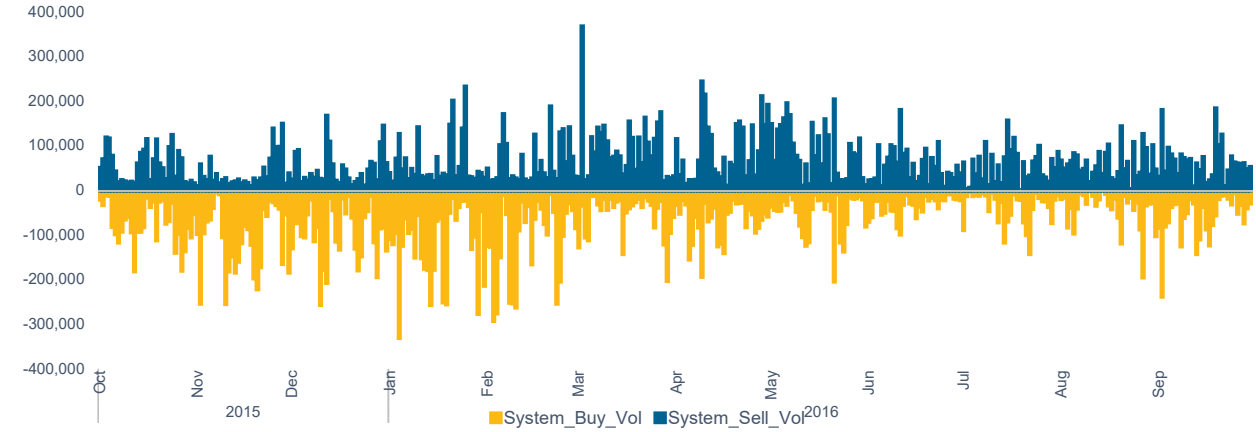
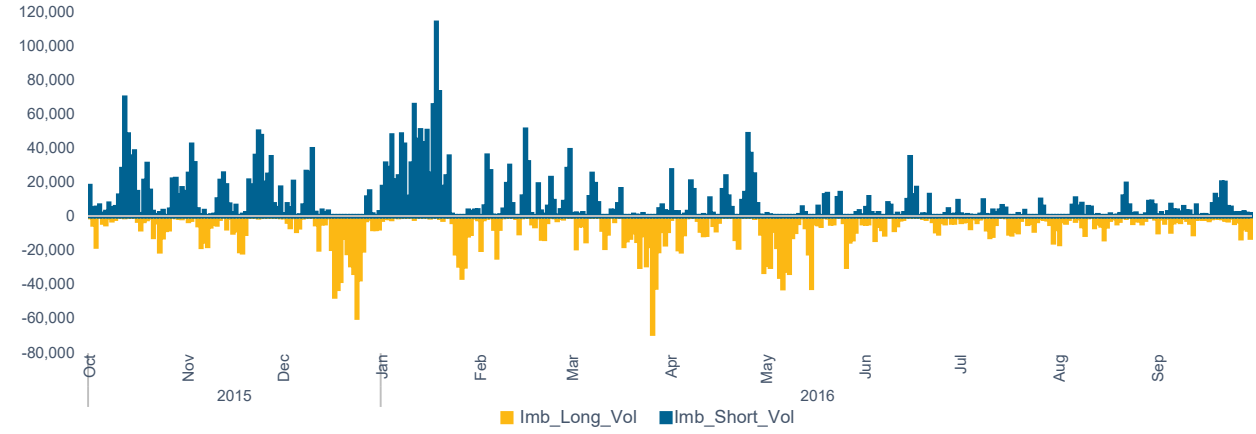



Table 6-7: MAM's balancing actions statistics, Germany - NCG

| | Annual quantity | Share of annual market | Number of days | Average daily quantity | Max daily quantity | Share of activity | Average price |
|---|---|---|---|---|---|---|---|
| | MWh | % | n° | MWh | MWh | % | EUR/MWh |
| **System Buys** | 26,474,790 | 2.72 | 366 | 72,335 | 330,671 | 52.1 | 13.14 |
| **System Sells** | 24,382,059 | 2.50 | 366 | 66,618 | 368,652 | 47.9 | 10.20 |
| **Total** | **50,856,849** | **5.22** | **366** | | | | NB: prices do not reflect Flexibility Option Price* |

** The price paid for the balancing services*

Figure 6-12: Network users' imbalance quantities, Germany - NCG (MWh)




[35] Market Area Manager.

Table 6-8: Network users' imbalance statistics, Germany - NCG

| | Annual quantity MWh | Share of annual market % | Min daily quantity MWh | Average daily quantity MWh | Max daily quantity MWh | Share of activity % | Average price EUR/MWh |
|---|---|---|---|---|---|---|---|
| **Network User Long** | 2,457,661 | 0.25 | 24 | 6,715 | 68,854 | 42.2 | 11.73 |
| **Network User Short** | 3,370,428 | 0.35 | 13 | 9,209 | 113,773 | 57.8 | 19.32 |
| **Total** | **5,828,089** | **0.60** | | | | | |

Figure 6-13: Price differentials, Germany - NCG (MWh)

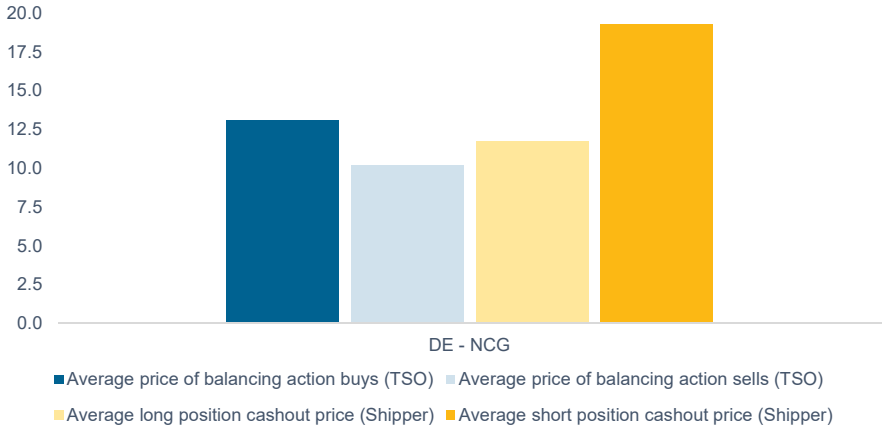



Figure 6-14: Cumulative neutrality financial position, Germany - NCG (million EUR)

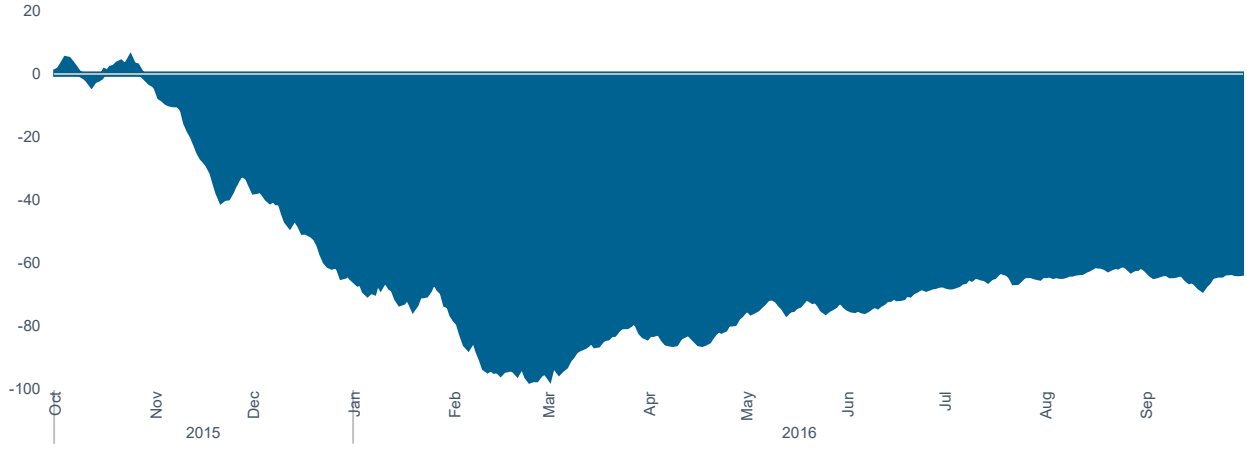


Table 6-9: Cumulative neutrality position[36], Germany - NCG

| | Quantities (MWh) | Cashflows (thousand EUR) | Relative share (%) |
|---|---|---|---|
| **Financial credits to neutrality** | | | |
| **TSO System Sells** | 24,382,059 | 248,668 | 79% |
| **Network Users' Imbalance Shorts** | 3,370,428 | 65,112 | 21% |
| **Sub-total** | | **313,781** | |
| **Financial debits to neutrality** | | | |
| **TSO Flex Option Cost** | | 42,191 | |
| **TSO System Buys** | 26,474,790 | 348,009 | 92% |
| **Network Users' Imbalance Longs** | 2,457,661 | 28,835 | 8% |
| **Sub-total** | | **376,845** | |
| **Net** | **1,179,964** | **-63,064** | |
| **Net neutrality per unit of market volume -0.0647 €/MWh** | | | |

Figure 6-15: Overall cumulated commercial imbalance position, Germany - NCG (MWh)


[36] NCG keeps track and offers full transparency over the two different neutrality accounts (IDM and NDM) in line with the Code. Of the balancing zones analysed, only NCG applies the variant 2-information model, as result of which parts of the cost/revenues of the MAM balancing actions covers NDM imbalances. A closer comparability with other balancing regimes would be reached should the revenues derived from IDM customers be looked alone. The drawback of such an approach would be that the full perspective of balancing revenues and costs spent by MAM is lost, in the view of the Agency.

## 6.4 Denmark – Energinet.dk

### 6.4.1 Short description of the balancing regime

(174) The Danish system covers a relatively simple single balancing zone that connects offshore gas supplies and an interconnection point with Germany to Danish consumers. The system also delivers gas to an interconnection point, which feeds the Swedish gas system.

(175) Denmark's approach draws heavily on the experience of the more developed north-west European regimes, the Netherlands, Belgium and Great Britain. The regime is based upon a simple daily balancing regime (with no within-day obligations) with the TSO's balancing actions taken in a mechanical way whenever the aggregated network user imbalance position exceeds an acceptable linepack range (*a green zone*[37]).

(176) Balancing regime implementation is largely textbook implementation of standard features of the base model implied by the Code. The upper and lower bounds of the green zone relative to the opening linepack position are based on local conditions and redetermined at the start of each Gas Day.

(177) Energinet.dk continues to work closely with industry stakeholders to evolve the operational balancing proposals to take account of the aspirations of the stakeholders and the state of market development in Denmark.

### 6.4.2 Regime performance

(178) The daily linepack data is not provided to the market, but was provided to the Agency for the sake of performing the analyses for this Report[38].

#### *6.4.2.1 TSO Balancing Actions*

(179) Activity appeared to be residual representing around 0.8% of system entry inputs. Balancing actions were taken on 141 days.

(180) Approximately three-quarters of the balancing action quantities represented buying gas onto the system. There were no obvious seasonal patterns to the actions.

(181) The average price of TSO balancing action System Buys (15.59 EUR/MWh) was notably higher than the average System Sell price (12.91 EUR/MWh).

#### *6.4.2.2 Network Users' Imbalance Cash-out*

(182) Over the year, the sum of the Network Users' Imbalances represented 4.7% of system throughput.

(183) The network users' aggregated cash-out quantities for Long and Short Positions were approximately equal (respectively 46 and 54% of all imbalances).

(184) The average prices of imbalance cash-out for Long and Short Positions were close (13.62 EUR/MWh for Long Positions cash-out prices, 14.15 EUR/MWh for Short Positions) – this reflected the derivation of the

[37] Similar to BeLux.

[38] Energinet.dk provided assistance.

cash-out prices which typically had low small adjustments[39] except on the rare number of days, when the system finished outside of the *green zone*.

#### *6.4.2.3 Neutrality*

(185) Over the year, the net financial neutrality cash flow represented a surplus of EUR 54,000, which tends to justify the Danish position that separate accounting (from transmission tariffs) for neutrality might be disproportionate[40].

(186) Overall, net neutrality position resulted in credits of 0.0008 EUR/MWh for the unit of gas entered into the system.

(187) However, it is clear that, on a cumulative basis, the aggregated neutrality position had swung over a range of nearly EUR 1.2 million (moving from a surplus of EUR 410,000 to a deficit of EUR 771,000).

(188) The net energy volumes imply that neutrality had net-sold approximately 2.3 GWh, which had contributed approximately EUR 33,000 to EUR 54,000 of the net neutrality credit.

#### *6.4.2.4 Overall commercial imbalance position and linepack*

(189) Cumulative commercial imbalance indicated that, day on day, network users have considerable access to system flexibility although with risks that the *small adjustments* may rise if the system finishes outside of the *green zone*.

(190) The derivation of acceptable *green zone*, which is defined taking account of the opening linepack figure each day, means that significant cumulative linepack effects will only occur where they are operationally acceptable.

### 6.4.3 Final comments

(191) The regime seems to be functioning well having regard to the small size of the network and market. Network users' imbalance quantities represented approximately 6.14 times the TSO balancing actions.

(192) Denmark may provide a model example for new emerging regimes particularly with regard to taking best practice from other regimes, but also for assessing the lessons from those regimes and applying them to local circumstances.

(193) Energinet.dk engages regularly with its stakeholders to inform the evolution of the commercial rules and operational practices. For example, network users are encouraging energinet.dk to give more thought to how it interacts with the market. Network users wish to understand better the price formation process and what impact the TSO has on it.

(194) The dynamic resetting of the *green zone* each day appears to allow efficient network user access to the inherent flexibility of the system in an open and transparent way that can be scrutinised by regulator and other market actors.

---

[39] The small adjustment between marginal Buy and marginal Sell price is set to 0.5%, except for the days when imbalances occur and then is 3%.

[40] Despite the fact that it is technically non-compliant with the Code.

### 6.4.4 Graphics and Charts for Denmark – Energinet.dk

Figure 6-16: TSO's balancing action, Denmark (MWh)

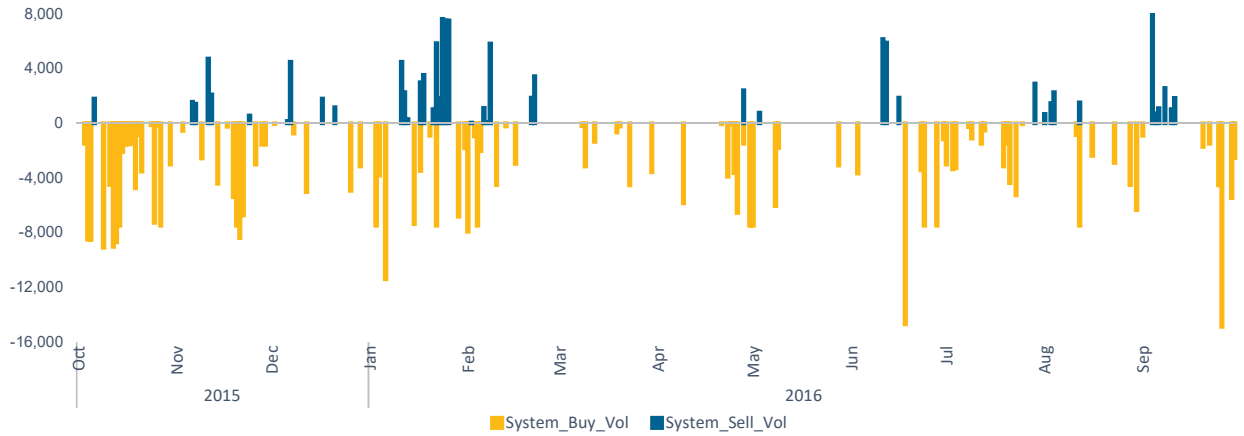



Table 6-10: TSO's balancing actions statistics, Denmark

| | Annual quantity | Share of annual market | Number of days | Average daily quantity | Max daily quantity | Share of activity | Average price |
|---|---|---|---|---|---|---|---|
| | MWh | % | n° | MWh | MWh | % | EUR/MWh |
| **System Buys** | 406,530 | 0.60 | 102 | 3,986 | 14,880 | 77.3 | 15.59 |
| **System Sells** | 119,400 | 0.17 | 43 | 2,777 | 9,150 | 22.7 | 12.91 |
| **Total** | **525,930** | **0.77** | **141** | | | | |

Figure 6-17: Network Users' imbalance quantities, Denmark (MWh)

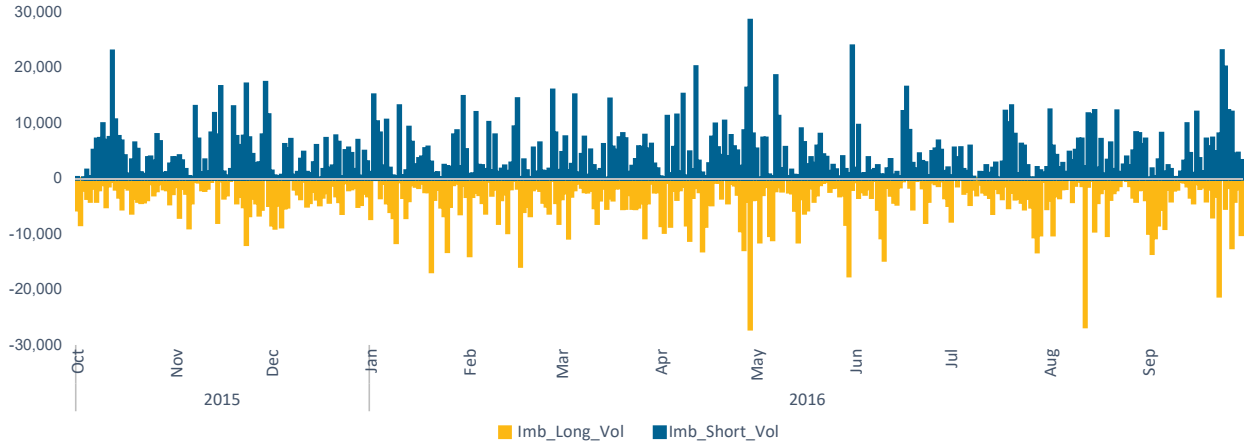



Table 6-11: Network users' imbalance statistics, Denmark

| | Annual quantity | Share of annual market | Min daily quantity | Average daily quantity | Max daily quantity | Share of activity | Average price |
|---|---|---|---|---|---|---|---|
| | MWh | % | MWh | MWh | MWh | % | EUR/MWh |
| **Network User Long** | 1,450,625 | 2.13 | 14 | 3,963 | 26,981 | 45.5 | 13.62 |
| **Network User Short** | 1,740,080 | 2.55 | 0 | 4,754 | 28,436 | 54.5 | 14.15 |
| **Total** | **3,190,705** | **4.67** | | | | | |

Figure 6-18: Price differentials, Denmark (MWh)

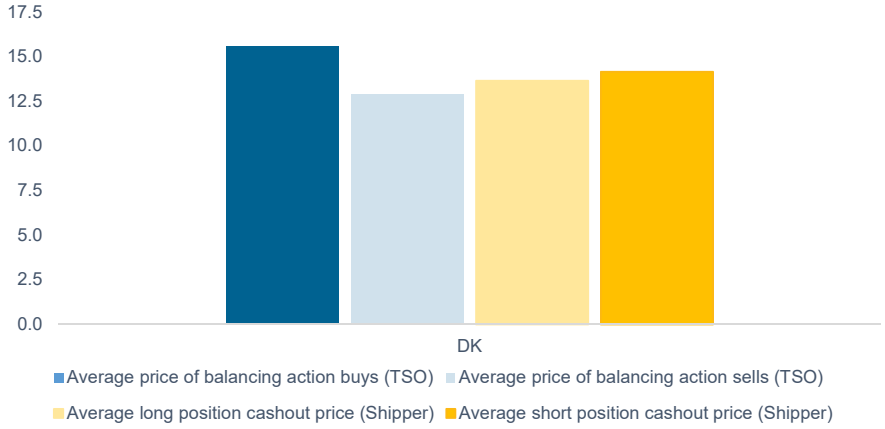



Figure 6-19: Cumulative neutrality financial position, Denmark (thousand EUR)

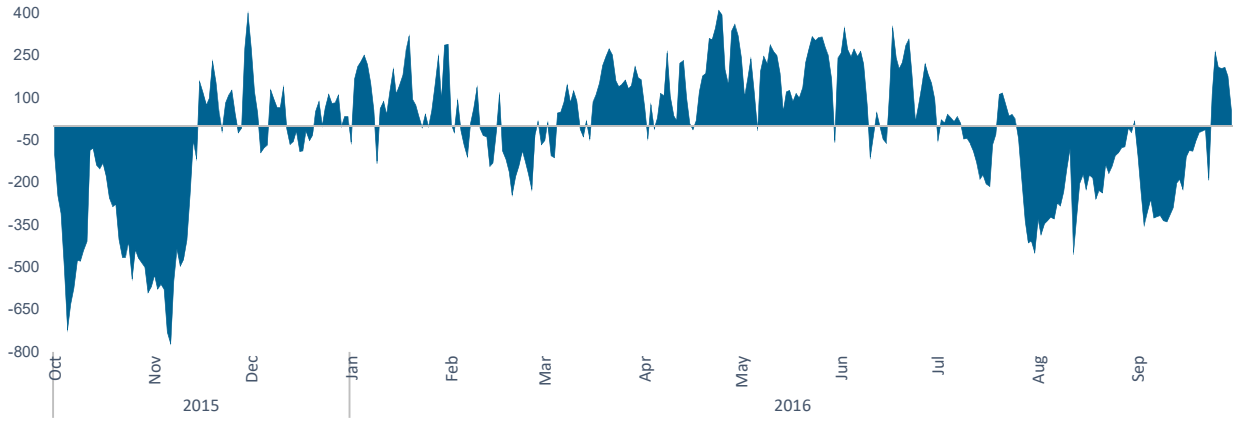
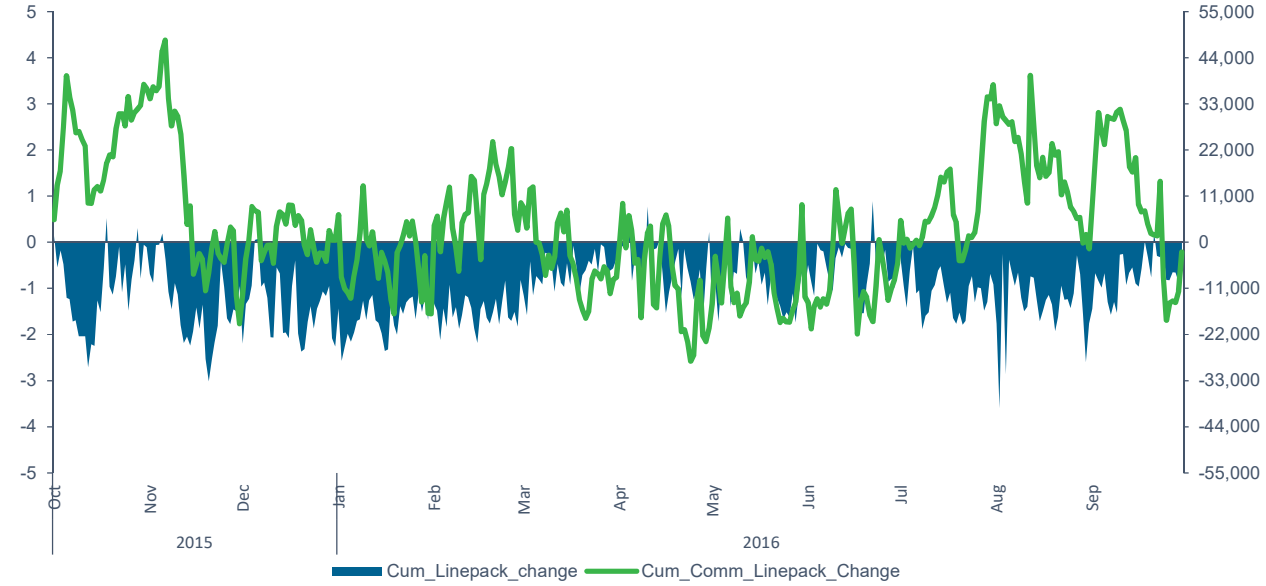



Table 6-12: Cumulative neutrality position, Denmark

| | Quantities (MWh) | Cashflows (thousand EUR) | Relative share (%) |
|---|---|---|---|
| **Financial credits to neutrality** | | | |
| **TSO System Sells** | 119,400 | 1,542 | 6% |
| **Network Users' Imbalance Shorts** | 1,740,080 | 24,614 | 94% |
| **Sub-total** | | **26,156** | |
| **Financial debits to neutrality** | | | |
| **TSO System Buys** | 406,530 | 6,338 | 24% |
| **Network Users' Imbalance Longs** | 1,450,625 | 19,764 | 76% |
| **Sub-total** | | **26,102** | |
| **Net** | **-2,325** | **54** | |
| **Net neutrality per unit of market volume 0.0008 €/MWh** | | | |

Figure 6-20: Linepack (mcm, left axis) and overall commercial imbalance position (MWh, right axis), Denmark



## 6.5 France: GRTgaz Nord balancing zone

### 6.5.1 Short description of the balancing regime

(195) The GRTgaz Nord area also includes both an H-gas and an L-gas sub-area (which were merged into a single gas area in 2013). The L-gas sub-area does not constitute a separate balancing zone. GRTgaz takes care of the conversion from H- to L-gas. Network users can use a swap product to access the L-gas sub-area.

(196) The GRTgaz Nord area overlaps with the PEG Nord market area. For the sake of invoicing, GRTgaz Nord belongs to the same zone, as mentioned above.

(197) GRTgaz allows network users supplying end consumers to subscribe (on a monthly basis) to a linepack flexibility service (Alizes), which may grant relief from exposure to the marginal based cash-out prices. The service fee is not included in neutrality and creates some leakage between neutrality and transmission revenues.

(198) Technically, the service is based on the end-of-day planned linepack, as published by GRTgaz. Subscribers get to know the actual daily service from Alizes ex-post (by their invoices). All imbalances, also those covered by the Alizes service, are cashed-out daily. The Alizes service provides an exemption from the marginal price settlement, up to the volumes that each network user has contracted, each day when GRTgaz has not intervened in the balancing zone. Otherwise, the service is unavailable and the marginal price applies to imbalances.

(199) For the eligible days of each month, when the Alizes service is available, reference prices for the eligible volumes under the Alizes service is equal to the weighted average prices ('the WAP') applicable on those days.

### 6.5.2 Regime performance

(200) Due to the existence of the linepack flexibility service Alizes, it was important to distinguish the volumes that were used by this service and the volumes subject to marginal cash-out prices[41]. The Alizes service applied on 237 days. On 11 days, the TSO has not intervened and, at the same time, the Alizes service was not used[42].

#### *6.5.2.1 TSO Balancing Actions*

(201) TSO's Buy and Sell balancing actions sum up to 0.58% of the total market entry volume, which makes the TSO a residual player. The TSO relied on the title market. The TSO bought on 74 days and sold on 44 days,

[41] Due to the existence of the linepack flexibility service Alizes, it was important to distinguish between:

- the network users' imbalance (long and short) portion to which the Alizes service applies: this portion is cashed out at the average price;
- the network users' imbalance (Long and Short) portion to which the Alizes service does not apply: this portion is cashed out at the marginal price.

During the treatment of the data these volumes were kept separately.

[42] For these 11 days, GRTgaz did not manage to trade gas on the market, even if there was a need. In order to prevent a market manipulation, the NRA has implemented price ranges where the TSO was allowed to trade gas. If there is no offer within these ranges, the TSO cannot trade gas. This limitation is implemented to prevent a network user from taking advantage of the TSO that would be forced to trade irrespective of the price.

in total 118 days. Even on the 3 days, when the TSO traded locational products, it also traded within-day title products.

(202) The total TSO/System Sell quantities represent 24% of the total, while the TSO/System Buy quantities 76%, so the TSO acts asymmetrically, in case, the system is short.

(203) There is a 17% price difference between the average TSO/System Buy prices (14.89 EUR/MWh), compared to the average System Sell prices (12.68 EUR/MWh).

#### *6.5.2.2 Network Users' Imbalance Cash-out*

(204) On average, network users' imbalance volumes represented 2.3% of the market entry.

(205) Of the 12.2 TWh total yearly imbalances (5.5 TWh Long and 6.7 TWh Short Imbalance cash-out quantities) 10.2 TWh were cashed out at marginal prices. Another 2 TWh (1 TWh Long and 1 TWh Short positions) were covered by the Alizes service, thus cashed-out at the WAP.

(206) Imbalance volumes are quite symmetrical and were split 45%-55% between the Long and Short Positions, while, for the Alizes service, the Long-Short Positions are fully symmetrical.

(207) On a daily level, Short imbalance positions are slightly higher (18 GWh on average) than the Long ones (15 GWh on average), and a similar pattern can be observed for the daily maximum values. The Alizes service was highly symmetrical on a daily level with daily average volumes of 2.8 GWh on both sides. Even the daily maximum values stayed close to each other with 25 GWh for Short and 23.5 GWh for Long positions.

(208) The average prices at which network users sell gas when they are long is 13.88 EUR/MWh, while the price at which they buy gas when they are short is 14.91 EUR/MWh. The Short Position cash-out price is 7% more expensive than the Long Position cash-out price.

#### *6.5.2.3 Neutrality*

(209) In the period analysed the system ended up with an average debit of 0.0049 €/MWh per unit of market volume for the gas that was taken out from the system.

(210) The neutrality ended up with a net energy surplus of 453 GWh of gas and generated a cash loss of approximately EUR 2.6 million (net financial neutrality). The net financial neutrality per unit of market volume was relatively small and close to zero, redistributing decently small values of money across the users.

(211) This calculation of the neutrality flows and costs does take into account the Alizes service's flows and costs. However, the Alizes service subscription costs were not included in the cash-out formula[43]. The Agency had not included those costs, which were on top of its neutrality calculations, in the net effects.

#### *6.5.2.4 Overall commercial imbalance position and linepack*

(212) The average opening linepack was 1.8 TWh, with minimum and maximum values reaching respectively 1.6 TWh and 2 TWh (20% range with respect of the average). The average daily linepack variation was 24 GWh/day, while the maximum was 197 GWh/day.

[43] The subscription cost to Alizes is proportional to the domestic delivery capacities and equal to 0.12 EUR/MWh for NDM delivery capacity and 0.06 EUR/MWh for daily metered delivery capacity. These costs are considered as a transmission revenue for the TSO.

(213) The aggregated commercial imbalances covered a range of 1,520 GWh. The highest absolute daily commercial imbalance variation - arising from the aggregate of network users' imbalances and TSO's balancing actions - reached 86 GWh, with a daily average of 18 GWh.

(214) The commercial imbalances and physical realities (linepack) decoupled as of January 2016. Until April, there was a period of persistent growth in the mismatch. The gap started closing in May. The NRA mentioned, among the possible causes of this difference, the physical swaps occurred for operational or commercial purposes.

### 6.5.3 Final comments

(215) The system looks reasonably stable and efficient.

(216) Network users generated four times the volume of TSO balancing actions. Network users' imbalances cover approximately 80% of total balancing volumes, while 20% comes from TSO balancing actions.

(217) The linepack service is not an *ex-ante* service, as one may believe. The availability of the service partly undermines the incentive of network users to balance themselves fully on a daily basis. On the other hand, network users will not know ahead whether the TSO takes balancing actions, so there is uncertainty whether the Alizes will kick in. Alizes was used on 237 days during the last Gas year 2015/16.

(218) It would be interesting to understand what part the residual monthly imbalance from Alizes plays in terms of volume and cost and contribution to the neutrality account.

(219) Stable access to online data could be further improved by the TSO on the relevant sites.

(220) The Agency recommends to the NRA to consider monitoring the TSOs balancing activity and the Alizes service as well as the incentives of network users using the relevant balancing tools, aiming at maximising the effectiveness of the balancing regime.

### 6.5.4 Graphics and Charts for France: GRTgaz-Nord

Figure 6-21: TSO's balancing actions, France-N (MWh)

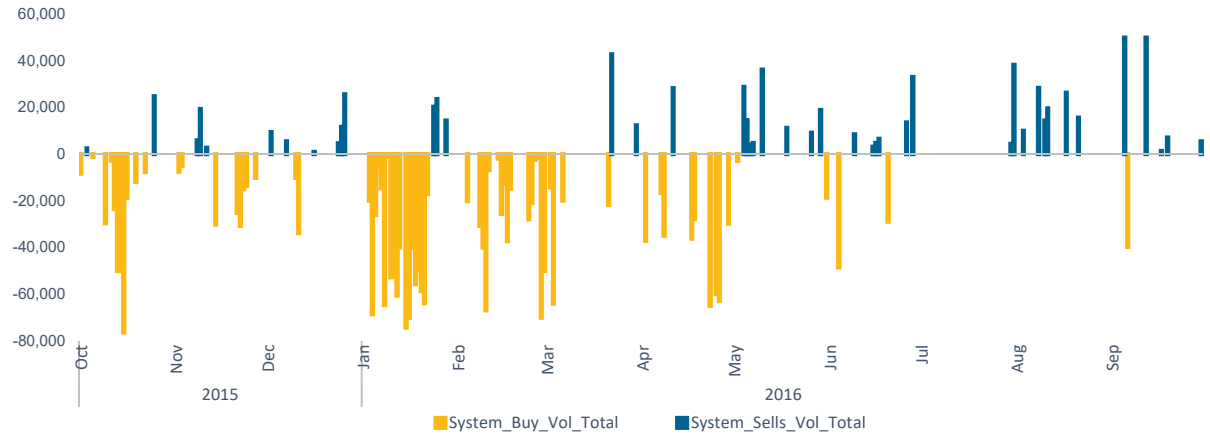



Table 6-13: TSO's balancing actions statistics, France-N

| | Annual quantity | Share of annual market | Number of days | Average daily quantity | Max daily quantity | Share of activity | Average price |
|---|---|---|---|---|---|---|---|
| | MWh | % | n° | MWh | MWh | % | EUR/MWh |
| System Buys | 2,355 | 0.44 | 74 | 32 | 76 | 76.45 | 14.89 |
| System Sells | 726 | 0.14 | 44 | 16 | 50 | 23.55 | 12.68 |
| **Total** | **3,080** | **0.58** | **118** | | | | |

Figure 6-22: Network users' imbalance quantities, France-N (MWh)

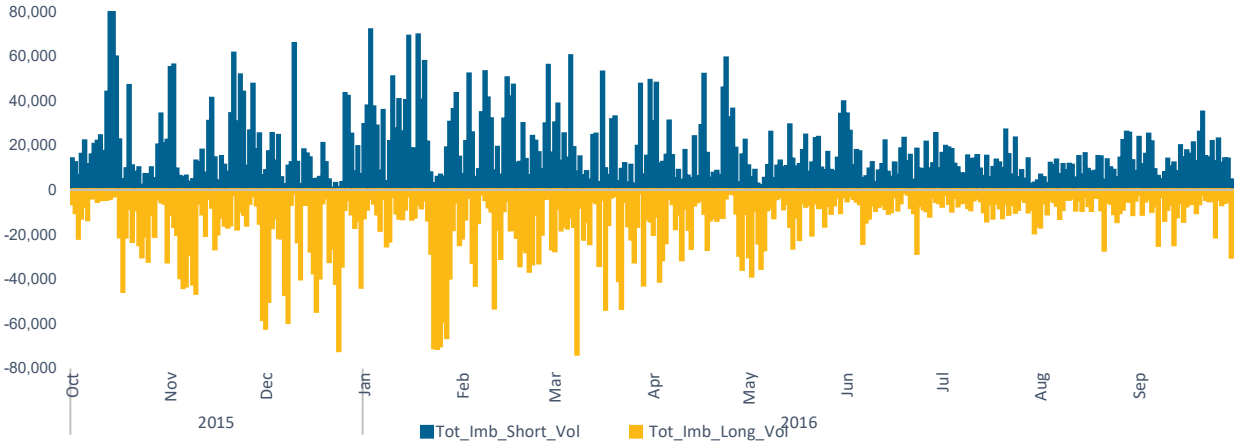



Table 6-14: Network users' imbalance statistics, France-N

| | Annual quantity | Share of annual market | Min daily quantity | Average daily quantity | Max daily quantity | Share of activity | Average price |
|---|---|---|---|---|---|---|---|
| | MWh | % | MWh | MWh | MWh | % | EUR/MWh |
| Network User Long | 5,504 | 1.03 | 0.63 | 15.04 | 73.21 | 45.17 | 13.88 |
| Network User Short | 6,680 | 1.25 | 0.63 | 36.72 | 84.33 | 54.83 | 14.91 |
| **Total** | **12,185** | **2.28** | | | | | |

Figure 6-23: Price differentials, France-N (EUR/MWh)

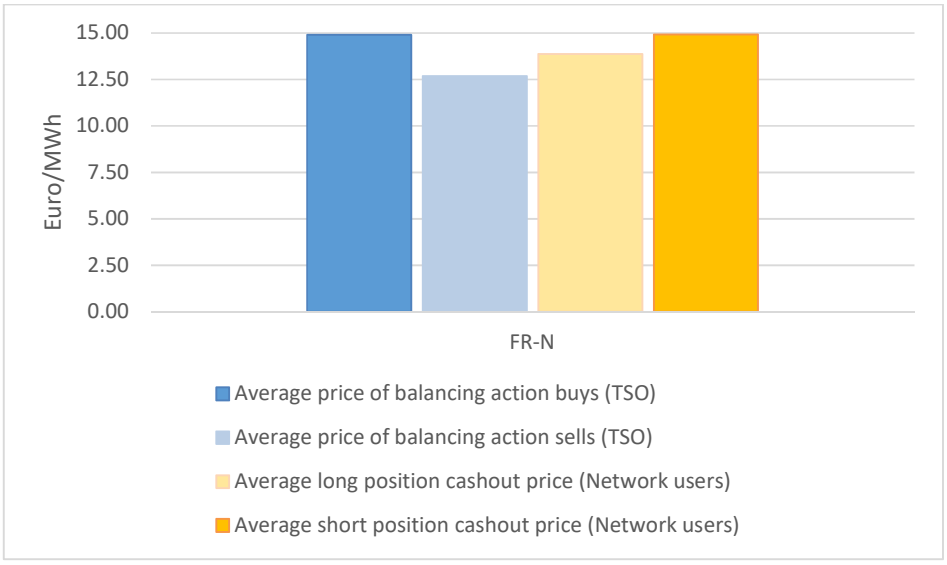



Figure 6-24: Cumulative neutrality financial position, France-N (million EUR)

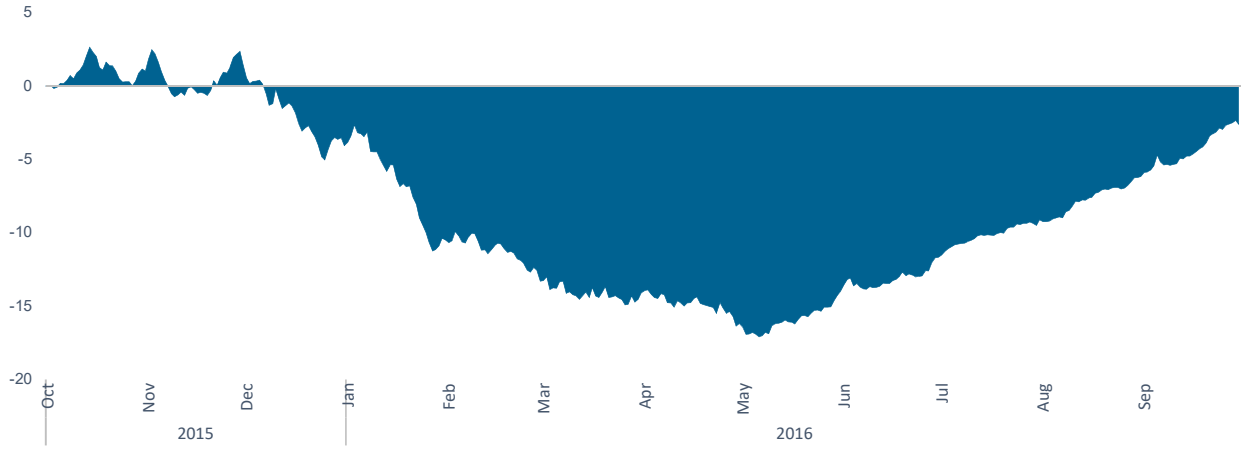
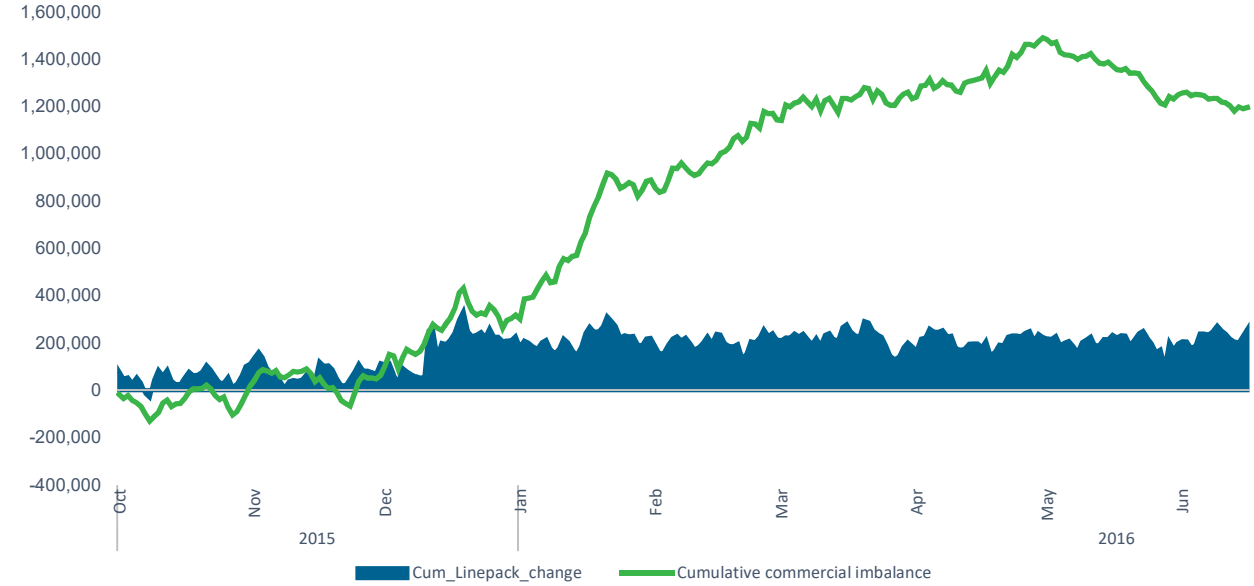



Table 6-15: Cumulative neutrality position statistics, France-N

| | Quantities (MWh) | Cashflows (EUR) | Relative share (%) |
|---|---|---|---|
| **Financial credits to neutrality** | | | |
| **TSO System Sells** | 725,570 | 9,202,419 | 8% |
| **Network Users' Imbalance Shorts** | 6,680,317 | 99,636,574 | 92% |
| **Sub-total** | | **108,838,993** | |
| **Financial debits to neutrality** | | | |
| **TSO System Buys** | 2,354,870 | 35,064,734 | 31% |
| **Network Users' Imbalance Longs** | 5,504,450 | 76,384,162 | 69% |
| **Sub-total** | | **111,448,896** | |
| **Net** | **453,433** | **-2,609,904** | |
| **Net neutrality per unit of market volume -0.0049 EUR/MWh** | | | |

Figure 6-25: Linepack and overall commercial imbalance position, France-N (MWh)




** Analysed interval: from 6 October 2015 to 22 June 2016 due to missing linepack data*

## 6.6 Slovenia - Plinovodi

### 6.6.1 Short description of the balancing regime

(221) The Slovenian TSO manages a small gas transmission network of nearly 1,000 km in length. There are no storage sites, which implies that peak consumption is covered via import, including from neighbouring storage sites. The entry-exit system is fully in place since 2013. The network counts around 300 exit points, mostly to end consumers directly connected at transmission level and exits to 14 DSOs.

(222) The network users are primarily responsible for balancing the network. Network users can either join a balancing group ('BG'), whose leader (balancing group leader, 'BGL') is responsible towards the TSO, for carrying out the balancing related activities of the group[44], or establish its own group.

(223) The VTP was established in October 2015. It counts nearly 20 registered users, with 7-8 active parties. A Trading Platform is provided by the TSO. The platform features within-day and day-ahead products and allows BGLs to trade both with each other and with the TSO. The marginal buy and sell prices paid by imbalanced network users are based on the trading platform's trades. Paper traders (those that do not own transmission capacity) can access the balancing market only via a BGL. The over-the-counter ('OTC') trades support flexibility on the balancing market, and balancing group members use that source of flexibility. Consequently, since the establishment of the new balancing regime, OTC trading shows an increasing trend, while balancing trading on the platform is rather stable after an initial peak.

(224) The TSO also relies on balancing services[45], whose price is linked to the Austrian market CEGH (Central European Gas Hub). The balancing services are in the merit order and can be selected before the short-term standardised products ('STSPs'), if they are cheaper. If used in such a manner, this tool would restrict the development of the local flexibility market. The Code foresees that balancing services are used where STSPs will not or likely not provide enough gas to keep the system within its operational limits. Fortunately, balancing services were deployed in small volumes and, so far, the STSPs have been preferred since they offered consistently lower prices.

(225) The TSO confirmed that, since the start of the new balancing regime, the network users have gained experience and changed their initial behaviour of being predominantly imbalanced long. The data for the Gas year 2015/16 still shows part of this inertia with gradual improvement.

### 6.6.2 Regime performance

(226) Slovenia had a full daily balancing regime since October 2015[46]. The network user imbalances in most cases trigger TSO actions, which is in the opposite direction to aggregated daily network user positions. The user

[44] By joining a BG, network users fully delegate all balancing activities to the BGL: from implementing nominations, to participating to the balancing market, from communicating with the TSO, to paying the imbalance costs. The role of the BGL is highly valued by the network users in Slovenia due to the lack of domestic storage, which decreases the need for balancing for a single network user, and to the lack of interest of competence of some network users to act directly in the balancing market. Each network user that joins a BG has its own service contract with it. Neither the TSO nor the NRA is involved in this contract. The number of BG has increased recently to six.

[45] The TSO has also used balancing services, mostly in the first part of the Gas year. This only happens in the direction of TSO/System Sell.

[46] The dataset is complete. It has to be noted that the linepack flexibility data provided refers only to the amount of gas made available to the network users, beyond the operational needs of the TSO. While it is understood that in all systems the TSO manages the linepack in order to make sure to keep the system safe, some systems provide the market with the full linepack

community appears to be consistently long, and so the system, if the TSO would not be taking gas off the system by selling gas.

#### *6.6.2.1 TSO Balancing Actions*

(227) TSO/System Buy and Sell balancing actions summed up to 2.16% of the total market entry volume; when balancing services were included, the TSO's activity reached 2.5% of total market entry. There are 31 Buy and 243 Sell days, showing an asymmetrical TSO's activity, especially in the winter period.

(228) In this case, coherently with the number of daily TSO actions, TSO Sell quantities represented 80% of all balancing actions' volumes.

(229) There was a small difference between the average price for Buy actions (15.6 EUR/MWh) and for Sell actions (14.90 EUR/MWh). The TSO also relied on balancing services for 80 GWh, mostly in Q1 of the Gas year 2015/16, and exclusively in the Sell direction. The average price for the Sell balancing services was higher at 17.59 EUR/MWh.

#### *6.6.2.2 Network Users' Imbalance Cash-out*

(230) The yearly imbalance volume reached 2.7% of the market entry volume.

(231) The imbalance volume showed an asymmetry towards Long positions: 90% of the positions were Long and only 10% of the positions were Short. Imbalances showed a large degree of variation: with an average of 1.5 GWh/day and a maximum of 5.4 GWh.

(232) The average price at which network users sold gas, the Long cash-out price was 14.68 EUR/MWh. When they were short, they bought on average at 20.45 EUR/MWh (Short Position cash-out price). The average Short position cash-out price was 40% higher than the average Long Position cash-out price.

#### *6.6.2.3 Neutrality*

(233) If spread over the market entry volume, the overall net financial neutrality (per unit of market entry) represented a credit of 0.0638 EUR/MWh, which was relatively high.

(234) The net financial neutrality unit value was highly influenced by the trend of the first five months of the Gas year 2015/16 where the combined action of:

- network users being consistently long (thus having to sell gas to the system at the end of the Gas Day), due to historical inertial behaviour and
- the TSO selling gas via balancing action trying to keep the physical balance of the network, despite the high long volumes imbalanced by the network users in the initial phase of the new regime.

(235) The net financial neutrality was EUR 1.4 million. The net energy position represented a net sale of 51 GWh for the analysed period generating an income to neutrality of about EUR 750,000. Once adjusted for the gas sold, the net adjusted financial neutrality pot decreased to EUR 650,000.

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data, used by both the TSO and the network users. The linepack flexibility values provided by Plinovodi does not allow immediate comparison with other balancing regimes.

#### 6.6.2.4 *Overall commercial imbalance position and linepack*

(236) The TSO provided network users with an average linepack flexibility for their commercial purposes of 14.7 GWh, with minimum and maximum values reaching respectively 8.6 GWh and 26.5 GWh. Beyond this linepack flexibility range, the TSO used additional operational linepack, whose value was not published to the market. This approach resembles the *green zone* approach, applied in Denmark or in the BeLux regime.

(237) The average variation of linepack flexibility was, in absolute terms, 0.9 GWh, while the maximum variation was 10 GWh.

(238) The cumulative net commercial imbalance covered a range of 65 GWh. The absolute highest daily commercial imbalance variation - arising from the aggregated Network User Imbalances and TSO balancing actions - reached 3.9 GWh, averaging at 0.9 GWh.

(239) According to the TSO, the reasons why the physical and commercial reality did not match could be related to Operational Balancing Agreements ('OBAs'), gas shrinkage, measurement errors, or work in the network. The TSO also pointed out that the linepack data was affected by physical effects such as measurement, compression, operational use, seasonal effects (temperature, flows, etc.).

(240) The question remains whether the mismatches are within acceptable ranges and whether there are any effects potentially distorting the operation of the balancing regime. For example, the use of OBAs means that the TSO might be affecting the operation of balancing regimes on either side of an IP, if the OBA is used for anything greater than steering differences.

### 6.6.3 Final comments

(241) Network users' imbalances represented approximately 1.1 times TSO balancing action volumes. The TSO has played quite an active role in balancing, instead of the network users.

(242) The other relevant element is that the price difference for network users' Long and Short imbalance positions was very high, which may be attributable to a range of factors including perhaps historical behaviours and the relatively large small adjustment applied to cash-out prices. The average imbalance prices may also imply a disproportionately high price for network users that find themselves short, and that could be the major reason for the asymmetry found in the Long and Short Positions.

(243) The TSO explained that network users in the past were used to oversupply the network, because being long was safer than being short. In other words, the price difference for long imbalances was biased in favour of the long network users. The network users' behaviour proved safer also for the TSO, whose only flexibility source in case of lack of gas came from the linepack. The analysis shows some residual inertia with this behaviour, though it was decreasing in the course of the Gas year 2015/16. The TSO confirmed that more recent market data shows an improving symmetry in network users' behaviour.

(244) Moreover, due to the aforementioned asymmetry, the system has cumulated quite a big amount of neutrality credit, compared to the size of the market and other systems[47]. This may indicate that after a first assessment, if the trend continues, a fine-tuning of the system might be needed.

(245) The TSO makes available the linepack flexibility data. Since the linepack flexibility does not cover the full linepack information needed, the Agency could not use this information for this Report. The NRA should encourage the TSO to make such data available in the future.

[47] See section 7.2.3.

### 6.6.4 Graphics and Charts for Slovenia - Plinovodi

Figure 6-26: TSO's balancing actions, Slovenia (MWh)

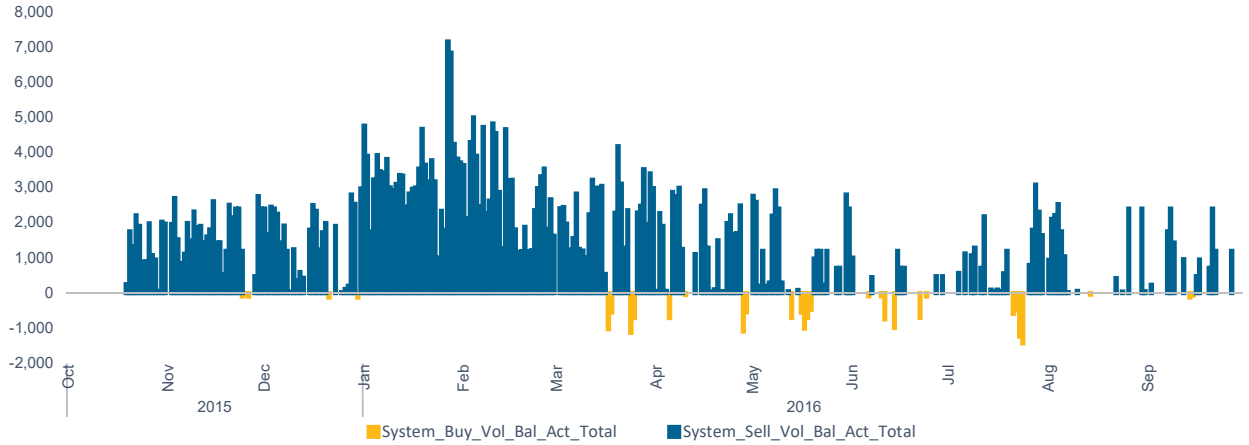



Table 6-16: TSO's balancing actions and services statistics, Slovenia

| | Annual quantity (actions) | Annual quantity (services) | Share of annual market (actions) | Share of annual market (services) | Number of days (actions) | Number of days (services) | Average daily quantity (actions) | Max daily quantity (actions) | Share of activity (total) | Average price (actions) | Average price (services) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | GWh | GWh | % | % | n° | n° | GWh | GWh | % | EUR/MWh | EUR/MWh |
| System Buys | 16.7 | 0.0 | 0.07 | 0.07 | 31 | 0 | 0.5 | 1.4 | 3.44 | 15.61 | |
| System Sells | 470.2 | 80.2 | 2.08 | 2.44 | 242 | 43 | 1.9 | 7.2 | 96.56 | 14.90 | 17.59 |
| **Total** | **486.9** | **80.2** | **2.16** | **2.51** | **273** | **43** | | | | | |

Figure 6-27: Network users' imbalance, Slovenia (MWh)

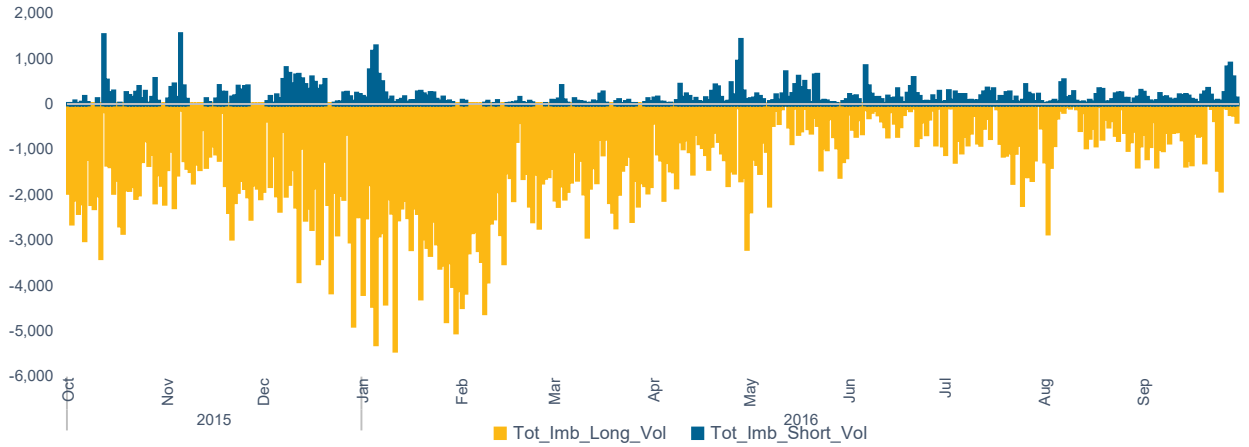



Table 6-17: Network users' imbalance statistics, Slovenia

| | Annual quantity | Share of annual market | Min daily quantity | Average daily quantity | Max daily quantity | Share of activity | Average price |
|---|---|---|---|---|---|---|---|
| | MWh | % | MWh | MWh | MWh | % | EUR/MWh |
| Network User Long | 547.01 | 2.42 | 0.01 | 1.49 | 5.42 | 89.50 | 14.68 |
| Network User Short | 64.15 | 0.28 | 0.00 | 0.18 | 1.54 | 10.50 | 20.45 |
| **Total** | **611.16** | **2.71** | | | | | |

Figure 6-28: Price differentials, Slovenia (EUR/MWh)

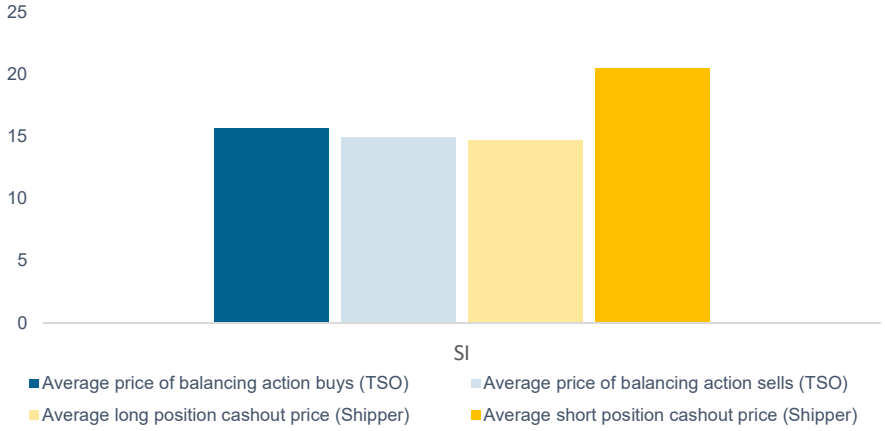



Figure 6-29: Cumulative neutrality financial position, Slovenia (EUR)

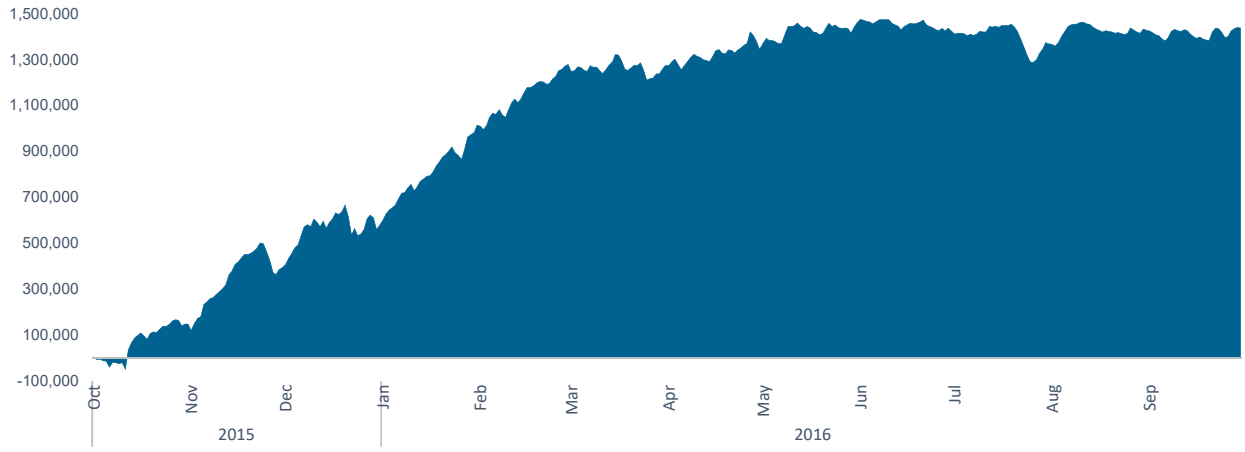
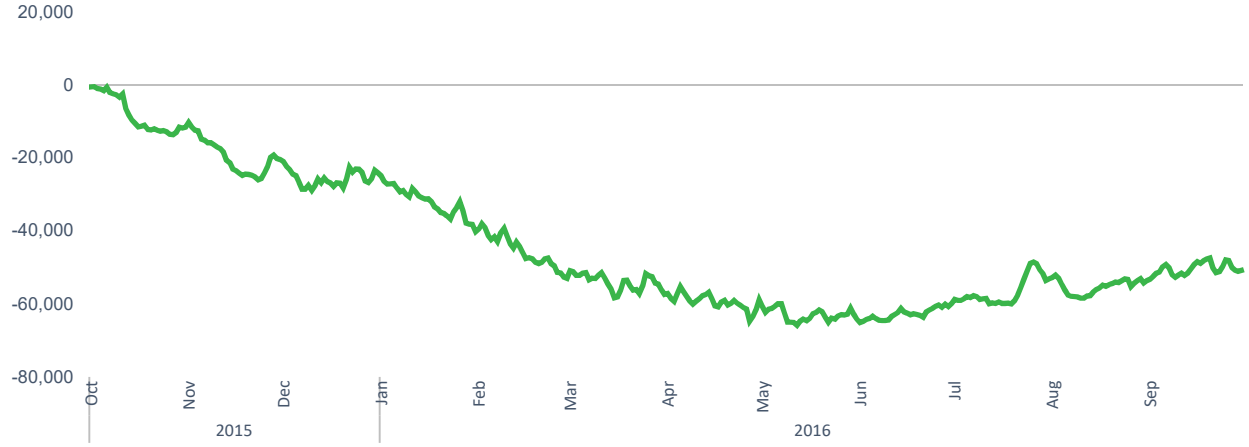



Table 6-18: Cumulative neutrality position statistics, Slovenia

| | Quantities (MWh) | Cashflows (EUR) | Relative share (%) |
|---|---|---|---|
| **Financial credits to neutrality** | | | |
| **TSO System Sells** | 550,429 | 8,415,452 | 87% |
| **Network Users' Imbalance Shorts** | 64,153 | 1,311,767 | 13% |
| **Sub-total** | | **9,727,220** | |
| **Financial debits to neutrality** | | | |
| **TSO System Buys** | 16,734 | 261,201 | 3% |
| **Network Users' Imbalance Longs** | 547,005 | 8,027,315 | 97% |
| **Sub-total** | | **8,288,516** | |
| **Net** | **-50,844** | **1,438,704** | |
| | | **Net neutrality per unit of market volume 0.063780 €/MWh** | |

Figure 6-30: Overall commercial imbalance position, Slovenia (MWh)



## 6.7 Spain – Enagás

### 6.7.1 Short description of the balancing regime

(246) The Spanish regime applies daily balancing as of 1 October 2016. Network users can balance themselves via the MIBGAS trading platform using title trades. When the system is close to its operational limits, in spite of network users' daily balancing, the TSO intervenes in the market by buying daily and within-day products. Network users who are imbalanced at the end of the day are exposed to the cash-out price, which is derived from the MIBGAS trading platform.

(247) The neutrality mechanism follows a causer-pay principle: the cost of the balancing system, for each specific day, is born by those being imbalanced ('causers'). The Agency notes that on the one hand, the mechanism weakens the broader socialisation of neutrality costs and, on the other hand, puts an additional balancing incentive on the network users to that already provided by the cash-out prices. This mechanism, to an extent, decreases the levelling effect of the neutrality charges.

### 6.7.2 Regime performance

(248) The dataset lifted from the TSO website was complete[48]. The period covered by the analysis is a different Gas year (2016/17) and covered only the first six months of the Gas year (the winter period). This created difficulties in comparing certain data with other zones, in particular prices.

#### *6.7.2.1 TSO Balancing Actions*

(249) TSO/System Buy and Sell balancing actions sum up to 0.64% of the total system entry volume. There were 34 Buy and 8 Sell days, totalling to only 42 days of TSO balancing actions. The TSO did not act with the same frequency on each side of the market.

(250) System Sell quantities represented 19% of all balancing actions, which shows an asymmetrical TSO Buy behaviour over selling.

(251) There was a significant difference between the average System Buy price (26.6 EUR/MWh) and System Sell price (17.69 EUR/MWh).

#### *6.7.2.2 Network Users' Imbalance Cash-out*

(252) Network Users' imbalance cash-out volumes totalled 3.5% of the system entry volumes.

(253) Imbalance volumes were reasonably symmetrical, being 55% Long Positions and 45% Short Positions.

(254) Aggregated network users' imbalances were typically in a defined range (average: +/- 19 GWh/day), except for four cases, when the imbalances were higher than +/-100 GWh.

(255) The average purchase and sale prices were rather aligned: network users sold gas at 23.65 EUR/MWh and bought gas at 25.22 EUR/MWh, showing a 7% difference between the Short and Long Position cash-out price.

[48] This is the only transitory country analysed in this Report. Given the later application date, the analysis period is shorter and covers the winter period of a different Gas Year. Therefore, the results are not directly comparable with the other zones analysed.

#### 6.7.2.3 Neutrality

(256) When spread over the total entry quantity, net financial neutrality generated a revenue of 0.0050 €/MWh for the unit of gas entered into the system.

(257) During the winter, neutrality purchased 47 GWh net energy. The cash surplus over the winter resulted in a revenue of approximately EUR 1 million. Given the shortened period, this may not allow a good basis for comparison.

(258) Since there was a surplus, the redistribution of the neutrality account applies to all the network users, should the balance remain positive until the end of the Gas year. The generated revenues are planned to be distributed back via the transmission tariffs.

#### 6.7.2.4 Overall commercial imbalance position and linepack

(259) The average opening linepack was 2.8 TWh, with minimum and maximum values reaching respectively 2.7 TWh and 2.9 TWh. The average daily linepack variation was 26 GWh, while the maximum variation reaches 112 GWh.

(260) The cumulative net commercial imbalance covered a range of 298 GWh. The highest absolute daily commercial imbalance - calculated as the aggregate of network users' imbalances and TSO's balancing actions - reached 129 GWh, with a daily average of 20 GWh.

(261) The commercial imbalances and the physical linepack position decoupled in the middle of the analysed period, but coupled again at the end of the period. CNMC explained that the TSO had to use gas from the network to inject it in the Yela underground storage, as cushion gas, which had just started operations. This operation, in addition to measurement differences at the end of the year, was one of the causes of the decoupling in the graph (Figure 6-35)[49].

### 6.7.3 Final comments

(262) The Spanish system features relatively scarce occasions of TSO interventions, which is in line with the principle of the Code. However, even if acting on a few days (also considering the restricted period analysed, with respect to the other system analysed in the Report), the volumes of TSO balancing actions were not minimal.

(263) Network users' imbalances were 5.4 times larger than the volume of TSO balancing actions. Network users represented approximately 84.5% of total balancing volumes compared to 15.5% TSO balancing quantities.

(264) The price at which the TSO bought gas was excessively high compared to the sell price, which may indicate that MIBGAS is an emerging hub: and perhaps not liquid enough. CNMC follows closely the development of the market.

(265) The network users' imbalance prices were generally within a confined range; the outliers might be due to sporadic situations when the network was under stress. It might be worth better to understand those situations to avoid costs to the system or end up with a high TSO buy price.

(266) The calculation of the net financial neutrality brought a surplus. Yet the actual results of neutrality on the users may differ, due to the causer-pay principle applied to neutrality accounting in Spain. The Agency has

[49] See Section 6.7.4.

no quantitative information on the individual neutrality flows. It may be interesting to compare those with the calculations on the aggregated ones and compare the distributional effects.

### 6.7.4 Graphics and Charts for Spain – Enagas

Figure 6-31: TSO's balancing actions, Spain (MWh)

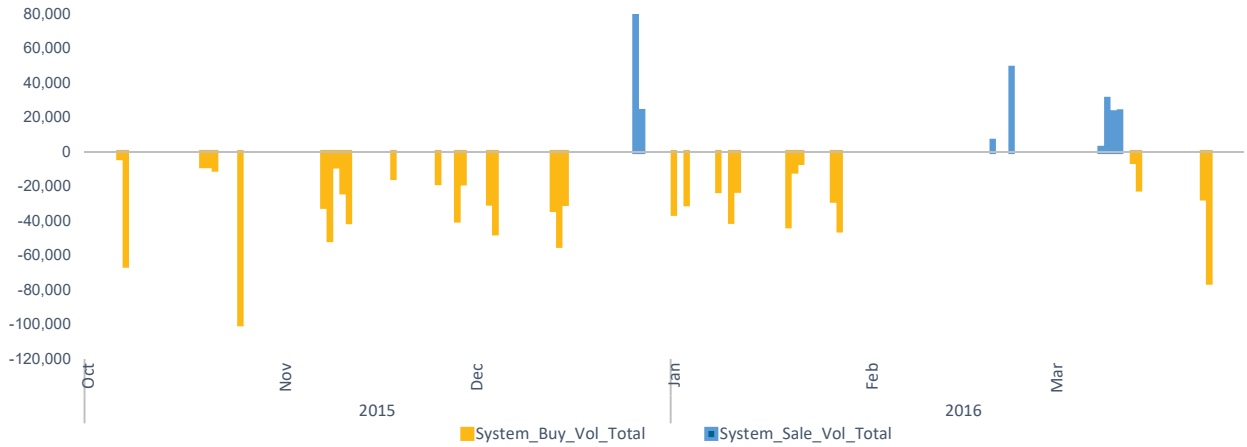



Table 6-19: TSO's balancing actions statistics, Spain

| | Annual quantity | Share of annual market | Number of days | Average daily quantity | Max daily quantity | Share of activity | Average price |
|---|---|---|---|---|---|---|---|
| | MWh | % | n° | MWh | MWh | % | EUR/MWh |
| System Buys | 1,051.49 | 0.52 | 34 | 30.93 | 99.77 | 81.24 | 26.06 |
| System Sells | 242.82 | 0.12 | 8 | 30.35 | 83.00 | 18.76 | 17.69 |
| Total | **1,294.30** | **0.64** | **42** | | | | |

Figure 6-32: Network users' imbalances, Spain (MWh)

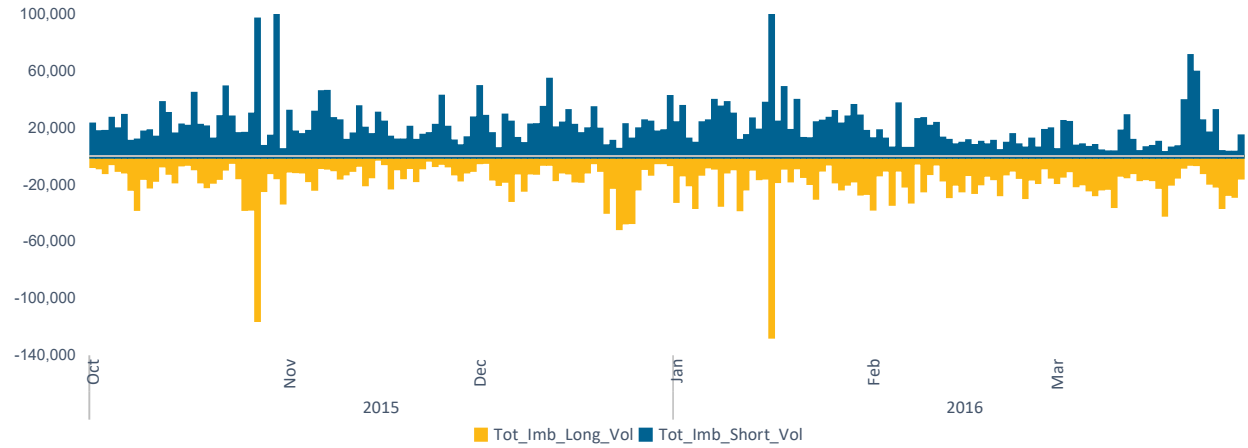



Table 6-20: Network users' imbalance statistics, Spain

| | Annual quantity | Share of annual market | Min daily quantity | Average daily quantity | Max daily quantity | Share of activity | Average price |
|---|---|---|---|---|---|---|---|
| | MWh | % | MWh | MWh | MWh | % | EUR/MWh |
| Network User Long | 3,132.84 | 1.55 | 1.28 | 17.21 | 126.91 | 44.58 | 23.65 |
| Network User Short | 3,894.82 | 1.92 | 2.38 | 21.40 | 144.02 | 55.42 | 25.22 |
| Total | **7,027.66** | **3.47** | | | | | |

Figure 6-33: Price differentials, Spain (EUR/MWh)

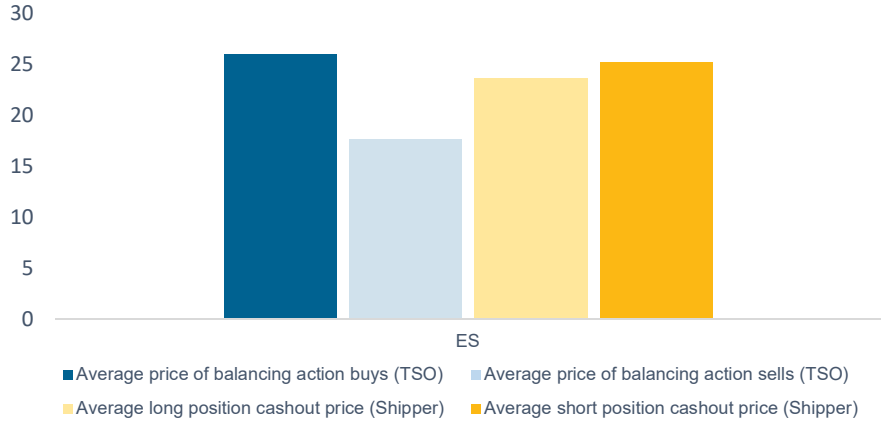



Figure 6-34: Cumulative neutrality financial position, Spain (million EUR)

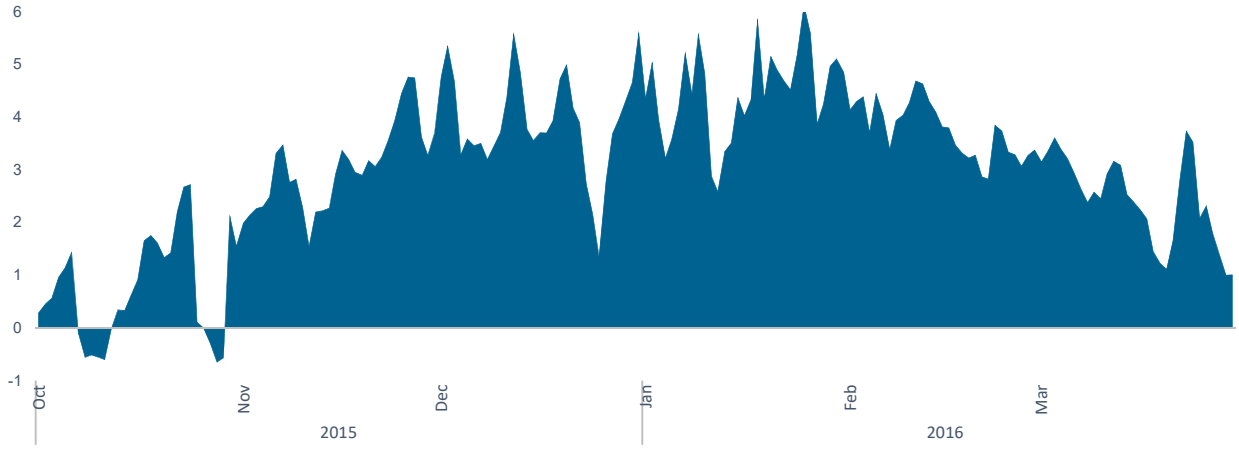
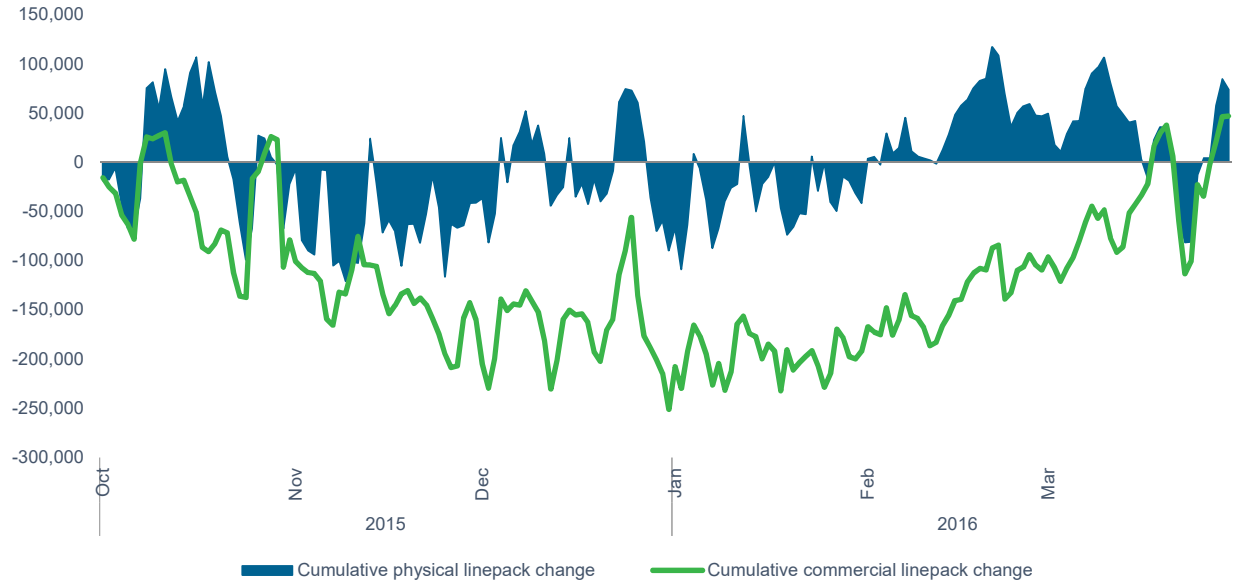



Table 6-21: Cumulative neutrality position statistics, Spain

| | Quantities (MWh) | Cashflows (EUR) | Relative share (%) |
|---|---|---|---|
| **Financial credits to neutrality** | | | |
| **TSO System Sells** | 242,818 | 4,295,985 | 4% |
| **Network Users' Imbalance Shorts** | 3,894,816 | 98,218,089 | 96% |
| **Sub-total** | | **102,514,075** | |
| **Financial debits to neutrality** | | | |
| **TSO System Buys** | 1,051,486 | 27,405,704 | 27% |
| **Network Users' Imbalance Longs** | 3,132,845 | 74,094,907 | 73% |
| **Sub-total** | | **101,500,610** | |
| **Net** | **46,696** | **1,013,465** | |
| | | **Net neutrality per unit of market volume 0.0050 EUR/MWh** | |

Figure 6-35: Linepack and overall commercial imbalance position, Spain (MWh)



# 7. Cross-regional balancing regime comparisons

(268) This Chapter develops inter-regime comparisons that might afford further insights as to the potential effectiveness of each implementation. Data has been collected and processed using the *Balancing Analytical Framework* for the balancing regimes described in the previous Chapter: e.g. GB-UK, BeLux, NCG (Germany), Denmark, France-N, Slovenia and Spain.

(269) The available data enables the analysis in this Chapter to compare of the various elements of each regime. Given that the Spanish analysis comprises only a winter period, this Chapter only shows the values of the Spanish indicators, without drawing comparisons with other balancing zones.

(270) This Chapter's comparisons present a set of output that may assist evaluating the balancing regimes and their appropriateness given local circumstances and policy objectives.

## 7.1 General considerations

(271) A mix of data tables[50] and charts are used to present the information and associated ideas.

(272) Some data provides context, others are presented graphically as well. A mix of absolute and normalised values are considered together in this comparative analysis. The normalised ones may be particularly helpful for comparative purposes and interpretation and these ones are usually plotted.

(273) It may be challenging to define acceptable ranges for any performance metric, but it may be worth trying to establish criteria, after careful consideration of regime performance. For example, establishing criteria might be desirable to assist in the assessment of both out- and under-performance beyond "normal" ranges.

(274) Making inter-regime comparisons will provide valuable insights into the differences in performance observed in the sample of countries. Differences need to be explored with stakeholders seeking to understand why the differences occur in conjunction with the specificities of the regimes. The emerging lessons may be an important part of reviewing regimes and may assist in identifying opportunities to improve key parameters in the regime. For example, the merit order, network user access to inherent system flexibility, information release to support network users' risk management, and cash-out price determination could all be improved should the insights from these analyses assist the identification of performance opportunities.

## 7.2 Areas for exploration

(275) The data and analysis draws heavily on the *Balancing Analytical Framework* and retains the same sections, namely:

1. TSO Balancing Actions;
2. Network Users' Imbalance Cash-out;
3. Neutrality;
4. Linepack level changes, including the relationship between the values of commercial imbalance position and the physical linepack.

(276) Overall, the indicators developed for each area of analysis need to be considered within its own area in conjunction with the indicators developed for other areas.

[50] In Annex 6

(277) Annex 6 contains tables reporting data for all defined metrics for all four areas of exploration, while the charts in this Chapter capture only the most relevant metrics. Usually the performance metrics are presented one by one to make easy the regional comparisons. Occasionally, metrics are presented in combination in the same chart to provide a more meaningful understanding of price comparisons (e.g. TSO Buy and Sell prices, Long and Short Imbalance cash-out prices, TSO transaction volumes versus imbalance quantities of network users or in the case of representing the two values of net financial and net adjusted financial neutrality).

### 7.2.1 TSO Balancing Actions

(278) Key metrics for comparison (annual measures) are:

1) Total Balancing Action Quantities (GWh);
2) Total Balancing Action Quantities (expressed as a % of zone entry quantities);
3) Percentage of Total Balancing Action Buy Quantities (expressed over Total Balancing Action Quantities);
4) Numbers of days when balancing actions are taken;
5) Average Price of Balancing Action Buys;
6) Average Price of Balancing Action Sells.

#### *7.2.1.1 Explaining the key metrics*

(279) *Total Balancing Action Quantities*. They provide a measure of the extent to which a TSO/MAM can be considered residual. Absolute values depend on the size of the systems and therefore only offer an incomplete understating. Expressing the total balancing action quantities as a percentage of the zone entry quantities makes the values more comparable. Generally, a "low" level (below 1% of total throughput) might be considered good, but care needs to be taken not to be unduly simplistic in the assessment. There are trade-offs within the regime design. Very low levels of residual TSO activity might imply the imposition of greater responsibilities on network users that might be inappropriately burdensome. Similarly, higher levels might indicate that the TSO is making particularly easy for network users to achieve their objectives. Interpreting the results involves considering what range might be reasonable for a simple daily balancing regime. The idea would be to understand the rationale for values that might appear, at first sight, too high or too low.

(280) *Percentage of Total Balancing Action Buy Quantities over Total Balancing Action Quantities*[51]. They afford insights as to whether there are asymmetric risks or behaviours persistent within the regime. It may be that TSOs, in their residual role, act on both sides of the market with similar frequency and size of actions. The TSO's Buy actions should be within a range of 25-75% of total TSO actions. Such an approach, which highlights the potential deviations from the aforementioned expected range, should generate a deeper understanding about the interactions within the operation al of the balancing regime.

(281) *Numbers of days when balancing actions are taken*. Very low numbers might be very good news or alternatively indicate that the regime is too restrictive and that network users are being heavily constrained and facing too onerous balancing requirements. Similarly, if the TSO/MAM is acting almost every day and in significant quantities, then network users' discipline may be inadequate or it may be worth assessing whether such TSO actions are desirable or necessary.

(282) *Average Price of Balancing Action Buys/Sells*. It provides a simple measure of whether the TSO is buying efficiently and/or the TSO is transacting in an efficient market. Large buy-sell spreads may indicate that the TSO is in considerable distress in the market, even if the balancing action quantities are small. The spread

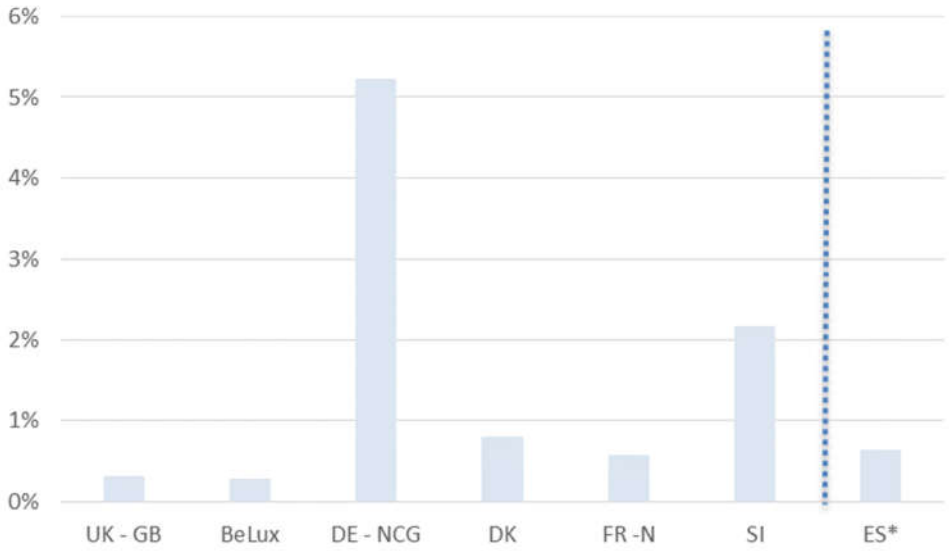
[51] The buy actions trigger higher imbalance prices than the sell actions and this is the reason why this metric was preferred over a similar one on the TSO sell actions.

might also provide an indication as to whether market liquidity is good. The real cost of TSO balancing is related to volumes multiplied by buy-sell spreads, so there are trade-offs that may be relevant to TSO decision-making, when taking balancing actions.

#### *7.2.1.2 Applying metrics for the cross-regional analysis[52]*

(283) Figure 7-1 reveals that the relative extent of balancing action quantity varies considerably between the analysed systems.

Figure 7-1: Total Balancing Action Quantities (% of zone entry quantities, GY 2015/16)




*Source: ACER*

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

(284) Even when normalised and expressed as a percentage of energy quantities entering the zone as in Figure 7-1, variations of TSO balancing actions are much larger than expected. For example, Great Britain and BeLux have around a 0.3% balancing action proportion compared to as much as 5.2% in NCG. The differences need careful consideration.

(285) For example, while in Great Britain and BeLux, the TSO balancing action proportions are very close, the operational regimes are very different. The British regime is more relaxed compared with the tight disciplines associated with the BeLux within-day obligations regime. The NCG outcome confirms a much higher TSO balancing action quantity, which needs to be considered in the context of the embedded services delivered within the NCG balancing system, such as the contribution towards the conversion service[53], and a balancing service in respect of NDM load[54]. Other countries lie between these extremes and consideration needs to

[52] For a quantitative analysis of all statistics, see also Annex 6.

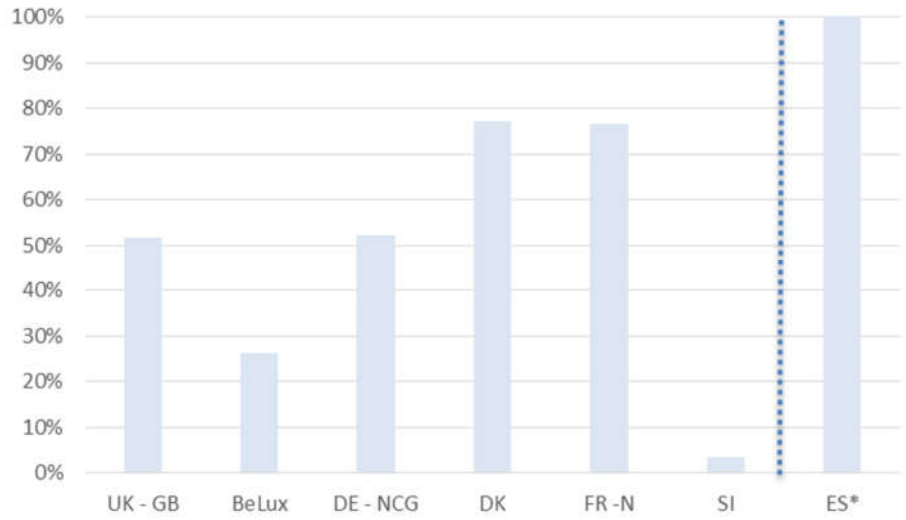
[53] Which provides a single balancing zone, rather than separate H- and L-cal zones, as for example occurs in BeLux.

[54] Whereby network users balance against a day-ahead NDM forecast.

be given as to whether performances close to that of Great Britain/BeLux might be achievable in different situations[55].

(286) The majority of the zones analysed indicate significant asymmetry in the TSOs balancing actions, as shown in Figure 7-2. The most extreme is Slovenia, where more than 96% of balancing activity is to sell gas off the system. Generally, where asymmetry exists, it should be investigated to establish whether the commercial regime is driving incentives that might be creating material distortions to the behaviour of network users.

Figure 7-2: Percentage of Total Balancing Action Buy Quantities (over all Balancing Action Quantities, GY 2015/16)



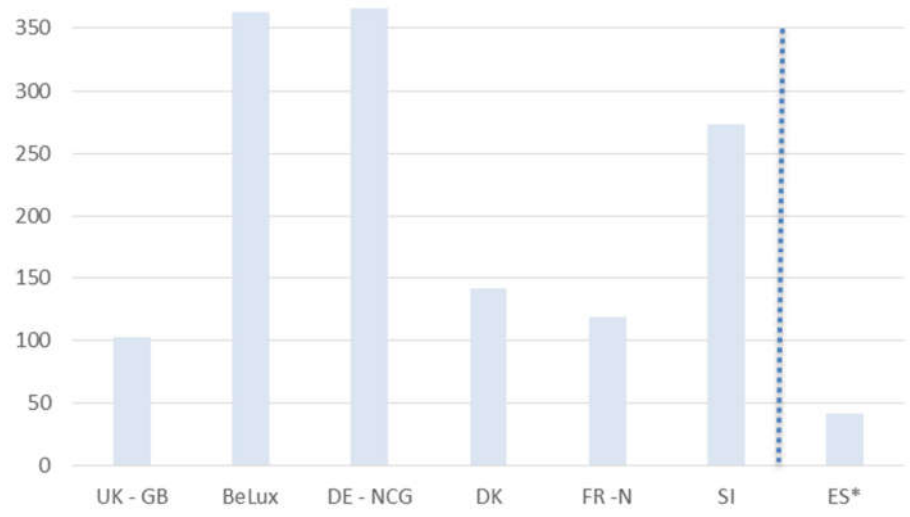

*Source: ACER*

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

[55] I.e. in the French network which has different topologies, or in Denmark and Slovenia, where the networks and consumer base are much smaller and higher proportions of TSO balancing actions might be inevitable.

(287) Figure 7-3 shows that the different approaches to balancing generate very different frequencies of balancing actions.

Figure 7-3: Numbers of days when balancing actions are taken (GY 2015/16)



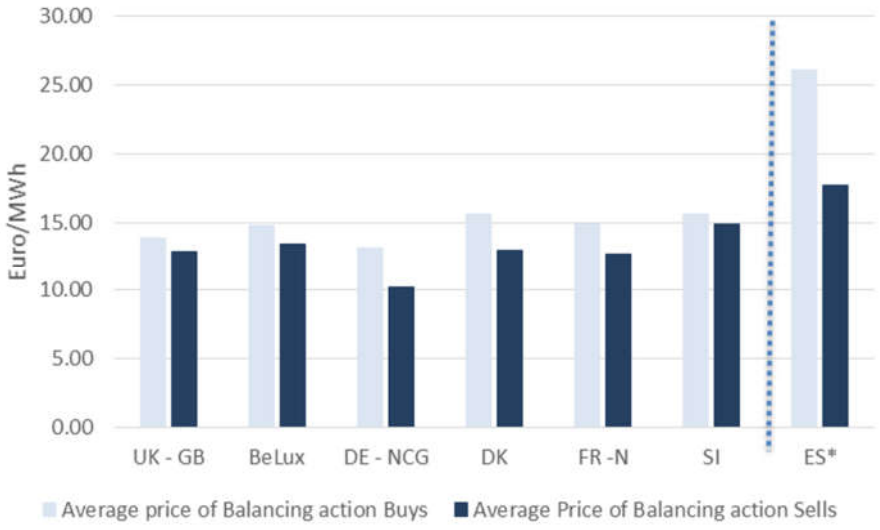

*Source: ACER*

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

(288) For example, the BeLux regime involves a balancing action taken every day to address the aggregated network user imbalance from the previous day. In BeLux, only a few days triggered within-day balancing actions. NCG takes balancing actions every day and on both sides, with every day often involving a range of different products within the merit order. In other countries, balancing actions are far less frequent, for example in Great Britain where balancing actions will only be taken when physically necessary.

(289) The average buy and sell price may give insights into the efficiency of the TSO's balancing actions.

Figure 7-4: Average Prices of Balancing action Buys and Sells (EUR/MWh, GY 2015/16)




*Source: ACER*

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

(290) All sample zones indicate that the TSO buys gas at higher prices than it sells it. In some situations, the differential is relatively modest (e.g. less than 1 EUR/MWh in Slovenia and Great Britain). However, in other countries the differentials are much larger, most noticeably in NCG. There may be merit in such zones to explore why the buy/sell spread is so high, because ultimately the differential generates costs in the regime that have to be paid by network users and ultimately borne by end-consumers.

(291) Specifically, there may be merit in thinking about how the various measures could be used to assess whether the relevant TSO is performing an efficient residual role.

### 7.2.2 Network Users' Imbalance Cash-out

(292) Key metrics for comparison (annual measures) are:

1) Total Imbalance Cash-out Quantities (Sum of Long and Short Positions, GWh);
2) Total Imbalance Cash-out Quantities (as a % of zone entry quantities);
3) Percentage of Total Network User Buys in the Imbalance Cash-out Quantity (is a percentage of all Network Users' Cash-out Quantity; Percentage of Short Positions);
4) Average Imbalance Long Cash-out Price (EUR/MWh);
5) Average Imbalance Short Cash-out Price (EUR/MWh);
6) TSO's Balancing Action Quantities (as % of Total Balancing Action Quantities plus Network Users' Imbalance Cash-out Quantities)

#### 7.2.2.1 Explaining the key metrics

(293) The first four metrics mirror the TSO's metrics and so many of the aspects described for TSO balancing translate across into this part of the analysis.

(294) *Total Imbalance Cash-out Quantities* sum up Long and Short Positions. This metric gives an absolute measure that could be assessed within the realities of the regime itself.

(295) *Total Imbalance Cash-out Quantities*, when expressed as a proportion of the quantities entering the zone, provide a measure of how well the network users are balancing.

(296) *Percentage of Total Network User Buys in the Imbalance Cash-out Quantity* (i.e. percentage of the end-of-day Imbalance Short Positions)[56], expressed as a percentage of Network Users' Imbalance quantities, indicates whether there is any bias in network user imbalance positions.

(297) *Average Imbalance Long and Short Position Cash-out Prices* capture the average prices for network users buying (i.e. addressing Short Imbalance Positions) or selling (i.e. addressing Long Imbalance Positions). The spread of prices may give an indication of the strength of the incentive to achieve balance.

(298) *TSO Total Balancing Action Quantities as a percentage of TSO Balancing Action Quantities plus Network User Imbalance Quantities* generates information about the relativity of the TSO action quantities compared to the commercial quantities passing through the neutrality mechanism. This measure is another device to consider the extent of the TSOs residual role in the context of the operation of the balancing regime.

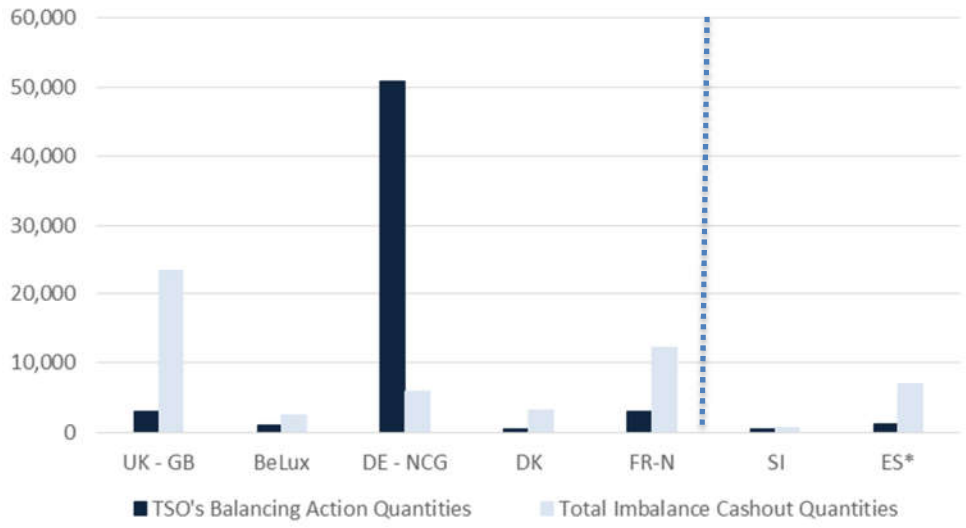
#### 7.2.2.2 Applying the imbalance metrics for the cross-regional analysis[57]

(299) Figure 7-6 contrasts the balancing action volumes of the TSO/MAM with the imbalances of the network users. While the network users' imbalances would show only a proportion of what network users exchanged during the Gas Day, it offers an insight about the dynamics of the market and the role the TSO plays in this market.

[56] Users buy at higher prices than sell and thus this metric was preferred over the one on users' long imbalance positions.

[57] For a quantitative analysis of all statistics, see also Annex 6.

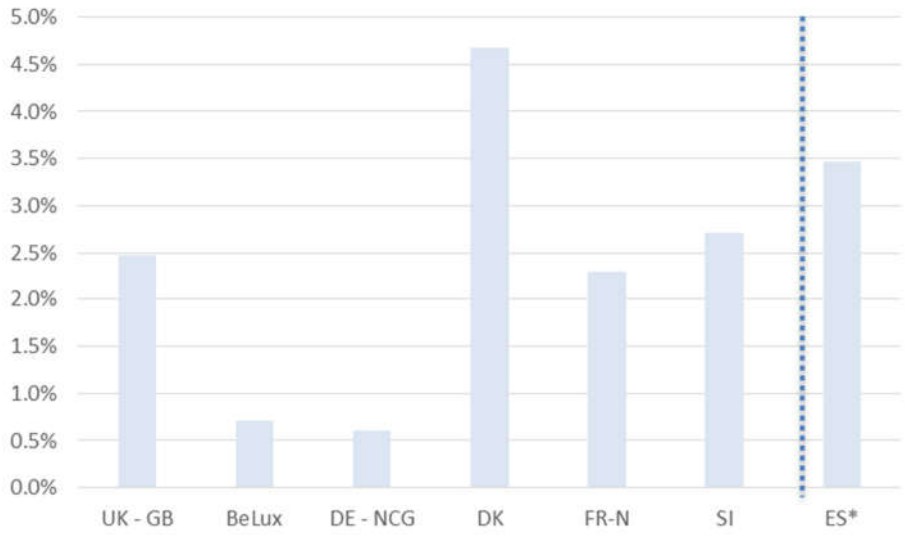
Figure 7-5: Total TSO's balancing actions and Network Users' Imbalances (GWh, GY 2015/16)




*Source: ACER*

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

Figure 7-6: Total Imbalance Cash-out Quantities (% of zone entry quantities, GY 2015/16)




*Source: ACER*

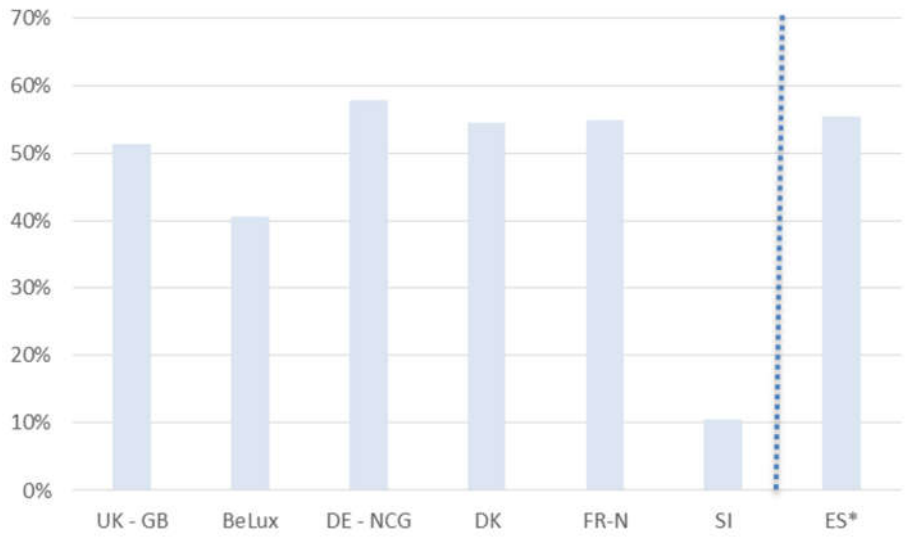
** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

(300) As shown in Figure 7-6, BeLux and NCG have the smallest levels of relative imbalance cash-out quantity, although this is probably attributable to very different reasons. BeLux includes a within-day obligation that provides incentives for network users to be very close to a balance within-day. Therefore, generally end-of-day imbalances are small. The NCG imbalances are calculated using a day-ahead forecast of NDM demand

in each network user's portfolio, so by construction the imbalances should be expected to be much lower than in those countries where network users are incentivised to balance against their actual demands on the day. France-N and Great Britain, both of which have daily balancing rules (i.e. without within-day obligations) have similar, albeit higher levels of imbalance. Imbalance levels are greater in Slovenia and Denmark, although this might be because the markets and the demand portfolios are smaller.

(301) Regarding network users' buy quantities, as shown in Figure 7-7 Slovenia stands out as a regime, where a high proportion of network user's cash-out quantity arise from an over-delivered position. The data for Slovenia indicates systematic bias in the imbalance position of network users, which needs to be considered in the context of the daily balancing incentives and the historic legacy.

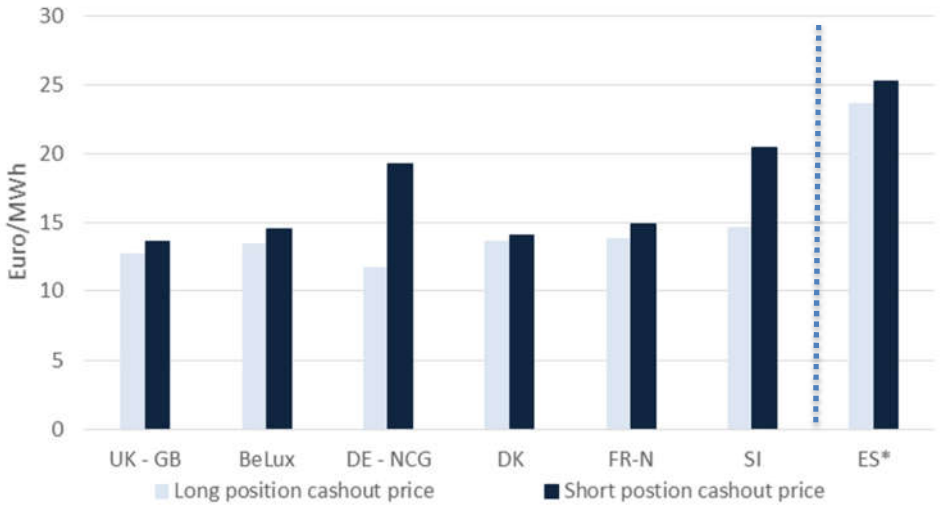
Figure 7-7: Percentage of Total Network Users' Buy Quantities (of all Cash-Out Imbalance Quantities, GY 2015/16)




*Source: ACER*

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

Figure 7-8: Network Users' Imbalance Cash-out average prices (EUR/MWh, GY 2015/16)



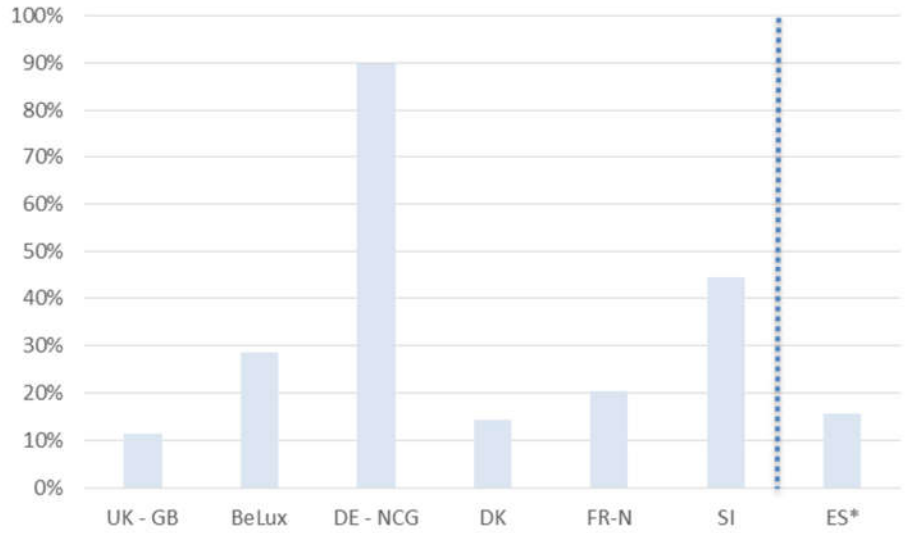

*Source: ACER*

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

(302) The average prices (Short and Long Position Cash-out Prices) in

(303) Figure 7-8 show that several countries have average price differentials just above 1 EUR/MWh, but with 2 notable exceptions. NCG exhibits a very large differential associated with an average network users' Short Position Cash-out Price of 19.32 EUR/MWh, against a Long Position Cash-out Price of 11.73 EUR/MWh. This provides a very strong incentive to balance, which may be another reason for the very low imbalance cash-out quantities, although it may be hard to justify differentials as large as 64%. Slovenia also displays wide variations that may warrant investigation and explanation in the context of how such widely differing average imbalance costs contribute to a well-functioning regime.

Figure 7-9: TSO balancing action quantities (% of total balancing quantities, GY 2015/16)




*Source: ACER*

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

(304) Concerning *TSO balancing action percentage*, as shown in Figure 7-9, NCG appears out of line compared with other countries. It is the only regime where the TSO is involved in greater balancing quantities than network user imbalance cash-out quantities. However, it has to be recognised that this may be an inevitable consequence of the regime design in Germany.

### 7.2.3 Neutrality

(305) Key metrics for comparison (all annual data) are:

1) Gross energy transacted (GWh);
2) Net energy position (GWh);
3) Absolute sum of cashflows for the 4 principal basic neutrality cashflows (thousand EUR);
4) Net financial neutrality (thousand EUR);
5) Net financial neutrality per unit of market volume (EUR/MWh);
6) Net adjusted financial neutrality per unit of market volume (EUR/MWh);
7) Maximum cumulative neutrality (unadjusted financial position) during the year (thousand EUR);
8) Minimum cumulative neutrality (unadjusted financial position) during the year (thousand EUR).

#### *7.2.3.1 Explaining the metrics*

(306) The range of metrics cover both gross and net quantities and cashflows, and act as a complement to the measures defined elsewhere, particularly in relation to TSO Balancing Actions and Network Users' Imbalance Cash-out Quantities. If all is functioning well, then the net effects on both quantities and cashflows should be small. Comparisons across regimes may afford insights that indicate relative performance across regimes.

(307) The maximum and minimum cumulative neutrality indicators should be carefully explored. It may be that seasonal variations correspond to either material linepack build/depletions within the balancing zone, or problematic gas accounting issues. Scrutiny is essential to ensure that the commercial regime is functioning well or that, at least, if there are significant net neutrality cashflows, the reasons are well understood. At the very least, NRAs and TSOs should monitor and assess these indicators on a regular basis.

#### *7.2.3.1 Applying the neutrality metrics for the cross-regional analysis*[58]

(308) *Gross energy transacted* represents the total quantities transacted via the four transactions (TSO/System Sells, TSO/System Buys, Network User Imbalance cash-out of long positions, Network Users' Imbalance Cash-out of Short Positions). It is the sum of the absolute size of the four individual energy flows, each summed over all days in the analysis period. The total flows should represent a small proportion of gas quantities transported in the system.

(309) *Net energy position* is the net position associated with the four energy transactions for the net commercial imbalance position, i.e. (Total System Buy Quantities plus Network Users' Imbalance Long Position Quantities) minus (TSO/System Sell Quantities plus Network Users' Imbalance Short Position Quantities).

(310) *Absolute sum of cashflows* represents the absolute sum of cashflows corresponding to the sum of the absolute values of cashflow associated with the four separate basic neutrality blocks (TSO/System Sells, TSO/System Buys, Network Users' Imbalance Cash-out of Long Positions, Network Users' Imbalance Cash-out of Short Positions).

(311) *Net financial neutrality position* represents the net sum of cashflows given by revenues minus costs from a neutrality perspective. Revenues arise from TSO/System Sells and Network Users' Imbalance Short Positions. Costs arise from TSO/System Buys and Network Users' Imbalance Long Positions. A net positive value indicates that neutrality has generated a cash surplus that should then lead to a refund, or credit, to be attributed to network users. Where the net value is negative, it implies a cost to be recovered via an attribution to network users.

(312) *Net financial neutrality position per unit of market volume* represents the neutrality charge rate assuming that the net neutrality is attributed to a base equivalent to the quantity of gas entering the system during the analysis period. A positive value indicates that the network users receive a credit, while a negative that the neutrality mechanism would imply a supplementary charge.

(313) *Net adjusted financial neutrality position per unit of market volume* provides a refinement of the previous metric, since the adjustment allow to obtain a volume-neutral metric, by attributing financial value only to the unmatched purchased (or sold) volumes.

(314) *Maximum and minimum cumulative neutrality* indicate the maximum and minimum values of the cumulative neutrality position over the analysis period. This indicator, in conjunction with the relevant graphic about daily cumulative neutrality, provides an important diagnostic on whether there is any material seasonality or within year trends in net revenue/costs generated by the four energy flows in the neutrality regime.

Commentary[59]

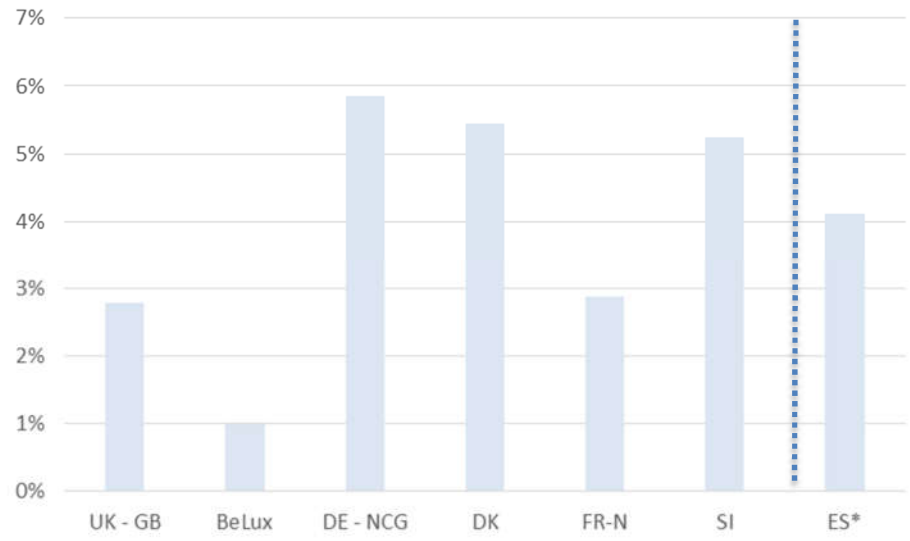
(315) Figure 7-10 shows considerable variation, in absolute terms, in the total gross energy transacted. When gross quantities are assessed in the context of market size, BeLux, perhaps due to the tight disciplines associated with its within-day regime, ranks the lowest with quantity representing approximately 1% of entry

[58] Supporting material available in Annex 3

[59] For a quantitative analysis of all statistics, see also Annex 6.

volumes. Great Britain and France-N, both of which are large systems with high throughputs, have neutrality quantity transactions representing 2.8% and 2.9% of entry quantities, respectively. The others have larger proportions: for example, Denmark 5.4% and Slovenia 5.2%, which may be attributable to size of zone (both network topology and throughput) and/or reflecting early stage of development of balancing regime. NCG at 5.8% probably reflects variant 2-information model implementation choice.

Figure 7-10: Gross energy transacted (% of market entry volume, GY 2015/16)



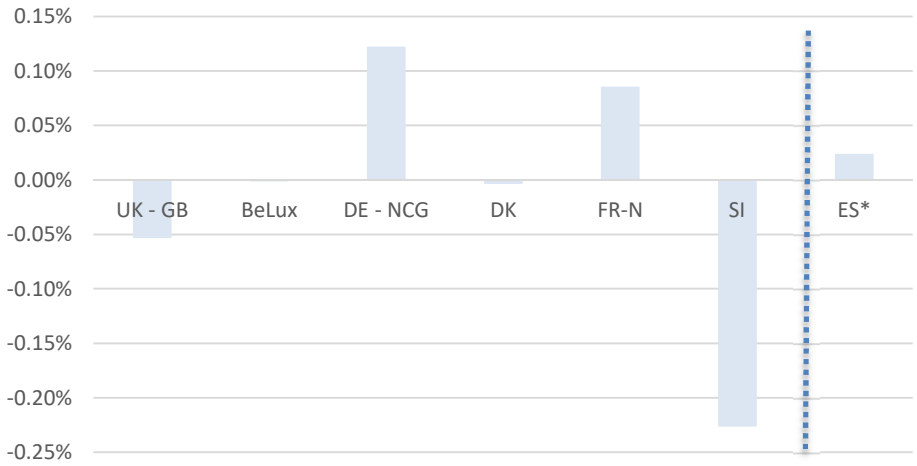

*Source: ACER*

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

(316) Figure 7-11 shows the net position associated with the four energy transactions and is consistent with the sign convention used in this Report for the net commercial imbalance position[60]. The net position should be very close to zero over the analysis period unless there is a significant change in linepack level or there are considerable gas accounting issues. The acceptability of the net quantity position needs to be considered in the context of the local circumstances. NRAs/TSOs should consider how close to zero they might expect the neutrality.

[60] I.e. Total System Buy Quantities plus Network Users' Imbalance Long Position Quantities less TSO System Sell Quantities plus Network Users' Imbalance Short Position Quantities.

Figure 7-11: Net energy position (% of market entry volume, GY 2015/16)

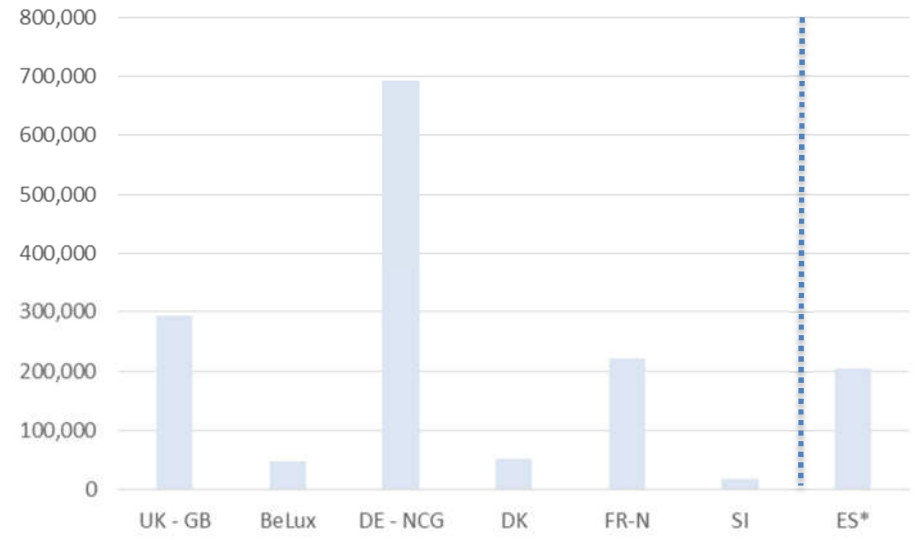



*Source: ACER*

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

(317) Figure 7-12 highlights a wide range of gross cashflows, which is worth careful consideration, given that net figures can mask many features of regime performance. The NCG cashflows are the highest, which is probably attributable to the variant 2-information model, where network users effectively balance against the day-ahead forecast of NDM load.

Figure 7-12: Absolute sum of cashflows (thousand EUR, GY 2015/16)

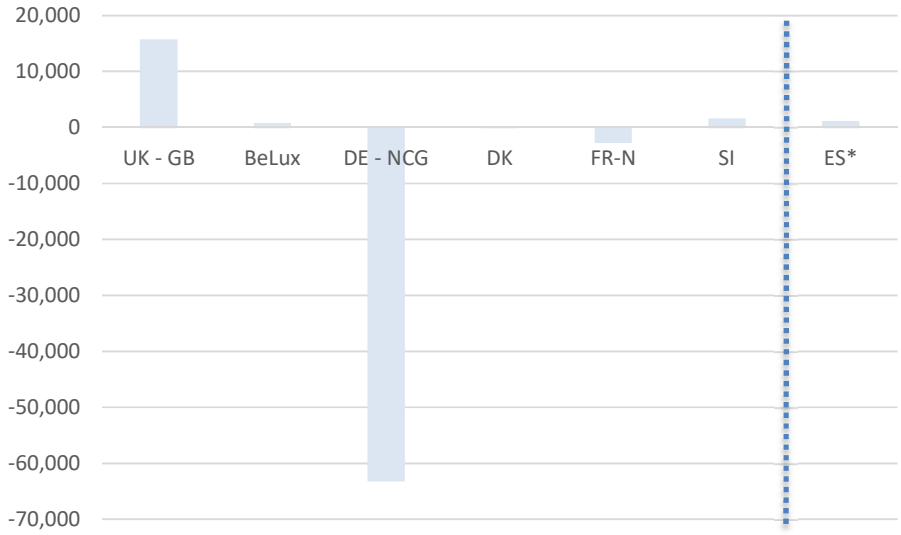



*Source: ACER*

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

(318) Figure 7-13 shows that the net financial neutrality position varies considerably between the analysed cases. While Danish position is close to zero, and the BeLux, French-N and Slovene net financial neutrality positions are in a range of +/- EUR 2.5 million; there are two outliers: Great Britain, which shows a positive net cashflow of nearly EUR 16 million (revenue), and Germany - NCG with EUR 60 million (cost). The latter case can be partly explained by the application of the variant 2-information model in Germany.

Figure 7-13: Net financial neutrality position (thousand EUR, GY 2015/16)



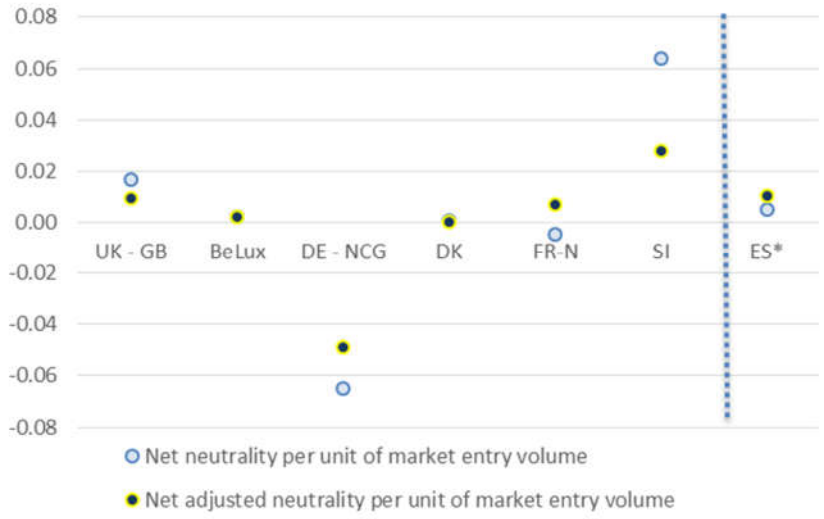

*Source: ACER*

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

(319) Figure 7-14 displays the diversity of the overall average credit or charge derived from neutrality, assuming it is levied at a uniform rate over entry quantities. Slovenia generates the highest credit rate, NCG the highest charge rate. Other zones have intermediate values, which generally might be considered to provide relatively modest levels of charge or credit neutrality rates. The charging rates in Figure 7-14 reflect the visible costs in the balancing regime, but in no way can recognise any internal risk management costs that become embedded within network users' businesses. Such embedded costs might be inappropriately large if, for example, end-of-day balancing incentives were too strong (large price differential thanks to the applied values of the small adjustments) or if within-day obligations generate high risk management costs within network user businesses.

(320) The adjusted neutrality unit measure, which is volume neutral (dark blue dots), shows that values are moving closer together on average along with a lower variance across values in the balancing zones analysed.

Figure 7-14: Net financial and net financial adjusted neutrality per unit of market volume (EUR/MWh, GY 2015/16)

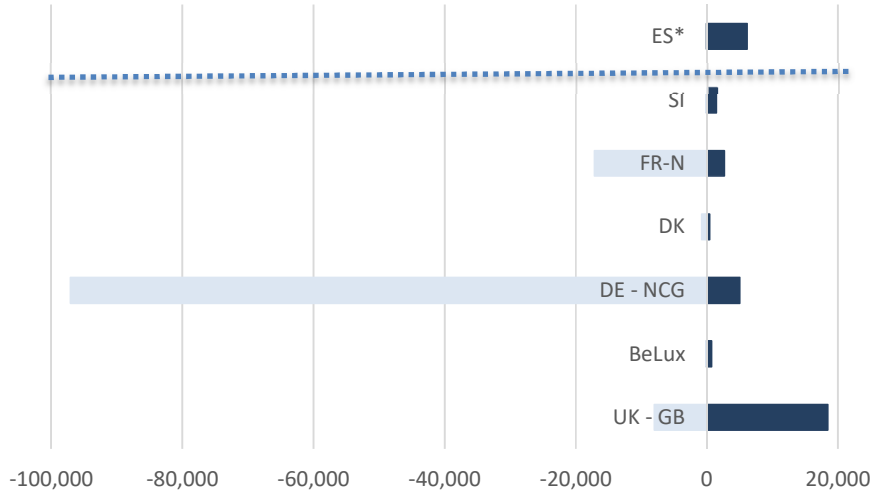



*Source: ACER*

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

(321) Figure 7-15 provides evidence of the maximum and minimum cumulative financial neutrality positions over the analysis period. These indicate that all sample zones do exhibit periods within the analysis period, where neutrality generates revenues or costs. The swings are substantial in many zones, for example more than EUR 26 million in Great Britain, which is smaller than EUR 100 million in NCG, but more than EUR 19 million in France-N.

Figure 7-15: Maximum and minimum cumulative neutrality (thousand EUR, GY 2015/16)




*Source: ACER*

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

(322) Overall, the neutrality measures explored above may provide valuable insights into the functioning of individual regimes and comparisons across regimes. It may be helpful for stakeholders periodically to review these summary indicators together with some of the data and graphics used in the individual country analysis included in Chapter 6 and discuss it with their TSOs.

### 7.2.4 Linepack levels: the relationship between physical linepack and commercial imbalances

(323) The preparation of the first Report highlighted that transparency about linepack is a sensitive issue in many countries. However, the commercial framework of the balancing regime does not exist in a vacuum. Linepack fluctuations will occur both day-on-day and within day. Linepack will vary because of the functioning of the commercial regime and, in some regimes, because of other influences (e.g. where a TSO takes action outside of the commercial balancing arrangements to manage linepack levels for operational purposes).

(324) Opinions vary as to the extent to which the community of users should have access to available linepack flexibility. Some regimes allow access to very limited flexibility. This appears to keep costs in the balancing regime low, but may in fact bury considerable costs in network user operational flows and risk management activity. Zones that allow substantial access to available linepack need to be wary that such access does not increase the visible costs of balancing in a material way, particularly if those costs cannot be accurately targeted at those causing those costs.

(325) The *Balancing Analytical Framework* therefore seeks to obtain information about both physical linepack positions, as well as deriving what effect the operation of the commercial framework might have on physical linepack in the system so that the two might be compared.

(326) There may be reasons why actual day-on-day linepack changes may be different to those attributable to the commercial functioning of the regime and therefore there is merit in NRAs/TSOs/stakeholders keeping these under review.

(327) This year's analysis in this area is rather limited because the Agency has very limited data to work on. The release of further data and open discussion about the issues raised about commercial regime functioning and its links to the availability of linepack flexibility within the zones is further encouraged.

(328) Key metrics used for this analysis include:

1) Highest opening linepack level (mcm or GWh);
2) Average opening linepack level (mcm or GWh);
3) Lowest opening linepack level (mcm or GWh);
4) Highest absolute linepack day-on-day change (mcm or GWh);
5) Average absolute linepack day-on-day change (mcm or GWh);
6) Highest absolute net daily commercial imbalance position (GWh);
7) Average absolute net daily commercial imbalance position (GWh);
8) Highest expected commercial regime impact on absolute linepack (GWh);
9) Average absolute commercial regime impact on absolute linepack (GWh).

#### 7.2.4.1 Explaining the metrics

(329) Having data available on the daily opening linepack position, and therefore day-on-day linepack changes, provides valuable information about the extent to which linepack varies within each zone. If network users balance every day, then this would typically leave opening linepack levels at the same level throughout the year. TSOs may want to vary linepack throughout the year and this could be done by taking balancing actions, or in some zones, TSOs use other tools and gas resources. Understanding the seasonality of linepack levels and maximums and minimums may provide valuable insights into the extent of flexibility available in the system.

(330) Highest and average net daily commercial positions are derived from the net position associated with the combination of aggregated network users' imbalances and TSO's balancing actions. A fuller explanation, and exploration of associated issues, is available in Annexes 2 and 3.

(331) As a starting point, the cumulative net daily commercial imbalance position starting from a zero reference point at the start of the data set (Gas Day on 1 October 2015) is calculated. The highest and lowest cumulative position values are derived over the period covered by the analysis. As explained in Annex 4, this data provides a measure of the expected range of linepack positions during the gas year attributable to the operation of the balancing regime.

(332) Some TSOs will measure linepack in volumes, others in energy. Conversion factors, to enable direct comparison, are unlikely to be critical because inter-regime differences will be much greater than any error associated with unit conversion.

(333) Exploring differences between regimes will be helpful in understanding different approaches to balancing. Specifically, the regime design needs to recognise the circumstances under which "linepack" can vary (including seasonally in many regimes). Different approaches may stem from different network characteristics, design and hub status. Understanding the most effective way to make an appropriate amount of linepack flexibility available to network users and efficiently support regime functioning is important.

#### 7.2.4.2 Applying the linepack metrics for the cross-regional analysis[61]

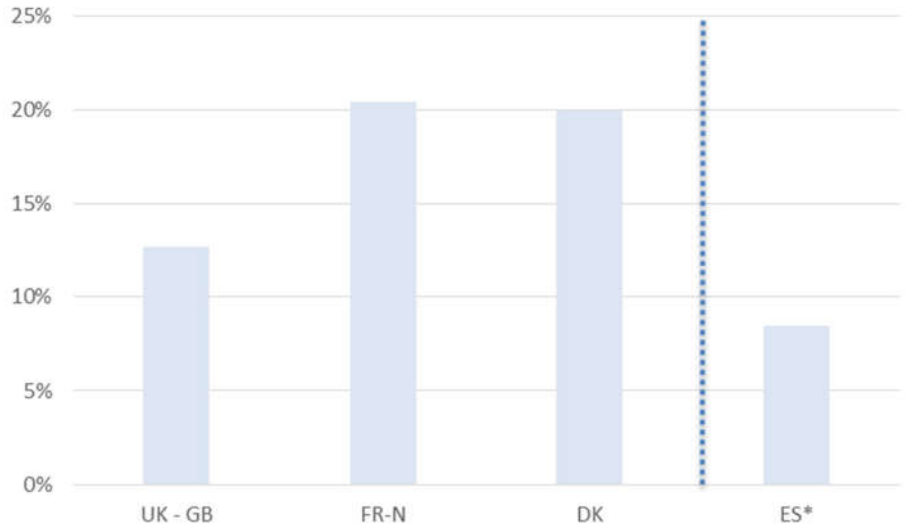
(334) Information about opening linepack levels is available for a subset of our sample zones. A few summary statistics have been derived and these have been used as the basis for comments. However, this remains an area of rather low transparency.

[61] Annexes 2 and 3 provide background information to the analytical framework and specifically to the issue associated with the comparison of linepack and commercial positions.

### Commentary[62]

(335) Figure 7-16 provides summary information on the widely varying levels of linepack in the zones, as well as the extent of variation in the opening linepack values in the zone. France displays the widest variation, with its peak opening linepack variation representing 20% of its average linepack level, whereas Great Britain's range is much smaller, with 13%.

Figure 7-16: Peak opening linepack variation (% of average linepack level, GY 2015/16)



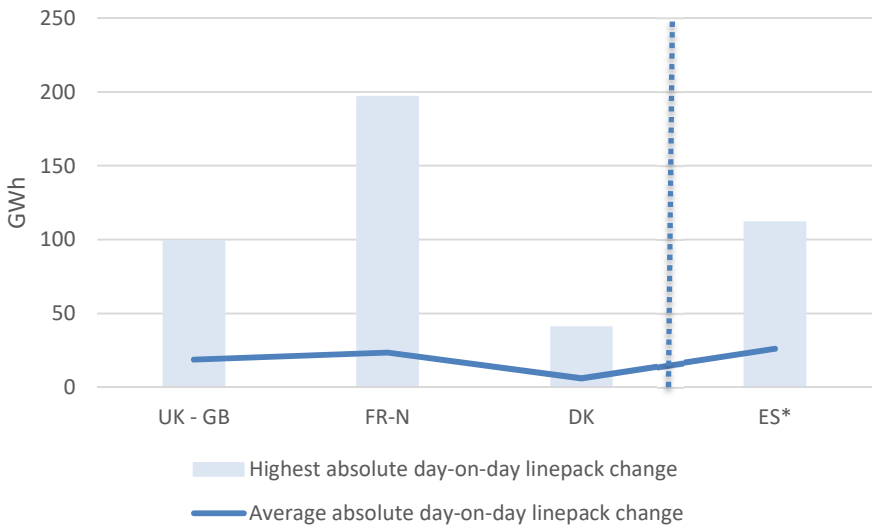

*Source: ACER*

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

[62] For a quantitative analysis of all statistics, see also Annex 6.

(336) Figure 7-17 provides insights into the extent to which actual day-on-day linepack varies in the relevant balancing zones. These numbers indicate considerable variability in both average day-on-day linepack change and in the largest day-on-day change observed. This variability informs about, under some circumstances, the extent to which zones can absorb substantial imbalances, e.g. of as much as 197 GWh on one day in the case of France-N. Whether and, if so, how these imbalances are addressed (either the next day or over a longer time period) might provide an indication of how much flexibility might reasonably be available in the system.

Figure 7-17: Highest and average absolute day-on-day linepack changes (GWh, GY 2015/16)

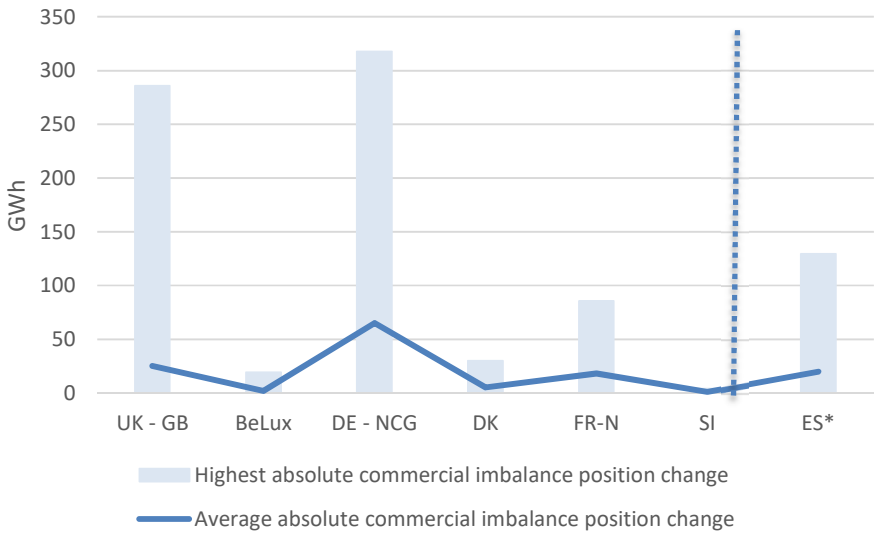



*Source: ACER*

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

(337) Figure 7-18 provides information about how much the balancing regime (i.e. the combined effect of network users and the TSO's actions in its residual balancing role) contributes to the day-on-day linepack change. While the NCG result suggests the largest impact, care needs to be taken in the interpretation, given the nature of the German (NCG) balancing regime and specifically its use of the variant 2-information model, where the larger bias are due to the seasonal biases of the NDM forecasts. BeLux has the smallest variations implied by this measure, although this may be partly attributable to the application of the within-day obligations regime, which could be expected to have a knock-on effect on daily balancing, given that the green zone is small. Linepack changes, which the TSO may trigger, will not be reflected in the commercial position analysed, where BeLux TSOs manage linepack using tools other than those classified as STSPs within the Code. Whilst Great Britain has experienced within-day linepack depletions of more than the highest absolute imbalance change displayed here, it is not clear that it has sustained any day-on-day linepack change as large as this, so the data point plotted may reflect data errors.

*Figure 7-18 Highest and average absolute commercial imbalance position change (GWh, 2016)*

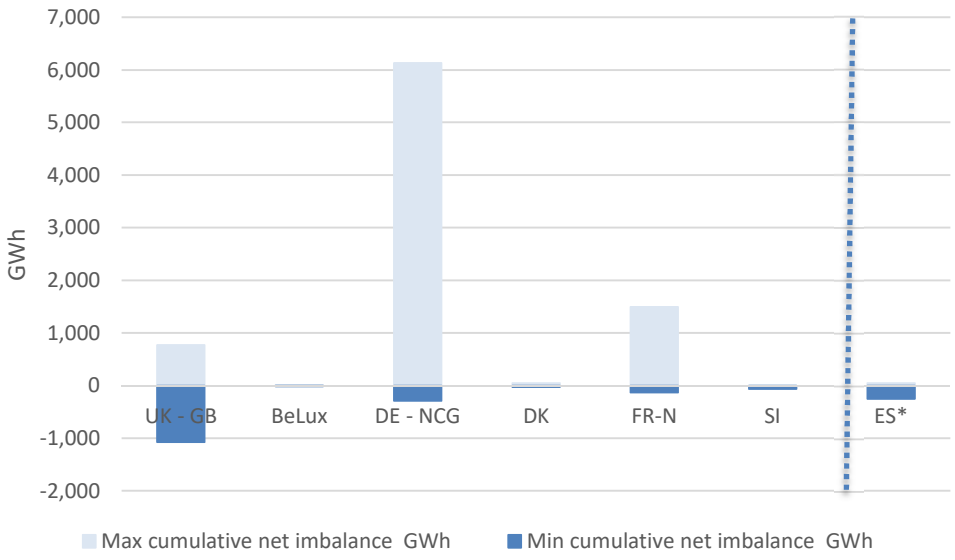



*Source: ACER*

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

(338) Figure 7-19 indicates the maximum and minimum cumulative positions of the daily commercial imbalance position observed during the period. The NCG values need to be interpreted in the context of the German regime (NCG) and are not further explored here. The British values indicate a substantial swing occurring over the year, although data issues cast considerable doubt about the validity of this observation. The BeLux regime indicates very low day-on-day changes and therefore the cumulated values are very small, although this reflects both the structure and operation of the BeLux balancing regime and that these commercial effects will not map to what may be going on physically within the system.

Figure 7-19: Maximum and minimum cumulative net imbalance (GWh, GY2015/16)




** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

## 7.3 High-level policy implications from the Balancing Analytical Framework

(339) NRAs/TSOs need to be encouraged to watch basic neutrality as a key indicator of not only wider regime performance, but also to ensure that robust gas accounting is taking place within the regime.

(340) Greater transparency on linepack might allow much greater understanding of the consequences of different balancing regime design options. In later editions of the Report, it may be appropriate to seek additional data and to cover more countries with this part of the analytical framework.

(341) Discussions on what one might consider to be residual values for TSO balancing actions, as well as how close to zero the neutrality account may be expected to close taking account of local circumstances, would be worthwhile to pursue with the involvement of stakeholders.

## 7.4 Way forward: how the analysis could be used

(342) The Agency believes that the *Balancing Analytical Framework* will help assess the effectiveness of balancing regimes. The Agency encourages NRAs, TSOs and stakeholders to analyse data using the full range of measures proposed in the *Balancing Analytical Framework*. A key objective should be to assess to what extent balancing regimes are functioning effectively, given local circumstances. When using indicators and drawing conclusions from them, it is important that the characteristics of each balancing regime is understood.

(343) The aspiration is that the analyses presented in Chapters 6 and 7 will be extended to cover a wider range of countries in subsequent reports, wherever NRAs/TSOs are willing to supply information and to engage in interpreting of the derived measures. In addition, the interpretation of the output requires careful consideration given the complex interactions within each balancing regime.

# Part III: Update analysis of the implementation of the main features of the Code

# 8. Operational Balancing

(344) This section explores the role played by TSOs in balancing markets on two aspects: the merit order in place, and the balancing actions. The first Report explains the rationale behind both concepts[63].

(345) The TSO's balancing actions must be consistent with the merit order advocated in the Code. The use of title products should be prioritised over any other STSPs or balancing services. Some progress was made during the last year regarding setting appropriate merit order lists and clarifying volumes and costs of TSO's balancing actions. The Agency recommends TSOs and NRAs to make additional effort to provide full transparency in this respect.

## 8.1 Merit order analysis[64]

(346) Table 8-1 contains a list of all products offered based on Article 9 of the Code. It shows the different merit orders adopted in the different balancing systems, grouped by clusters according to the adopted date of entry into force.

63 http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER%20Report%20on%20the%20implementation%20of%20the%20Balancing%20Network%20Code.pdf

64 Source: ENTSOG data verified by the NRAs.

Table 8-1: Merit orders adopted by the Member States (2017)

| Platform and products | | Cluster 2015 | | | | | | | | | Cluster 2016 | | | | | Cluster 2019 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Trading Platform** | | AT | BELUX | DE | DK | FR-N | HU | NL | SI | UK-GB | CZ | ES | HR | IT | PT | BG | EL | IE | LT | PL | PL_T | RO | SE | SK | UK-NI |
| **Title** | within day | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | * | * | | | 1* | 1 | | | | | |
| | day-ahead | | | 1 | | | 2 | | 1 | | 2 | 2 | 1 | 3 | * | * | | | 2* | 2 | 1* | * | | | |
| **Locational** | within day | | | 2 | | 2 | 3 | | | 2** | | 3 | 2 | 2 | * | * | | | | | | | | | |
| | day ahead | | | 2 | | | 4 | | | | | 4 | 2 | 4 | * | * | | | | | | | | | |
| **Temporal** | within day | | | 2 | | | | 2 | | | | | | | | * | | | | | | | | | |
| **Trading with adjacent zones** | | | | 2 | | | | | | | 3 | | | | | | | | | 4* | 2* | | | | |
| **Balancing Platform** | | | | | | | | | | | | | | | | | * | | | | | | | | |
| **Title** | | | | | | | | | | | | | | | | | | | | | 3* | | | 1 | |
| **Locational** | | | | 3 | | | | | | | | | | | | | | | | 3* | 4* | | | | |
| **Balancing services** | | | | 4 | | | | | 3 | | 4 | | 3 | 5* | * | 1 | 1 | 1 | 3 | 5** | | 1 | | 2 | 1 |
| **Options designed nationally: weekly trades** | | | | | | | | | | | | | | | 1 | | | | | | | | 1 | | |

planned * not used ** rarely used

PT: similar merit order as ES in order to use the Mibgas Platform. Until then, weekly trades.

SE: planned merger with the DK balancing zone by April 2019.

IE: planned Trading Platform by end of 2017

PL_T: WD products are planned

*Source: ACER based on ENTSOG data collection and own search via NRAs*

(347) The first cluster groups Member States that have implemented the Code by October 2015. The second cluster groups Member States with transitory measures. The third cluster groups Member States with interim measures.

(348) *Cluster 2015* – There are significant differences in the application of the Merit Order List (MOL). Six Member States allow for a broad set of options. Only three Member States (Austria, BeLux and Denmark) have foreseen title products only in their merit order. Despite the longer MOL, seven balancing zones use title products most of the time. For example, Great Britain has locational products in the merit order, but in practice, it relies exclusively on within-day title products. Some volumes of balancing services were used in Germany and Slovenia.

(349) *Cluster 2016* - Member States in cluster 2016 have introduced by now all essential elements of the MOL. Title products proved effective in the Czech Republic, Spain and Italy. The MOL implementation in Croatia cannot be fully assessed at this stage. Some of these regimes foresee supportive tools like balancing services (Croatia), storage market (Italy) or flexibility market (Czech Republic).

(350) *Cluster 2019* - No or little progress has been made. There will be a new trading platform in Ireland and perhaps a Balancing Platform established in Greece by the end of 2017. The high-methane zone in Poland follows up closely its interim measure plans with a view to abolish them in 2019. In most countries belonging to this cluster, a major effort in favour of market reforms would be required in order to satisfy both the TSO and network users' balancing requirements by April 2019. Most TSOs have still to perform the necessary steps to try to stimulate the market, including the formulation of robust migration strategies under interim measures reports. In certain cases, many products in the MOL exist only in a legislative text, but not in the market offer. The use of balancing services is characteristic to most balancing regimes in this cluster.

(351) The use of balancing services is not homogenous across Member States. Eight balancing zones do not rely on these measures. Some Member States did not provide clear information about the use of balancing services. Within the twelve Member States using balancing services, this instrument plays a more or less prominent role in the merit order: six balancing zones show a limited reliance on balancing services, as they are used as a last resort; the other six balancing zones rely on balancing services exclusively or as a first choice[65].

(352) One emerging issue is the procurement of balancing products in adjacent balancing zones. Products from adjacent balancing zones are competing with each other. However, these merit orders may differ and the trading activity across adjacent zones might not be placed at the same level in the different MOLs[66]. The easiest way to solve this issue would be that network users perform all cross-zonal trading activity. Therefore, the Agency recommends that TSOs strive to provide network users access to flexibility from adjacent systems without the need of TSO intervention.

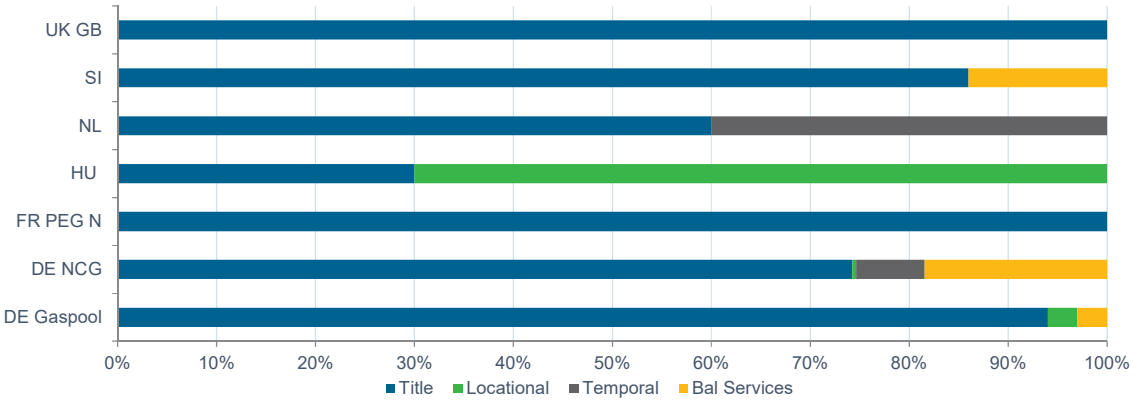
## 8.2 Balancing actions analysis

(353) The use of locational or temporal products is envisaged in the Code to reflect local circumstances. The preference is to prioritise the use of title products. This chapter provides a quantitative analysis of the operational use of the balancing products available to the TSO. Data collected regarding the operational balancing of the TSOs only allowed conducting the analysis for the 2015 cluster.

(354) The countries where the merit order is homogeneous and which use only title products are not analysed in this breakdown. This concerns Austria, BeLux and Denmark (where only title products are used). Great Britain is part of the analysis, as the merit order includes locational products, although those are rarely used.

(355) Figure 8-1 provides the proportions of products used among those available to the TSO via the MOL in the respective Member State.

Figure 8-1: Proportions of used products available to the TSO via the MOL in the respective member state (GY 2015/16)




[65] Beside the systems listed in the paragraph, Sweden has interim measures that would not constitute a balancing service, yet the products applied would not satisfy the requirements of daily balancing (weekly trades).

[66] For example, in Gaspool - DE products compete with WD title products from CZ, as well as WD and DA title products from PL.

*Source: ACER elaboration based on ENTSOG data collection*

(356) Great Britain and France-N are *de facto* operating with title products only. In Hungary and the Netherlands[67], the TSOs used a high share of locational and temporal products, respectively. In the Gaspool market area in Germany, the use of balancing services is limited.

(357) In Germany, both balancing zones follow the same rules and MOL. Yet the two MAMs are operating differently. In the Gaspool market area, 94% of the balancing gas volumes sourced by the MAM were title products. In the NCG market area, the title products share is below 75%. From May 2016, NCG does not use balancing services anymore. Exchange-based temporal products replaced them. The reason for the differences between the two German zones is likely due to the interaction of network users' behaviour and the different technical parameters of the two networks[68]. The NRA, BNetzA, which is best positioned to assess the detailed operation of the two balancing systems, should follow up the evolution of both balancing regimes.

## 8.3 Conclusions of the analysis on merit order and balancing actions

(358) Little progress was made over the last year regarding the merit order and TSO's balancing actions. Access to data remained an issue. The Agency integrated several data sources to provide a reliable assessment. A high level of transparency is key to increase network users' confidence in the balancing regimes, since they ultimately bear the consequences of TSO's residual balancing actions.

(359) The implementation of the merit order shall be fully transparent and the Agency will provide further insights into regimes functioning in its subsequent editions of its monitoring reports.

[67] Due to the nature of the NL regime.

[68] Including those parameters that determine the MAM's balancing actions.

# 9. Information provision

(360) According to the Code, network users have the responsibility to balance their daily portfolios. The Code aims to support the network user in managing its market risks and opportunities in an appropriate and cost efficient way. To enable network users to do so, the Code sets minimum requirements for information provision.

(361) While the first Report explained the importance of information provision in general, this Report covers the information provision associated with linepack, and how inputs and off-takes are forecasted.

(362) The Agency observes a very mixed success regarding information provision. The Code provides for a minimum level of information that might be consistent with proper market functioning. According to ENTSOG's survey, 26 TSOs/MAMs out of 30 that self-assessed themselves, and indicated having implemented all information provisions. The TSOs' answers were crosschecked by the NRAs. The Agency however has been unable to find evidence that such a high level of compliance has been *de facto* achieved.

(363) The Agency however notices that some Member States start from a situation where only minimum levels of information are provided. While this may comply with the legal requirements, network users have indicated that more comprehensive information and a higher frequency of information provision would better assist the development of the short-term market.

(364) The Agency notes that not all balancing regimes have a properly functioning NDM attribution. Even those that have this process in place have not yet delivered the performance assessment reports or completed cost-benefit assessments on the information model used. The work in this area needs to continue in the following years. It is also unfortunate that, in some countries, the NRA has not yet assigned the responsibilities for the different parts of the process (e.g. forecasting parties are not appointed).

(365) Finally, the Agency recognises that there are different views on the meaning of the legislation, in particular about the linepack transparency[69].

## 9.1 Information about the linepack and the overall status of the transmission network

(366) The main provision on information about linepack and the overall status of the transmission requires TSOs to publish the amount of gas in the transmission system at the start of each Gas Day and to hourly forecast and publish the amount of gas in the transmission system at the end of each Gas Day. Where within-day obligations apply, hourly updates are necessary. Alternatively, TSOs shall publish the aggregate imbalance position of all users at the start of the balancing period and the forecast of the aggregated imbalance position of all users at the end of each Gas Day.

(367) Roughly, one third of the Member States provide the information about linepack[70]. While the network users would benefit from hourly data about and updated forecasts, the Agency sees rudimentary daily information in many Member States.

[69] The general rule states that TSOs shall publish the amount of gas in the transmission system at the start of each Gas Day and the forecast of the amount of gas in the transmission system at the end of each Gas Day and update this information on an hourly basis. Alternatives apply. (Article 32(1) of the Balancing Network Code and point 3.4(5) of Annex I to the Regulation (EC) No. 715/2009).

[70] The country assessment sheets in the second volume shed light on the zones where this information is missing and provides useful links in this respect.

(368) Regarding the publication of linepack, the first challenge is to agree on what kind of information TSOs would need to publish. Through the debates about the national implementations[71], the Agency identified three approaches which are applied to how the publication of linepack information is approached:

- The first is to publish the overall gas volume in the pipeline system. This approach reflects best the generic rule provided by the Code.
- The second is to publish the available linepack flexibility (the part of the gas volume in the system, which the network users could still use).
- The third option is not to provide any linepack related data, but to provide only the aggregated imbalance position of users (alternative rule provided by the Code).

(369) In this Report, the Agency explains why linepack volumes would deserves publication[72].

## 9.2 Information about inputs and off-takes of the system

(370) The Code has a full chapter on information provisions and brings forward a set of rules on when and how information should be provided concerning intraday-metered inputs and off-takes, daily-metered off-takes, non-daily metered off-takes, inputs and off-takes after the Gas Day.

(371) The Code requires DSOs to provide necessary data for information provision, regardless of whether the distribution system is part of the respective balancing zone. In nine countries, DSOs do not provide the TSOs with the necessary information.

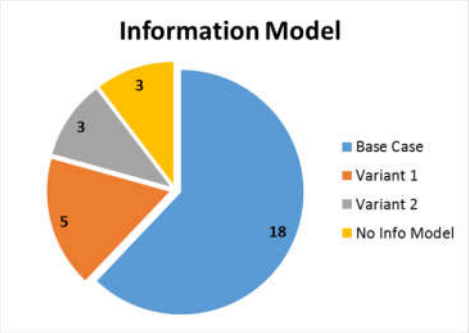
(372) The Code identifies three different information models. Each model has different standards for information frequency, as follows:

- '**base case**' where the information on NDM off-takes consists of a day-ahead and within-day forecasts. Some models provide 4-5 forecasts updates to network users.
- '**variant 1**' where the information on NDM and daily metered off-takes is based on apportionment of measured flows during the Gas Day. These models in practice offer frequent, hourly updates in Belgium and the Netherlands.
- '**variant 2**' where the information on NDM off-takes is a day-ahead forecast. This model is applied in Germany and Portugal.

[71] See country assessment sheets in the second volume of this Report.

[72] Further information is available in Chapter 4 and 7 and in Annex 4.

Figure 9-1: Information models adopted in the EU

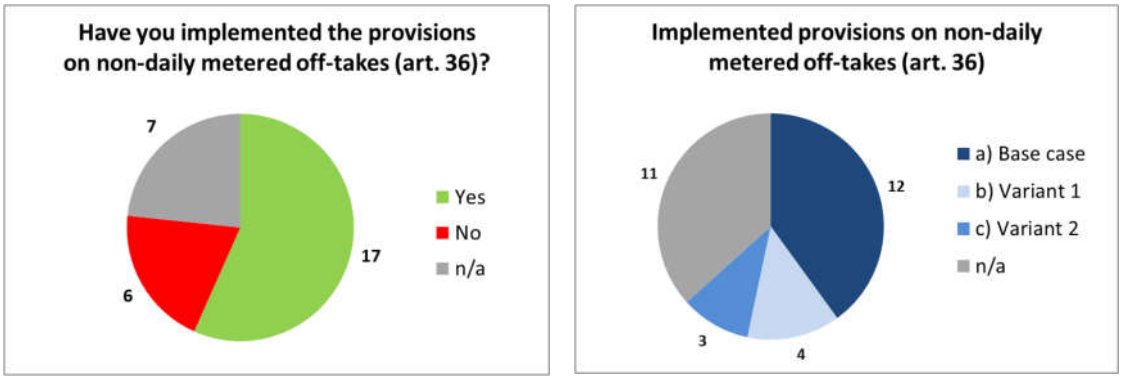



*Source: ACER's elaboration based on ENTSOG's data collection*

(373) Most TSOs in the European Union apply the base case model[73].

### 9.2.1 Information about non-daily metered off-takes

Figure 9-2: Implementation of the provisions of non-daily metered off-takes (IM Questionnaire 2016)




*Source: ACER's elaboration based on ENTSOG's data collection*

(374) The figures above display a summary of the responses received to ENTSOG's questionnaire[74]. About 43% of the TSOs stated that they have not implemented the provisions on NDM off-takes according to the Code. The reasons were various: lack of non-daily metered off-takes (Greece, Poland-TGPS, Slovakia), lack of interests from users (Sweden), absence of the information model (Croatia), under-developed legislation and/or market (Romania, Northern Ireland), changing to variant 1 model which is based on apportionments (Hungary).

[73] The country assessment sheets contained in Volume II of this Report provide further details.

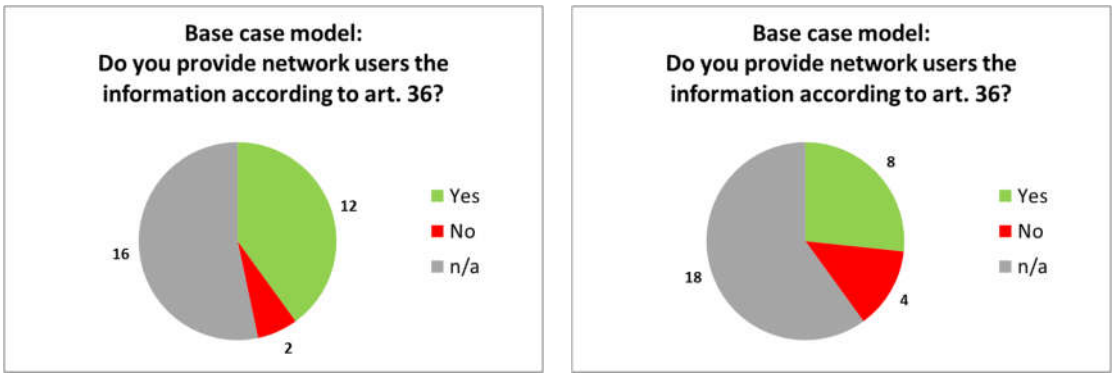
[74] Specifically, questions 13.14 and 13.14.1.

#### 9.2.1.1 Provisions for non-daily metered off-takes in the base case model

(375) When designing an information model, practical considerations[75] shall be taken into account, such as the opening hours of the Trading Platform, the timing when the TSO can provide the best possible forecast (accuracy), the end of the re-nomination cycle, the frequency of the forecasts during the Gas Day.

(376) These features could be also important, when TSOs intend to improve the models over time, in particular forecast accuracy.

Figure 9-3: Provided information in case of base case model (IM Questionnaire 2016)




*Source: ACER's elaboration based on ENTSOG's data collection*

(377) As displayed on the left chart of the figure above, twelve TSOs indicated having implemented the base case model, according to the Code. The right chart shows that eight TSOs out of the twelve provide more than two forecast updates, which goes beyond the Code provisions.

#### 9.2.1.2 Provisions for non-daily metered off-takes in the variant 1 model

(378) The balancing systems that adopt the variant 1-information model[76], such as the BeLux H-cal and the Dutch zone, provide hourly updates well beyond the required two updates, so as to allow network users closely to follow their positions and balance themselves.

#### 9.2.1.3 Provisions for non-daily metered off-takes in the variant 2 model

(379) Where the information model variant 2 is applied, the NDM off-takes are forecasted once on a day-ahead basis. Portugal and the two German balancing zones (Gaspool and NetConnect Germany) apply this model. It should be carefully assessed whether the simplicity of forecast model does bring about complexity and unwanted repercussions in other parts of the balancing regime, like in neutrality accounting or increased number of TSO's actions[77]. In Portugal, where the NDM portfolio covers less than 10% of the demand, such repercussions may seem to be more limited than in Germany.

[75] Even if not explicitly mentioned in the Code.

[76] BeLux H-gas, Bulgaria, Netherlands (GTS) and Slovenia.

[77] Chapter 6 and 7 of this Report offer additional insights on the NCG case.

### 9.2.2 Information about intraday metered inputs and off-takes

(380) Usually network users' allocation equals its confirmed quantity. Where a network user's allocation does not equal its confirmed quantity, the TSO provides network users with a minimum of two updates of their measured flows[78]. The majority of TSOs implemented these provisions.

### 9.2.3 Information about inputs and off-takes after the Gas Day

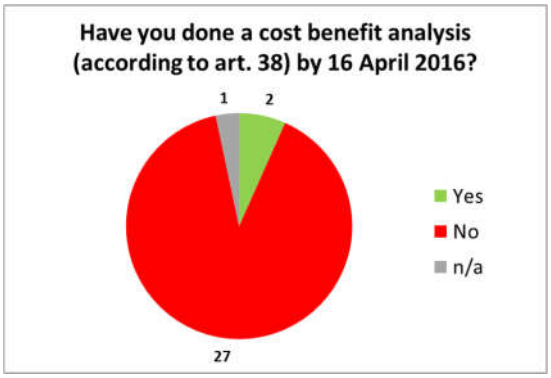
(381) The Code contains information provisions for inputs and off-takes after the Gas Day. Network users should know their initial allocation for inputs and off-takes and an initial daily imbalance quantity[79], which could help them to follow how their position evolves throughout the month. Very few TSOs did not meet these provisions and for specific reasons: for example, Poland-TGPS has only intraday-metered inputs and off-takes, and the NL-BBL interconnector uses an in-equals-out balancing regime.

## 9.3 Cost benefit analysis

(382) According to the Code, the TSOs shall assess the costs and benefits of increasing the frequency of information provided to network users, reducing the related timelines to provide information, and to improve the accuracy of the information provided.

(383) The Code sets minimum standards for information provision, as a starting point. The cost-benefit analysis shall be the tool to inform about the changes needed in the information model, and at what price such changes may come. Network users can signal their needs in the consultation phase of such analyses.

Figure 9-4: Cost benefit analysis




*Source: ACER's elaboration based on ENTSOG's data collection*

(384) The cost-benefit analysis required by the Code is still pending for the large majority of the TSOs. It is worth noting that the countries showing delayed implementation are also those where the process of assessing the current information provision has not yet taken place.

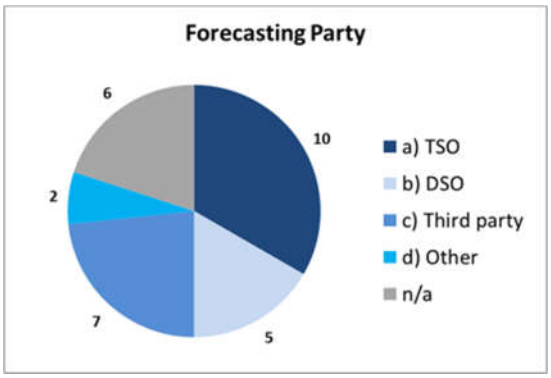
[78] At least the aggregate intraday-metered inputs and off-takes.

[79] Base case and variant 1: allocations concern all gas delivered to the distribution system; Variant 2: the non-daily metered off-takes shall equal the forecast of a network user's non-daily metered off-takes provided day-ahead. For Variant 1, the initial allocation and initial daily imbalance quantity equal the final allocation and the final daily imbalance quantity.

## 9.4 Information obligations of DSOs and forecasting parties

(385) The Code foresees a responsible forecasting party to collect and model the network user's NDM off-takes and, where appropriate, its subsequent allocations. It is the NRA's responsibility to designate the forecasting party, which may be a TSO, a DSO or a third party able to fulfil this activity. The forecasting party needs sufficient and updated information from the DSOs to fulfil its tasks.

Figure 9-5: Forecasting party designated/ Information provided to TSOs by DSO and forecasting party




*Source: ACER's elaboration based on ENTSOG's data collection*

(386) In some balancing zones, the TSO is responsible for forecasting - in France-N, Great Britain, Denmark and Portugal. This is often justified by data availability and existing forecasting experiences and capabilities. In the German balancing zones, Lithuania and the H- and L-cal gas balancing areas of Poland, the DSOs are the forecasting parties. This could be justified with DSOs having more detailed information. Seven TSOs indicated that a third party is responsible for forecasting (like OTE in Czech Republic or EDSN in Netherlands-GTS).

(387) The most concerning issue is that in six countries there is no information model or forecasting party decided upon. Altogether, responsible parties need to improve their information provision.

(388) The results presented in this Chapter therefore indicate that there are major deficiencies in many parts of the Europe Union about the implementation of information provisions concerning gas off-takes. To be able to balance their daily balancing accounts, network users should have an ability to get *reasonable* estimates of their off-takes from the system.

# ANNEXES

## Annex 1: List of abbreviations and country codes

| Acronym | Definition |
|---|---|
| ACER | Agency for the Cooperation of Energy Regulators |
| ENTSOG | European Network of Transmission System Operators for Gas |
| NRA | National Regulatory Authority |
| TSO | Transmission System Operator |
| MS | Member State |
| Code | Balancing Network Code |
| IP | Interconnection Point |
| WDO(s) | Within-day Obligation(s) |
| MAM | Market Area Manager |
| STSP(s) | Short-Term Standardised Product(s) |
| DM / NDM | Daily metered / Non-daily metered |

| Acronym | Country |
|---|---|
| AT | Austria |
| BE | Belgium |
| BG | Bulgaria |
| CZ | Czech Republic |
| DE | Germany |
| DK | Denmark |
| EE | Estonia |
| EL | Greece |
| ES | Spain |
| FI | Finland |
| FR | France |
| HR | Croatia |
| HU | Hungary |
| IE | Ireland |
| IT | Italy |
| LT | Lithuania |
| LU | Grand Duchy of Luxemburg |
| LV | Latvia |
| NL | The Netherlands |
| PL | Poland |
| PT | Portugal |
| RO | Romania |
| SE | Sweden |
| SI | Slovenia |
| SK | Slovakia |
| UK-GB | Great Britain |
| UK-NI | Northern Ireland |

# Annex 2: Balancing Analytical Framework for Balancing Regime Operation - Rationale for development of an analytical framework

## A.2.High-level introduction to the framework

(389) The analytical framework provides quantified evidence for an informed assessment of the operation of the individual balancing regimes.

(390) The Code features a daily balancing regime. The framework, therefore, seeks to obtain data at a daily level of granularity that will enable assessments of:

- quantities and prices associated with network users' imbalance and TSO balancing activities;
- an assessment of the primary cashflows associated with neutrality;
- the extent to which the balancing zone stock varies day-on-day within the system and how closely this matches the net commercial imbalance position.

(391) The analytical framework aims to turn raw data into meaningful information. This information should better inform an assessment of the effectiveness of individual regime performance, as well as an inter-regime comparison.

(392) The framework might be refined and developed further. For example, individual countries might choose to extend the application locally and/or the Agency may evolve the approach for subsequent editions. The framework, and its outputs, may also provide further insights into those regimes that have not yet fully implemented the enduring features required by the Code.

### A.2.1 Building the analysis

#### The core dataset

(393) The following table illustrates the inputs to the analytical framework used in Chapters 6 and 7.

Table A.2-1 – Daily source data for the analytical framework

| | Data element | Unit | Comment |
|---|---|---|---|
| 1 | TSO's Balancing Action Buy Quantity | MWh | Total Quantity of gas purchased via TSO balancing actions (for all Merit Order transactions and balancing services) |
| 2 | TSO's Balancing Action Buy Cost or Average Price | EUR or EUR/MWh | Either total cost of all quantities in 1 or average price |
| 3 | TSO's Balancing Action Sell Quantity | MWh | Total Quantity of gas sold via TSO balancing actions (for all Merit Order transactions and balancing services) |
| 4 | TSO's Balancing Action Sell Revenue or Average Price | EUR or EUR/MWh | Either total cost of all quantities in 3 or average price |
| 5 | Network Users' Imbalance Long Quantity | MWh | Total quantity of network users imbalance long positions i.e. sum of imbalance positions over all network users which are long on the day |
| 6 | Network Users' Imbalance Long Cost or Average Price | EUR or EUR/MWh | Either total cost of all quantities in 5 or average price |
| 7 | Network Users' Imbalance Short Quantity | MWh | Total quantity of network user imbalance short positions i.e. sum of imbalance positions over all network users which are short on the day |

| | Data element | Unit | Comment |
|---|---|---|---|
| 8 | Network Users' Imbalance Short Revenue or Average Price | EUR or EUR/MWh | Either total cost of all quantities in 7 or average price |
| 9 | Daily opening stock position | GWh or mcm | Depending on the convention the stock position will be expressed in either volume (mcm) or energy (GWh) |
| 10 | Entry Quantities into balancing zone | MWh | The quantity entering the system – used as a proxy for market size. |

1. Please note that cashflow considerations in this report are in respect of the neutrality account. TSO Balancing Buy Action and settlement of Network User long positions are costs (cashflows out of neutrality), whereas TSO Balancing Sell Action and settlement of Network User short positions represent revenues (cashflows into neutrality).
2. Different currency units will apply outside of Eurozone.

(394) The derived statistics and charts can afford insight into the overall performance of the balancing regime. The interpretation and debate about the framework's outputs should inform an enhanced understanding of the effectiveness of each implemented balancing regime.

### Data sourcing processing, limitation, and enhancement of the initial ENTSOG dataset

(395) The analysis relied on data for the Gas year 2015/16 (1 October 2015 to 30 September 2016) for all sample countries[80].

(396) The Gas year 2015/16 was chosen as the targeted period for two reasons. First, it is the first full year of mandated Code compliance for those countries that elected the October 2015 implementation. Secondly, it is the time span associated with data collected by ENTSOG, and for which the Agency received individual balancing zone spreadsheets.

(397) The ENTSOG dataset did not contain inputs on a number of variables that the Agency has decided to assess. Therefore, the Agency complemented the initial ENTSOG dataset in the following areas:

- cost/revenue data for network user imbalances
  - The aggregated daily imbalance quantities for network users long and short positions are not associated with cost/revenues or average prices in the ENTSOG spreadsheet.
  - Where marginal cash-out prices apply to all imbalances, it is sufficient to know these daily prices. This would not be sufficient if, for example, imbalance tolerances apply within the cash-out mechanism.
  - Where network users' imbalances are subject to different cash-out treatment, the Agency has collected the respective volumes and prices and treated them accordingly.

- physical linepack levels or day-on-day changes
  - The ENTSOG dataset does not contain physical linepack levels or information about day-on-day linepack changes. In some cases, the TSO itself provides limited or no linepack information by exercising the option to publish commercial proxies derived from aggregated positions associated with nominations[81], instead of linepack data.
  - Filling this gap may help assess the alignment of the physical operation of the system and its commercial functioning.
  - Where available, the Agency has collected this data separately.

(398) In other cases, the ENTSOG dataset did not include all the necessary balancing action data:

[80] Given that Spain implemented a new balancing regime on 1 October 2016, a later period from 1 October 2016 to 1 March 2017 features in the analysis.

[81] Chapter 8 provides, for each zone analysed, a synthetic description of how each dataset was constructed.

- cost/revenue data against TSO balancing action data
    - The price information contained in each set of buys/sells in the original ENTSOG spreadsheet does not, in all cases, represent the average price associated with transactions in that block for the day.
    - Filling this gap required the development of a methodology to derive such a price. For example, the methodology would need to address how to treat the fixed costs where balancing services using a fixed-commodity option-exercise price structure is used; or missing data where, for example, all prices associated with within-day balancing action costs and prices levied on causers were not available.
    - In this Report, the Agency has addressed these issues following discussion and agreement with NRAs and/or TSOs/MAM.[82]

(399) Individual discussions took place with all NRAs (or TSOs) involved in the sample to ensure a thorough understanding of the information sought and that both the data from the ENTSOG spreadsheets, and subsequently derived or supplied data, is accurate or fit for purpose[83].

(400) To minimise the risks of data processing errors and to reduce rework associated with data extraction and submission, the analysis starts from ENTSOG's individual balancing zone. The Agency imported the ENTSOG datasheets into a series of spreadsheets that delivered the new analysis. The Agency complemented the ENTSOG-sourced data with extracts from TSO websites or via data supplied direct from the TSO/NRA.

### A.2.3 Developing summary statistics and graphical presentations

(401) A key aim of the analytical framework is to turn basic data into information to facilitate an assessment of each regime's performance and to assist comparison of the performances of the different regimes.

(402) The analytic framework delivers a series of tabular and graphical outputs for each balancing regime.

(403) The four areas considered are:

- TSO Balancing Actions;
- Network Users' Imbalance Cash-out;
- Neutrality;
- Linepack changes and physical/commercial relationship.

(404) The sections below explain each of the four areas.

#### TSO Balancing Actions

(405) An example of the summary data[84] is as follows:

[82] For example, for this year's analysis, the fixed costs were reflected in the summary neutrality analysis, but are not reflected in the average daily price of balancing gas deployed.

[83] The Agency has sought to verify with the information providers that the data used in this analysis is fit for purpose. The Agency appreciates the efforts of NRAs/TSOs who have contributed to ensuring robust data and our understanding of how it can be used. The Agency has indicated where it still has reservations about the data quality in the individual country assessments in Chapter 8.

[84] The balancing action summary data and graphic has been taken from the Danish analysis.

Table A.2-2 – TSO's balancing actions statistics, Denmark

| | Annual quantity | Share of annual market | Number of days | Average daily quantity | Max daily quantity | Share of activity | Average price |
|---|---|---|---|---|---|---|---|
| | MWh | % | n° | MWh | MWh | % | EUR/MWh |
| System Buys | 406,530 | 0.60 | 102 | 3,986 | 14,880 | 77.3 | 15.59 |
| System Sells | 119,400 | 0.17 | 43 | 2,777 | 9,150 | 22.7 | 12.91 |
| Total | **525,930** | **0.77** | **141** | | | | |

(406) The analysis separates out the TSO/System Buy activity from the TSO/System Sell activity.

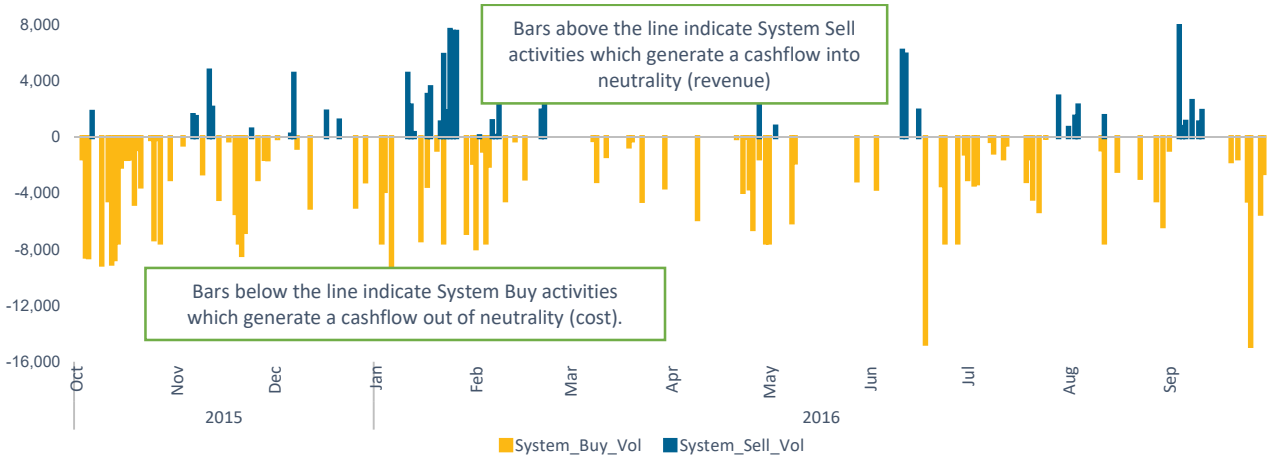
(407) The "Share of annual market" column results from the ratio between the quantity in the preceding column and the gas quantities entering the balancing zone.

(408) The "Number of days" represents the number of days in which the relevant actions have taken place over the analysis period. So the total line represents the number of days on which either a Buy or Sell action was taken so the data indicates that actions were taken on both sides of the market (i.e. Buy and Sell on the same day) on 4 occasions.

(409) The "Share of activity" is the actual annual quantity of Buy or Sell expressed as a percentage of the total balancing gas transacted.

(410) The "Average Price" column indicates the average price paid or received for System Buys or System Sells respectively over the analysis period.

Figure A.2-1: TSO balancing action, Denmark (MWh)




(411) The combination of summary data and graphical information affords an opportunity to understand relationships in the data and patterns that would be very difficult to spot from the raw data.

### Network Users' Imbalance Cash-out

(412) An example of the summary data[85] is as follows:

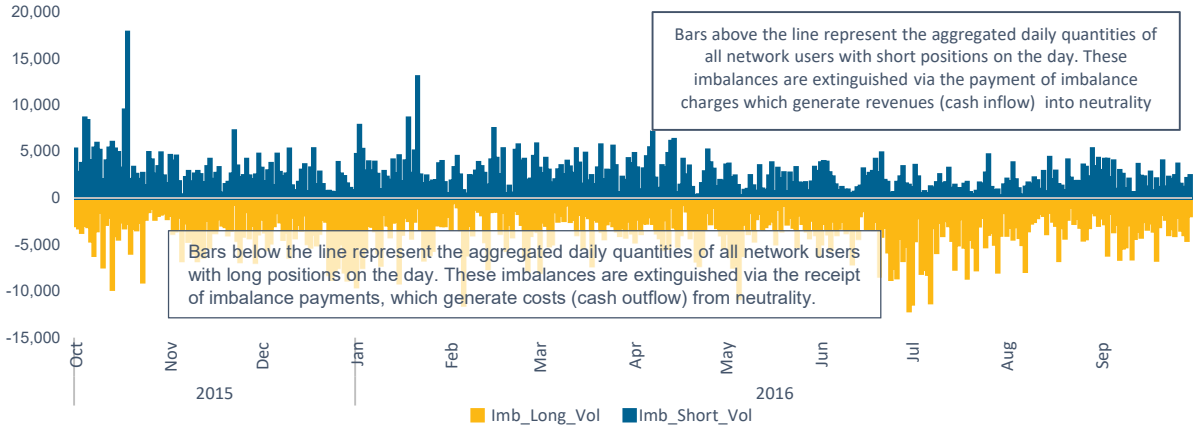
Table A.2-3 – Network Users' imbalance statistics, Denmark

| | Annual quantity | Share of annual market | Min daily quantity | Average daily quantity | Max daily quantity | Share of activity | Average price |
|---|---|---|---|---|---|---|---|
| | MWh | % | MWh | MWh | MWh | % | EUR/MWh |
| Network user Long | 1,450,625 | 2.13 | 14 | 3,963 | 26,981 | 45.5 | 13.62 |
| Network user Short | 1,740,080 | 2.55 | 0 | 4,754 | 28,436 | 54.5 | 14.15 |
| Total | **3,190,705** | **4.67** | | | | | |

[85] Data obtained from BeLux H-cal zone analysis.

(413) The logic of the derivation is analogous to that used for TSO balancing summary information.

Figure A.2-2: Network Users' imbalance quantities, Denmark (MWh)




(414) This summary data and graphics offer an opportunity to understand relationships and patterns in the imbalance cash-out area. Additionally, linking this data to the one present in the TSO's balancing summary information provides insights into the relativity between TSO balancing and network users' imbalance cash-out activity.

### Neutrality analysis

(415) The cashflows via neutrality are an important barometer of the performance of any balancing regime.

(416) There are four basic cashflows. Two generate credits, or cashflows into neutrality. These arise from TSO Sells via balancing actions and sales to network users where their daily imbalance indicates they were short. Two generate costs, or cashflows out of neutrality. These arise from TSO Buys via balancing actions and purchases from network users where their daily imbalance indicates they were long.

(417) The analysis derives summary data (both quantities and cashflows) associated with these four components. The net of all four elements is unlikely to be exactly volume neutral or cash neutral.

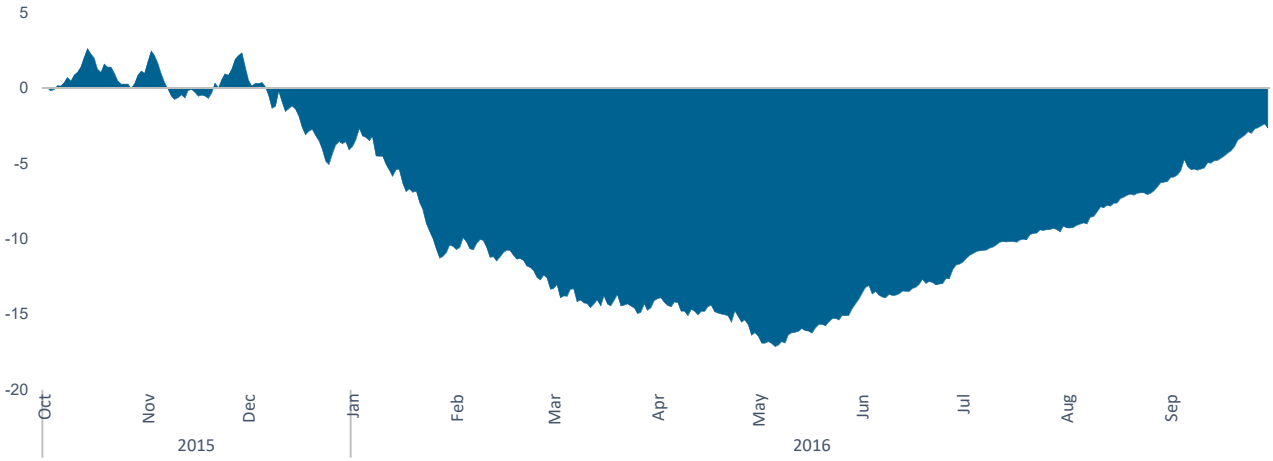
(418) Positive net quantities imply that the neutrality account has sold more gas than it has purchased. Positive net financial implies that neutrality has generated a surplus of cash, which should be available, or has been returned, to network users.

Table A.2-4: Cumulative neutrality position statistics, France-N

| | Quantities (MWh) | Cashflows (EUR) | Relative share (%) |
|---|---|---|---|
| **Financial credits to neutrality** | | | |
| **TSO System Sells** | 725,570 | 9,202,419 | 8% |
| **Network User Imbalance Shorts** | 6,680,317 | 99,636,574 | 92% |
| **Sub-total** | | **108,838,993** | |
| **Financial debits to neutrality** | | | |
| **TSO System Buys** | 2,354,870 | 35,064,734 | 31% |
| **Network User Imbalance Longs** | 5,504,450 | 76,384,162 | 69% |
| **Sub-total** | | **111,448,896** | |
| **Net** | **453,433** | **-2,609,904** | |
| | | **Net neutrality per unit of market volume -0.0049 EUR/MWh** | |

(419) The chart below indicates the development of the net neutrality cumulative financial figure over the analysis period. Net neutrality is explained via a numerical example in Annex 3.

Figure A.2-3: Cumulative neutrality financial position, France-N (million EUR)




## Linepack changes and physical/commercial relationship

(420) Gas is compressible and so there is no absolute requirement to match supply and demand over short timescales. Therefore, the total stock of gas, or inventory, within a gas system can vary. However, inputs and offtakes from the system have to be managed within tolerances to guarantee the integrity of the system. There may also be efficiencies, particularly from a TSO perspective, associated with operating within narrower stock ranges than might be necessary to ensure security of supply and integrity of the system.

(421) The Code requires the TSO to use the balancing market for more than just balancing actions to address the impacts of the aggregated effect of network users[86].

(422) If the balancing incentives are working well, then network users (both individually and in aggregate) should be close to balanced. If this is the case, then the stock in the system should not change very much from day to day.

(423) Under certain assumptions, the net effect of network user imbalances and net effect of TSO balancing actions (net commercial imbalance) should be equal to the day-on-day physical stock change. Annex 4 explains in more detail the logic supporting this, the assumptions and the consequences of these assumptions.

(424) The analytical framework therefore looks at linepack levels and, specifically, at whether the effect of the overall commercial imbalance is consistent with observed linepack changes.

(425) Many countries have opted for the alternative information provision options in the Code rather than provide network users with projected linepack information. The analytical framework of this Report only requires a measure of opening linepack, although this is only available by a very small number of countries.

(426) Access to an appropriate proportion of the flexibility available in the system will facilitate the functioning of the short-term market. Care needs to be taken in the design of the balancing regime

[86] Article 6 of the Code requires TSOs to take balancing actions in order to maintain the transmission within its operational limits, and achieve an end-of-day linepack position different from that anticipated, consistent with economic and efficient operation of the transmission network.

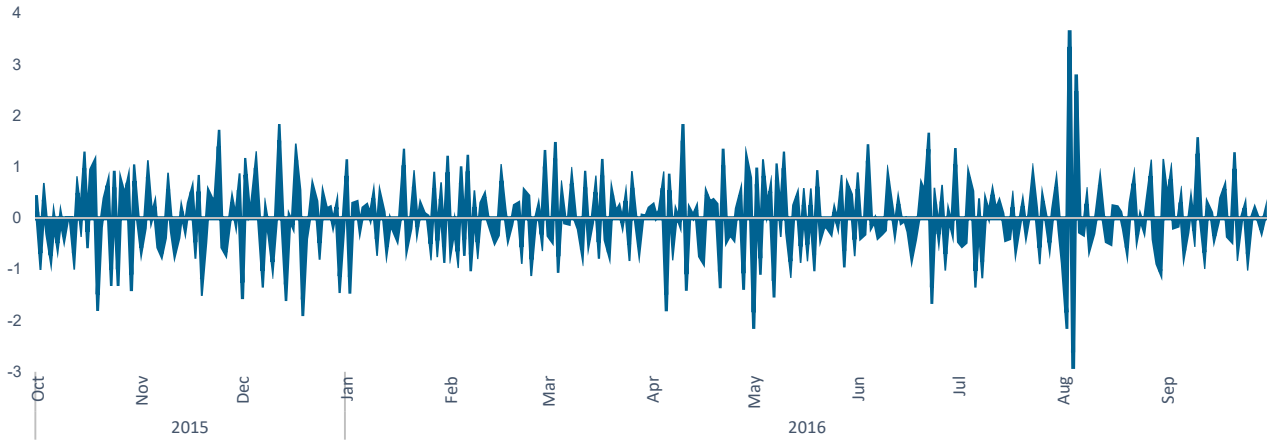
to ensure efficient outcomes that balance network operational requirements and imbalance risk management burden placed upon network users.

(427) Some summary data and graphics may well be useful to assess regime functioning as follows[87]:

Table A.2-5: Opening linepack, Great Britain

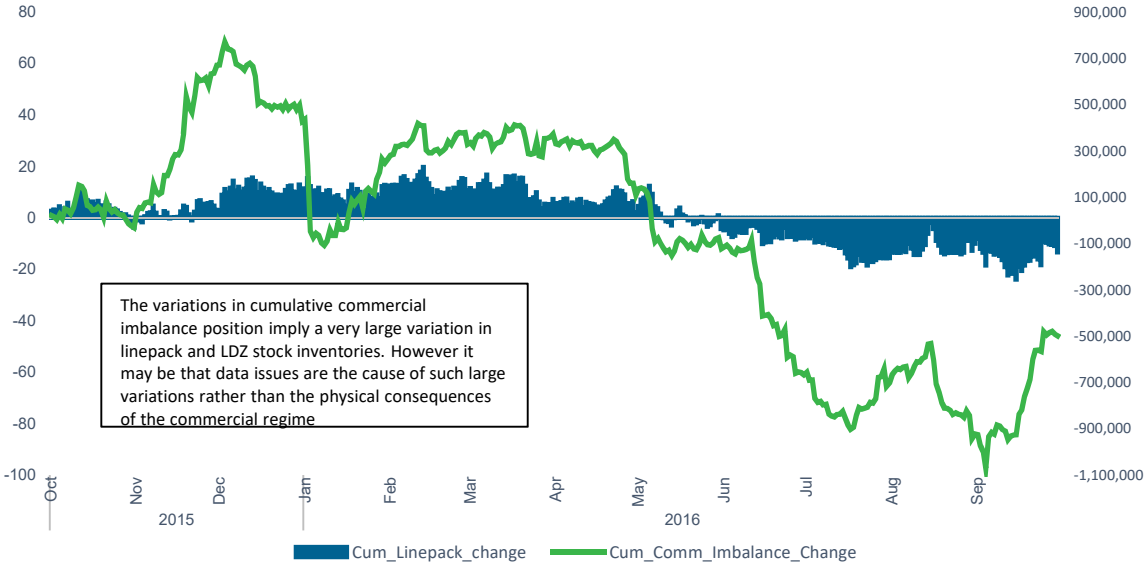
| | Opening linepack (mcm) |
|---|---|
| Max | 364.8 |
| Min | 321.0 |
| Average | 346.0 |

Figure A.2-4: Daily linepack change, Denmark (mcm)




(428) Of particular interest is the alignment of the physical and commercial worlds.

Figure A.2-5: Overall commercial imbalance position (right axis) and linepack (left axis), Great Britain (MWh)




(429) The primary objective of such a chart is the exploration of why the two positions do not match and whether the disparities are acceptable. A wide range of factors can cause the observed differences. Their assessment will provide valuable insights into the functioning of the individual regimes and to

[87] This table represents data from Great Britain. Great Britain publishes linepack information in volume rather than energy terms. An approximate conversion can be made using 11 GWh to 1 mcm factor.

lessons to be learnt for the evolution of other regimes. Annex 4 provides further details about this comparison.

# Annex 3: Understanding the neutrality regimes cashflows

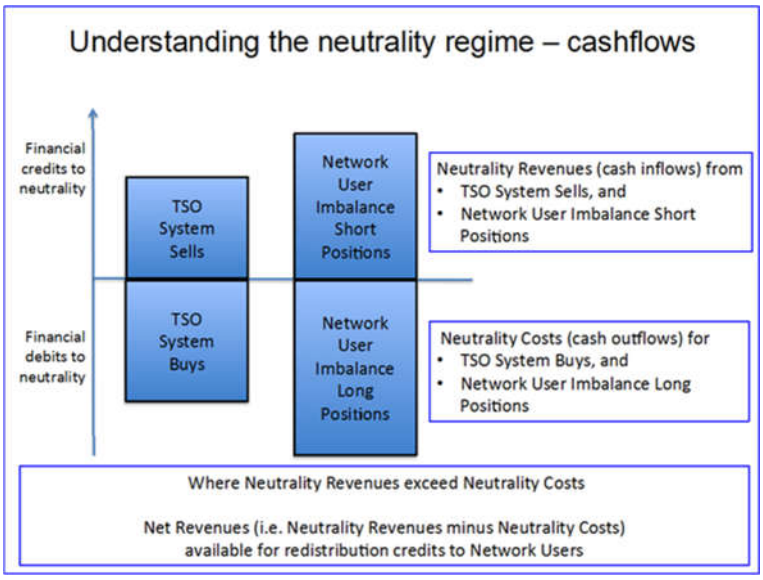
## A.3.1 Conceptual framework

(430) This analysis considers only the basic energy and cashflows associated with the four actions of TSO Balancing Buys and Sells, and Imbalance cash-outs of daily Long and Short imbalance positions. The flows are financially considered from the perspective of neutrality:

- revenues come from TSO/System Sells and Network Users' Imbalance Short Positions;
- costs to neutrality arise from TSO/System Buys and Network Users' Imbalance Long Positions.

(431) Where neutrality revenues exceed costs, then financial surpluses will be available to enable credits to be redistributed to network users.

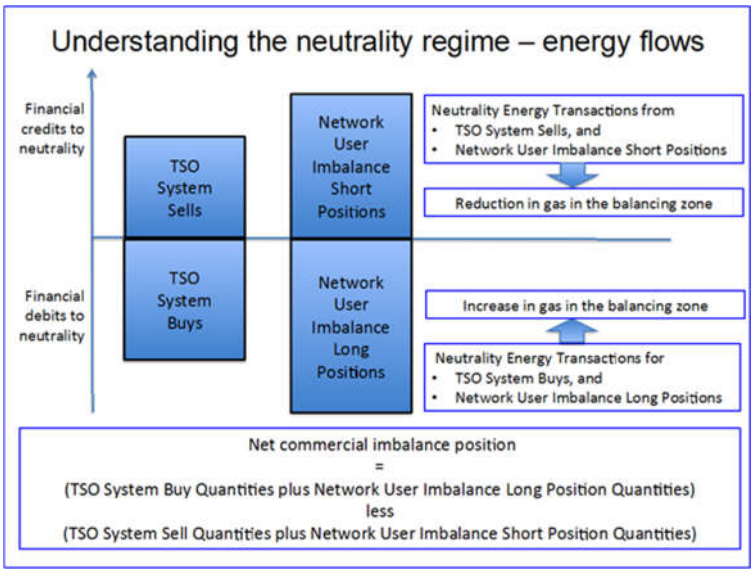
Figure A.3-1: Understanding the cashflows of neutrality




(432) The energy flows need to be considered next to the cashflows. The financial flows associated with the four basic transactions referred to above are unlikely to be energy neutral over periods as long as a year.

(433) The next flowchart displays the commercial transactions and their effect on the physical stock by representing the energy flows. The same conventions as above apply for the derivation of the net energy positions.

Figure A.3-2: Understanding the energy flows of neutrality

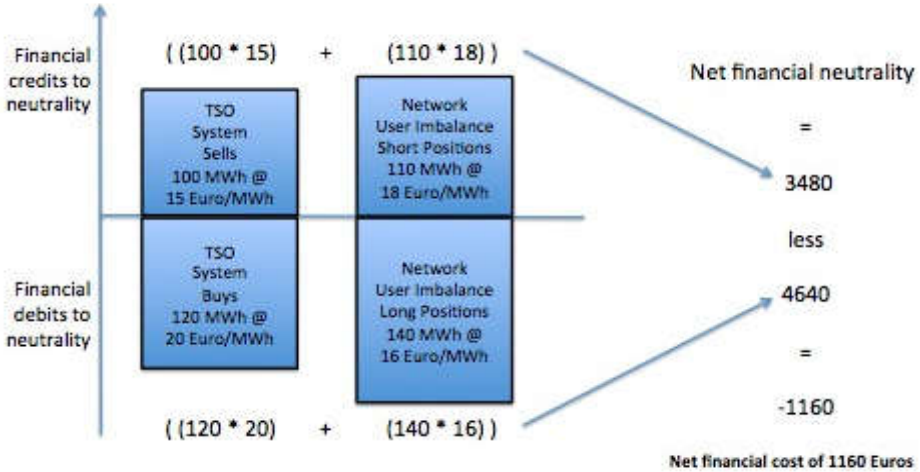



## A.3.2 Numerical example

(434) This Section provides a specific numerical example to illustrate an approach that might be helpful to interpret the observed overall neutrality effects. The chart below shows how the four basic cashflows and energy flows in the neutrality system contribute to a EUR 1,160 neutrality cost, assumed in the example.

(435) The first chart explains the cashflows. TSO/System Sells and Network Users' Imbalance Short Positions generate EUR 3,480 of financial credits. Costs of EUR 4,640 arise from TSO/System Buys and Network Users' Imbalance Long Positions. The net effect is a cost of EUR 1,160.

Figure A.3-3: Decomposing the net neutrality cost

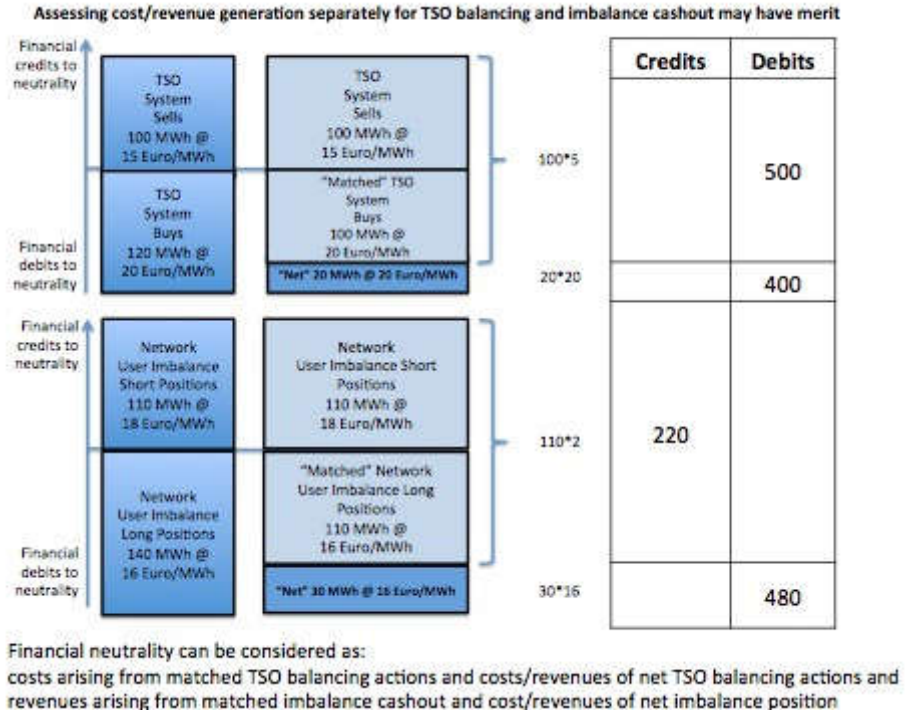



Using the four basic building blocks provides insights into the aggregated consequences of financial neutrality

(436) The net quantity of gas transacted through the four buy/sell mechanisms contribute to the final costs. So net quantity purchases have created costs to neutrality, which will tend to inflate the financial neutrality cost, compared to a situation where neutrality had bought and sold the same quantities of gas.

(437) Similarly, net quantity sales would have generated an income to neutrality that would tend to understate the net financial neutrality cost. This net financial position therefore shall be adjusted with the energy volumes. The Report uses the net adjusted financial position to reflect on the energy flows and their impact. Indeed, in the graphical illustrations the majority of the net costs of EUR 1,160 might be considered to arise from the net purchase of gas via neutrality.

Figure A.3-4: Decomposing the net neutrality cost




(438) EUR 880 of the neutrality cost can be considered to arise from net purchase of energy leaving an underlying net adjusted financial neutrality of minus EUR 280 (i.e. a cost of EUR 280). This cost can be considered as the result of EUR 500 cost arising from crossing the buy-sell spread for balancing gas offset by the EUR 220 benefit obtained from the cash-out price differential.

(439) The Report therefore considers the net financial neutrality values alongside the net adjusted financial neutrality in the individual regime assessments and when making comparisons.

(440) Thus, to generalise, we can see that neutrality costs/revenues can be considered to comprise distinct elements which can be represented as:

- “costs" arising from crossing the buy-sell spread associated with TSO balancing actions;
- “revenues” arising from the dual price mechanism associated with the cash-out of network user imbalances;
- cost/revenue associated with the net quantity over the relevant period.

(441) The numerical example also hints that the net energy quantity associated with neutrality is unlikely to be zero. Gas accounting issues contribute to differences, along with the price differentials between sell and buy prices, as well as small adjustments. To conclude, the net quantities should reflect the difference in stock between the start and end of the analysis period.

### A.3.3 Net adjusted financial neutrality

(442) The Report favours the approach that adjusts net financial neutrality to take account of the associated net quantity. An example justifies this position.

(443) Consider two regimes each of which has a net financial neutrality cost of EUR 500,000 over a period. At first sight, the regimes may present similar underlying cost performance.

(444) Suppose that, in the first case, the net quantity associated with the neutrality transactions is a net purchase of 30 GWh, whereas in the second case the overall position represents a net sell of 20 GWh. Let us assume that the value of the gas is similar in both cases and is 15 EUR/MWh.

(445) Regime 1: The value of the net quantity of gas purchased is EUR 450,000 (30 GWh at 15 EUR/MWh). This EUR 450,000 will have contributed to the neutrality cost so, had neutrality been volume neutral, the underlying cost could have been considered to be only EUR 50,000 (the overall cost of neutrality less the value of the gas “gained” by neutrality, namely EUR 500,000 minus 450,000).

(446) Regime 2: The value of the net quantity of gas sold is EUR 300,000 (20 GWh at 15 EUR/MWh). This amount of EUR 300,000 will have contributed a revenue to neutrality so, had neutrality been volume neutral, then the underlying cost could have been considered to be EUR 800,000 (the overall cost of neutrality plus the value of the gas “lost” by neutrality, namely EUR 500,000 plus 300,000).

(447) This illustrates that in some circumstances it may be necessary to look beyond the net financial neutrality measure. To develop reliable interpretations of both net financial neutrality and net adjusted financial neutrality might be helpful.

# Annex 4: Exploring the relationship between physical and commercial values in balancing regimes

## A.4.1 Background

(448) This Annex provides some context and explain the rationale behind comparing day-on-day linepack changes with the defined net daily commercial imbalance positions. The net daily commercial imbalance position is the net result of adding network users' imbalance positions and the TSO balancing actions. TSOs do not publish linepack data in many instances; instead, TSOs publish the aggregated network imbalance.

## A.4.2 Understanding terminology

(449) Balancing regime terminology is not standardised. It is clear that references to linepack continues to create confusion and so this Section seeks to explore relevant concepts. Specifically, this Section aims at exploring the differences between the day-on-day linepack change and the net daily commercial imbalance positions, so to provide additional understanding.

(450) Understanding the different usages of linepack terminology is therefore an essential first step to understand the use of this comparator.

- **Linepack**

(451) At any particular point in time, the network of a balancing zone contains gas. This might be referred to as inventory, or stock, or often colloquially as linepack[88]. The amount of gas in the system is typically assessed in volume terms. Because gas pressures and temperatures in the system vary, it is usual practice to calculate the amount of gas in the system under standardised conditions. Linepack levels are declared in millions of cubic meters under standard conditions or may be converted into energy units.

(452) TSOs will have various methodologies for determining linepack levels. Usually it will be based on a representation of the physical network (including pipeline lengths and diameters, which enable component volumes to be derived). Pressures are then applied (these might be based on observed and measured pressures or derived pressures within the network) as multiplicative factors to the component volumes to derive the amount of gas, which are subsequently converted and aggregated into the standardised volume in the system.

(453) The linepack level in the system is effectively the cumulative difference between total inputs and total offtakes[89]. Another perspective is that the physical change in linepack over a day should be equal to the difference between that day's total inputs and offtakes. Thus two numbers can be sourced that should represent the same quantity: the change in gas in the system, but assessed from two different methodologies. The first approach is derived from the linepack values calculated by the TSO. The second approach is based upon calculations derived from outputs from the functioning of the commercial regime.

- **Linepack flexibility**

(454) Gas systems can be operated at different pressures and so there are acceptable ranges of gas volumes within the system (i.e. linepack levels) that can be accommodated. To maintain the integrity of the system, and ensure its safe operation, the system must be operated within certain pressure

[88] Strictly speaking, in many systems, linepack relates to the transmission system only and does not include distribution.

[89] Including TSO's own use, e.g. compressor fuel usage and losses.

ranges. These ranges imply maximum and minimum levels of linepack at any time. These ranges might well be far beyond those which the TSO would regard as efficient, or even operationally acceptable. What will be operationally acceptable will have to be evaluated in the context of the system. Furthermore, these pressure ranges, and hence the associated linepack limits, will depend upon the particular circumstances. For example in the theoretical circumstance when all of a pipeline's capacity is being used to transmit gas, then there will be no linepack flexibility available[90].

(455) Accessing the full range of linepack flexibility may create operational requirements that generate costs in the system. For example, operating the system to maintain extremity pressures and to ensure security of supply under extreme conditions might involve additional compression usage to redistribute linepack.

(456) Thus, from a TSO's operational perspective, it is not only the absolute level of linepack, but also the distribution of linepack (that is the gas) in the system that is important. Whilst the linepack (i.e. absolute level of gas) in the system is based upon the cumulative effect of total inputs less total offtakes, the distribution of linepack will be affected by the TSO's actions in respect of system management (e.g. routing of gas and use of compression).

(457) The operational balancing decision-making process effectively defines the network users' access to linepack flexibility. Typically, when there are excursions (or expected excursions) beyond acceptable thresholds, the TSO will intervene to take a balancing action. Other parts of the balancing regime then determine the financial consequences to network users, including via imbalance cash-out exposures and neutrality charges.

(458) The balancing regime design must reflect the realities of the physical system. An aim of the Code is to foster a short-term commercial market and the Code assumes daily balancing as a vehicle to encourage trading.

(459) The Code addresses both physical and commercial matters. For example, it defines the requirements for a TSO to take balancing actions to keep the system within its operational limits, as well as achieving an end-of-day linepack consistent with economic and efficient operation of the system. It also defines the commercial rules for network users and particularly their financial incentives to achieve a daily balance.

(460) A critical design element is the extent to which network users, in aggregate, have access to linepack flexibility, or perhaps more precisely, an economic and efficient amount of linepack flexibility. This is why careful consideration needs to be applied to the design of within-day obligations so that they do not unduly constrain network user's freedom unless justified. These issues were explored in the Within Day Obligations Workshop in Brussels on 15 May 2017[91].

(461) Additionally, it is important to understand how the commercial activities associated with the balancing regime align with what may be happening on the system from a physical perspective. Very little information is available about within-day variations in linepack and interaction with within-day network users' imbalance management. The analytical framework seeks to take a tentative first step by considering whether the daily effects of the commercial regime map closely to the observed

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[90] However, in practice pipelines are never used at maximum theoretical capacity, because system sizing usually includes a design margin that will enable some linepack flexibility. It is important to recognise that most pipelines will have been operated based upon engineering optimisation which might seek to limit actual variations in linepack to well below that linepack flexibility which might be available. The UK-GB case history is an example where only very limited linepack flexibility was made available to the market during the early liberalised period (where potential linepack depletions of even 3-4 mcm would be addressed via balancing actions, whereas in recent years depletions of well in excess of 30 mcm, which previously had been considered impossible, are now tolerated). National Grid now indicates that these very significant linepack variations do not generate costs and are consistent with its obligations to economically and efficiently operate the system.

[91] http://www.acer.europa.eu/Events/ACER-Workshop-on-Within-Day-Obligations-In-the-context-of-Gas-Balancing-Code-implementation/default.aspx

physical changes in stock levels within the balancing zone. The rest of this Annex focuses on this issue.

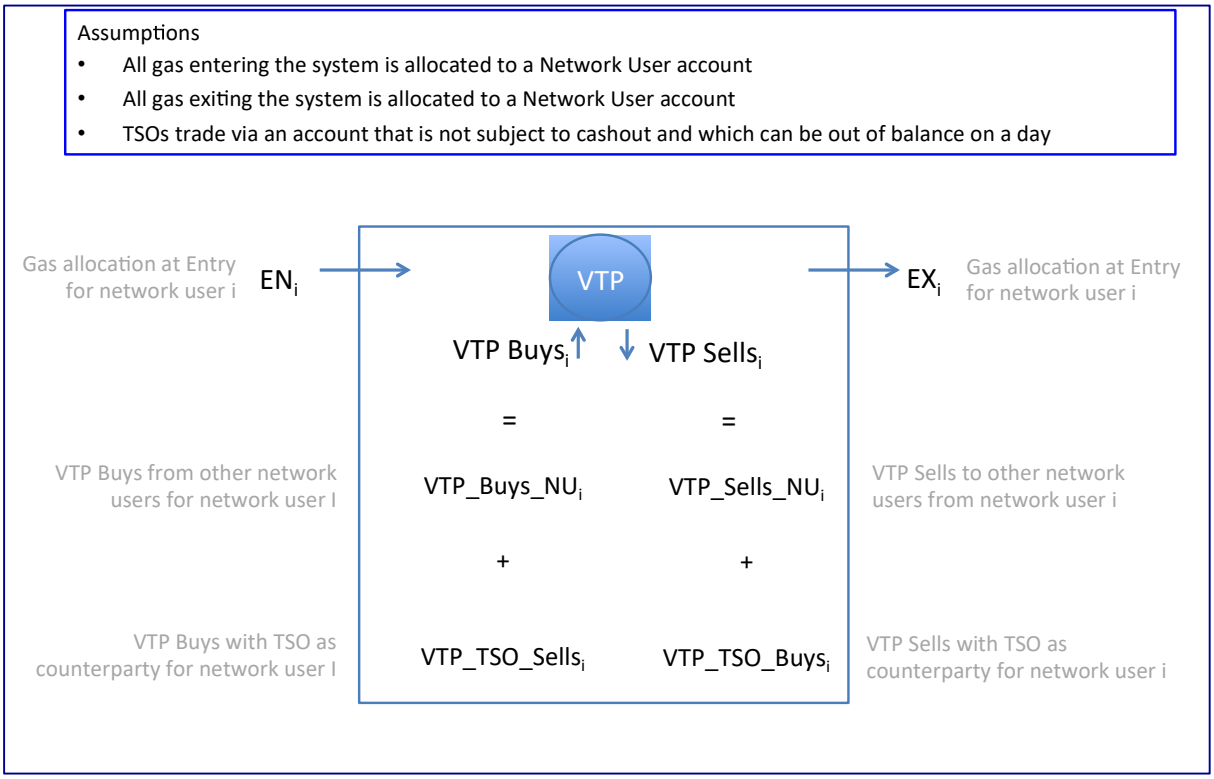
### Understanding the relationship between physical linepack changes and commercial regime

(462) The actual level of linepack in the system will be determined by the cumulative differences of total inputs into and total offtakes from the system[92].

(463) The combined effect of commercial actions of network users and balancing actions taken by the TSO, that is the net daily commercial imbalance position, should be expected to have an effect on the physical linepack position.

(464) For example, consider a daily balancing regime where all physical inputs and physical offtakes are allocated to network users. Thus, all gas entering and leaving the system is accounted for in the

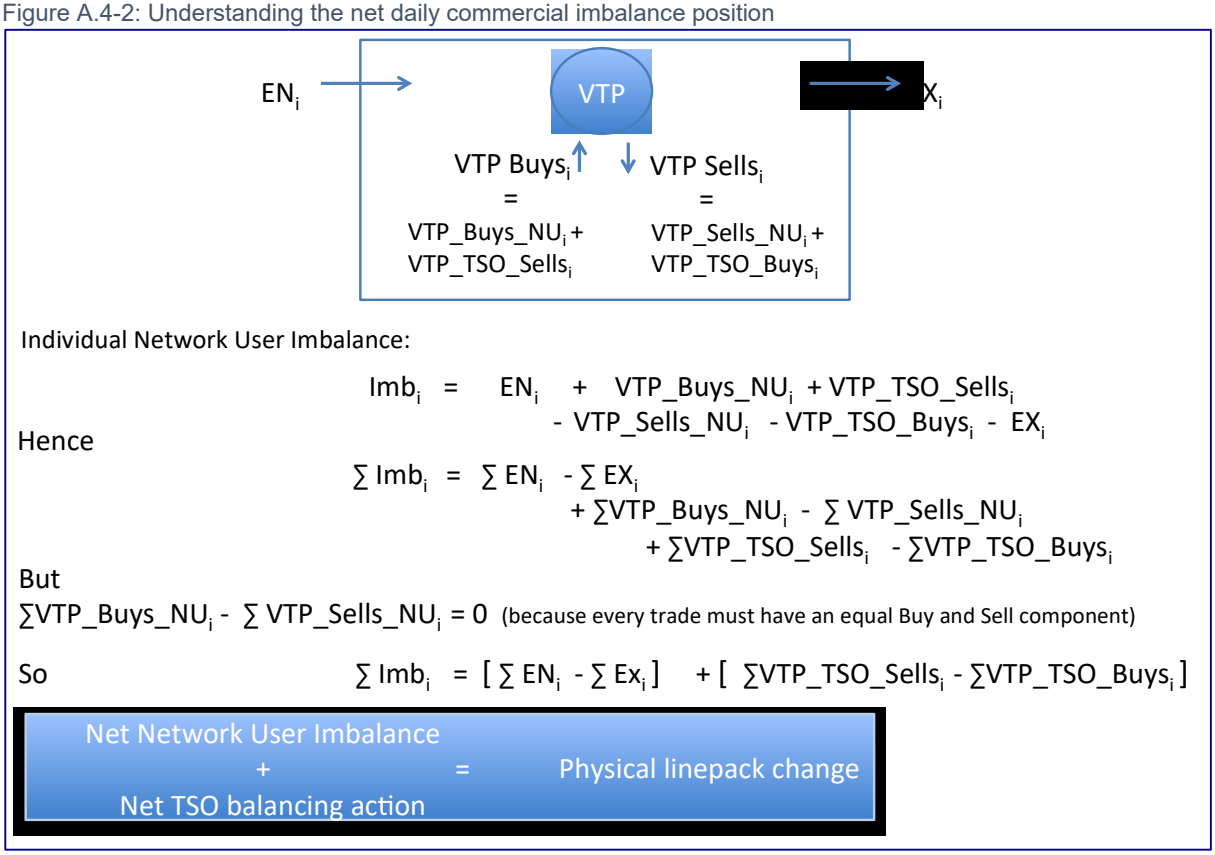
Figure A.4-1: Understanding the net daily commercial imbalance position




imbalance cash-out processes. The TSO trades via an account that is not subject to cash-out. Therefore, under these assumptions, and over the day, the net aggregated network users' imbalance position plus the net TSO balancing action should translate into a change of linepack within the system (see illustrations 1 & 2). Thus, the net user imbalance plus the net TSO balancing action will provide the energy equivalent of the linepack change (i.e. difference between closing linepack position and opening linepack position).

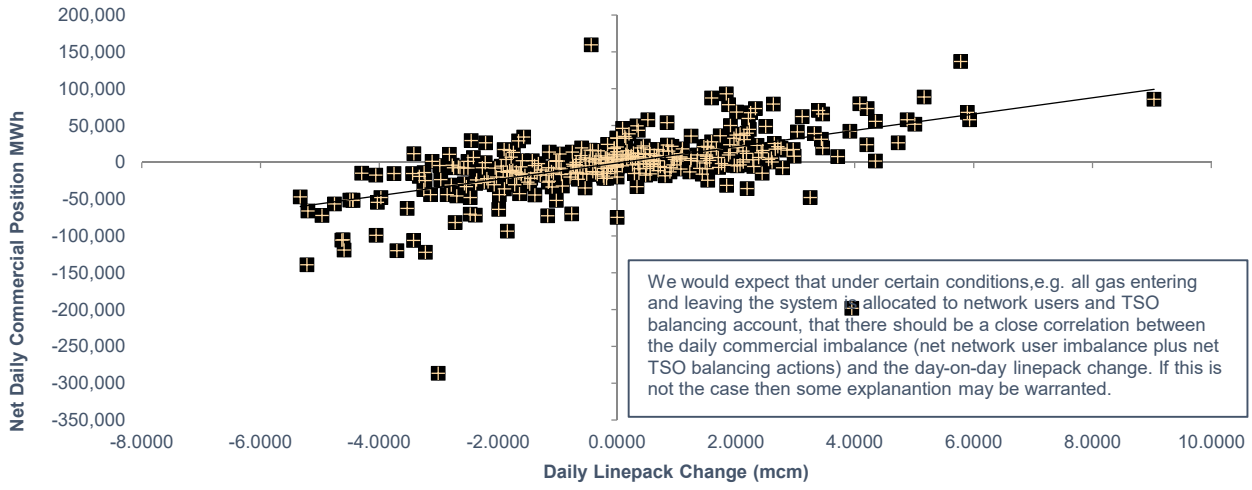
[92] Assumes that offtakes take account of all gas off taken from the system, including that used or lost in the transportation of gas.

Figure A.4-2: Understanding the net daily commercial imbalance position




(465) Whilst the net daily commercial imbalance position associated with the day's commercial balancing regime operation will be measured in energy, it can be compared with the actual physical linepack change over the day (defined in volume). The two may not precisely match (including for example because of calorific value (CV) variation within the system and over time); however, unless there is a specific reason, these differences should be small both on any individual day and, over a period, on a cumulative basis.

Figure A.4-3: Net daily commercial position vs physical linepack changes




(466) As some TSOs and NRAs mentioned, differences may arise from a number of sources including metering errors, shrinkage losses or wider TSO activities outside balancing actions that either bring gas onto the system or take it out of the system. NDM forecast bias might also play a role.

(467) Thus, where day-on-day physical linepack changes are not close to the anticipated effect arising from the day's commercial balancing regime operation, the reasons should be investigated and explained to ensure confidence in the operation of the regime.

(468) In the above case, taken from the UK-GB regime, there are a number of factors might explain some of the variation. For example, some of the outliers are probably caused by some data errors. Additionally, linepack in the UK-GB system relates to transmission system only, but offtakes are effectively allocated at exit from distribution. Therefore, the stock level to be compared with the net daily commercial imbalance position should comprise both linepack and distribution zone stock. Whilst this is unlikely to explain the entire mismatch, it may explain part of it.

(469) Differences, and particularly trends in differences, between the cumulative physical and commercial positions may indicate matters that need attention within the regime e.g. errors arising because of persistent bias in metering.

(470) Another observation might be that some regimes operate with very low system-level commercial imbalance tolerances. These tolerances are often referred to as "green zones" and typically indicate that, if the net imbalance position of network users in aggregate exceeds, for example, +/- 30 GWh, then the TSO will intervene in its residual balancing role, either with a balancing action or to force trades between network users. This may unduly restrict network users' freedom to access available linepack flexibility. For example, this may be the case if the physical linepack levels in the system are observed to vary far more widely than the commercial regime data might indicate.

# Annex 5: Data collection and data processing

(471) In most cases, ENTSOG provided the data related to the TSOs' balancing actions and the respective cost, with the exception of Spain – Enagás.

(472) Prices were collected: The Agency sourced the imbalance cash-out prices via the involved NRAs and TSOs, since such prices were not part of the ENTSOG data collection. Additional information on linepack and neutrality accounting was provided directly by the NRAs/TSOs involved.

(473) For the **UK-GB** case, additional information was required to apply the analytical framework e.g. linepack information. Data has been extracted from MIPI Data Explorer although data is missing for 27/8/16, 28/12/15 26/10/15, 28/11/15 whilst other data looks suspect including some identical consecutive opening linepack levels or a level of zero on 15/8/16.

(474) For the **BeLux** balancing zone, the ENTSOG data was complemented with data from the TSO and the TSO Transparency site for both price and volume data. The linepack information is not public.

(475) The analysis on the **Danish** balancing regime has been based upon data received from energinet.dk, the Danish TSO, via ENTSOG, complemented with additional data supplied directly from energinet.dk. Additional data was required to establish the daily prices associated with network users' imbalance cash-out.

(476) The **German (NCG)** data was received from NCG via ENTSOG and was substantially complete and is understood to be accurate. NCG helped by identifying public sources for some missing data. Intra-Day metered ('IDM') data from NCG has been collected from the BNetzA directly.

(477) The **French (GRTgaz-Nord) data** collection was supported by CRE, the French NRA. The. Agency integrated the Alizes service in the dataset. The linepack data was obtained by aggregating L-gas- and H-gas linepack data, published separately on the TSO's website. The analysis misses linepack daily data for 93 days, possibly due to a persisting website failure. The weighted average price (WAP) and the system marginal sell and buy prices have been downloaded from the TSO's website[93]. The analytics in this Report focuses on the days where the data was available on the longest uninterrupted data interval.

(478) The ENTSOG data collection provided the data on **Slovenian** TSOs' balancing actions, services and respective prices. The NRA and TSO provided the data on linepack flexibility, cash-out prices, and network users' imbalances.

(479) The ENTSOG did not collect data for transitory regimes, which implemented the Code after 1 October 2016. Hence, the ENTSOG data collection could not provide any quantitative information about the **Spanish** system. The Agency constructed the dataset on its own initiative, relying on the Enagás' website, and supported by CNMC, the Spanish NRA. The quantitative analysis of the Spanish balancing system focuses on the winter of Gas year 2016/17 only (covering 1 October 2016 to 31 March 2017).

[93] http://www.smart.grtgaz.com/en/prix_bourse?startDate=2015-10-01&endDate=2016-09-30&range=daily. Yet the Agency is not convinced that the prices are the correct ones for the calculation of the network users' cash out prices and is still awaiting confirmation from the NRA. According to the TSO webpage explaining how the balancing prices are calculated, the WAP is provided by Powernext (http://www.powernext.com/#sk;tp=app;n=market;f=listMarketTable;t=layout/gasSpot;fp=system_name:gasSpot,delivery:fr;lang=en_US;m=marketdata ). The Powernext Spot Index file shows slightly different values than those available from the TSO's website. The average difference is by the way zero; therefore, there should not be any big impact in the overall analysis, also for the sake of the calculation of the neutrality costs. In theory, the series taken from the TSO's website should only include the TSO's trades, while that taken from Powernext all trades.

Figure A.5-1: Data sources

| Balancing zone | Data type | Period | Source |
|---|---|---|---|
| BELUX | All data | 1 Oct 2015 – 30 Sep 2016 | ENTSOG and NRA/Fluxys https://gasdata.balancing.fluxys.com/SDPBSYS/Pages/Reports/BalancingInformation.aspx |
| DE | All data | 1 Oct 2015 – 30 Sep 2016 | ENTSOG and BNetzA https://www.net-connect-germany.de/en-gb/Information/Balancing-Gas-Supplier/Publications/Results-of-longterm-tenders |
| DK | All data | 1 Oct 2015 – 30 Sep 2016 | ENTSOG and Energinet data |
| ES | All data | 1 Oct 2016 – 31 Mar 2017 | Provided by Enagás and the NRA |
| FR-N | Linepack* | 1 Oct 2015 – 30 Sep 2016 | http://www.smart.grtgaz.com/en/stock_conduite |
| | Prices | 1 Oct 2015 – 30 Sep 2016 | http://www.smart.grtgaz.com/en/prix_bourse |
| | Imbalance volumes | 1 Oct 2015 – 30 Sep 2016 | http://www.smart.grtgaz.com/en/soldes_desequilibres |
| SI | All data | 1 Oct 2015 – 30 Sep 2016 | Provided by ENTSOG or NRA |
| UK | All data | 1 Oct 2015 – 30 Sep 2016 | NGG-MIPI Data Explorer |

** Linepack data was missing or equal to zero for 93 days in the selected interval*

(480) The Agency would like gratefully to acknowledge the assistance of the NRAs/TSOs/MAM that have helped provide essential data to support the first application of the *Balancing Analytical Framework*.

# Annex 6: Statistics for Chapter 7

## A.6.1 TSO's Balancing Actions

| | | UK - GB | BeLux | DE - NCG | DK | FR-N | SI | ES* |
|---|---|---|---|---|---|---|---|---|
| **Total Balancing Action Quantities** | GWh | 2,940 | 953 | 50,857 | 526 | 3,080 | 487 | 1,294 |
| **Total Balancing Action Quantities** | (% of Zone Entry) | 0.3% | 0.3% | 5.2% | 0.8% | 0.6% | 2.2% | 0.6% |
| **Percentage of Total Balancing Action Buy Quantities** | (% over all balancing Quantities) | 51.6% | 26.2% | 52.1% | 77.0% | 76.4% | 3.4% | 81.2% |
| **Balancing actions taken** | No of days | 102 | 363 | 366 | 141 | 118 | 273 | 42 |
| **Average Price of Balancing action Buys** | (EUR/MWh) | 13.86 | 14.81 | 13.14 | 15.59 | 14.89 | 15.61 | 26.06 |
| **Average Price of Balancing action Sells** | (EUR/MWh) | 12.84 | 13.39 | 10.20 | 12.91 | 12.68 | 14.90 | 17.69 |

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

## A.6.2 Network Users' Imbalance Cash-out

| | | UK - GB | BeLux | DE - NCG | DK | FR-N | SI | ES* |
|---|---|---|---|---|---|---|---|---|
| **Total Imbalance Cash-out Quantities** | GWh | 23,496 | 2,398 | 5,828 | 3,191 | 12,185 | 611 | 7,028 |
| **Total Imbalance Cash-out Quantities** | % of zone entry quantities | 2.47% | 0.70% | 0.60% | 4.67% | 2.28% | 2.71% | 3.47% |
| **Percentage of Total Network Users' Buy Quantities (in Total Imbalance Cash-out Quantities)** | % of all cash-out quantities | 51.3% | 40.6% | 57.8% | 54.5% | 54.8% | 10.5% | 55.4% |
| **Average Network Users' Long Position Cash-out Price** | EUR/MWh | 12.744 | 13.48 | 11.73 | 13.62 | 13.87 | 14.68 | 23.65 |
| **Average Network Users' Short Position Cash-out Price** | EUR/MWh | 13.644 | 14.58 | 19.32 | 14.14 | 14.91 | 20.45 | 25.22 |
| **TSO balancing action percentage** | % of TSO's balancing action quantities + network users' imbalances | 11% | 28% | 90% | 14% | 20% | 44% | 16% |

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

## A.6.3 Neutrality

| | | UK - GB | BeLux | DE - NCG | DK | FR-N | SI | ES* |
|---|---|---|---|---|---|---|---|---|
| **Gross energy transacted** | GWh | 26,435 | 3,351 | 56,685 | 3,717 | 15,265 | 1,178 | 8,322 |
| **Net energy position** | GWh | -498 | -1 | 1,180 | -2 | 453 | -51 | 47 |
| **Absolute sum of cashflows** | Thousand EUR | 291,269 | 46,525 | 690,626 | 52,258 | 220,288 | 18,016 | 204,015 |
| **Net financial position** | Thousand EUR | 15,599 | 680 | -63,064 | 54 | -2,610 | 1,439 | 1,013 |
| **Net neutrality per unit of market volume** | EUR/MWh | 0.0168 | 0.0020 | -0.0647 | 0.0008 | -0.0049 | 0.0638 | 0.0050 |
| **Net adjusted neutrality per unit of market volume** | EUR/MWh | 0.0093 | 0.0019 | -0.0490 | 0.0003 | 0.0072 | 0.0281 | 0.0106 |
| **Maximum yearly cumulative neutrality** | Thousand EUR | 18,409 | 690 | 5,005 | 410 | 2,636 | 1,478 | 6,124 |
| **Minimum yearly cumulative neutrality** | Thousand EUR | -8,015 | -64 | -97,057 | -771 | -17,115 | -48 | -640 |

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

## A.6.4 Linepack levels

| | | UK - GB | BeLux | DE - NCG | DK | FR-N^ | SI° | ES* |
|---|---|---|---|---|---|---|---|---|
| **Max opening linepack level** | GWh | 4,013 | | | 295 | 1,961 | 27 | 2,944 |
| **Average opening linepack level** | GWh | 3,807 | | | 271 | 1,797 | 15 | 2,823 |
| **Lowest opening linepack level** | GWh | 3,531 | | | 241 | 1,594 | 9 | 2,706 |
| **Highest absolute day-on-day linepack change** | GWh | 99 | | | 41 | 197 | 10 | 112 |
| **Average absolute day-on-day linepack change** | GWh | 19 | | | 6 | 23 | 1 | 26 |
| **Highest absolute commercial imbalance position change** | GWh | 286 | 19 | 318 | 30 | 86 | 4 | 129 |
| **Average absolute commercial imbalance position change** | GWh | 25 | 2 | 65 | 5 | 18 | 1 | 20 |
| **Max cumulative net imbalance** | GWh | 770 | 11 | 6,127 | 48 | 1,490 | -1 | 47 |
| **Min cumulative net imbalance** | GWh | -1,071 | -15 | -293 | -28 | -130 | -66 | -251 |

*^ Linepack data for France-N is missing for misses 92 days.*

*° Linepack data for Slovenia refers to linepack flexibility only; therefore, it is not directly comparable with the other systems' linapack values.*

** Data for Spain refer to a later and shorter period (1 Oct 2016 – 31 Mar 2017) therefore the values in the table are not directly comparable.*

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