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ACER Report on the implementation of the Balancing Network Code

THIRD EDITION

6 August 2018

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Table of contents

Executive summary

In this Third Report (2018) on the implementation of the Balancing Network Code ('the Third Report'), the Agency for the Cooperation of Energy Regulators ('the Agency') analysed the **effective functioning of balancing regimes** in a number of Member States/gas zones.

The Third Report applied again the *Balancing Analytical Framework* to five additional balancing zones, ordered by the highest network users' imbalance: SnamReteGas (Italy), FGSZ (Hungary), GazSystem (Poland high-calorific zone), Net4Gas (Czech Republic), Market Area East (Austria); and repeated the analysis for two previously reviewed zones: National Grid Group (UK-GB) and Energinet.dk (Denmark), as a benchmark. The data analysis builds on daily data for the Gas Year 2016/17. The *Framework* applies a broad set of indicators and charts that illustrates the functioning and the performance of the balancing regimes.

Main conclusions from the Third Report…

1. The Agency takes note of the implementation delays and emphasises that Member States need to take the necessary steps to meet the April 2019 deadline for full implementation.
2. The Agency notes that transmission system operators ('TSOs') play an important role in the development of short-term markets. TSOs' balancing activities shall stimulate the short-term market. The use of other tools than short-term standardised products ('STSPs') can reduce TSO's procurement of gas, slowing down the development of market liquidity.
3. The Agency observes that choices in the implementation of balancing lead to differences in balancing performance. In addition, the indicators used by the *Framework* point out possible areas for improving the balancing regimes.
4. The Agency stresses that access to complete data for all the inputs of the *Framework* is a precondition for its analysis. The Agency therefore urges national regulatory authorities ('NRAs') and the European Network of Transmission System Operators for gas ('ENTSOG') to provide complete and validated data for **all** the indicators of the *Framework*.

…and its recommendations:

1. NRAs, TSOs and market players are encouraged to follow the evolution of the balancing design implemented in their countries, paying special attention to the small adjustment and the information aspects of the regime.
2. The evolution of the neutrality streams and matters of gas accounting require regular follow up by NRAs and TSOs.
3. Where significant use of other tools beyond STSPs takes place, the appropriateness of these tools, the transparency about their use and their regular review shall be part of regulatory scrutiny.
4. Tolerance removals shall take place step-by-step and Balancing Platforms shall be carefully assessed and preferably closed down, if not necessary.
5. The Agency invites other interested parties to use the *Framework* to carry out their own analysis and to offer feedback to the Agency in order to improve the *Framework*.

1. Purpose and Structure of the Report

1.1 Purpose of the Report

(1) This Report is the Agency's third Report about the implementation of the Balancing Network Code[1] ("the Code"). It continues the implementation monitoring activity and builds upon the work done in the two earlier Reports[2].

(2) This Report analyses the functioning of the balancing regimes in seven countries during the Gas Year 2016/17 and presents findings, recommendations and an indication of desirable next steps to deliver the full implementation of the Code by April 2019.

2. From the earlier editions to the third edition of the Report

(3) The first Report introduced a standard approach to assessing the Code implementations in all countries using a standardised form: a country assessment sheet. The Report was published in 2016. The country assessment sheet assessed the key elements of the Code compliance and effectiveness. The analysis split countries into three clusters: those fully implementing the Code by 1 October 2015, those electing for a deferred implementation as approved by the NRA by 1 October 2016, and the final group that elected to use interim measures to encourage liquidity and hence a functioning short-term wholesale market until April 2019.

(4) The second Report, published in 2017, built upon the first Report. It reassessed all countries' progress using the same assessment. The second Report also introduced the Balancing Analytical Framework ('the *Framework*'). The *Framework* uses quantitative measures to assess regime performance and facilitate inter-regime comparisons. It was first applied to seven balancing zones. The results of the analysis stimulated debates about how the choices available in the Code could be exercised, and what operational effects such decisions have.

(5) The ACER-ENTSOG Joint Workshop on Gas Balancing Code in November 2017 (the Third Joint Workshop)[3] provided an opportunity to explore the growing body of findings of both the Agency and ENTSOG. The Third Joint Workshop concentrated on the critical issue of information provision. The discussion about the provision of linepack information was also addressed during this workshop and additional considerations are included in Annex 4 of this Report. The information provision about non daily metered ('NDM') demand forecast and allocation was further discussed in the Fourth Joint Workshop in June 2018[4]. The Agency believes the release of appropriate information fosters efficient market functioning. Network users must have appropriate information to ensure they can manage their risks and opportunities so that the benefits of efficient market functioning can flow to gas consumers.

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[1] Regulation (EU) No 312/2014 establishes a Network Code on Gas Balancing of Transmission Networks.

[2] ACER Report on the implementation of the Balancing Network Code, 2017, Volume I: https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER%20Report%20on%20the%20implementation%20of%20the%20Balancing%20Network%20Code%20(Second%20edition)%20Volume%20I.pdf

ACER Report on the implementation of the Balancing Network Code, 2017, Volume II: https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER%20Report%20on%20the%20implementation%20of%20the%20Balancing%20Network%20Code%20(Second%20edition)%20Volume%20II.pdf

ACER Report on the implementation of the Balancing Network Code, 2016: https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER%20Report%20on%20the%20implementation%20of%20the%20Balancing%20Network%20Code.pdf

[3] A joint workshop organised by the Agency and ENTSOG, held on 22 November 2017 in Vienna: https://www.entsog.eu/events/3rd-joint-entsog-acer-workshop-on-gas-balancing#welcome

[4] 12 June 2018 ACER/ENTSOG Joint Workshop on gas balancing Code, held in Brussels: https://www.entsog.eu/events/4th-joint-entsog-acer-workshop-on-gas-balancing#welcome

(6) This year the Agency's implementation monitoring activity has focussed on applying the *Framework* to five new countries[5]: Poland (high-calorific zone), Italy, Czech Republic, Hungary, and Austria (Market Area East). This work has involved substantial interactions with the relevant NRAs. The Agency thanks those NRAs, TSOs, and market operators for their engagement and the fruitful discussions about their implementations.

3. Implementation assessment, conclusions and future steps

3.1 High-level conclusions and actions:

(7) This Third Report builds upon the experience of the first two Reports and reflects the Agency's understanding of progress since the last Report.

3.1.1 Current assessment of implementation

(8) Many countries have achieved substantial progress in their efforts to implement and efficiently operate a regime consistent with the provisions of the Code. As with the previous Report, this Report identifies both progress towards well-functioning balancing regimes and short-term wholesale markets functioning in some parts of Europe.

(9) However, the implementation of the Code is still patchy: whilst some regimes are in a well-developed stage, others have made limited or no progress. Substantial efforts are needed before a full, Europe-wide implementation is achieved.

(10) Due to this, the benefits the Code should be delivering to consumers are not fully realised yet. The lack of development of short-term wholesale markets frustrates full and effective retail competition. Delays continue particularly in the countries that did not, or only sporadically, followed the Code development process and the comitology discussions on balancing.

(11) The less developed regimes need to draw up and enact plans aimed at achieving compliant and efficient outcomes. While challenges are not the same in all the Member States, the Agency stresses that in those countries where more work needs to be done the commitment to change needs to be stronger. The Agency continues to support the more challenging change processes, but it is in no position to take leadership of those projects, which are placed in the hands of the relevant Member States. Bulgaria, Romania, and Greece show significant implementation delays and shall report to the Agency on progress by the legal deadline of April 2019. Successful implementation of the Code in these countries depends on the commitment of the Member States to apply the right design. It is unlikely that full implementation will now be possible in all Member States within the mandated timelines.

(12) In many countries that are using interim measures or even transitory measures, progress has been much slower than anticipated, like in Ireland and Portugal. Interim measures should be phased out by April 2019, by which time full market based balancing with the TSO using only STSPs for its balancing actions and full daily cash out should be implemented. The Agency encourages all countries to make progress towards the April 2019 goal.

Specific results from the application of the *Framework* in the five new countries

(13) The application of the *Framework* has again provided a much deeper understanding about the regimes under consideration than would have been possible from the application of the Agency's country assessment sheets or the comparative analysis used by ENTSOG in its monitoring reports. The *Framework* provokes questions on the detailed implementation of the system, its operational and financial performance, and whether there are consequences of other system features beyond those envisaged in a straightforward

[5] Additionally the analyses for GB-UK and Denmark, which were analysed in the second Report, have been rerun to provide further comparators.

application of the Code. The analysis therefore assists the assessment of both compliance and the effectiveness of regime implementation.

(14) The following sub-Sections contain observations or recommendations for consideration in respect of each regime analysed this year for the first time.

Italy

(15) The Italian regime includes features that make the interpretation of the standard outputs from the *Framework* challenging.

(16) Network users' imbalances are some of the largest in Europe, even taking account of the size of the Italian market. The reasons for this should be assessed. Of relevance may well be information provision to network users, and the adequacy of NDM demand forecasts should be a priority for investigation and remedy, if needed.

(17) The Italian regime displays one of the largest levels of balancing intervention, which, at least in part, may be a result of the apparently poor network users' balancing performance. Beyond normal balancing actions, the Italian regime gives two opportunities for the TSO to alter flows on the system outside of the balancing actions performed on the Trading Platform.

(18) First, the TSO has access to a set-aside quota of storage capacity which it can use to address mismatches between actual and anticipated gas "in kind" to cover losses, fuel gas, and unaccounted-for gas[6]. Additionally, the TSO can use this service to change linepack levels in the system. This is referred to as 'storage nominated by the TSO' ('SNT') in the Italian system. This service is only used day-ahead. Consideration should be given to whether any gas necessary for these purposes would better be provided by the TSO using Short-term Standardised Products on the Trading Platform.

(19) Secondly, the system features an opportunity where the TSO has rights to alter gas flows from storage for system management purposes compared with the aggregated nominated quantities for storage users. This is referred to as 'storage operated by the TSO' ('SOP'). This opportunity is used within day and allows the TSO to mandate physical flow changes at storage and subsequently use STSPs to balance the system. If the use of STSPs does not deliver storage flows consistent with those mandated by the TSO, then the TSO will source or dispose of any differences the next day using the 'market for gas in storage' ('MGS') daily auctions for gas in storage. The gas procured by the TSO is traded market-based. This approach is associated with an incentive designed to limit its use.

(20) The Agency's assessment is that the TSO should use STSPs on the Trading Platform, as the sole means to balance the system. While the TSO's direct control over storage does not prevent the TSO from giving price signals to the market and allows additional security and confidence to the TSO in case of emergency, the use of STSPs is both sufficient and efficient to manage system imbalances.

(21) The Agency notes that the Italian approach may generate an increased set of cash flows[7], which is transparent but complex. The Agency encourages careful consideration of whether the arrangement has merit or whether, now that confidence in the functioning of the STSPs has been established, the far simpler model advocated in the Code and implemented elsewhere should be used in Italy as well.

(22) The Agency appreciates the step forward in this direction announced with the publication of the consultation document (Ref. 347/2018/r/gas) that foresees the elimination of SNT. The Agency also appreciates that

[6] The Agency appreciates the openness with which ARERA has discussed the issues associated with such technical matters as the approach to addressing losses, fuel usage and unaccounted-for gas. These issues will have an influence on the operation of the balancing regime and for gas accounting. Analyses of other countries has not yet reached this level of detail.

[7] These payments involve payments for balancing actions taken, incentive risk/rewards with regard to storage injections and withdrawals, and costs/revenues to neutrality arising from the D+1 exchange of gas in storage to address the SOP difference between nominated and actual flows in and out of storage.

additional data on the storage schemes has been provided to support this Report[8]. The Italian TSO is not the only one to use such services: other TSOs may have access to similar schemes, but the Agency could not collect enough analytical evidence in the timeframe of this Report.

Hungary

(23) The Hungarian regime shows only occasional balancing actions. There appears to be a low level of transparency in the regime about balancing actions. When balancing actions are taken, the prices are at significant differentials to market prices. It is understood that the TSO is using storage services to balance the system rather than always using the STSPs available on the Trading Platforms. This reduces liquidity in the market and may frustrate the development of a robust balancing market that can be used by both the TSO and network users.

(24) Two platforms are available for the TSO: one provided by a third party, the other by the TSO itself. This further fragments liquidity. An initial analysis suggests that the third party platform is delivering lower prices. Careful consideration should be given to the merits of consolidation into a single platform or for the balancing policy to determine which platform should provide the first source of balancing gas, favouring the more effective platform.

(25) The Hungarian regime appears to be in an early stage of development. Improvements should be made to information release, including greater transparency about when, to what extent, and through what channel the TSO takes balancing actions. Balancing actions should be taken using STSPs rather than via the use of the TSO's direct access to storage services. The TSO should look to improve transparency about its balancing decision making process to establish whether this might improve price competition amongst those offering flexibility to the TSO.

Poland

(26) The Polish H-cal zone system is maturing well during the interim measure phase. A critical issue over the next year will be the steps to eliminate the tolerance and whether the small adjustment in the cash out regime should be adjusted once tolerances are removed. The Agency notes that Poland has reduced imbalance tolerance from 5% to 2.5% from 1 April 2018. Careful consideration should be given to whether there might need to be another interim adjustment before the tolerance is abolished and to whether the small adjustment to imbalance cash out pricing might be refined too.

(27) The Agency also encourages further development of the regime to deliver full compliance with the Code in respect of the low-cal zone and the Transit Gas Pipeline System Yamal-Western Europe ('TGPS').

Czech Republic

(28) The Czech system displays some of the lowest TSO's balancing actions and network users' imbalance levels observed. These must be interpreted carefully in the context of the local circumstances and the implementation approach.

(29) The regime has been designed from the perspective that, provided that nominations are matched in respect of transit flows, there is ample flexibility available in the system to satisfy domestic balancing requirements. The conclusion is therefore that tight daily balancing incentives are unwarranted in the Czech system, because network users can carry over substantial imbalances and address them on the next day or on later days.

(30) By comparison with other countries, network users' balancing performance (as assessed by imbalances derived from inputs plus net trades less offtakes) is poor[9]. However, this has to be considered in the context of the regime's intent, that a flexibility service is available which enables network users to use their

[8] The additional data arrived too late for the Agency to rerun the analysis also including the quantitative evaluation of the storage services.

[9] The little cashed out imbalances quantities are mainly the consequence of the linepack flexibility service and not of network users' proactive balancing behaviour.

entitlements and that secondary trading of flexibility allowances to avoid daily balancing cash out on most, if not all of their imbalances. The network users can then chose to trade gas the next day to address the carry-over.

(31) The Agency's view is that the design is outside of the intent of the Code, because balancing should be an ex-ante activity and all individual network users' imbalance (net daily position) should be cashed out. The Agency encourages further consideration as to whether, in the circumstances specific to the Czech Republic, the approach offers greater efficiency compared to a more typical implementation of the Code as observed in other countries.

Austria

(32) The Austrian system comprises two-tier balancing, often referred to as ex-ante and ex-post regimes. The nature of the Austrian regime implementation means little can be gained in terms of understanding of the regime functioning by an analysis of the ex-ante regime alone.

(33) Within the ex-ante regime, network users are required to establish and maintain a nomination balance.

(34) Many actors have expressed the concern that the ex-ante regime is unacceptably restrictive, having been designed to minimise the effects of transit flow uncertainty on linepack levels. Whilst the regime ensures strong discipline, it may deprive network users of access to inherent linepack flexibility that can be provided at no, or minimal, cost. Additionally the regime may artificially inflate demand for storage services, which ultimately may increase costs to gas consumers.

(35) A full consideration of the Austrian regime would require the incorporation of extensive data from the ex-post regime. However, the required information on the ex-post regime was offered to the Agency too late for its analysis to be compatible with the timeline for the production of this Report.

(36) The Agency notes that the operational roles of the MAM (Market Area Manager)[10] in both the ex-ante and ex-post regime have been consolidated into one organisation: AGGM (Austrian Gas Grid Management AG). This organisation now offers a one-stop shop for network users.

(37) The Agency also notes that E-control is currently in the process of consulting about how the Austrian balancing system might evolve better to meet the requirements of the Code and market players.

Overall assessment

(38) The case studies indicate the value of applying the *Frame*work, which has exposed the main features of the functioning of the different regimes and shined a light upon different performances. The Agency recommends that all countries deliver the necessary information (including physical linepack information) to enable a transparent application of the *Framework* to inform debate between NRAs, TSOs, and stakeholders about the efficacy of individual regime implementations.

(39) Detailed discussions with NRAs have provided valuable insights into the efficacy of current balancing regimes. The analysis of physical linepack levels and the interaction of both commercial arrangements associated with network users' balance and physical system management via other tools have been particularly helpful to both the Agency and the relevant NRAs to understand the implications of policy choices. For example, exploring the mechanisms used to manage losses, fuel usage and unaccounted-for gas and their impact on the functioning of the balancing regime might be necessary to ensure a full appreciation of the efficacy of the regime itself.

3.1.2 Getting the regime design correct

(40) The Agency's implementation monitoring activity have confirmed the importance of getting an appropriate balancing regime design. This has to make careful use of choices available in the Code. The choice should be consistent with both local commercial and physical realities and their interactions. Critical elements

[10] In the Austrian system, the market area manager is called MADAM (market area and distribution area manager).

include the TSO's balancing action policy, the ability of network users to balance, the delivery of appropriate transparency and data quality, and full daily cash out.

(41) The paragraphs below define critical elements of regime design. The detailed interaction between all these components should be carefully considered. The implementation of the Code defines a framework in which the behavioural interactions between the TSO (as system and balancing manager) and network users (who have access to gas flexibility and should have an opportunity to manage their risks and opportunities) are critical. These elements will determine whether or not a regime operates effectively.

(42) The **TSO's balancing action policy** is key and must be developed appropriately in response to both physical requirements and the needs of the market. In the early days of market operation, the TSO has a critical role in moving away from dedicated balancing services to using STSPs that can be used by all market actors. Its activities should contribute to, and stimulate market functioning. Specifically, the TSO has to support information provision to the market to enable network users to manage their risks and opportunities. This needs to cover information about system status, the TSO's balancing actions, and network users' inputs and offtakes. The extent of ex-ante transparency about the TSO's balancing actions requires careful consideration. If provided, such information may trigger competitive repricing of flexibility that encourages and stimulates the market. This may be particularly helpful if the TSO's balancing is a substantial part of the short-term market. Over time, the significance of the TSO's role in physical balancing, once network users are better able to manage their risks and opportunities, will be much lower. Its major role will have shifted to information provision to support network users balancing their portfolios and therefore the system.

(43) This year's analysis also indicates that TSOs make significant use of other tools beyond STSPs for managing linepack levels. The appropriateness of these tools warrants particular attention. Such tools may prevent the short-term wholesale market from functioning well and reduce the TSO's procurement of gas to build-up further liquidity[11].

(44) **Enabling network users to balance** depends critically on them having information to understand their risks and opportunities. NDM demand forecasts are critical and processes and procedures must deliver an adequate accuracy. This will assist network users to manage their exposures and reach lower individual imbalances: as a result, the system as a whole would be closer to balance and the TSO's role may become more residual.

(45) **Enhanced data quality and transparency** might also assist better regime functioning and performance. The Agency considers that each regime should carefully assess what information should be made available to all market players. For example, a better understanding about the circumstances under which a TSO will take balancing actions may involve providing greater clarity about the trigger points for TSO balancing action in respect of either or both commercial positions and linepack positions. Such understanding should improve regime functioning. Information should only be withheld from the market where its release is proven to be detrimental to market functioning. Enhanced data release will also help wider players assess the efficiency of individual regime operation.

(46) **Full daily cash out** is fundamental in the Code. It can only be delivered in an efficient way when other enablers, particularly information provision, are appropriate. The implementation challenge over the next year will be the transition of several countries to full daily cash out[12]. **Tolerance removal** may need to be planned on a step-by-step basis and careful setting of the **small adjustment** is important. All financial aspects of the balancing regime should be effective and should not generate undue risks to network users.

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[11] The Code Article 6(1)((b) provides that: "The transmission system operator shall undertake balancing actions in order to: [….] achieve an end-of-day linepack position in the transmission network different from the one anticipated on the basis of expected inputs and offtakes for that gas day, consistent with *economic and efficient operation* of the transmission network."

[12] Whilst ACER has now seen two regimes where a full daily cash out does not occur based upon individual network user's daily imbalance (inputs plus net trades less offtakes) it understands the specific circumstances in the two countries that might imply such an outcome. However, ACER believes that for other regimes still being developed the full daily cash out is appropriate and should be the intended model, as implied by the Code.

(47) **Balancing platforms** are permitted as an interim measure until April 2019 and even to 2024 where sufficient market liquidity has not been established. It is understandable that many TSOs attach great importance to the existence of balancing platforms, although experience shows that the STSPs on Trading Platforms have proved effective within a rather short timeframe after being put in operation. Retaining a balancing platform might be considered acceptable provided that the TSO uses the Balancing Platform only when necessary, and under a clear regulatory and market framework which is not detrimental to market functioning.

(48) **Incentives** can play a helpful role in promoting market-friendly decision making by the TSOs. Both Italy and Great Britain have found this approach preferable to the TSO acting using prescriptive rules or approaches to, for example, its decision-making process for balancing actions. Where incentives have not been used, other countries (e.g. Denmark) have found that an open, public discussion with stakeholders has helped define the discretion to be exercised by the TSO and how its decisions might be made.

(49) **Transit** remains a significant challenge in balancing regimes, particularly where transit flows are large relative to national demand. There may be merit in considering further how transit flows should be treated under the Code, including specifically whether some limitation on nomination imbalances might be appropriate to limit potential impact on physical linepack levels.

(50) The Agency, in preparing future editions of the Report, will consider whether it would be appropriate to seek additional data and to cover more countries with the *Framework* and/or to consider how the performance of different regimes has changed compared to their initial assessment.

3.1.3 Actions to improve the implementation of the Code

Effective balancing regimes

(51) The Agency encourages all NRAs and TSOs to review their regime using the *Framework* to assess whether the regime can be further refined to deliver a better market or outcomes for consumers. NRAs and TSOs should monitor basic metrics associated with TSO balancing, network users' imbalance, neutrality and linepack variation (and the commercial imbalance position). These key indicators provide a good understanding of regime performance, and should help ensure robust gas accounting within each regime.

(52) Even where regimes are well established, opportunities may exist to improve regime functioning. The Agency encourages a dialogue between countries to share lessons learnt.

Balancing regimes change

(53) The parameters within a regime's specification will also need to evolve as circumstances change in each balancing zone. Local infrastructure will change, the availability of gas (and particularly gas flexibility) and the community of network users will vary. Market players, NRAs and TSOs should therefore monitor regime performance on an ongoing basis and should make regime changes to ensure that the short-term wholesale market continues to function efficiently.

(54) This year's analysis has highlighted that all regimes should be kept under review, even where a full implementation of the Code has been assessed locally. By way of example, the Agency's assessment this year questions whether the efficiency of the Hungarian regime could be enhanced if a single Trading Platform were to be used for all TSO balancing. Major challenges still exist, for example in Austria, to deliver efficient, well-functioning balancing regimes.

Interim measures

(55) The Code envisaged that this transition should be completed within five years of the Code's approval. The countries employing interim measures should foresee their withdrawal by April 2019. A full implementation of the Code should be imminent although the Agency believes this will be unlikely in several countries.

(56) The Agency encourages all countries using interim measures to complete the Code implementation by April 2019 using intermediate steps during the next few months where this might reduce risks of substantial step changes[13].

(57) The Agency requests those countries which fail to achieve full implementation by April 2019 **to notify the delay and propose remedial plans** that are submitted to the Agency and ENTSOG, indicating when full implementation is achieved.

3.2 Next steps and the Agency's focus for future Reports

(58) The Agency welcomes feedback from stakeholders on this Report and its previous Reports.

(59) The Agency remains keen to develop a quantified assessment of regime performance. Stakeholders' views about the size of TSO's balancing action activities, network user imbalance levels, as well as on how close to zero the neutrality account may be expected to close, taking account of local circumstances. A reasoned view from the market participants about what the appropriate ranges are/might be, would be welcomed by the Agency. Network users could also encourage NRAs and TSOs to explore and discuss with them the outcomes of the assessments made based on the *Framework*.

(60) The annual implementation monitoring is not mandatory for the Agency.

(61) The Agency could focus in the future on the following issues:

1) Compliance review after April 2019 for all / or late implementer countries;

2) Further evaluation of regime effectiveness and further deployment of the *Framework* enhancing its content, analysis and the number of countries considered.

Future Reports might seek to:

1) Make recommendations for laggard countries, including on whether consideration should be given to infringement proceedings;

2) Mark the evolution of the balancing regimes previously analysed and establish best practices in the key implementation areas having regard to local circumstances[14];

3) Initiate a discussion with national regulators and stakeholders on whether elements of the Code need to be amended[15].

[13] For example, the removal of tolerances might be achieved using an intermediate step rather than a complete removal close to April 2019. Similarly, where major adjustments to cash out price exposure are applied stepwise changes may avoid excessive risks associated with major changes.

[14] This may assist both regimes: the ones that are already fully functioning, but in which improvements might be possible as well as those laggard countries that still need to take early steps towards Code implementation.

[15] Subjects might include: 1)whether the intent of the current Code should be upheld in the context of full daily balancing, with daily imbalances being extinguished via cash out at the marginal price; 2), whether additional rules might be needed to satisfactorily address the specific issues of transit arrangements across a balancing zone.

4. Applying the *Balancing Analytical Framework*

(62) The second Report[16] introduced the *Framework*. The terminology used in this Report follows the terminology developed in the second Report, which could be used as reference.

(63) Many NRAs, TSOs, and stakeholders indicated that they valued the results and commentaries included in the second Report. The wider application of the *Framework* might assist both those balancing zones analysed and others to assess the effectiveness of balancing regime implementations.

(64) This year, five additional NRAs requested that their regimes be assessed via the *Framework*. This Chapter includes an analysis of these balancing zones: Italy, Hungary, Poland (High calorific zone). Czech Republic and Austria (Market Area East). The balancing zones are ordered by the highest total network users' imbalances, which hints at the size of the trading activity and potential market liquidity.

(65) For completeness, and to provide relevant comparators with the sample used in the second Report, Great Britain and Denmark have also been included in the analysis.

(66) The *Framework* relies on a significant amount of information and brings to light results that, given the limited time available for this Report, are at times only briefly commented and not fully investigated.

4.1 Italy – Snam Rete Gas

4.1.1 Short description of the balancing regime

(67) Italy implemented the Code from 1 October 2016. The Italian regime is based on daily balancing and does not use within day obligations.

(68) Italy is a net gas importer and its high-pressure network is the largest in Europe at around 32,000 km.

(69) Snam Rete Gas acts on behalf of all TSOs active in Italy when it comes to system management and balancing.

(70) The TSO has access to a Trading Platform where title and locational products are available. The TSO also has access to the market for gas in storages.

(71) Prior to the implementation of the Code, storage was the only source of flexibility accessible during the Gas Day and the TSO had the right to nominate gas into and out of storage. A retrospective auction would then be used to determine storage inventory changes for those network users delivering or offtaking the gas associated with the TSO's action.

(72) Moreover, a quota of storage was set aside for system management purposes. This accommodated the mismatch of losses, fuel gas, and unaccounted-for gas provided by network users and the actual value. Storage would also be used to manage programmed changes in linepack.

(73) The current regime preserves these two opportunities and enables the TSO directly to secure flows in and out of storage for system management purposes: these are referred to as SOP (Operational Storage) and SNT (TSO-nominated storage)[17]. The system design incorporates incentives aimed to ensure that the TSO

[16] A detailed description of the *Balancing Analytical Framework* is provided in Chapter 5 and the Annexes of Volume I of the second Implementation Monitoring Report: https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER%20Report%20on%20the%20implementation%20of%20the%20Balancing%20Network%20Code%20(Second%20edition)%20Volume%20I.pdf .

[17] The terminology here refers to defined terms in the national Network Code.

acts in an efficient way when considering the use of STSPs, and its two above-mentioned additional storage tools.

Operational Storage (SOP)

(74) In the current system, the TSO keeps a facility which ensures flow changes at storage for system management purposes[18] rather than accept the daily linepack variation caused by network users. This tool permits the TSO to have confidence that, in case physical flow changes in the system are required, it can command this tool rather than use STSPs and wait to see if a physical response occurs. According to the Agency's assessment, the SOP facility seems to be contrary to the spirit of the Code, since it can represent an additional balancing tool for the TSO other than STSPs[19].

(75) The TSO takes balancing actions using STSPs, which might be expected to change physical renominations and the linepack level of the network.

(76) The TSO will then re-adjust storage flows accordingly to reduce SOP. The SOP is the difference between user-nominated flows[20] at storage and the actual physical flow[21]. The TSO is subject to incentives, as explained in the Section *Linepack and storage-related incentives* below.

(77) The SOP therefore represents a gas input or offtake from the system each day. Effectively the TSO procures gas from, or disposes gas to storage users via storage inventory changes. The relevant quantities, and prices are determined in the MGS the day after the gas has flowed. The costs or revenues associated with SOP feed into the national gas balancing neutrality redistribution applied.

TSO-nominated storage (SNT)

(78) The TSO also has access to its own storage services and gas resources for SNT usage[22], which it nominates on its own account. The service is used to cover two requirements. Firstly, to provide gas injection or withdrawal from the system to compensate for the difference between expected network users' gas in kind inputs to cover losses, fuel gas, and unaccounted-for gas and the TSO's expectation of the same. Secondly, the TSO may wish to change the level of linepack in the system for operational reasons. These two aspects are addressed via the TSO nominating gas into or out of the system using its own storage services. This is the SNT nomination. It is made at day-ahead so that it can be considered separate from any later balancing activity that occurs within day.

(79) The costs of SNT are recovered via the transportation tariffs.

Linepack and storage-related incentives

(80) The incentives are designed to encourage the TSO to act in an efficient way. For example, the TSO is incentivised to achieve an end-of-day linepack level close to a predetermined target level. The relevant performance measure adjusts for the SOP, because it would be inappropriate for the TSO to command and control storage flows to meet its preferred end-of-day linepack target. Additionally, the TSO faces an incentive in relation to the pricing of its balancing actions. In essence, the TSO is incentivised to transact close to the average value of gas over the day and to consider the trade-off between meeting linepack target, SOP and the prices taken for balancing actions.

(81) The analysis presented below is based on the standard formulation of the *Framework*. Thus, it includes the four main energy and cash flows associated with basic neutrality. The analysis reveals that there are other

[18] To ensure operationally acceptable linepack distribution and ranges.

[19] The Code also allows to use balancing services, but these are not foreseen in Italy.

[20] Including the SNT nomination.

[21] Which should reflect the TSO's request to the Storage System Operator (SSO).

[22] The facility to support SNT represents less than 2% of the overall storage space available to network users.

substantive influences at work in the Italian system that should be considered, specifically the effects of SOP and SNT[23].

4.1.2 Regime performance

(82) The Italian regime features daily balancing. This assessment is based on the first year of operation of the regime. Both operational experience and the analysis could inform refinement of the regime with its associated TSO incentives.

4.1.2.1 TSO Balancing Actions[24]

(83) The TSO took balancing actions using STSPs on approximately three quarters of the days during the year. Of the days involving balancing actions, approximately 67% involved buy actions and 42% involved sell actions. On 13 days, the TSO acted on both sides of the market.

(84) These quantities involved in these balancing actions represented approximately 1.7% of the total quantity of gas entering the system (or just over 2% of domestic demand).

(85) The TSO purchased notably more gas via System Buys (approximately 70% of balancing action quantities, representing 11 TWh) than it sold via System Sells (4.8 TWh). System Buy action sizes during the first half of the year averaged about twice the size of System Buy actions in the second half and System Sells throughout the year.

(86) The average price of System Buys was 20.60 EUR/MWh against 17.68 EUR/MWh for System Sells. The average prices of System Buys and System Sells differs significantly (2.92 EUR/MWh, a 16.5% premium of Buys over Sells). The differential is higher (3.3 EUR/MWh) in the first half of the year than in the second half (2.5 EUR/MWh).

(87) Beyond the balancing actions taken using STSPs, the TSO influenced flows on the system using its right to nominate gas flows on and off the system ahead of the Gas Day using its own storage nomination services and via its command-and-control rights over storage for within day system management activities. The command-and-control rights created flows on and off the system via SOP quantities, which could be considered to have similar impacts to STSP System Buys and System Sells. The following Table presents the impact of usage of the additional two tools:

Table 4-1 Use of STPSs, SOP, and SNT in Italy, GY 2016/17 (MWh)

MWh	STSPs	SOP	SNT
"System Buys"	10,950,767	4,955,666	3,922,402
"System Sells"	4,760,586	4,231,935	1,789,189
Total	15,711,353	9,187,601	5,711,591

4.1.2.2 Network Users' Imbalance Cash out

(88) Network users' imbalances were significant, representing 8.37% of gas entering the system (approximately 9.7% of national demand).

(89) Network users' Short Positions represented approximately 54% of the imbalance cash out quantities, with around 46% being associated with network users' Long Positions.

(90) The weighted average price associated with over delivered gas was 18.87 EUR/MWh (Long Positions), whereas the weighted average price of network users' Short Positions was 19.69 EUR/MWh, implying an average spread of 0.8 EUR/MWh.

[23] The Agency is grateful to ARERA for its assistance in securing further information about these elements and for its commentaries in the context of the Italian regime.

[24] In this analysis, Balancing Actions cover the use of STSPs.

(91) The small adjustment determining the imbalance prices is a fixed value of 0.108 EUR/MWh, equal on average to +/-0.6% in the analysed period, one of the lowest observed.

4.1.2.3 Neutrality

(92) The overall credit arising from the net financial neutrality was around EUR 10 million, equivalent to a revenue of 0.011 EUR/MWh for each unit of gas entered onto the system.

(93) The gross cash flows associated with basic neutrality[25] were more than EUR 1,750 million, by far the highest recorded by the application of this *Framework* in any of the systems analysed, including past year's results. Over the year, the cumulative financial neutrality position varied, but was always positive peaking at more than EUR 63 million.

(94) Overall, the neutrality mechanism (that is all System balancing plus Network Users' Imbalance transactions) transacted 91.3 TWh. The net quantity sold was 42.9 GWh. Thus, this gas will have generated an income to neutrality estimated at just over EUR 0.7 million.

4.1.2.4 Overall commercial imbalance position and linepack

(95) The Italian transmission system is the largest in Europe[26]. Linepack levels are by far the highest seen in the analysis; it is significantly higher than in GB, a market of comparable size.

(96) The standard analysis within the *Framework* cannot explore the potential impacts on linepack levels created by the combined effects of SOP and SNT.

(97) The Agency notes that the net position of TSO's balancing actions (using STSPs) and network users' imbalance is close to zero over the year.

4.1.3 Final comments

(98) The performance of the regime appears very different across the year. Regime operation may have reflected considerable uncertainty about the new regime during the early part of the year. For example, there were considerably more and larger balancing actions, System Buy activities, in the first half of the year. The performance of the regime improved during the second half of the year, which may reflect the learning and evolution of TSO balancing behaviours.

(99) A key influence may have been the introduction and evolution of the incentive mechanisms applicable to the TSO. Three incentives are used[27]: to optimise linepack and prioritise storage service, to transact balancing actions at prices close to the market and to deliver accurate demand forecasts. These are understood to have been a key driver of more market-friendly TSO behaviour and the incentives are being assessed on an ongoing basis.

(100) The TSO's intervention quantities involved in the operation of the regime appear substantially higher (in both absolute and proportional assessments) compared with those declared in other analysed balancing regimes. However, care needs to be taken with such comparisons because many countries have not indicated the extent to which the TSO might be using tools beyond STSPs, for example, to manage linepack to achieve a TSO's preferred operational position.

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[25] The analysis here covers the four basic cash flows associated with anticipated implementation to the Code involving TSO purchase and sale of gas associated with TSO's System Buys and System Sells, and with network user purchase and sale of gas via the extinguishing of network users' short and long positions associated with daily balancing cash out. The Italian regime design involves the TSO using both SNT and SOP, which will create additional costs and revenues that should be considered as part of the overall balancing costs.

[26] Italian high pressure network is around 32,000 km long and the linepack is around 530 mcm. The GB high pressure network is around 7,700 km long and the linepack is around 340 mcm.

[27] The incentives were introduced on 17 October 2016.

(101) TSO's balancing actions via STSPs are at higher levels than experienced in other countries. This may in part be because of the poor network users' balancing performance. Beyond STSPs, the TSO appears to be making extensive use of storage services. The TSO uses storage services to manage variability in losses, fuel usage, and unaccounted-for gas and to change linepack levels (via SNT). The TSO makes extensive use of its opportunity to command and control injections and withdrawals from storage also for within day system flow management purposes (as evidenced by SOP quantities[28]).

(102) The difference between average prices for TSO System Buys and System Sells is one of the highest seen and should be carefully considered in the light of experience and the parameters used in the various incentive schemes.

(103) Network users' imbalance quantities represents nearly 10% of national demand. This is higher than observed in other countries. Careful consideration needs to be given as to why the quantities are so large, for example by investigating whether network users have sufficiently accurate and timely information about NDM demand forecasts. ARERA started an extensive reform with respect to forecast and allocation of NDM offtakes. This reform will be effective from 1 January 2020.

(104) The imbalances are often priced at the relatively small differential to average daily gas value transacted on the GME Trading Platform[29]. There may be merit in exploring the incentivising effect of the small adjustment, which may be, at present, deliberately not too penalising because of inadequate NDM demand forecasting accuracy. The Agency repeats that efforts should be taken to improve information provision to network users that enable them to manage their opportunities and risks.

(105) The basic neutrality cash flows imply a very small overall neutrality redistribution of around EUR 10 million (representing a tiny proportion of the more than EUR 1,720 million cash flows associated with basic neutrality cash flows).

(106) However, the Italian regime involves, similarly to others, a wider range of costs and revenues that need to be considered[30]. For example, the provision of SNT involves the TSO in having both storage services and to have gas resources to manage its storage inventory. This generates costs that the Agency understands contribute to transmission tariff charges. Additionally, it is necessary for the TSO to purchase or sell gas to address non-zero SOP outcomes. This is achieved via an ex-post auction of storage inventory gas. The Agency understands that the costs and revenues associated with these transactions contribute to the national balancing neutrality redistributions. The Agency notes that the Italian regime provides a high level of transparency and that regular reporting about all costs/revenues generated within and accounted for the balancing regime is available to network users.

(107) The Agency has also invited ARERA to consider whether the TSO should continue to have the within day command-and-control storage service. The Agency's view is that the operation of the command-and-control approach will have both physical and commercial regime implications, which will be different to a situation, where the TSO only had access to STSPs. It is important that the balancing regime is designed so that daily market based prices are properly formed based on the supply/demand position. Using STSPs would signal demands to the market in the right balancing period and may therefore enhance price formation. The Agency therefore encourages ARERA to consider the trade-offs associated with allowing the command and control storage facility. ARERA highlighted that, in normal conditions[31], this facility is not affecting the daily commercial operation of the TSO in terms of STSP procurement, but only has the effect of minimising linepack variation that should be recovered the following days.

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[28] The SOP quantities represent about 1.2% of national demand. These represent flow differences between actual aggregated nominations across storage users and the flows commanded by the TSO. This level is several times larger than the balancing activity levels in many other countries.

[29] Due to the low small adjustment, equal to 0.108 EUR/MWh.

[30] The Agency encourages all countries to fully apply the *Framework* to investigate discrepancies between the commercial and physical positions associated with the operation of the balancing regime (and specifically the four basic transactions) and actual linepack positions.

[31] I.e. in all cases except when the Ministry declares an emergency situation according to the conditions stated in the security of supply rules.

(108) Overall, the Agency sees a number of opportunities for evolution of the Italian regime in different areas:

- **Information provision to network users** is critical to enable the evolution of the responsibility for balancing to network users. Earlier reports described this in detail. Urgent attention needs to be given to fit-for-purpose NDM demand forecasts.

- The **TSO** needs to learn to work with, and **to trust, the market**. The TSO should now have confidence that the market will deliver flexibility in response to short-term wholesale market price variations. Therefore the restriction, and possibly the full removal, of the SOP facility should be planned to enhance the trading on the title within day market and not on the day-after on the MGS market.

- The TSO has dedicated resources to support its **wider system management activity**. Consideration should be given as to whether this activity could be delivered more efficiently within the short-term market using STSPs. ARERA agrees and has announced a change in the relevant arrangement from the start of the next tariff regulatory period (1 January 2020). The Agency recommends that detailed information about all costs and revenues be supplied to support national balancing neutrality arrangements and to enable scrutiny of regime performance, as envisaged in the Code.

- The Agency notes the efforts of ARERA to **use and refine incentives** to drive the performance of the TSO in a market-friendly way. The TSO should be only rewarded where it is delivering higher levels of performance that are improving regime functioning and delivering benefits to consumers. Therefore, the Agency encourages continued high levels of transparency and regulatory scrutiny to make sure that network users can track costs coming from transmission charges, national balancing neutrality, and for performance payments under the incentive schemes.

4.1.4 Graphics and Charts for Italy – Snam Rete Gas

Figure 4-1: TSO's balancing actions, Italy – Snam Rete Gas (MWh)

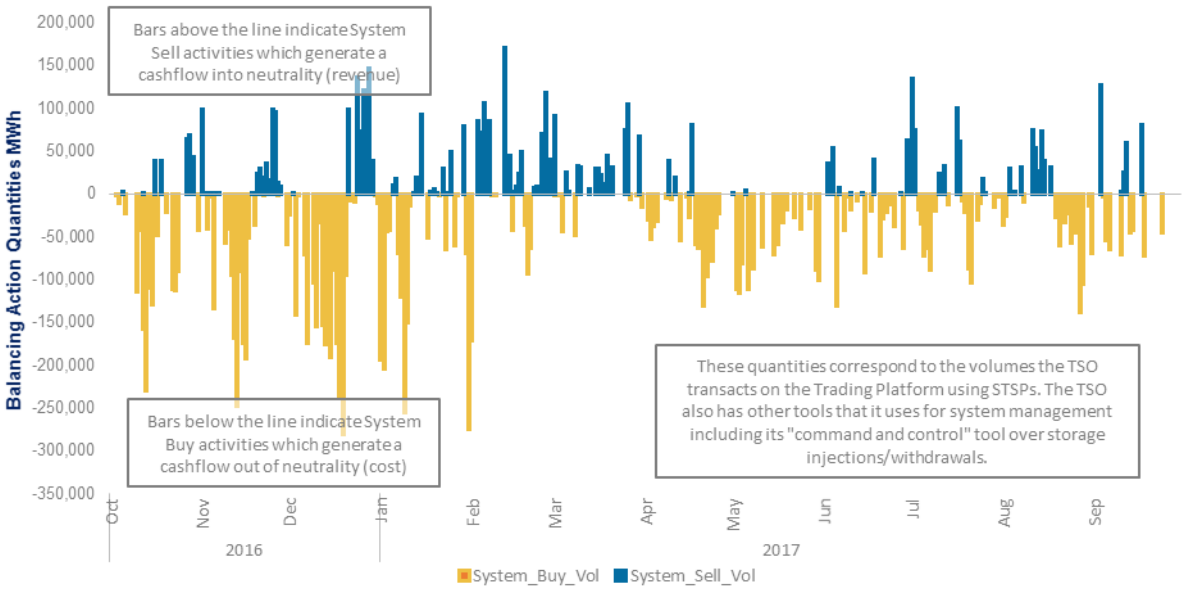


Table 4-2: TSO's balancing actions statistics, Italy – Snam Rete Gas

	Annual quantity MWh	Share of annual market %	Number of days nº	Average daily quantity MWh	Max daily quantity MWh	Share of activity %	Average price EUR/MWh
System Buys	10,950,767	1.21	170	64,416	279,564	69.7	20.60
System Sells	4,760,586	0.53	113	42,129	172,000	30.3	17.68
Total	15,711,353	1.74	270				

Figure 4-2: Network users' imbalance quantities, Italy – Snam Rete Gas (MWh)

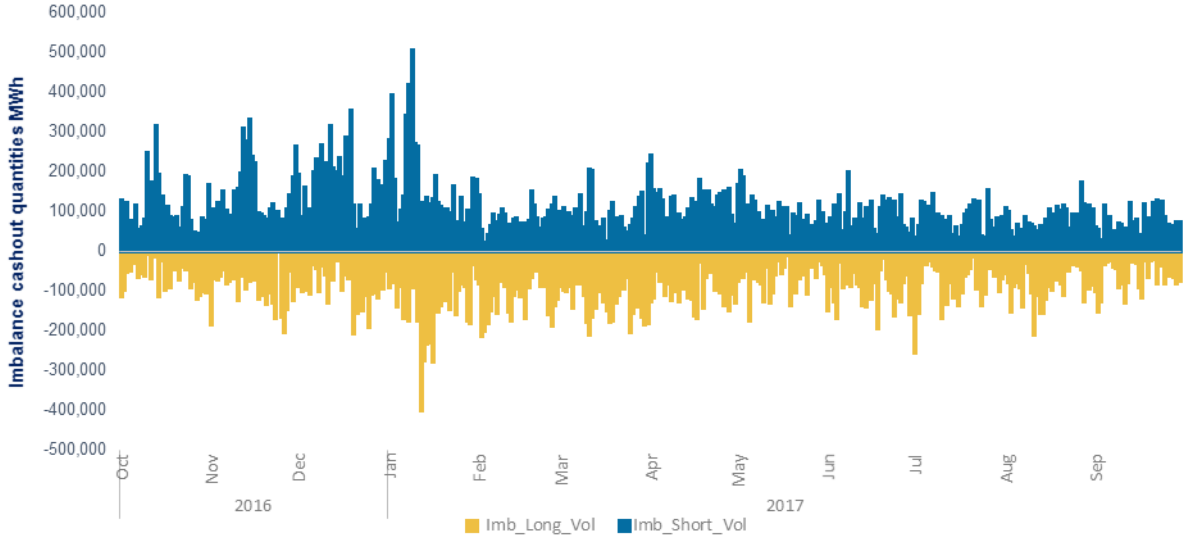


Table 4-3: Network users' imbalance statistics, Italy – Snam Rete Gas

	Annual Quantity MWh	Share of annual market %	Min daily quantity MWh	Average daily quantity MWh	Max daily quantity MWh	Share of activity %	Average price Euro/MWh
Network Users' Longs	34,657,985	3.84	0	94,953	402,799	45.9	18.87
Network Users' Shorts	40,891,081	4.53	22,454	112,030	504,206	54.1	19.69
Total	75,549,066	8.37					

Figure 4-3: Price differentials (average prices for the four primary gas transactions), Italy – Snam Rete Gas

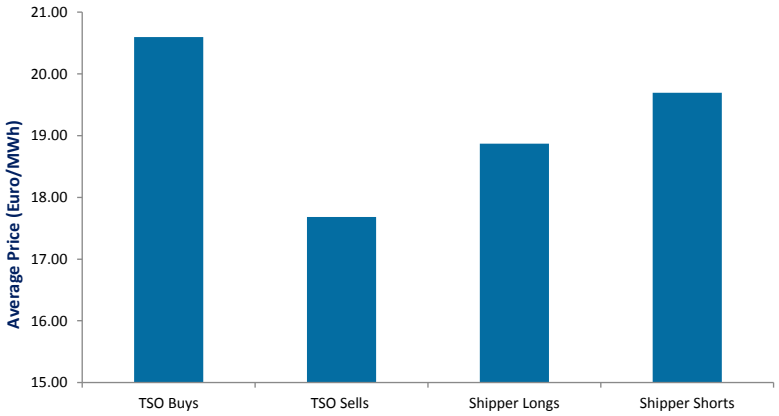


Figure 4-4: Cumulative neutrality financial position, Italy – Snam Rete Gas (million EUR)

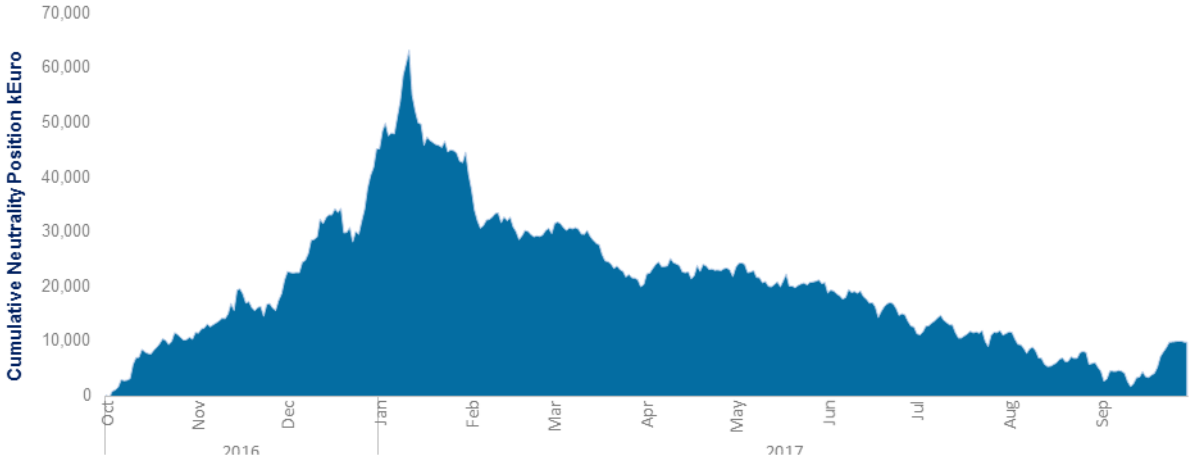
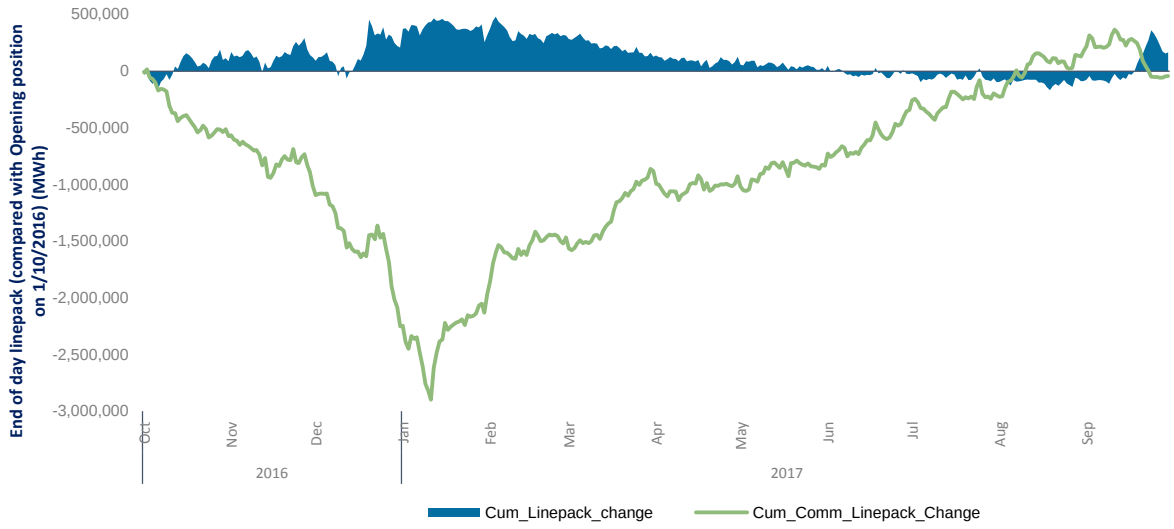


Table 4-4: Cumulative neutrality position, Italy – Snam Rete Gas

	Quantities (MWh)	Cash flows (kEuros)	Relative share
Financial Credits to Neutrality			
TSO System Sells	4,760,586	84,165	9%
Network Users' Imbalance Shorts	40,891,081	805,317	91%
Sub-total	45,651,667	889,483	
Financial Debits to Neutrality			
TSO System Buys	10,950,767	225,568	26%
Network Users' Imbalance Longs	34,657,985	654,029	74%
Sub-total	45,608,752	879,597	
Net	42,915	9,886	
Net neutrality per unit of market volume		0.0110	Euros/MWh

Figure 4-5: Opening Linepack, Italy – Snam Rete Gas (MWh)



4.2 Hungary - FGSZ

4.2.1 Short description of the balancing regime

(109) The Hungarian gas transmission system is used to support substantial transit as well as to deliver gas to satisfy national demand. Just over 50% of the gas entering Hungary in the analysed year was used to satisfy national demand (110 TWh).

(110) Hungary indicated that it had fully implemented the Code from October 2015.

(111) Whilst a Trading Platform provided by a third party is available (CEEGEX), the TSO also has also used its own Trading Platform.

4.2.2 Regime performance

(112) Not all aspects of the Code were fully implemented ahead of the year analysed. For example, not all information requirements mandated in the Code were implemented.

(113) The balancing regime initially featured a zero small adjustment for the marginal price setting, until a 1% small adjustment was introduced on 1 April 2017. The very small adjustments seek to mitigate the risk of NDM demand forecast errors for network users. However, this approach provides no, or relatively modest, incentives to balance, except on days when the TSO has taken Balancing Actions.

4.2.2.1 TSO Balancing Actions

(114) TSO's Buy and Sell balancing action quantities totalled to 727 GWh, representing 0.36% of entry flows (0.66% of national demand).

(115) Balancing actions were only taken on 78 days. Balancing actions were therefore infrequent, but quite large relative to market size. It does not appear that balancing actions were taken to manage the system between tight linepack boundaries. It is also understood that the TSO has access to storage flexibility, which may be undermining its requirements to take explicit and transparent balancing actions in the market. Overall, there is limited transparency about the TSO's activities.

(116) By far the majority of System Sells occurred during the winter period, when the small adjustment was set to zero.

(117) There was a major difference in the average price for System Buys (21.34 EUR/MWh) compared with System Sells (15.91 EUR/MWh). The differential is remarkably high (a 34% premium of Buys over Sells) given that the TSO was selling major quantities of gas during the high demand period.

4.2.2.2 Network Users' Imbalance Cash out

(118) The yearly imbalance cash out volumes represent 4% of national demand. The level of imbalance is largely attributed to the NDM demand forecast errors, although a marginal contributory factor may be the modest balancing incentive via the small adjustment.

(119) The imbalance volume showed a modest propensity for network users to be long (2,294 GWh, 52% of total imbalance quantities) compared with network user short positions (2,112 GWh). Overall, the modest propensity to be long could be seen as an approach by network users to mitigating the risk of short positions where they might be exposed to the higher cash out prices arising from TSO distress associated with System Buy actions.

(120) The average price at which network users sold gas, the Long Position cash out price, was 18.48 EUR/MWh. When they were short, they bought on average at 18.73 EUR/MWh (Short Position cash out price). This is a remarkably small difference largely attributable to the small or zero small adjustment and the infrequency of imbalance cash out price setting by TSO Balancing Actions. This differential (0.25 EUR/MWh) is much smaller than the one on TSO's balancing actions (5.43 EUR/MWh) described in paragraph (117). The NRA could not provide a definite explanation for this result.

4.2.2.3 Neutrality

(121) If spread over the market entry volume, the overall net financial neutrality (per unit of market entry) is a cost of 0.0092 EUR/MWh. This represents a cost of 0.021 EUR/MWh (per unit of national demand).

(122) The net financial neutrality unit value was highly influenced by the significant difference in buy and sell prices associated with the TSO's Balancing Actions (21.34 and 15.91 EUR/MWh), the asymmetry in volumes between System Buys and System Sells, and by the fact that, over the year, the four primary neutrality transactions involved a net total purchase of 23 GWh.

(123) The net financial neutrality represented a cost of EUR 1.9 million. The net energy position represented a net purchase of 23 GWh at an estimated cost of more than EUR 400,000. Once adjusted for the gas purchased, the net adjusted financial neutrality pot represented a cost of approximately EUR 1.5 million.

4.2.2.4 Overall commercial imbalance position and linepack

(124) The opening linepack in the system varied from a minimum of 623 GWh to a maximum of 758 GWh.

(125) The average variation of opening linepack was approximately 6 GWh, while the maximum variation was 29 GWh.

(126) The cumulative net commercial imbalance covered a range of 150 GWh. Compared with the 1 October position, the commercial impact of the four principal neutrality transactions implied a maximum line depletion of 80 MWh, although at another point in the year a maximum increase of 70 MWh was implied.

(127) Overall, there was a strong alignment of commercial imbalance and linepack change on most days, save for a few days, when dislocations are apparent.

4.2.3 Final comments

(128) Network users' imbalances represented more than six times TSO balancing action volumes. The TSO played a relatively infrequent role in balancing, although its actions on a few days might be considered large in relation to demand levels.

(129) The difference between the prices of the TSO's System Buy and System Sell balancing actions were considerable. It is possible that network users did not have adequate information about the status of the system and/or the likelihood of TSO needing to take balancing actions. This may have contributed to this apparent inefficiency. The TSO is also understood to have access to storage flexibility. This may have contributed to the infrequent actions and the avoidance of STSPs. The latter detracts the TSO from supporting appropriately the development of the short-term wholesale market.

(130) Information and hourly forecast about the end-of-day system status provides network users with information to assess both their individual positions and that of the community of users. It has two roles. Firstly it might indicate whether the system is substantially out of balance and therefore provide insight into whether, and to what extent, network users are pushing the system into an under or over-delivery position and how that position evolves during the day. Secondly, this information can provide valuable insight into whether the TSO (or other network users) might shortly request for flexibility in the market. Thus, the provision of better system status information can deliver helpful input to both the demand and supply side of the short-term flexibility market, thereby enhancing its efficiency.

(131) Additionally, it may be that the relatively rare TSO balancing interventions were surprising the market and that limited depth of competitively priced flexibility was creating distressed purchases and sales, again contributing to the very wide buy–sell spread associated with the TSO's actions.

(132) Reconsidering the TSO's balancing action policy and processes may be desirable. Some countries have found it helpful to have the TSO's actions well defined in the early days of market evolution. The TSO may wish to signal the anticipated intervention in the market, and potentially even provide an indication of the size of the actions, to stimulate the market. At the same time, it may need to have some scope for discretion about the precise timing of the actions in response to the market's competitive repricing activity. Some TSOs (including in both Great Britain and Denmark) found that the interaction of the TSO with market players was

an important part of establishing a well-functioning short-term gas flexibility market. Very low levels of balancing should not necessarily be seen as efficient. Costs arise as a function of volumes transacted and buy-sell spreads and so there may be trade-offs that need to be considered in the sense that greater traded volumes may stimulate smaller buy-sell spreads.

(133) Additionally, the use of two platforms may also contribute to inefficiencies, particularly if price dislocations occur on the two platforms. Over the analysed year, the within day title product average prices on the CEEGEX Trading Platform were better than those on the TSO's Trading Platform (20.88 EUR/MWh against 21.78 EUR/MWh for System Buys, 16.19 EUR/MWh against 15.74 EUR/MWh for System Sells). Having two platforms is not necessarily inappropriate if balancing actions secure the highest price efficiency. However, either an obligation should be placed on the TSO to demonstrate that it is securing the most favourable price for balancing transactions, or a balancing policy should be developed. The balancing policy could identify one platform to be used and only if insufficient gas is available, the TSO will opt for the second one. The first priority platform could be selected based upon either liquidity assessments, number of players registered to the platform, or based on the charges to be paid for using the platform.

(134) Furthermore, having two Trading Platforms generates a requirement on the TSO to ensure that all market users have timely information about the evolution of cash out prices. Having two platforms also risks splitting liquidity. The merits of having a single Trading Platform warrant consideration.

(135) Overall, there may be merit in trying to improve information provision to network users, including NDM demand forecasting, providing hourly forecasts for system status information and to evolve the TSO's balancing policy, to greater transparency around the TSO's balancing actions, and to seek to avoid the TSO being a distressed buyer or seller of gas.

(136) Another important element is that the price difference for network users' Long and Short Imbalance Positions was very low. Without creating a price incentive, network users will have a lower push to balance. Careful consideration should be given to the small adjustment. A slightly larger small adjustment might be helpful to improve network users' balancing performance. This should be explored with network users in the quest to establish an appropriate balancing incentive. Network users should also have a say about an improved TSO balancing policy.

4.2.4 Graphics and Charts for Hungary – FGSZ

Figure 4-6: TSO's balancing actions, Hungary - FGSZ (MWh)

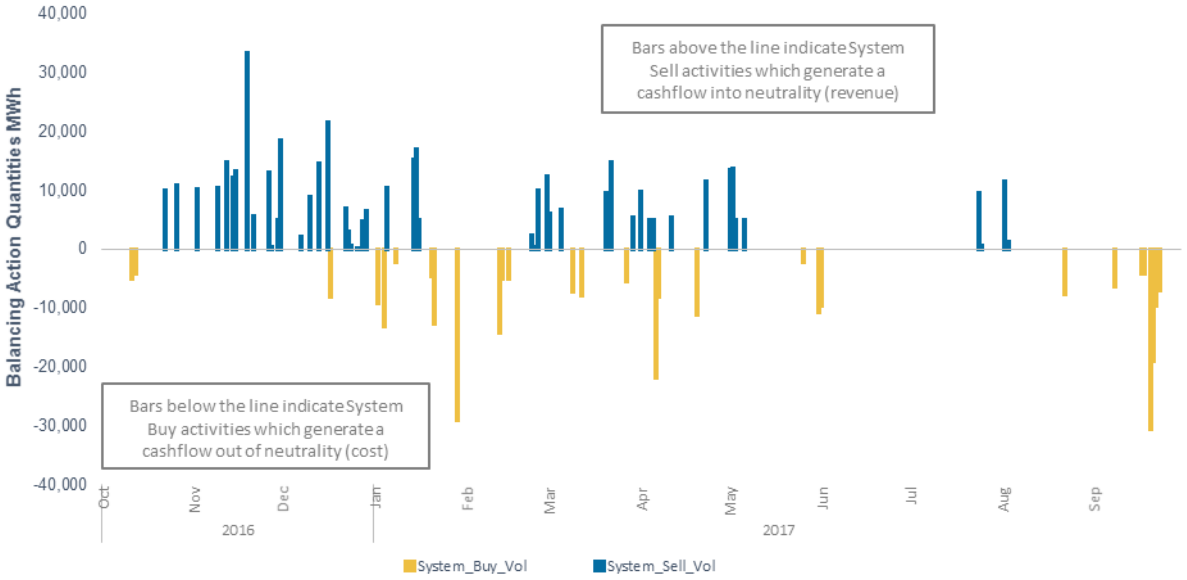


Table 4-5: TSO's balancing actions and services statistics, Hungary – FGSZ

	Annual quantity MWh	Share of annual market %	Number of days nº	Average daily quantity MWh	Max daily quantity MWh	Share of activity %	Average price EUR/MWh
System Buys	283,844	0.14	29	9,788	30,600	39.1	21.34
System Sells	443,002	0.22	49	9,041	33,390	60.9	15.91
Total	726,846	0.36	78				

Figure 4-7: Network users' imbalance, Hungary - FGSZ (MWh)

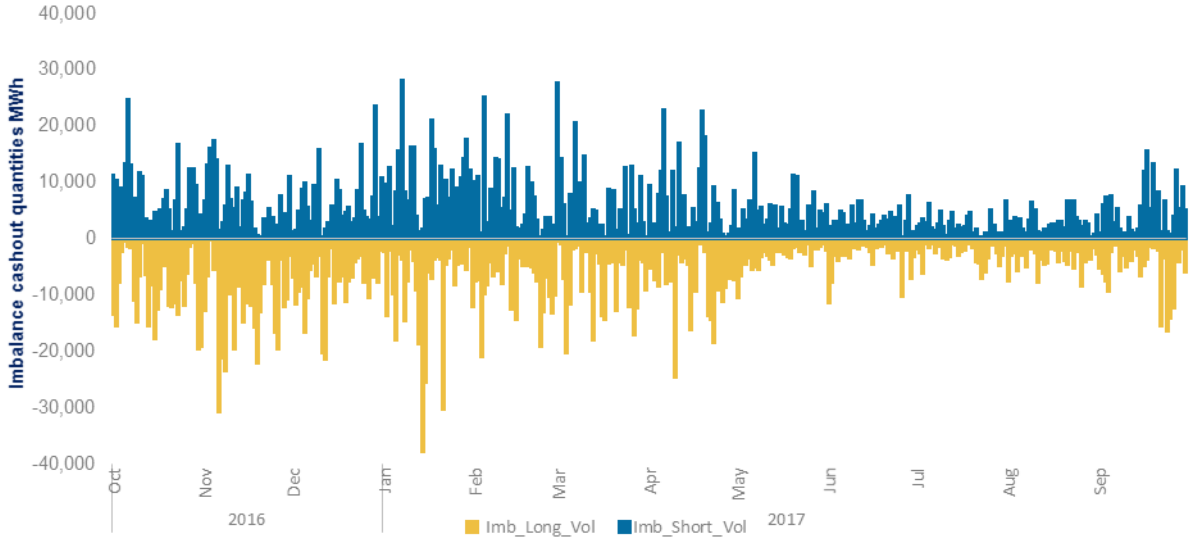


Table 4-6: Network users' imbalance statistics, Hungary – FGSZ

	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 Users' Long	2,293,645	1.13	121.384	6,284	37,850	52.1	18.48
Network Users' Shorts	2,111,542	1.04	49.606	5,785	28,067	47.9	18.73
Total	4,405,187	2.17					

Figure 4-8: Price differentials (average prices for the four primary gas transactions), Hungary – FGSZ (EUR/MWh)

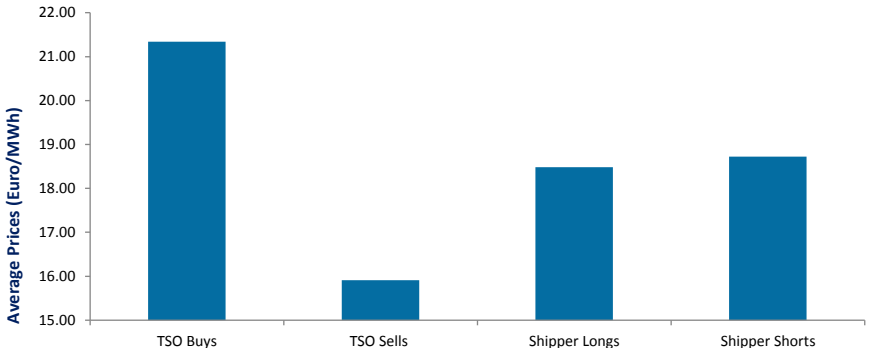


Figure 4-9: Cumulative neutrality financial position, Hungary – FGSZ (EUR)

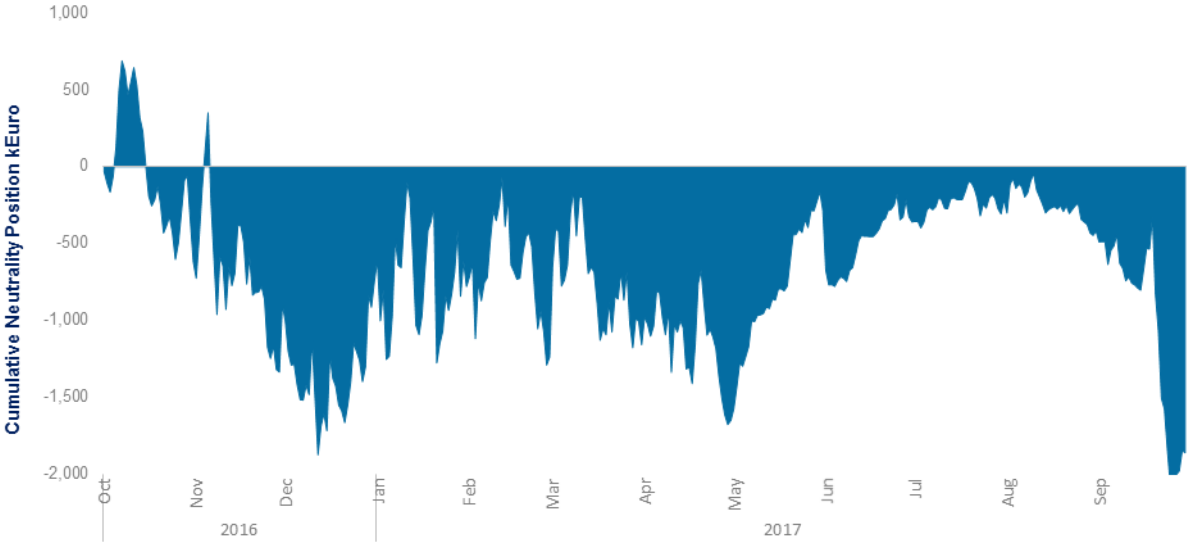
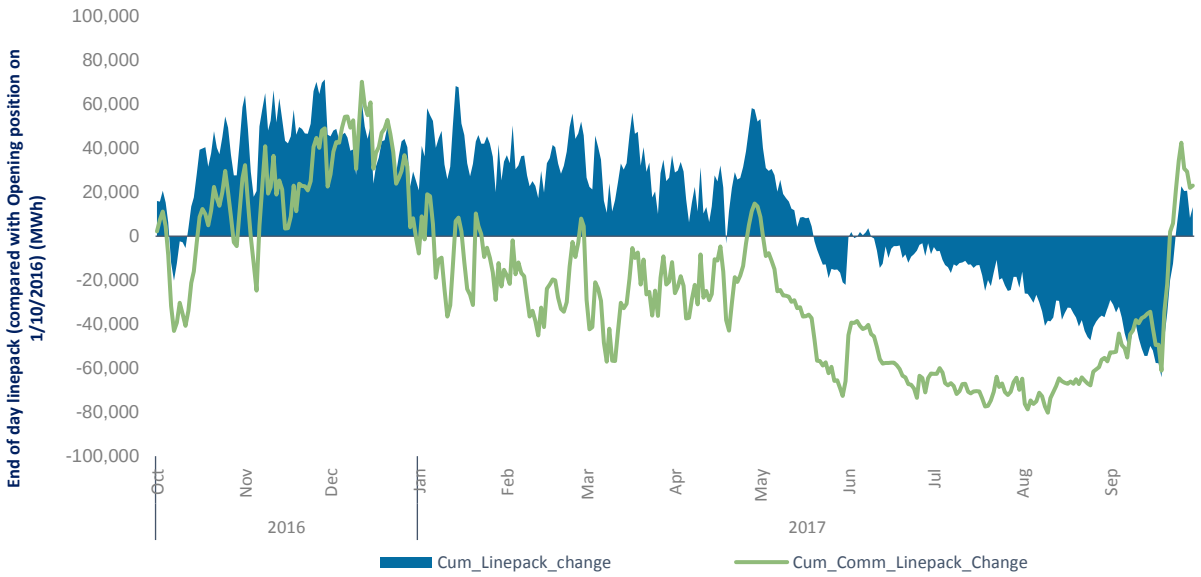


Table 4-7: Cumulative neutrality position statistics, Hungary – FGSZ

	Quantities (MWh)	Cash flows (kEuros)	Relative Share
Financial Credits to Neutrality			
TSO System Sells	443,002	7,047	15%
Network Users' Imbalance Shorts	2,111,542	39,539	85%
Sub-total	2,554,544	46,587	
Financial Debits to Neutrality			
TSO System Buys	283,844	6,057	13%
Network Users' Imbalance Longs	2,293,645	42,391	87%
Sub-total	2,577,489	48,448	
Net	-22,945	-1,861	
Net neutrality per unit of market volume		-0.0092	EUR/MWh

Figure 4-10: Overall commercial imbalance position and linepack, Hungary – FGSZ (MWh)



4.3 Poland high calorific zone – Gaz-System

4.3.1 Short description of the balancing regime

(137) The balancing regime in the high calorific zone deploys interim measures involving the use of tolerances and the potential use of a Balancing Platform.

(138) The high calorific zone includes a very small, but physically separate distribution network, which is directly supplied from the Czech Republic via the Branice interconnection point. This area, which is not connected to any Polish transmission pipeline, received its entire gas supply for the 2016/17 Gas Year via a balancing service contract. The quantities are small and thus have been excluded from the analysis below[32].

(139) Poland is planning an orderly transition aimed at removing the interim measures by April 2019. As part of its transition, tolerances were reduced from the 5% of user throughput in the period of analysis to 2.5% from April 2018. A Balancing Platform is in place, although it was not used during the period or before the period captured in this Report.

The other two Polish balancing zones

(140) In Poland, two other balancing zones exist: the TGPS and the low calorific balancing zone in the southwestern part of the country. In both balancing zones, two interim measures (balancing platform and interim imbalance charge) were introduced. The interim imbalance charge in the low calorific balancing zone and in TGPS is set using different rules.

(141) In the low calorific balancing zone, the marginal prices are set as the highest/lowest price recorded in transactions concluded on the balancing platform[33] in respect to that Gas Day or weighted average price of gaseous fuel in transactions concluded on the balancing platform in respect to that Gas Day, +/- 10% as a small adjustment. Trading on Polish Power Exchange ('TGE') will probably be possible for the low calorific balancing zone in 2019.

(142) In TGPS, the interim imbalance charge takes into account the transportation costs of gas between Poland and Germany. The marginal prices are set based on TGE and EEX day-ahead indexes plus the transportation costs to TGPS through the Mallnow and PWP interconnection points.

(143) TGE offers day-ahead products[34] in the TGSP balancing zone. The trade is possible as from March 2016, but no trades actually occurred so far, since there is apparently neither interest from market players, nor need for balancing purposes.

4.3.2 Regime performance

(144) This analysis covers the operation of the Polish high calorific zone. The regime remains in transition but good progress has been made to foster a viable short-term wholesale market.

4.3.2.1 TSO Balancing Actions

(145) All balancing transactions were conducted using title products on the Trading Platform.

[32] The total quantity procured under the Balancing Services arrangement is 2,533 MWh at a cost of less than EUR 50,000. These quantities and costs have been excluded from the analysis.

[33] Called Balancing Services Market.

[34] Contract name: SGT_BASE.

(146) Balancing actions in total represented just over 0.9% of total entry quantities (1.1% of national demand). TSO's balancing actions generally follow the imbalance position of all network users at the end of the previous Gas Day. The TSO took balancing actions every day, expect one[35].

(147) The TSO sold gas on more days than it purchased. Modest quantities were transacted by the TSO; the largest balancing action involved a System Sell of 24,246 MWh.

(148) The difference between the average price of System Buys (19.00 EUR/MWh) and System Sells (17.47 EUR/MWh) creates a moderate spread of 1.53 EUR/MWh (a 9% premium of Buys over Sells).

4.3.2.2 Network Users' Imbalance Cash out

(149) Imbalance quantities were about 2% of total entry quantities.

(150) Tolerances reduced network users' exposure to the marginal price of imbalances. Only 13% of the 2,278 GWh associated with network user Long Positions were cashed out at the marginal price. Only 32% of the 2,044 GWh of network user Short Positions were cashed out at the marginal price.

(151) The relief of the wide tolerances (5% of an assessment of individual users throughput based either on exits or on a derivation of entries plus exits) shields network users from being exposed to the marginal prices. The marginal prices are set based on the 10% small adjustment[36].

(152) The overall result, including tolerated gas imbalances, is that long network users were paid on average 18.01 EUR/MWh for their overdeliveries, whereas short network users were charged 19.22 EUR/MWh for their underdeliveries.

4.3.2.3 Neutrality

(153) Overall, the net neutrality position had a credit of 0.0136 EUR/MWh per unit of gas entered into the system.

(154) The net energy position represented a sell of approximately 105 GWh.

(155) The net financial effect of the four neutrality cash flows over the year generated a revenue of approximately EUR 2.9 million.

(156) The neutrality account shows a net sell position, which has yielded a revenue of approximately EUR 1.9 million, while the balancing regime financial settlements have generated a EUR 1 million surplus over the year when assessed on a volume neutral basis.

4.3.2.4 Overall commercial imbalance position and linepack

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

(158) The highest commercial imbalance on the day was approximately 30 GWh. Commercial imbalances of this size were observed in both directions over the year. The commercial data implies that approximately 100 GWh may have been removed from linepack over the year.

(159) The cumulative overall commercial position indicates a downward trend over the year. Over the year, the accounted-for gas accounted implies a reduction in physical linepack of 105 GWh that could be associated with the commercial operation of the balancing regime.

[35] On 30 November, due to operational and technical reasons, the TSO did not undertake any balancing actions.

[36] Terminology of the Code, see Article 22, in particular Article 22(7).

4.3.3 Final comments

(160) Network Users Imbalance Quantities represented approximately twice the TSO's balancing action quantities.

(161) The tolerances provided significant protection for network users. It is likely that a better performance might be achievable. This will depend upon network user ability to accurately predict demand, which will depend upon the accuracy of NDM demand forecasting. The scope for improvements in network user balancing based on the current provision of information should become apparent shortly after that tolerances have been halved to 2.5% from 1 April 2018.

(162) When tolerances are fully removed, the accuracy of NDM demand forecasting will be critical to network users. There may be merit in assessing NDM demand forecasting performance to establish whether efforts to improve its accuracy is warranted. An aspiration should be a reasonable accuracy of NDM demand forecasting and an appropriate small adjustment which lead to an acceptable short-term market liquidity.

(163) Once tolerances are removed, balancing incentives will be more influenced by the small adjustment. The current 10% small adjustment is much larger than is implemented in other countries analysed and careful consideration should be given to whether a more modest incentive would be sufficient.

(164) The TSO operates a balancing platform called the Balancing Service Market. Network users holding a gas trading licence and having concluded a dedicated agreement with the TSO can register to the balancing platform.

(165) Whilst the Code envisages all necessary STSPs being available on a Trading Platform, under the specific circumstances described in Article 47(3) of the Code, a Balancing Platform could operate until April 2024. The TSO may want to retain the use of the Balancing Platform. This would enable balancing via the trading of locational products to deliver gas on the Eastern Polish border. As liquidity develops and the full range of necessary products is introduced on the Trading Platform, the need for the Balancing Platform decreases.

(166) To the extent that the TSO uses the Balancing Platform only when and until necessary, its prolonged existence may not be detrimental to efficient market functioning. The review of the interim measure should continue in the future under a clear regulatory framework. If the evolution of the market provides sufficient basis for balancing, the Balancing Platform should cease to exist.

4.3.4 Graph and charts for Poland high-calorific zone – Gaz-System

Figure 4-11: TSO's balancing actions, Poland high-calorific zone – Gaz-System (MWh)

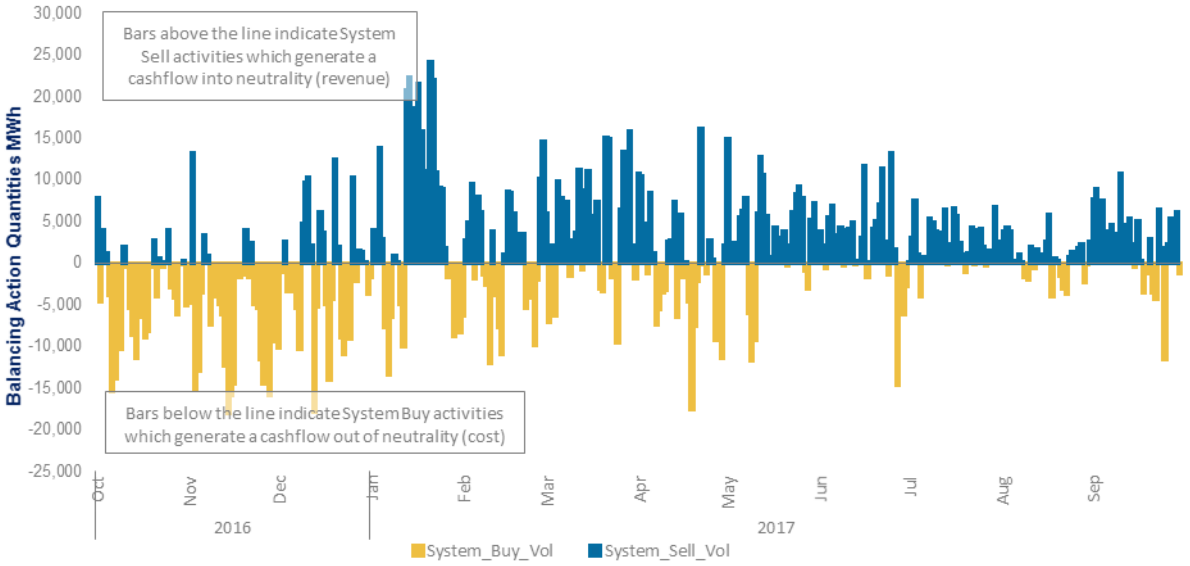


Table 4-8: TSO's balancing actions statistics, Poland high-calorific zone, Gaz-System

	Annual quantity MWh	Share of annual market %	Nos of days nº	Average daily quantity MWh	Max daily quantity MWh	Share of activity %	Average price EUR/MWh
System Buys	823,830	0.39	150	5,492	18,073	41.5	19.00
System Sells	1,162,875	0.55	214	5,434	24,246	58.5	17.47
Total	1,986,705	0.93	364				

Figure 4-12 Network users' imbalance quantities, Poland high-calorific zone, Gaz-System (MWh)

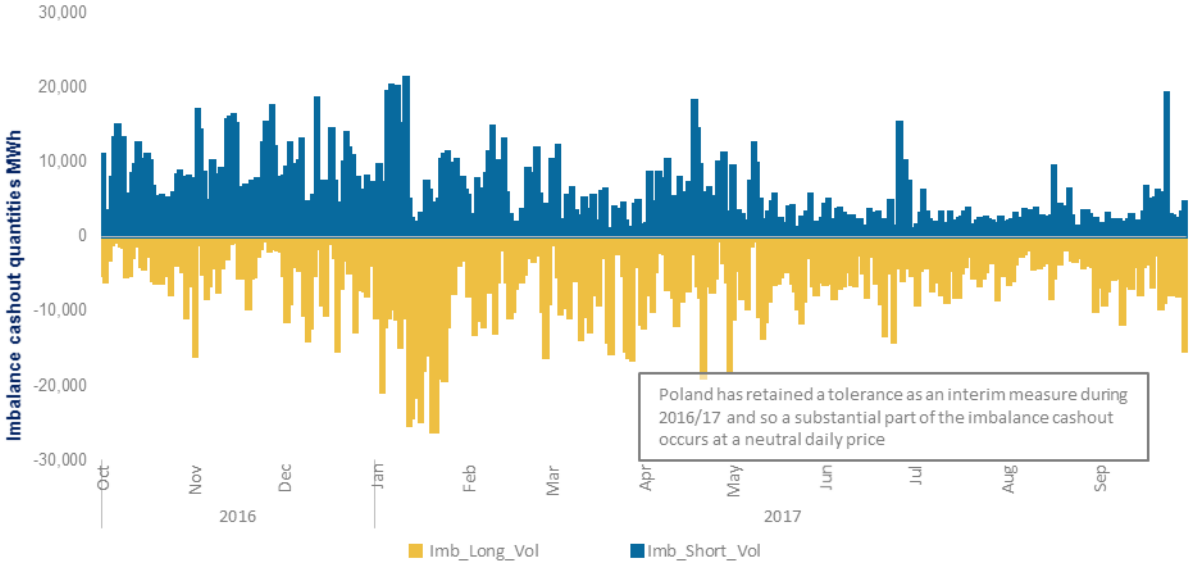


Table 4-9: Network users' imbalance statistics, Poland high-calorific zone, Gaz-System

	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 Users' Longs	2,278,071	1.07	188	6,241	26,183	52.7	18.0
Network Users' Shorts	2,044,287	0.96	381	5,601	21,395	47.3	19.2
Total	4,322,358	2.03					

Figure 4-13: Price differentials (average prices for the four primary gas transactions), Poland high-calorific zone, Gaz-System (EUR/MWh)

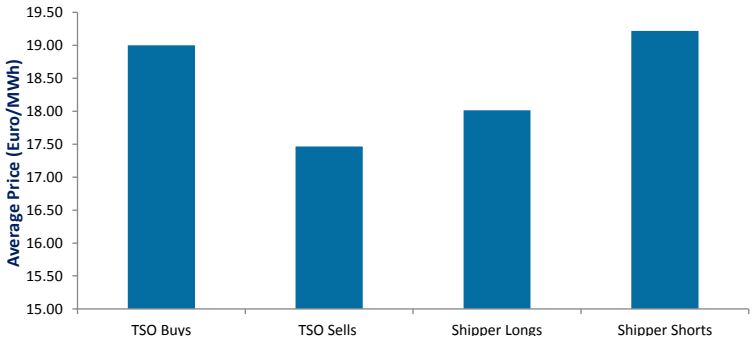


Figure 4-14: Cumulative neutrality financial position, Poland high-calorific zone, Gaz-System (thousand EUR)

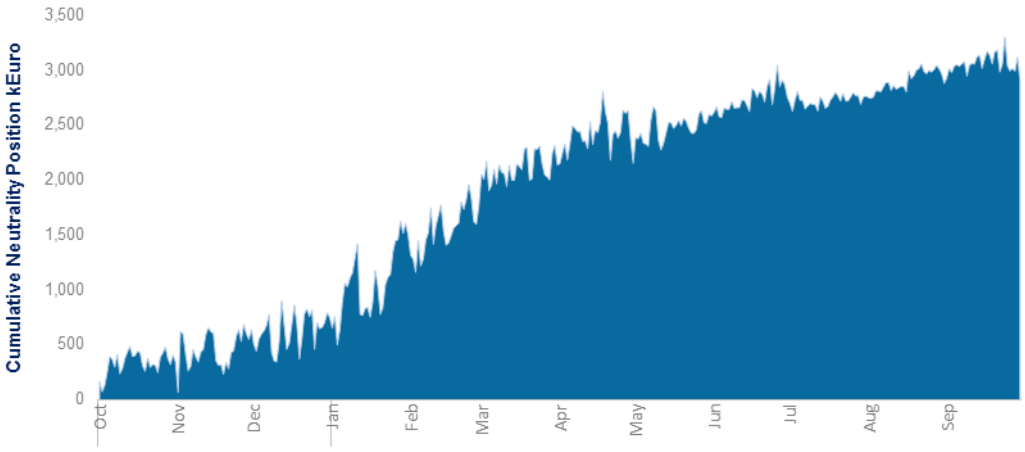
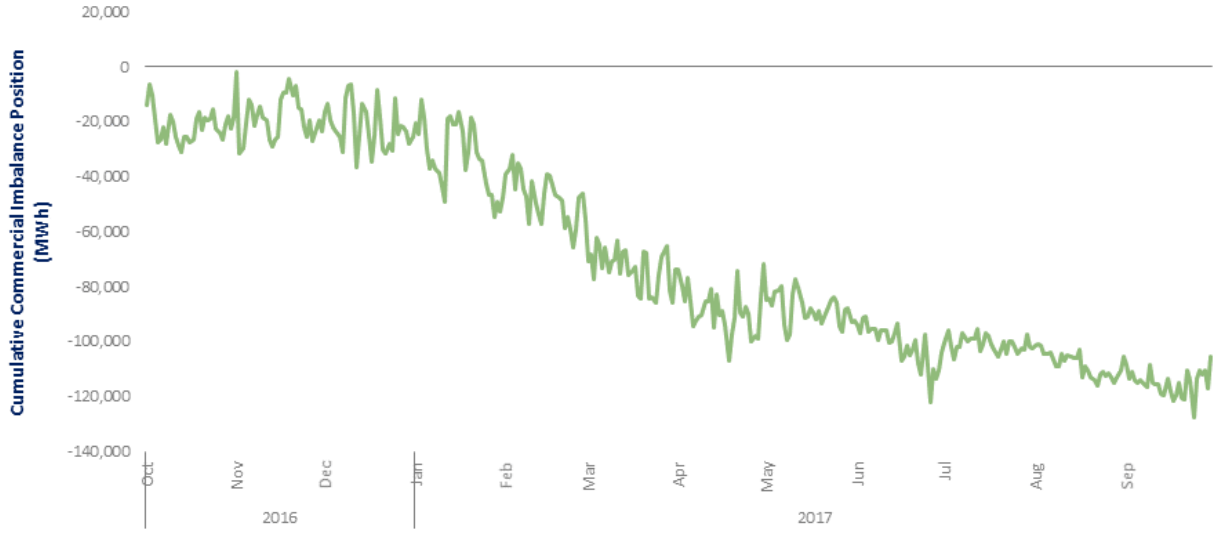


Table 4-10: Cumulative neutrality position statistics, Poland high-calorific zone, Gaz-System

	Quantities MWh	Cash flows kEuros	Relative share
Financial Credits to Neutrality			
TSO System Sells	1,162,875	20,311	34%
Network Users' Imbalance Shorts	2,044,287	39,285	66%
Sub-total	3,207,162	59,595	
Financial Debits to Neutrality			
TSO System Buys	823,830	15,653	28%
Network Users' Imbalance Longs	2,278,071	41,039	72%
Sub-total	3,101,901	56,692	
Net	105,261	2,903	
Net neutrality per unit of market volume		0.0136	EUR/MWh

Figure 4-15: Overall commercial imbalance position Poland high-calorific zone, Gaz-System (MWh)



4.4 Czech Republic – NET4GAS

4.4.1 Short description of the balancing regime

(167) The Net4Gas system serves both transit and national gas demand. The data analysed for the Gas Year 2016/17 suggests that approximately 199 TWh of gas entered the system of which approximately 92 TWh served national demand. The numbers about Market Volumes – in the dataset used in the analysis for this Report - were updated based on the information provided on OTE. At the same time, no transit volumes associated with the Gazelle pipeline, which is operated under TPA exemption, have been provided.

(168) The Czech Republic implemented the gas balancing arrangements in July 2016 in response to the Code.

(169) This implementation introduced a market-based balancing with the aspiration to deliver a low cost balancing system for network users. This is achieved by taking advantage of physical opportunities provided by the network.

(170) The regime defines a market operator, whose role is fulfilled by OTE. OTE is the commercial interface with network users, particularly in relation to all aspects associated with bilateral trade nominations, gas flow nominations, communication of allocations, operation of gas exchange, unused flexibility market, and all aspects of balancing regime settlement.

(171) Network users using the pipeline for transit flows are obliged to nominate a balanced position with the intention that their activities will not create variation in linepack levels within the system.

(172) The regime was designed noting that NDM demand is uncertain, but that the aggregated effects of this uncertainty are less than uncertainties in the Czech gas system, including:

- the impacts of Operational balancing agreements ('OBAs') at border points and storages,
- the TSO's requirement to change linepack levels and its distribution to deliver efficient transport services under different flow directions and scenarios experienced by the Czech system.

(173) Whilst network users are provided with updated NDM demand portfolio information twice within the day, the balancing implementation has been designed to shield network users against full daily cash out of imbalances that might be attributable to uncertainties associated with NDM demand.

(174) The implementation therefore features a service that reduces the extent of imbalances that are subject to daily cash out. Network users are each given flexibility quantities on each day, effectively defined by the size of their portfolio[37]. The flexibility quantities reduce the network user's exposure to cash out. Only imbalances exceeding the flexibility held by the network user are cashed out at the relevant marginal price. Furthermore, the flexibility entitlements are tradeable[38].

4.4.2 Regime performance

(175) The specific features of the Czech regime mean that careful interpretation shall be applied when comparing its regime performance with that of other countries. The analysis below provides some commentary to

[37] The level of gas trading activity and capacities at storage and borders (where OBA arrangements apply) do not generate any flexibility entitlement.

[38] The Czech regime reduces the quantities subject to cash out and therefore the net revenues going through neutrality. It is argued that this reduces costs to network users because it eliminates exposures that individual network users cannot manage. However, this needs a very careful assessment and comparison against the implementation of a strict full daily balancing regime implementation. Firstly, the revenues arising from cash out cannot necessarily be considered a cost, because the resulting cash flows should be explicitly redistributed to network users. This happens explicitly where a balancing neutrality mechanism applies. The effects are less clear, where it is reflected in transportation charges, and as such need to be considered. Secondly, the alleged distortion arising from full cash out will not occur because individual network users are all subject to the same proportional errors in their NDM demand forecasts.

enable appropriate interpretation and conclusions. The start of the analysed period covered early operational experience and learning about regime functioning following its July 2016 implementation.

4.4.2.1 TSO Balancing Actions

(176) TSO's Buy and Sell balancing actions sum up to 0.23% of the total market entry volume. This represents less than 0.5% of national demand. Actions are infrequent, occurring on only 48 days across the year.

(177) The quantities transacted on each side of the market are remarkably similar: 230 GWh on the Buy side, and 229 GWh on the Sell side. This may be due to a system design feature according to which the TSO manages a specific TSO account targeting a close-to-zero cumulative position.

(178) The TSO has considerable discretion over when and how it takes its balancing actions. Most balancing actions are taken within day, although approximately 22% of balancing gas was sourced at Day-Ahead on the basis that prices are more attractive in this timescale. The relatively low frequency and quantities of gas involved in balancing actions may reflect the relatively high levels of linepack available in the system. This is a consequence of the significant transit volumes subject to input/offtake nomination matching. This facilitates to accommodate the nominated imbalances in respect of national demand.

(179) It is also likely that the TSO is taking other actions associated with getting additional gas on or off the system to manage the system from a physical perspective; for example, when more or less gas is desirable in the system under scenarios of different flow directions. The data confirms that the balancing actions are not easily explicable by reference to any of the network users commercial positions, or cumulative commercial position (defined by daily imbalance (long and short) positions), or physical linepack positions. There are other influences at work here, such as OBA effects at border IPs and storage facilities, which may provide further insight into the TSO's balancing decisions.

(180) There is an 8% price premium of the average TSO/System Buy prices (18.92 EUR/MWh), when compared to the average System Sell prices (17.55 EUR/MWh).

4.4.2.2 Network Users' Imbalance Cash out

(181) On average, network users' imbalance quantities (i.e. that part of the imbalance that is subject to cash out) represented 0.29% of the market entry quantities, approximately 0.6% of national demand. This comprised Long Positions of 298 GWh and Short Positions of 272 GWh. These quantities represent only those that are cashed out at marginal prices. Overall 570 GWh of imbalance were cashed out.

(182) Daily imbalances (based on inputs, net gas traded positions and offtakes) correspond to 3,665 GWh (Long) and 3,636 GWh (Short). These represent a total of 7,301 GWh. These imbalances represent approximately 8% of national demand, one of the highest so far analysed. However, it is important to note that the regime has deliberately been designed to be benign to network users given the uncertainty about their offtakes, and some of the imbalance will be a response from individual network users' ability to address carry-over from one day to the next.

(183) It is possible that better network user balancing would be reasonable in the Czech Republic (e.g. having regard to the accuracy of within day NDM demand forecasts and the NDM allocations delivered shortly after the end of the Gas Day). However, whether more accurate network user balancing would be beneficial may be less clear, given that the uncertainties (and current balancing performance) can easily be accommodated in linepack variation and generally addressed in subsequent days.

(184) Effectively 92% of the daily imbalances were not cashed out, as a result of the application of the flexibility service. Most of the cash out avoidance can be attributed to the flexibility service allocation initially provided free of charge to each network user based on its portfolio [39]. A secondary market exists whereby unused flexibility can be traded between network users with a price effectively determined in an auction. The operation of this secondary market eliminates the cash out nearly every day based on the current levels of performance observed in the Czech Republic.

[39] For more details, see schedule 5 to Public Notice no. 349 /2015 of 8 December 2015, on the Gas Market Rules.

(185) Where cash out occurs the average prices at which network users sell gas when they are long is 17.39 EUR/MWh, while the price at which they buy gas when they are short is 19.06 EUR/MWh. The Short/Long imbalance price differential reaches approximately 10%.

4.4.2.3 Neutrality

(186) In the period analysed, the four principal neutrality cash flows considered in the *Framework* generated a modest cost of EUR 332,000, equivalent to a cost of 0.0017 EUR/MWh if levied on entry quantities.

(187) The neutrality ended up with a net energy purchase of 27 GWh of gas, having a value of around EUR 500,000. Overall, on a quantity neutral adjusted basis, the regime generated a credit of around 0.001 EUR/MWh if levied on entry quantities or 0.002 EUR/MWh on national demand.

(188) Neutrality financial outcomes would likely be very different if a full daily cash out were applied. The data supplied indicates that if all imbalances had been cashed out on a daily basis then a net sell of 19 GWh would have occurred over the year. If balancing performance did not improve then more than ten times the quantities would be cashed out, generating a significant surplus for redistribution back to network users because of the differences in the marginal prices. However, the stronger incentives to balance would likely improve balancing performance so it is impossible to predict outcomes based on past performance.

4.4.2.4 Overall commercial imbalance position and linepack

(189) The average opening linepack was 1.65 TWh, with minimum and maximum values reaching respectively 1.57 TWh and 1.73 TWh (approximately a 10% variation). The average daily linepack variation was 14 GWh, while the maximum was 84 GWh.

(190) Data provided to support the application of the *Framework* also included aggregated information about network users' long and short imbalance positions based on inputs plus net trade quantities less offtakes. The daily commercial imbalance position confirms that the gas flows generated by the market imply quite large swings in daily linepack levels, averaging 11 GWh, across a range of 63 GWh of build to 48 GWh of depletion. These levels demonstrate the less exacting requirements, when compared with other balancing regimes, to physically balance the flows on and off the system on a daily basis. Additionally wider influences, for example OBA operation at IPs and storage facilities, may help to explain the full physical linepack variation identified above.

(191) This variability, and the ability to accommodate mismatched flows, need to be considered in the context of an average national domestic daily demand of approximately 250 GWh/day. Put simply, the Czech regime does not need to be balanced daily, rather significant physical imbalances can be absorbed and corrected on the next day, or provided cumulative effects are acceptable, on a later day.

4.4.3 Final comments

(192) In the year analysed, the system delivered low network user imbalance quantities, i.e. the quantities cashed out. Additionally it delivered low levels of TSO residual balancing. However, this period represents the first full year of operation of the new balancing regime when both TSO and network users had to go through substantial learning. Additionally, the NRA has noted that the period was characterised by limited variation of weather conditions or gas price volatility.

(193) The TSO was involved in very low levels of, and infrequent, balancing actions. The nature of the TSO's interventions may be crucial to overall regime functioning. Therefore, the way in which TSO's interventions in the market (e.g. triggers for actions, their size and timing, associated transparency and exercise of discretion) are determined, may affect market functioning and the assessment of the efficiency of the TSO's balancing.

(194) Network users' daily balancing performance does not appear to be good. It is a matter of fact that network users do not accurately balance on a daily basis. However, the current system can accommodate less-than-good network users' daily balancing performance since, provided that transit flow entry and exit nominations are matched and these flows are efficiently managed through the system, there is an adequate inherent linepack flexibility. This inherent flexibility accommodates the currently low level of network users' balancing performance. Essentially, there is not an exacting requirement to achieve a close daily matching of input

and offtake quantities. Generally, quite wide ranges of end-of-the day imbalances can be rolled forward into another day, when compared with other systems. If, in the future, the inherent system flexibility decreases, network users would need to be subject to stronger incentives to balance their own positions.

(195) The Czech regime incorporates a flexibility service that can accommodate substantial imbalances. The flexibility service delivers an ability to accommodate in excess of 40 GWh of overdelivery and 40 GWh of underdelivery. This represents a very substantial ability to accommodate aggregate network user imbalances, given that average national demand during the relevant year was in the region of 250 GWh. Indeed, it is surprising that, with such a generous service to eliminate the risk of imbalance cash out, the secondary trading of flexibility service does not avoid almost all imbalance cash out on almost all days.

(196) The flexibility service therefore enables the possibility of substantial carryover from one day to the next. Of course, successive carryover of substantial imbalances in the same direction each day would not be possible but the flexibility service means that imbalances on one day may subsequently influence several following days. The advantage of the approach used is that these carryovers ca be attributed to many network users who may address the carryovers in the most favourable way taking account of their gas trading opportunities, their allocated flexibility service and the potential to trade other network user's unused flexibility service across several days.

(197) An alternative approach, and possibly a better one in case of future lower inherent system flexibility, would be to use the more standard regime implied by the Code: balancing should be an ex-ante activity rather than ex-post and all of an individual network user's imbalance (net daily position) should be cashed out. Network users would then be incentivised to trade within day based on their expectations of demand, at least in part determined by the NDM demand forecasts. The TSO would have a residual role that could involve taking actions to address aggregated network users' under- or over-delivery, taking account of any change in aggregated NDM demand after the last forecast.

(198) However, in the Czech system, within day trading might not be necessary as the TSO may elect to use its discretion and trade gas for the next day having due regard to expected supply/demand situation and envisaged gas prices over the next few days given the ability to absorb system level imbalances.

(199) In conclusion, next to the legal obligation of the Code, efficiency might be an additional consideration deserving attention. A more detailed analysis, which was not feasible in the timescales of this Report, is desirable to assess whether the current Czech system offers efficiency benefits over a more standard implementation of the Code.

4.4.4 Graphics and Charts for the Czech Republic - Net4Gas

Figure 4-16: TSO's balancing actions, Czech Republic - Net4Gas (MWh)

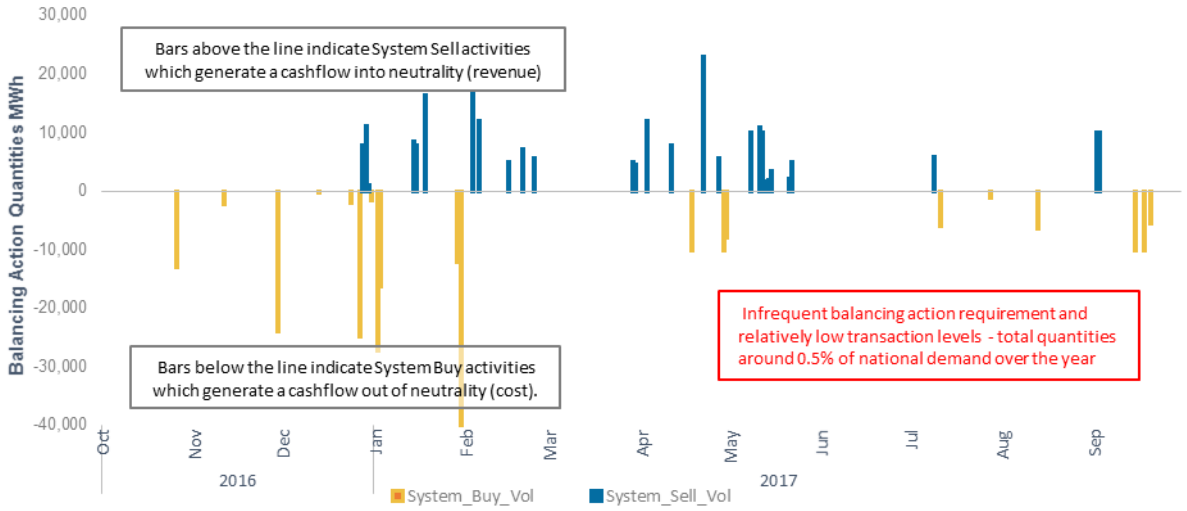


Table 4-11: TSO's balancing actions statistics, Czech Republic - Net4Gas

	Annual quantity (MWh)	Share of annual market %	Number of days nº	Average daily quantity MWh	Max daily quantity MWh	Share of activity %	Average price EUR/MWh
System Buys	230,050	0.12	20	11,503	40,000	50.1	18.92
System Sells	229,454	0.12	28	8,195	23,000	49.9	17.55
Total	459,504	0.23	48				

Figure 4-17: Network users' imbalance quantities, Czech Republic - Net4Gas (MWh)

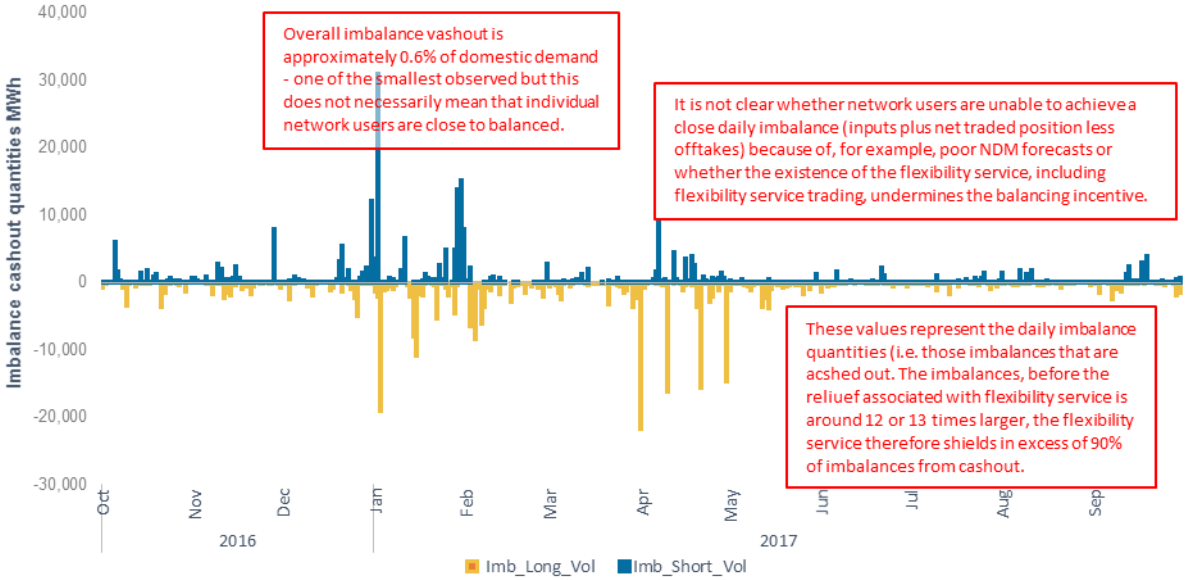


Table 4-12: Network users' imbalance statistics, Czech Republic - Net4Gas

	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 Users' Longs	298,094	0.15	0	817	21,697	52.3	17.39
Network Users' Shorts	271,585	0.14	0	744	31,099	47.7	19.06
Total	569,679	0.29					

Figure 4-18: Price differentials (average prices for the four primary gas transactions), Czech Republic - Net4Gas

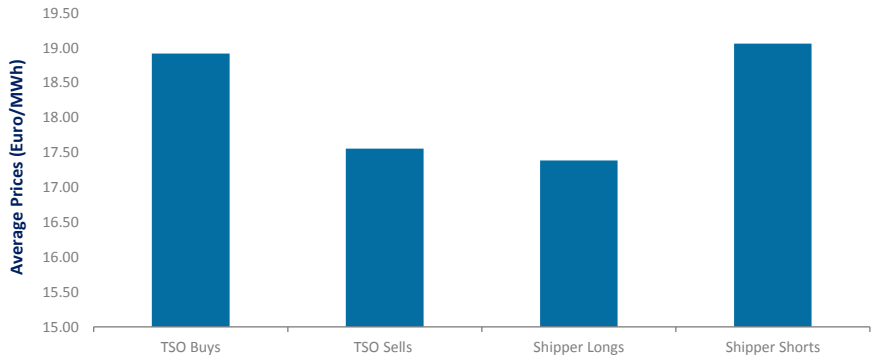


Figure 4-19: Cumulative neutrality financial position, Czech Republic - Net4Gas (million EUR)

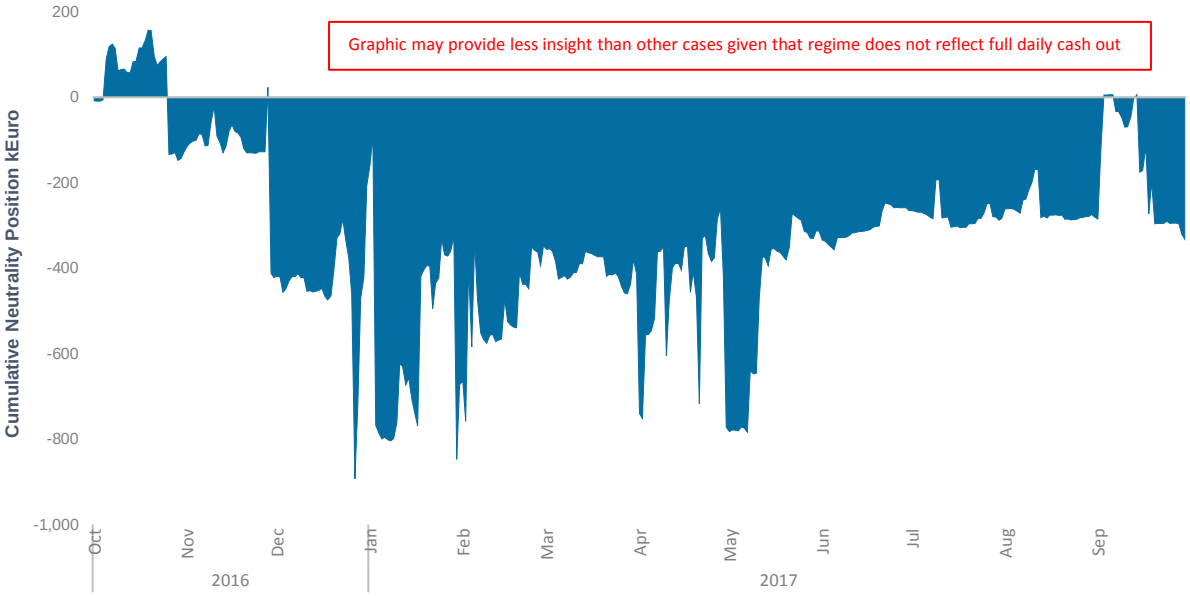
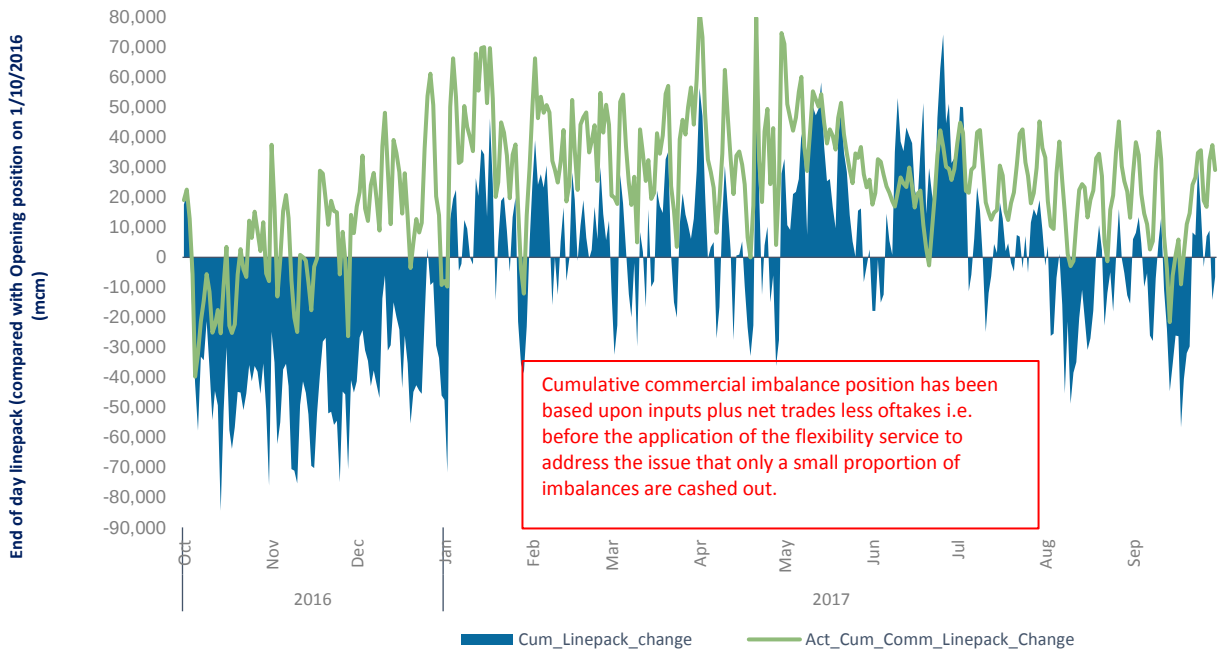


Table 4-13: Cumulative neutrality position statistics, Czech Republic - Net4Gas

	Quantities MWh	Cash flows kEuros	Relative share
Financial Credits to Neutrality			
TSO System Sells	229,454	4,028	44%
Network Users' Imbalance Shorts	271,585	5,176	56%
Sub-total	501,039	9,204	
Financial Debits to Neutrality			
TSO System Buys	230,050	4,353	46%
Network Users' Imbalance Longs	298,094	5,183	54%
Sub-total	528,144	9,536	
Net	-27,105	-332	
Net neutrality per unit of market volume		-0.0017	EUR/MWH

Figure 4-20: Cumulative physical linepack position and overall cumulative commercial imbalance position, Czech Republic - Net4Gas (MWh)



4.5 Austria – Market Area East[40]

4.5.1 Short description of the balancing regime

(200) Austria implemented a new balancing regime during 2013, right before the adoption of the Code.

(201) The Agency analysed Market Area East, which comprises substantial transit pipelines and the distribution system. This area includes entries and exits from/into storage facilities, interconnection points, and domestic production.

(202) The Austrian gas system also comprises two other Market Areas (Tyrol and Vorarlberg), which are distribution networks physically inter-connected to the NCG (Net Connect Germany) zone. These regions were established as satellite zones to NCG in October 2013.

(203) The Market Area East operates on a two-tier basis with separate balancing regimes applying to the so called ex-ante and ex-post regimes. The rules have been defined to meet the requirements of a system predominantly used for transit. Network users have a strong disincentive to creating any variations in linepack associated with their gas flow and trading activities. Essentially, the ex-ante balancing system involves a tight nomination regime with within day obligations. The ex-post regime addresses the consequences of the ex-ante activity on actual gas flows on and off the system and includes gas cash out arrangements.

(204) The ex-ante balancing regime is essentially a nomination-matching regime. Network users[41] who deliver imbalanced nominations are given a period to amend their nominations to achieve a daily balance. If the network user does not restore a balanced position within a prescribed timeframe, the Market and Distribution Area Manager (MADAM)[42] will intervene on behalf of the network user to transact gas at the Central European Gas Hub and restore the individual network user's balance position. The only imbalances that can remain on the system would be those too small to be addressed on the Trading Platform (less than 1 MWh/h).

(205) The ex-post regime addresses actual consumptions from the distribution systems in Market Area East. The distribution operators co-operate with the MADAM and provide consumption forecasts of NDM demand portfolios to the network users. Network users are not obliged to use these forecasts for nomination purposes. Balancing actions are taken to ensure acceptable stock positions in the distribution zones. The ex-post regime includes a daily cash out regime based on the actual imbalances of network users.

(206) Only information relating to the ex-ante regime has been provided for the purposes of this analysis; the required information on the ex-post regime was offered to the Agency too late for its analysis to be compatible with the timeline for the production of the Report[43].

(207) The balancing actions taken by the MADAM are indicated in the graphic below.

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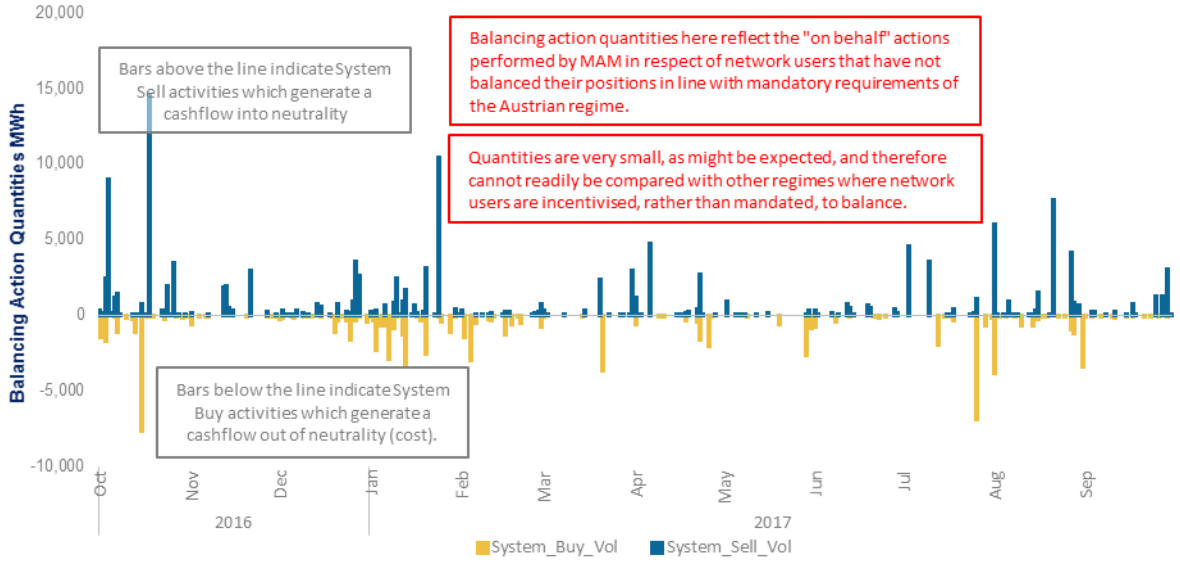
[40] This market area comprises two TSOs: Gas Connect Austria (GCA) and Trans Austria Gasleitung (TAG).

[41] The Austrian regime defines Balancing Responsible Parties who may provide aggregation services for the network users in a similar way as in the German regime.

[42] Since 1 July, this role has been delivered by the Austrian Gas Grid Management AG (AGGM). The role covers balancing activities in respect of both transmission and distribution and is hence referred to as MADAM.

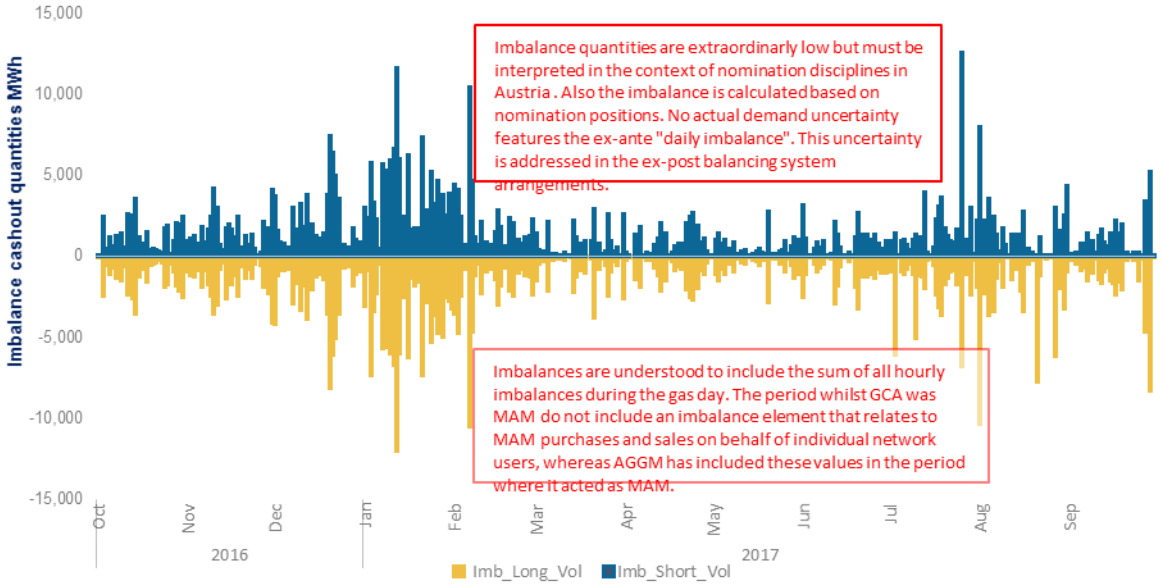
[43] The Agency could perform the ex-ante regime quantitative analysis only late in the process due to pending clarifications needed from the MADAM. After the Agency's initial data analysis, the MADAM offered to provide quantitative data also on the ex-post regime. At the same time, E-Control shared with the Agency a succinct qualitative description of the ex-post regime, with no additional data. The Agency has finally decided not to include the description of the ex-post regime and its quantitative analysis in the Report, since the required information was offered to the Agency too late to be compatible with the timeline for the production of the Report. Moreover, the Agency noted that, after the preliminary findings about the Austrian system, the regime would have been difficult to compare with the other system.

Figure 4-21: MADAM's balancing actions, Austria – Market Area East (MWh)



(208) The imbalances associated with network users are indicated in the graphic below.

Figure 4-22: Network users' imbalance quantities, Austria – Market Area East (MWh)



(209) The above graphics, although in a format comparable with those used elsewhere in this Chapter, cannot be interpreted in a similar way because of the fundamental differences between the Austrian ex-ante regime and the implementations of all aspects of the Code analysed in this Chapter.

(210) The Austrian regime incorporates many of the ideas of the Code in the ex-post balancing regime, which is outside the scope of this analysis.

(211) The Austrian regime has been criticised by many actors because of its fragmented two-tier structure. E-Control recently consulted about changes to the Austrian regime to produce a single integrated set of arrangements, consistent with the Code. Feedback from market participants was quite divergent. Thus, E-Control will launch an elaboration process with the market participants and continue the discussions, based on the feedback received.

4.6 Great Britain – National Grid Group (Gas)

4.6.1 Short description of the balancing regime

(212) The British 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 dual 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.

(213) The British regime has been included in this year's analysis for two reasons: firstly, it is the most mature regime and, secondly, all of its key features are reflected either as fundamental principles or as options in the Code.

4.6.2 Regime performance

(214) This analysis has been completed based upon information received from National Grid Gas via ENTSOG, linepack data was sourced from National Grid's Data Explorer tool, financial information was converted into Euros using a daily exchange rate provided by, or derived from, European Central Bank data[44].

4.6.2.1 TSO Balancing Actions

(215) The balancing actions represented approximately 0.32% of system entry quantities. Balancing actions were taken on 109 days of the Gas Year and the TSO never acted on both sides of the market on the same day.

(216) Balancing action quantities were higher on the Buy side of the market (64% of quantities). Some seasonality is apparent with more System Sells (than System Buys) in the summer and more System Buys (than System Sells) in the winter.

(217) The average prices over the year were reasonably close, creating a 6.5% premium of System Buys (17.25 EUR/MWh) over System Sells (16.20 EUR/MWh), particularly given the above seasonality in the TSO's balancing action quantities.

4.6.2.2 Network Users' Imbalance Cash out

(218) Network user imbalances represented approximately 2.45% of system entry quantities. This is approximately eight times the volume of TSO balancing actions.

(219) Network user imbalances over the year were symmetric (50.1% representing imbalance cash out of network user Short Positions, 49.1% representing network user Long Positions).

(220) The price differential associated with the average purchase and sale price of imbalance gas was small (16.25 EUR/MWh for Long position cash out price and 17.35 EUR/MWh for Short position cash out price).

4.6.2.3 Neutrality

(221) Overall, the basic neutrality measure implied an average charge of 0.0022 EUR/MWh (for gas entered into the system.)

(222) Across the year, neutrality has purchased a net 820 GWh of gas and in the process has generated a net neutrality cost (net financial neutrality) of EUR 2.2 million. The value of the net energy of the 820 GWh of gas purchased might be in the region of EUR 13.8 million. Effectively, therefore, the regime might be considered to have generated a credit of EUR 11.6 million.

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[44] Initial data were sourced from http://sdw.ecb.europa.eu/quickview.do?SERIES_KEY=120.EXR.D.GBP.EUR.SP00.A . The exchange rate for the days when no official rate was published were calculated averaging the values of first the available exchange rates before and after the data gap.

(223) The cumulative neutrality measure revealed significant within year effects with cumulative neutrality reaching a maximum cost of more than EUR 2.2 million and a maximum credit of EUR 20.7 million.

(224) Overall, the net costs/revenues were small and translated into small credit or cost rates, when aggregated over the analysed period. Despite this, some modest redistributive effects might occur, because of the variation associated with the daily neutrality cost/revenue generation[45].

4.6.2.4 Overall commercial imbalance position and linepack

(225) The average opening linepack was 343 mcm (3,773 GWh)[46], with minimum and maximum values reaching respectively 329 mcm (3,619 GWh) and 360 mcm (3,960 GWh) (9% range with respect of the average). The average daily linepack variation was 1.8 mcm (19.8 GWh), while the maximum was 10.7 mcm (117 GWh).

(226) The cumulative commercial imbalance arising from the aggregate of network user imbalances and TSO balancing actions reached 178 GWh. The largest depletion of linepack attributable to these commercial imbalances was 169 GWh.

(227) 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 Great Britain, with the stock[47] of the Local Distribution Zone being one of the contributory factors to the apparent inconsistency.

(228) The cumulative net commercial imbalance appeared to cover an extraordinary wide range of more than 1,688 GWh (ranging from 820 GWh to minus 868 GWh). It is difficult to know, whether the total gas in the system (linepack and Local Distribution Zone stock) could reasonably vary by so much. As pointed out last year, these differences might warrant further investigation to ensure that all aspects of gas accounting are robust.

4.6.3 Final comments

(229) 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. It should be noted that this was not the case in the first few years of daily balancing regime operation, but today the regime represents the preferred state following considerable evolution. The operation of the regime also reflects the aspirations of market actors.

(230) 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. It should also be noted that the TSO has a financial incentive to trade close to the market price, to keep day-on-day linepack changes to a minimum and to consider the trade-off between these two aspirations.

(231) 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.

(232) Over the year, neutrality has net purchased 820 GWh of gas. This represents a significant cost and explains why the overall neutrality outcome is a net cost[48].

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[45] Distributional effects in Sterling will have been different to those implied in this analysis because of the substantial movements in GBP/EUR exchange rate during the analysis period.

[46] National Grid publishes linepack information in volumes (mcm). Conversion of volumes to energy equivalents requires consideration of the calorific value of gas. A conversion of 1 mcm = 11 GWh has been used to derive comparative information for use in the following Chapter.

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

[48] GB has a long history of neutrality generating modest credits that are redistributed to network users.

(233) There may be some merit in giving consideration to the reasons for the substantial seasonality seen in the cumulative commercial imbalance position and the cumulative financial neutrality during this year.

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

Figure 4-23: TSO's balancing actions, Great Britain – National Grid Group (Gas) (MWh)

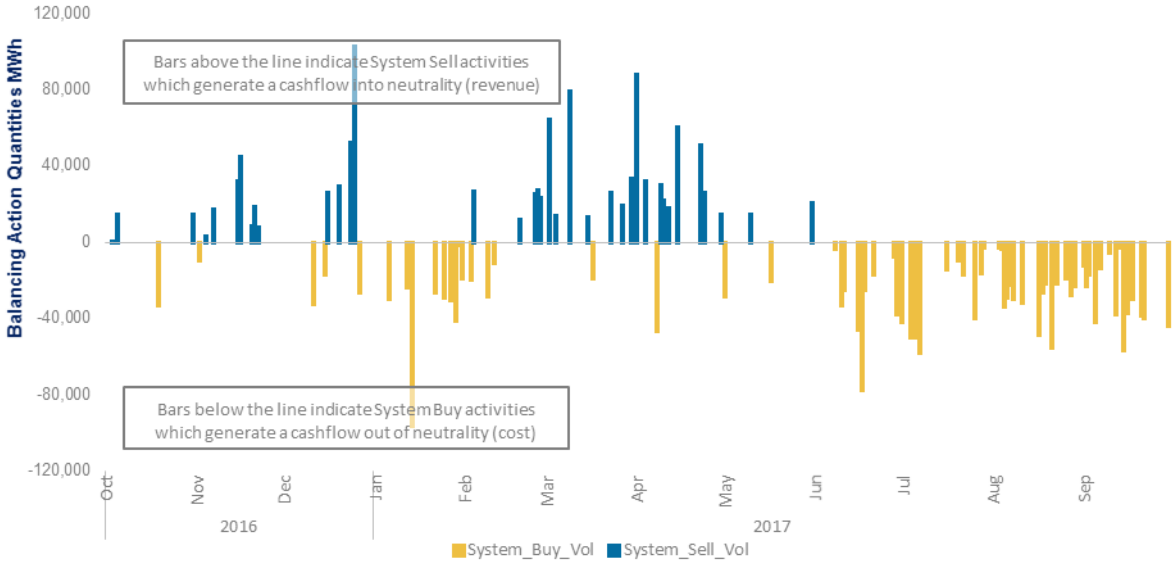


Table 4-14: TSO's balancing actions statistics, Great Britain – National Grid Group (Gas)

	Annual quantity MWh	Share of annual market %	Number of days nº	Average daily quantity MWh	Max daily quantity MWh	Share of activity %	Average price EUR/MWh
System Buys	2,017,120	0.21	71	28,410	96,713	64.2	17.25
System Sells	1,126,653	0.12	38	29,649	102,809	35.8	16.20
Total	3,143,773	0.32	109				

Figure 4-24: Network users' imbalance quantities, Great Britain – National Grid Group (Gas) (MWh)

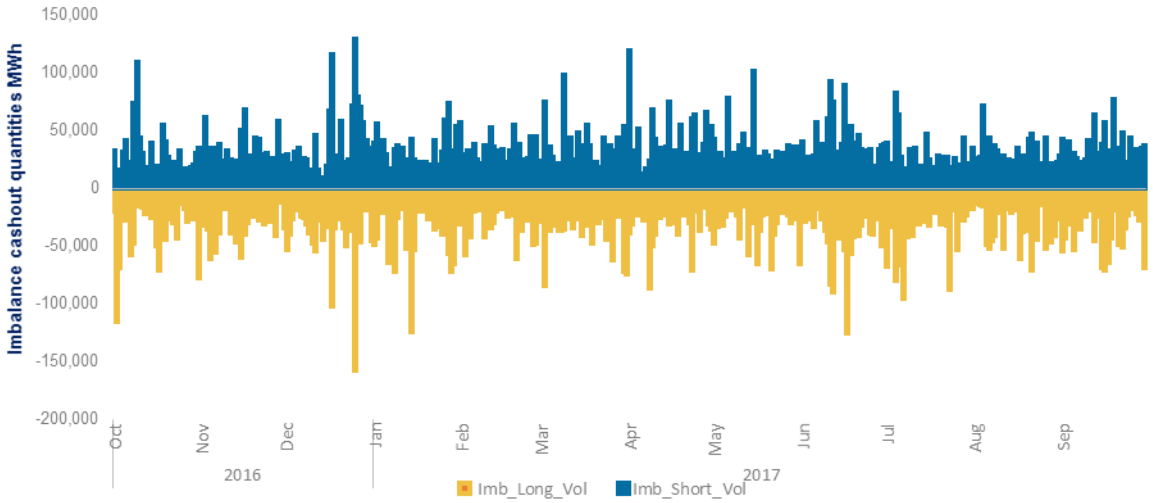


Table 4-15: Network users' imbalance statistics, Great Britain – National Grid Group (Gas)

	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 Users' Long	11,943,231	1.22	5,272	32,721	157,702	49.9	16.25
Network Users' Shorts	12,014,171	1.23	6,629	32,916	129,501	50.1	17.35
Total	23,957,402	2.45					

Figure 4-25: Price differentials (average prices for four primary gas transactions), Great Britain – National Grid Group (Gas) (EUR/MWh)

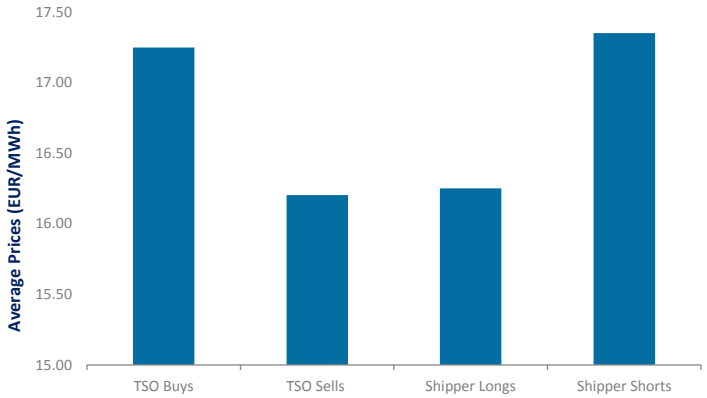


Figure 4-26: Cumulative neutrality financial position, Great Britain – National Grid Group (Gas) (EUR million)

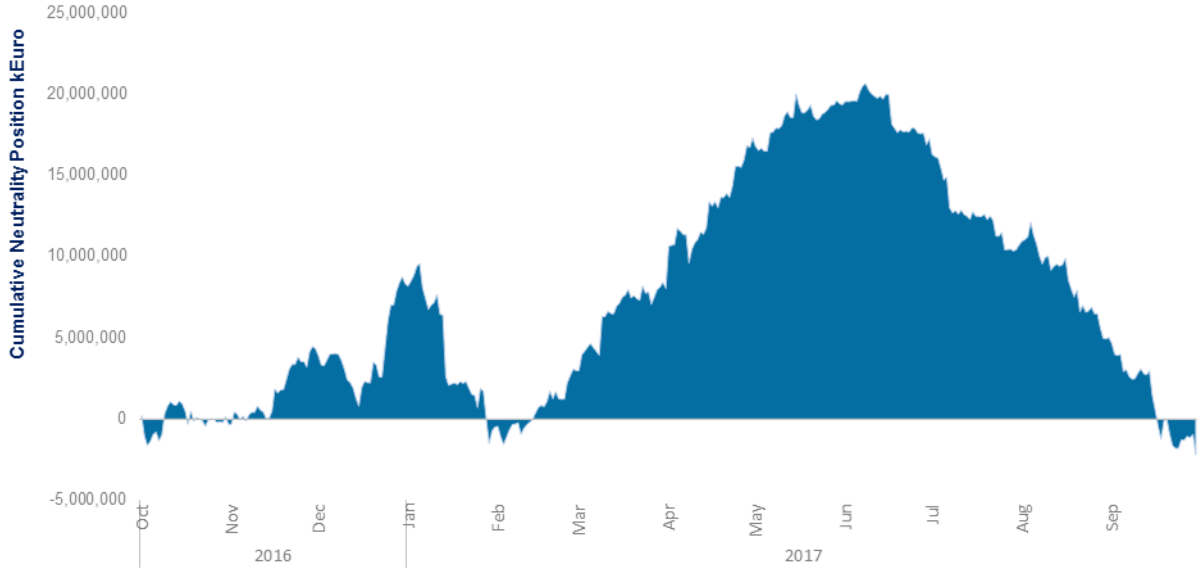
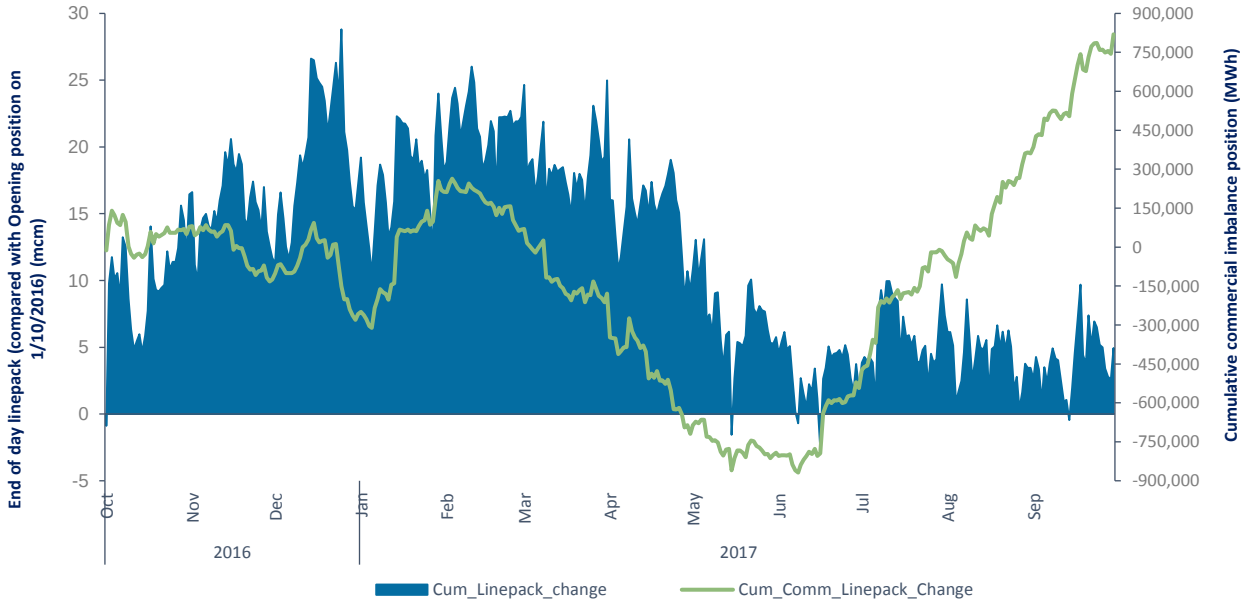


Table 4-16: Cumulative neutrality position statistics, Great Britain – National Grid Group (Gas)

	Quantities (MWh)	Cash flows (EUR)	Relative share
Financial Credits to Neutrality			
TSO System Sells	1,126,653	18,253,255	8%
Network Users' Imbalance Shorts	12,014,171	208,437,467	92%
Sub-total	13,140,824	226,690,722	
Financial Debits to Neutrality			
TSO System Buys	2,017,120	34,791,364	15%
Network Users' Imbalance Longs	11,943,231	194,086,450	85%
Sub-total	13,960,351	228,877,814	
Net	-819,526	-2,187,091	
Net neutrality per unit of market volume		-0.0022	EUR/MWh

Figure 4-27: Overall commercial imbalance position (right axis) and linepack (left axis), Great Britain (MWh)



4.7 Denmark – Energinet

4.7.1 Short description of the balancing regime

(234) The Danish balancing system was analysed as part of the second Report.

(235) The analysis has been performed again this year to act as a comparator for the counties analysed for this Report. Denmark provides an excellent example of an implementation built upon best practice taken from the more developed North-West European countries and further evolved thanks to a continuous and inclusive stakeholder engagement.

4.7.2 Regime performance

(236) The daily linepack data is not provided to the market, but was provided directly to the Agency for the sake of performing the analyses for this Report[49].

4.7.2.1 TSO Balancing Actions

(237) The TSO's activity appeared to be residual, representing around 0.6% of system entry inputs. Balancing actions were taken on 91 days.

(238) Slightly more than 60% of the balancing action quantities represented buying gas onto the system. Buy actions were taken on 52 days, with sells on 40 days. The sell activity was more frequent during the winter period.

(239) The average price of TSO balancing action System Buys (17.02 EUR/MWh) was only a little higher than the average System Sell price (16.71 EUR/MWh), creating an average spread of less than 2%.

4.7.2.2 Network Users' Imbalance Cash out

(240) Over the year, the sum of the Network Users' Imbalances represented just over 7% of system throughput.

(241) The network users' aggregated cash out quantities for Long and Short Positions were approximately equal (respectively 49 and 51% of all imbalances).

(242) The average prices of imbalance cash out for Long and Short Positions were close (16.29 EUR/MWh for Long Positions cash out prices, 16.35 EUR/MWh for Short Positions).

4.7.2.3 Neutrality

(243) Over the year, the net financial neutrality cash flow represented a surplus of EUR 42,000, which tends to justify the Danish position that separate accounting (from transmission tariffs) for neutrality might be disproportionate[50].

(244) Overall, the net neutrality position resulted in credits of 0.0007 EUR/MWh each the unit of gas entered into the system.

(245) However, it is clear that, on a cumulative basis, the aggregated neutrality position swung over a range of nearly EUR 1.2 million (moving from a surplus of EUR 405,000 to a deficit of EUR 826,000).

(246) The net energy volumes sold amounted to approximately 841 MWh, which contributed approximately EUR 13,500 to the net neutrality credit of EUR 42,000. The underlying credit from neutrality on a neutral volume basis was less than EUR 30,000.

[49] Energinet provided assistance.

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

4.7.2.4 Overall commercial imbalance position and linepack

(247) Actual opening linepack varied over a range from 259 GWh to 295 GWh, with an average of 277 GWh. The average day-on-day change was 5 GWh with a maximum of 22 GWh.

(248) The highest daily commercial balance on any day was 41 GWh, substantially larger than the actual linepack change on the day. Cumulative commercial imbalance indicated that, day-on-day, network users have considerable access to system flexibility, for a balancing zone of this size.

(249) There are significant differences between the cumulative physical linepack position and the cumulative commercial imbalance position, which implies that there are other causes of variation in physical linepack beyond the effects observed within the Danish national balancing market.

(250) The derivation of an acceptable *green zone*[51], means that significant cumulative linepack effects will only occur where they are operationally acceptable, but that access to system flexibility will be made available to network users whenever it is practical to do so.

4.7.3 Final comments

(251) The regime seems to be functioning well, having regard to the small size of the network and market. Network users' imbalance quantities represented almost 12 times the TSO balancing actions.

(252) 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 the regulator and other market actors.

(253) The buy-sell spread associated with the TSO's balancing actions appears remarkably small. This may be partly explained by the fact that the regime displays a modest tendency towards System Sells during the winter, the higher gas price-period.

(254) Imbalance cash out quantities, at just over 7%, are higher than observed in last year's analysis. There may be merit in assessing the underlying performance in the context of NDM demand forecasting accuracy and the relatively modest incentive provided by the imbalance cash out regime.

(255) The annual average prices for TSO balancing actions (both buy and sell) are higher than each of the annual average prices for network users' long and short imbalance cash out prices. This is an unusual outcome. The reason is that the TSO Balancing Sell actions are taken predominantly in the winter period when the prices are higher, while Network User Sells via the imbalance mechanism more evenly over the year. This is unlikely to be a problem, given that there is a high degree of transparency about when the TSO is likely to act, and the actions are of relatively modest size. If further deterioration of network users' imbalance performance continues, it is likely that TSO balancing interventions would increase and the unusual pricing effect observed would disappear.

[51] Which is defined taking into account of the opening linepack data each day and wider operational circumstances.

4.7.4 Graphics and Charts for Denmark – Energinet

Figure 4-28: TSO's balancing action, Denmark – Energinet (MWh)

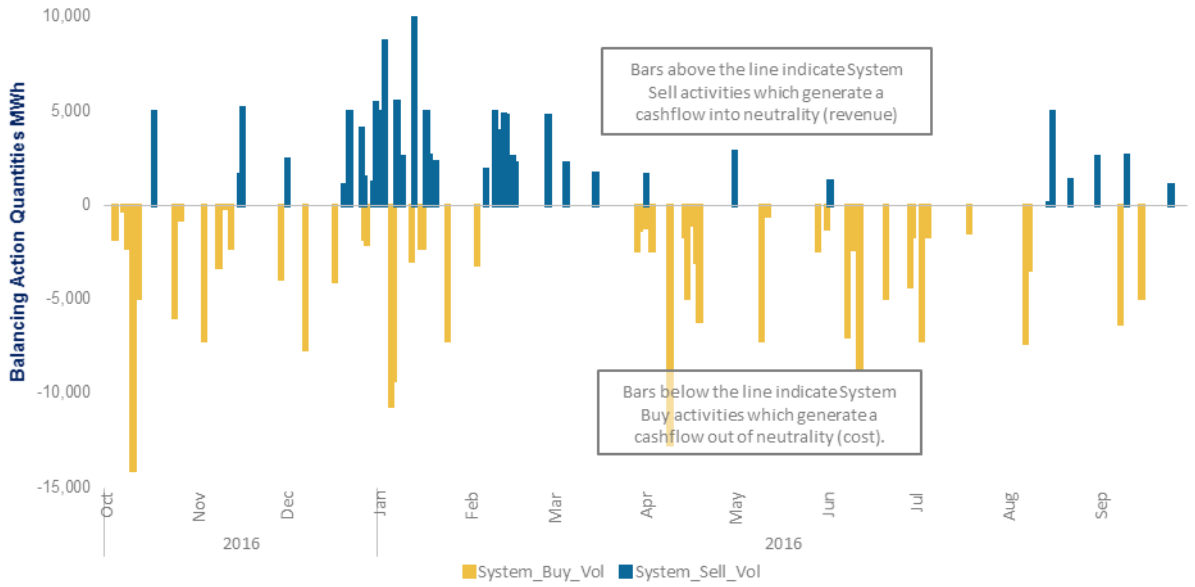


Table 4-17: TSO's balancing actions statistics, Denmark – Energinet

	Annual quantity MWh	Share of annual market %	Number of days no	Average daily quantity MWh	Max daily quantity MWh	Share of activity %	Average price EUR/MWh
System Buys	211,246	0.37	52	4,062	14,100	61.4	17.02
System Sells	132,936	0.23	40	3,323	11,735	38.6	16.71
Total	344,182	0.60	90				

Figure 4-29: Network Users' imbalance quantities, Denmark – Energinet (MWh)

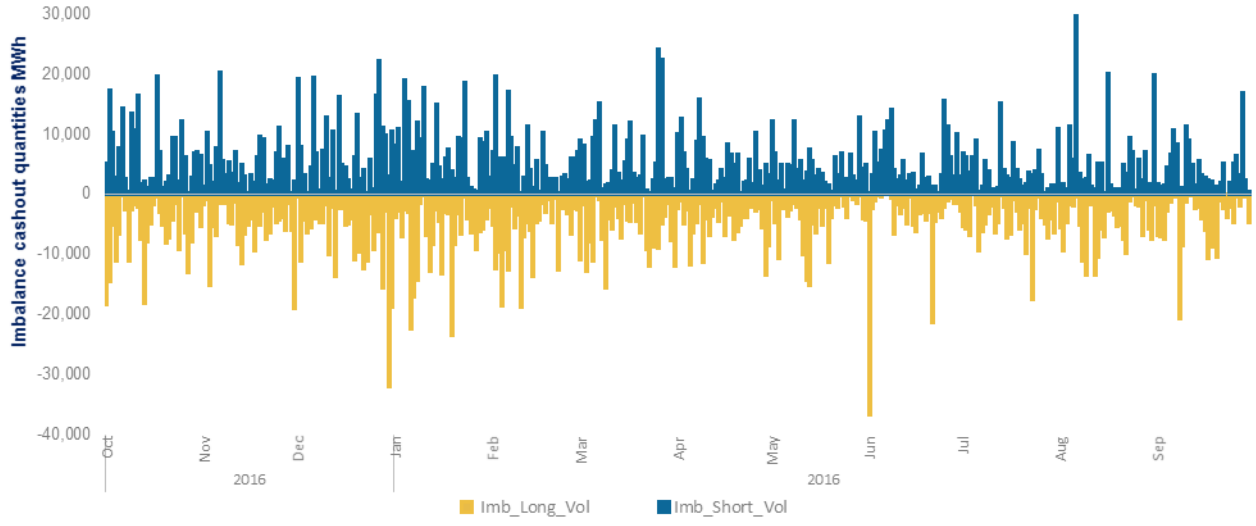


Table 4-18: Network users' imbalance statistics, Denmark - Energinet

	Annual Quantity MWh	Share of annual market %	Min daily quantity MWh	Average daily quantity MWh	Max daily quantity MWh	Share of activity %	Average price Euro/MWh
Network Users' Long	1,977,485	3.5	0	5,418	36,730	49.0	16.29
Network Users' Shorts	2,056,636	3.6	0	5,635	41,359	51.0	16.35
Total	4,034,121	7.1					

Figure 4-30: Price differentials (average prices for the four primary gas transactions), Denmark - Energinet (MWh)

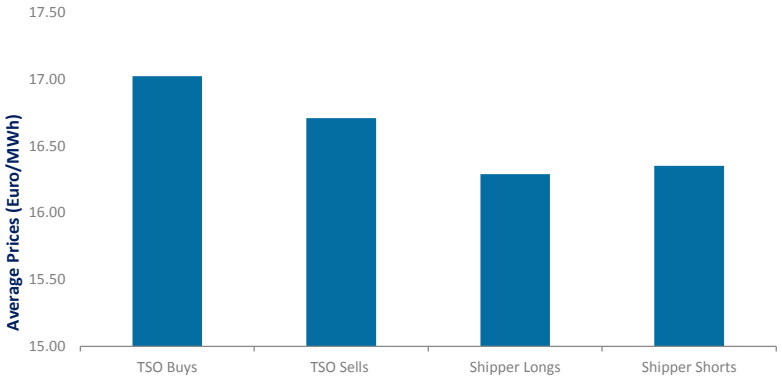


Figure 4-31: Cumulative neutrality financial position, Denmark – Energinet (thousand EUR)

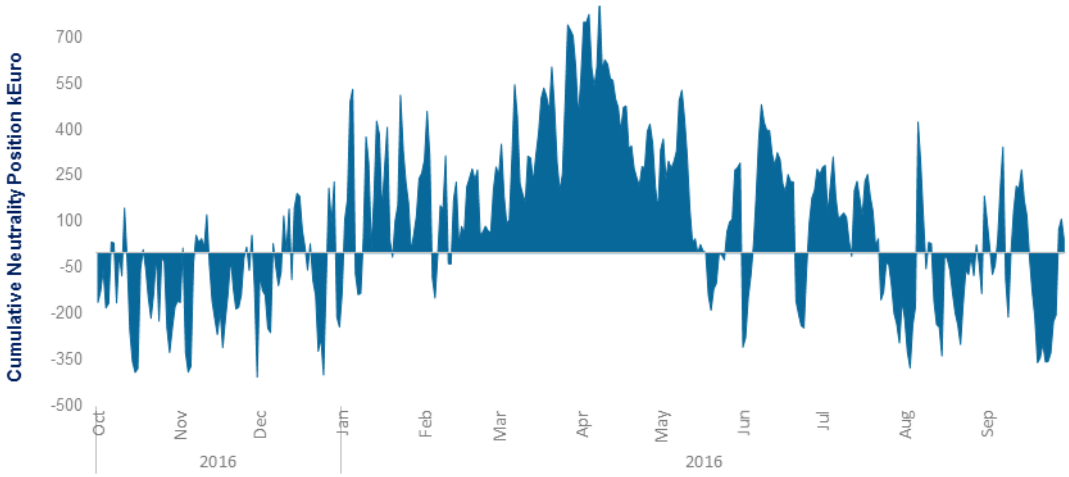
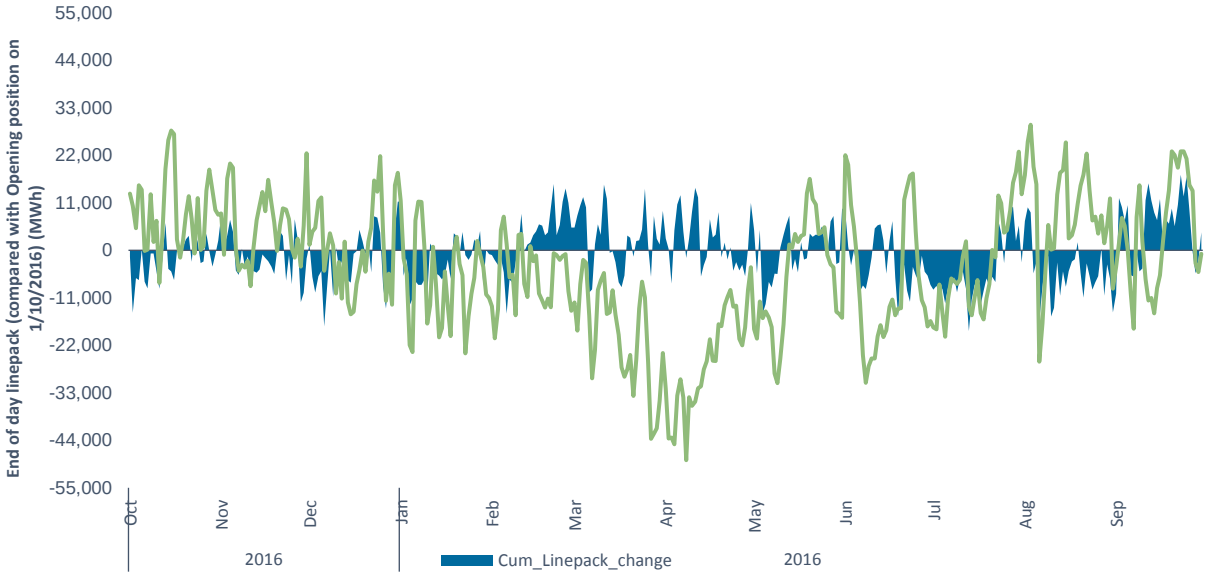


Table 4-19: Cumulative neutrality position, Denmark – Energinet

	Quantities (MWh)	Cash flows (kEuros)	Relative Share
Financial Credits to Neutrality			
TSO System Sells	132,936	2,221	6%
Network Users' Imbalance Shorts	2,056,636	33,628	94%
Sub-total	2,189,572	35,849	
Financial Debits to Neutrality			
TSO System Buys	211,246	3,596	10%
Network Users' Imbalance Longs	1,977,485	32,211	90%
Sub-total	2,188,731	35,807	
Net	841	42	
Net neutrality per unit of market volume		0.0007	EUR/MWh

Figure 4-32: Linepack (MWh, left axis) and overall commercial imbalance position (MWh, right axis), Denmark - Energinet



5. Cross-zonal balancing regime comparisons

5.1 General considerations

(256) As it was done in the second Report, a mix of data tables[52] and charts present the information and associated ideas arising from a comparison of the balancing zones analysed in the previous Chapter.

(257) 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 are usually plotted.

(258) While it may be challenging to define generally acceptable ranges for any performance metric, it may be worth trying to establish criteria according to which each performance metric, in the context of the overall regime performance, denotes good or acceptable functioning. Establishing criteria might be desirable to assist in the assessment of both out- and under-performance beyond "normal" ranges.

(259) 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 to get a better understanding of their nature. This assessment must consider the specificities of the regimes and local circumstances.

(260) The emerging lessons may be important in identifying opportunities to improve key parameters of the regime. For example, assessment of such matters as the merit order, network users' access to inherent system flexibility, information release to support network users' risk management, and cash out price determination might suggest opportunities to revise approaches or reset parameters to enhance the efficient functioning of the balancing regime and the development of the short-term wholesale market.

(261) Furthermore, learning from the inter-regime comparisons may assist countries that have made limited progress in implementing the Code to speed up their transition to a fully effective and compliant regime.

(262) There is no single formulation of critical design elements (including approach and specific parameters) that will be optimal for each country. Rather, local circumstances and opportunities will influence what might be achievable. The *Framework*, including cross-regime comparison, should be regarded as a tool to assist the regulators and stakeholders to assess the adequacy and scope for improvement in each regime.

5.2 Areas for exploration

(263) The comparative regime analysis draws heavily on the output of the *Framework* presented in the previous Chapter 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.

(264) Overall, the indicators developed for each area of analysis need to be considered both within their respective Sections and in conjunction with the indicators developed for other Sections.

(265) Annex 3 contains tables reporting data for all defined metrics for the four Sections explored, while the charts in this Chapter capture only the most relevant metrics. Annex 5 contains the description of the metrics, which were described in the second Report, and therefore the descriptions are not repeated in the body of this Report.

(266) Usually, the performance metrics are presented one-by-one to facilitate comparisons. Occasionally, metrics are presented in combination in the same chart to provide more meaningful price comparisons (e.g. TSO

[52] The full set of data used to develop this Chapter is included in Annex 3.

Buy and Sell prices together with Long and Short Imbalance cash out prices or where presenting the two values of net financial and net adjusted financial neutrality).

5.2.1 TSO Balancing Actions

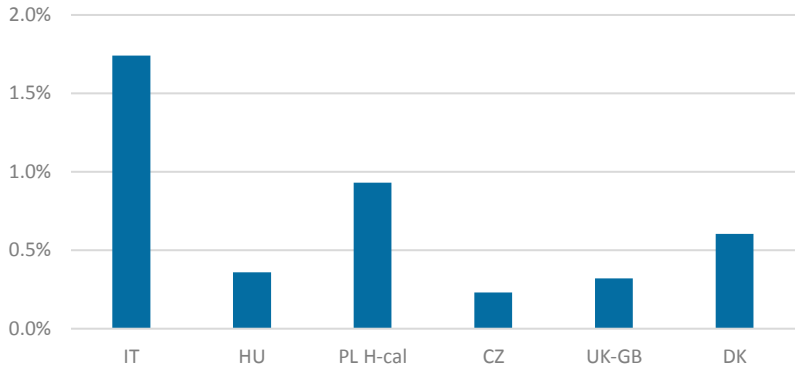
(267) Key metrics for comparison (annual measures) are:

1) Total Balancing Action Quantities (GWh);
2) Total Balancing Action Quantities (as a % of zone entry quantities);
3) Total Balancing Action Buy Quantities (as a % of 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.

Applying metrics for the cross-regional analysis[53]

(268) Figure 5-1 reveals that the relative extent of balancing action quantity varies considerably between the analysed regimes.

Figure 5-1: Total Balancing Action Quantities (% of zone entry quantities, GY 2016/17)



Source: ACER

(269) Even when normalised values are compared, like balancing actions expressed as a percentage of energy quantities entering the zone, variations of TSO's balancing actions are considerable. For example, the Czech Republic has the lowest value of 0.23%, whereas Italy has the highest, 1.74%[54, 55].

(270) Apart from Italy, the TSO would be considered to be residual against a threshold of 1% of market entry volumes in all the other analysed regimes. The variation in activity level may be influenced by differences in balancing action policies. For example, in Poland, the TSO performs a correction for network users' imbalance from the previous day when determining the balancing quantities to be taken the next day. In the Czech Republic, the implemented regime provides an opportunity for network users to carry-over imbalances into the next day and correct for them on the next day, or a later day which may contribute to a reduced level of TSO balancing activity. Other countries lie between these two situations. Consideration needs to be given to whether an optimum range of balancing activities could be determined as residual, for assessment purposes.

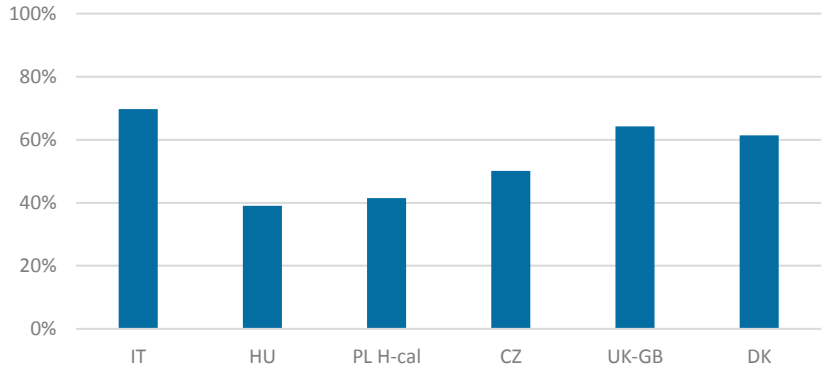
[53] The data tables used in this comparative analysis are included in Annex 3.

[54] The Italian figure only corresponds to its use of STSPs. The Italian TSO also has other tools (referred to as SOP and SNT and explored in the previous Chapter). The use of these tools is also at comparable levels to the use of STSPs.

[55] Even when weighing the TSO's balancing actions against national gas consumption, Italy shows the highest share at around 2%, while most countries see a higher increase (due to the high share of transited gas), with only Poland and Denmark reaching 1%.

(271) Many of the zones analysed indicate modest asymmetry in the TSO's balancing actions, as shown in Figure 5-2. Italy shows the highest asymmetry at around 70% of TSO's Buys, Great Britain has the next highest asymmetry at 64.2%. The data for Great Britain[56] indicates the preponderance of System Buy actions late in the analysed period. It is not clear why such seasonality in the actions appears, nor whether its extent indicates a problem. Yet it may illustrate that, where asymmetry exists, the NRA should investigate it to establish whether the commercial regime may distort the behaviour of network users or the proper functioning of the balancing system.

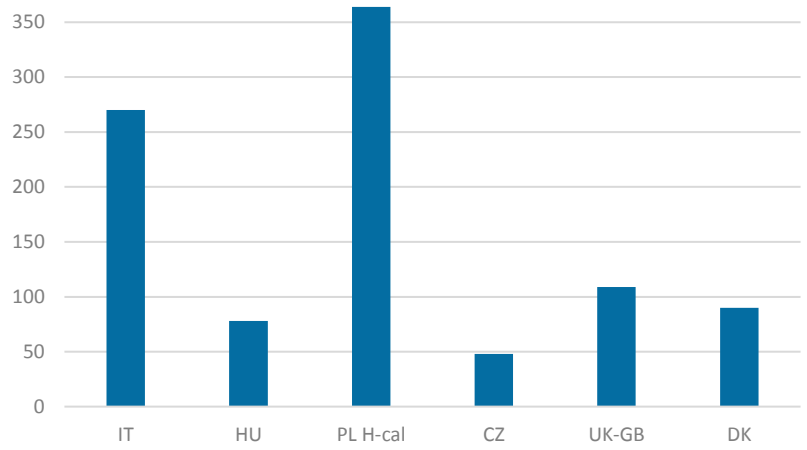
Figure 5-2: Total Balancing Action Quantities (% of zone entry quantities, GY 2016/17)



Source: ACER

(272) Figure 5-3 shows that the different approaches to balancing generate very different frequencies of balancing actions.

Figure 5-3: Numbers of days when balancing actions are taken (GY 2016/17)



Source: ACER

(273) The considerable variation is partly explained by very different approaches taken by the TSO's in their balancing action decisions. For example, the TSO in Poland expects to take a balancing action every day. The size of the balancing action will reflect the aggregate network user imbalance from the previous day possibly adjusted if the TSO is already aware of any length or shortage anticipated in respect of the current Gas Day.

(274) In Italy, the TSO used STSPs on 270 days, although it is understood that it used other tools as well, i.e. its right to command and control storage injections/withdrawals and the use of its own storage service for linepack management every day.

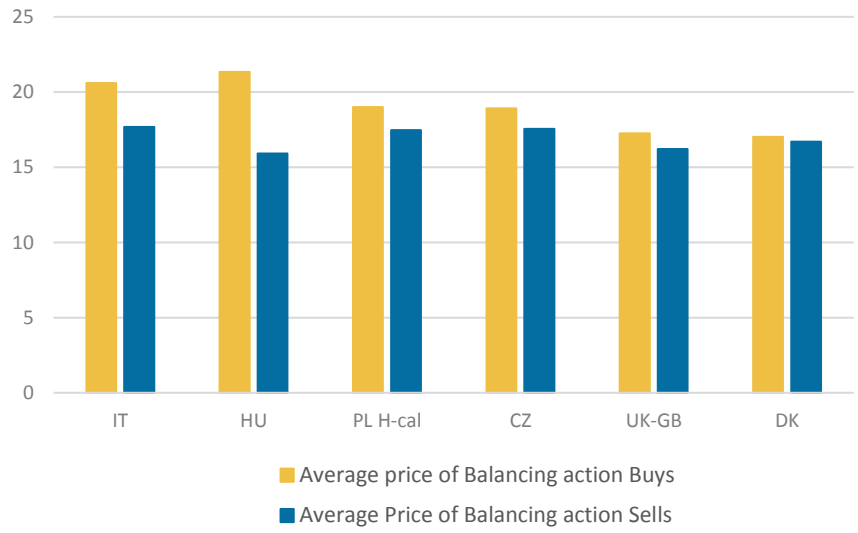
[56] See TSO's balancing actions, Great Britain – National Grid Group (Gas) (MWh) graphic in Chapter 4.6.4.

(275) Great Britain and Denmark have evolved their balancing policies in response to network users' aspiration that the TSO does not disrupt the market and that the TSO buys and sells volumes that will move prices, therefore signalling to network users (via evolution of cash out price) changed exposures to imbalance cash out.

(276) The very low level of TSO balancing activity in the Czech Republic reflects the design of a regime that does not follow a strict daily balancing, provided that transit flows are managed on a strict "in versus out" basis, so the system can absorb substantial imbalances associated with national demand[57]. Therefore, the TSO[58] only intervened to take balancing actions on 13% of the days. In Hungary, the TSO intervened rarely using STSPs, however it has additional facilities whereby it can call on storage services, although no quantified data has been provided to support such analysis in this Report.

(277) The average buy and sell prices illustrated in Figure 5-4 may give insights into the efficiency of the TSO's balancing actions.

Figure 5-4: Average Prices of Balancing action Buys and Sells (EUR/MWh, GY 2016/17)



Source: ACER

(278) All sample zones indicate that, as expected, the TSO buys gas at higher prices than it sells it. In some situations, the differential is relatively modest. There may be merit in probing buy and sell prices more closely to assess the efficiency of the TSO's balancing activities. In some countries, e.g. Great Britain[59] and Italy[60], the TSO is exposed to financial incentives in relation to its balancing activity, which may encourage more efficient TSO balancing.

(279) Differences in the TSO's balancing action buy and sell costs generate net costs that are recovered from network users via neutrality. Whilst the quantities involved in Hungary are small, the differential between average buy and sell price is an outlier. There may be merit to explore why the buy/sell spread is so high.

[57] Provided that imbalances do not accumulate too much in one direction over a number of days.

[58] It is the TSO, in its system operator function, that decides upon the requirement and size of balancing actions rather than OTE, which performs the market operator role.

[59] GB has an incentive that requires it to consider the trade-off between trading gas at prices close to the market and allowing linepack carryover from one day to the next. Balancing incentives were introduced in 1999 and subsequently evolved in consultation with the industry to ensure that the TSO's balancing decisions are made in a way that encourages a well-functioning short-term market.

[60] Italy has introduced, and is in the process of evolving an incentive scheme designed to encourage efficient balancing actions of the TSO. These include three elements. The first is designed to incentivise the TSO to achieve its target daily linepack level recognising the contribution made by SOP. The second is to encourage the TSO to trade at close to market prices. The third is to improve the TSO's forecasting accuracy.

For example, increasing the transparency about the TSO's balancing action decision making process and its application, and focussing the TSO's activity on a single platform might encourage greater competition in the supply of short-term flexibility and therefore closer buy/sell prices.

(280) The TSO and the network users are part of a complex behavioural system under the Code implementation. The TSO's balancing action policy can have a major impact on the functioning of the market.

(281) The more mature markets have found that a wide dialogue with industry actors has been necessary to establish appropriate TSO policies and procedures. In the early days of market evolution, high visibility of balancing processes and precise requirements for gas can stimulate the market and encourage competitive repricing. Later on, as maturity improves, stakeholders might prefer a different approach, where TSOs have much greater discretion about determination of size and timing of operational balancing actions/decisions.

5.2.2 Network Users' Imbalance Cash out

(282) 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) Total Imbalance Cash out Quantities (as a % of zone entry quantities);
4) Total Network User Buy Quantities (as a % of all out Quantity quantities);
5) Average Imbalance Long Cash out Price (EUR/MWh);
6) Average Imbalance Short Cash out Price (EUR/MWh);
7) TSO's Balancing Action Quantities (as a % of Total Balancing Action Quantities plus Network Users' Imbalance Cash out Quantities).

Applying the imbalance metrics for the cross-regional analysis[61]

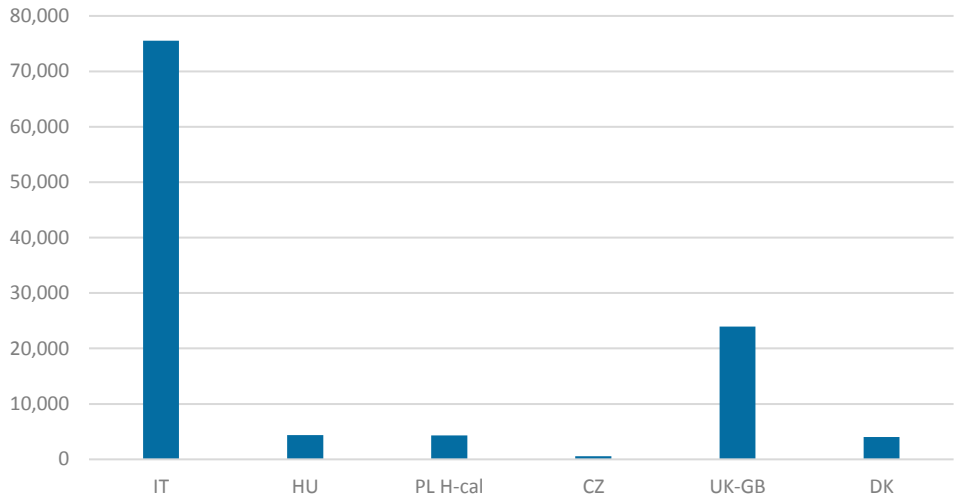
(283) Figure 5-5 displays the imbalances of network users. This data does not include quantities traded in the short-term wholesale market[62]. The network users' imbalance quantities cannot provide any insight into the extent network users trade in the prompt market to manage their imbalance exposures. However, the imbalance quantities provide insight into whether the network users cannot, or choose not to, manage their imbalances.

(284) The Italian imbalances are the largest seen so far in the application of the *Framework*. This might partly be explained by the size of the market, but it may be attributable, *inter alia,* to NDM demand forecasting error beyond the modest imbalance cash out incentive applied.

[61] Full data set available in Annex 3.

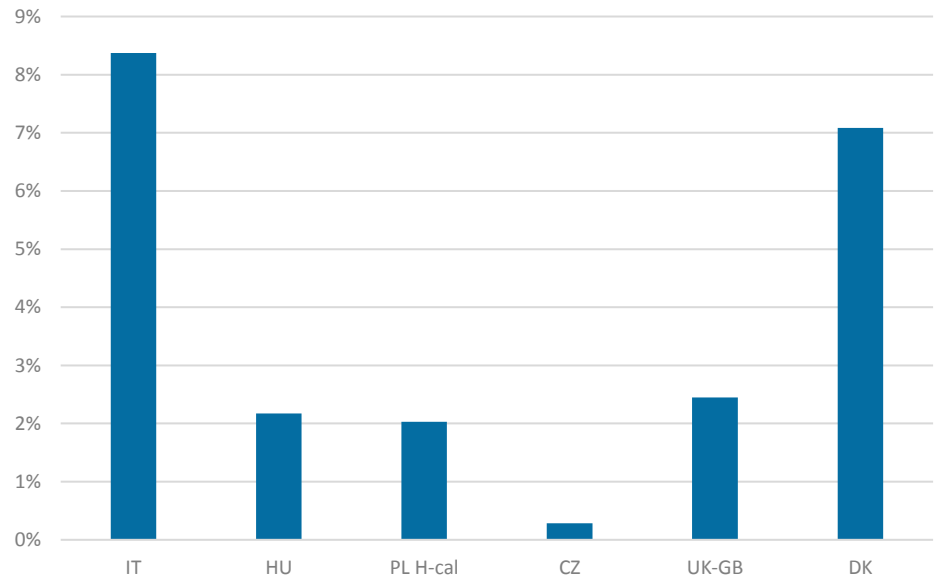
[62] Further information about these can be seem in the Market Monitoring Reports, the 2017 analysis will be published later this year.

Figure 5-5: Network Users' Total Imbalances (GWh, GY 2016/17)



Source: ACER

Figure 5-6: Total Imbalance Cash out Quantities (% of zone entry quantities, GY 2016/17)



Source: ACER

(285) As shown in Figure 5-6, several regimes have Imbalance Cash out Quantities of approximately 2% of zone entry quantities. Italy, in its first year of regime operation, is significantly higher. The Danish value is also high and notably higher than observed in last year's analysis.

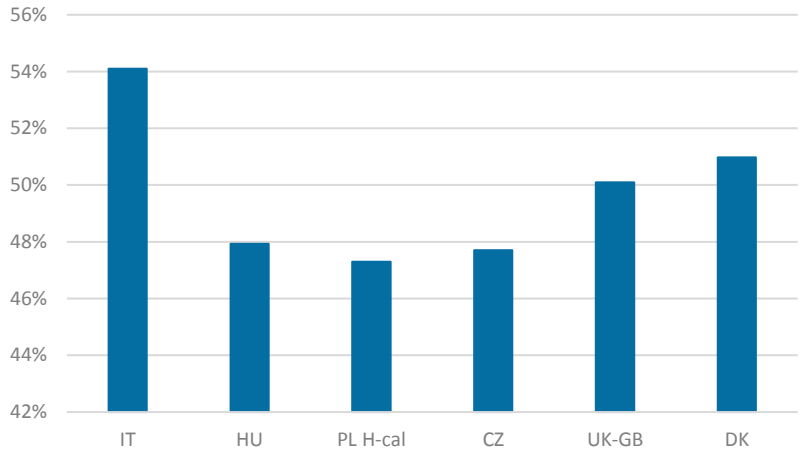
(286) The Czech value is the lowest observed so far in any application of the *Framework*. The specifics of the Czech regime need to be recalled: the very low levels emerging here correspond to only that part of the imbalance that is cashed-out daily, and do not include the volumes exchanged in the unused flexibility market. The Czech regime includes a flexibility service[63] mainly aimed to compensate for unpredictable imbalances of the NDM off-takes, which means individual network users' accounts are not reset to zero every day and imbalances can be carried over to the extent that the limits set by the flexibility service allow.

[63] The flexibility service amount is derived from the network user's initial allocation of service (based on its portfolio demand), net of any use of flexibility service and trade of unused flexibility with other network users.

Daily imbalances[64] amount to approximately 8% of entry quantities. Such a high value depends also on the possibility for network users to carry-over imbalance volumes to the next day[65]. The Polish results may be noteworthy; despite generous tolerances, the overall network users' imbalances represent approximately 2% of market entry quantities[66].

(287) Regarding the share of network users' buy quantities, as shown in Figure 5-7, most countries are reasonably close to 50% as would be expected given that there is also no significant asymmetry in the sample associated with TSO balancing actions. The Italian position is the most skewed and, given Italy's large absolute imbalance quantities, it implies a remarkable asymmetry in terms of absolute network users' buy/sell quantity.

Figure 5-7: Percentage of Total Network Users' Buy Quantities (of all Cash Out Imbalance Quantities, GY 2016/17)



Source: ACER

Figure 5-8: Network Users' Imbalance Cash out average prices (EUR/MWh, GY 2016/17)

Source: ACER

[64] Calculated as inputs plus net traded gas positions less offtakes.

[65] The Czech system does not require network users to be balanced on a daily basis: this system design feature can partly explain the low performance in this indicator, which cannot be fully attributed to the inability of network users to reach lower imbalances, but rather to it being unnecessary.

[66] Some balancing zones, such as the Czech Republic, Hungary, and Denmark, would see Network Users' imbalance share nearly double if, instead of entry volumes, imbalances would be weighed against domestic consumption.

(288) The average prices (Short and Long Position Cash out Prices) are shown in Figure 5-8. The prices show some diversity. The Danish and Hungarian differentials are remarkably small and influenced by the low small adjustments applied. In Denmark, these relatively modest marginal price differentials may have contributed to the increasing imbalance quantities identified above.

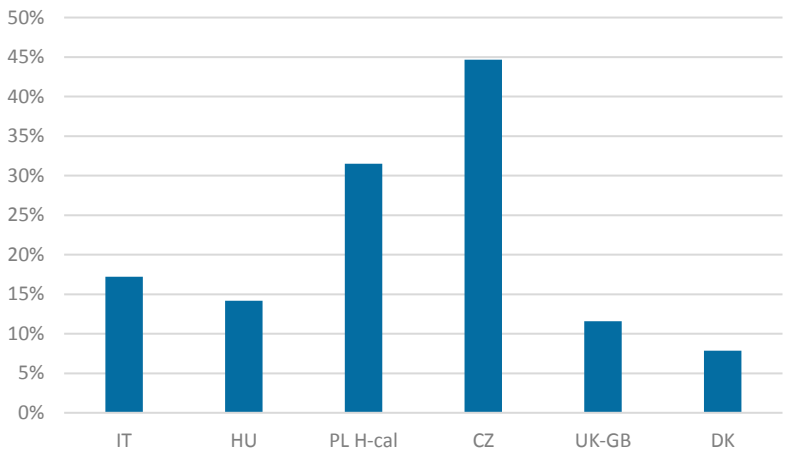
(289) The Polish gas price differential is at least partly explained by two major influences:

- the small adjustment is very high (implying a much higher differential price to be expected),
- but it is offset by the application of generous tolerances (the daily imbalance quantity up to the first 5% of a network users' portfolio demand is cashed at a market price, rather than at the marginal cash out price).

(290) Whilst the Czech differential is the largest observed, it does not have a major impact given the relatively small quantities transacted, their infrequency and timings across the analysed year.

(291) The interaction between TSO balancing and imbalance cash out needs careful consideration. Infrequent balancing actions and very small default marginal price differentials may yield relatively modest balancing incentives, which may see relatively large imbalance cash out quantities as for example in Denmark in the analysed year. However, this might not necessarily be a problem. If network users' overall balancing performance was to deteriorate further, then the TSO might need to intervene more. Therefore, its balancing transacted quantities might be expected to increase the marginal price cash out differentials. Overall, the behavioural interactions inherent in the regime should ensure a natural self-correction and deliver efficient outcomes.

Figure 5-9: TSO's balancing action quantities (% of total balancing quantities, GY 2016/17)



Source: ACER

(292) Concerning TSO Total Balancing Action Quantities as a percentage of TSO Balancing Action Quantities plus Network User Imbalance Quantities, as shown in Figure 5-9, the Czech system appears out of line compared to other countries. However, the Czech regime has been designed specifically to avoid both network users' daily cash out and to keep TSO balancing quantities low. The regime has delivered very low quantities for both. Given the small values of both inputs to this metric, the volatility of this measure might be significant.

(293) The situation in Poland may also be the result of the combined effect of its approach[67] to balancing and the application of generous tolerances. On a daily basis, there appears to be greater alignment of the direction of individual network user imbalances (so less netting-off than occurs in some other countries), and so the

[67] Generally the previous day's net network user imbalance defines an offsetting TSO balancing action on the next day.

TSO's correction the next day leads to a value for this metric higher than the norm associated with other countries. This effect is likely to be reduced post 1 April 2018, given Poland's tolerance reduction.

5.2.3 Neutrality

(294) The range of metrics covers both gross and net quantities and cash flows, and acts as a complement to the measures defined in the previous Sections of this Chapter, particularly to TSO Balancing Actions and Network Users' Imbalance Cash out Quantities. If the operational balancing regime and gas accounting processes are functioning well, then the net effects on both quantities and cash flows should be small. Comparisons across regimes may afford insights into relative performance.

(295) The maximum and minimum cumulative neutrality indicators should be properly 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 cash flows, the reasons are well understood. At the very least, NRAs, with the support of TSOs, should monitor and assess these indicators on a regular basis.

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

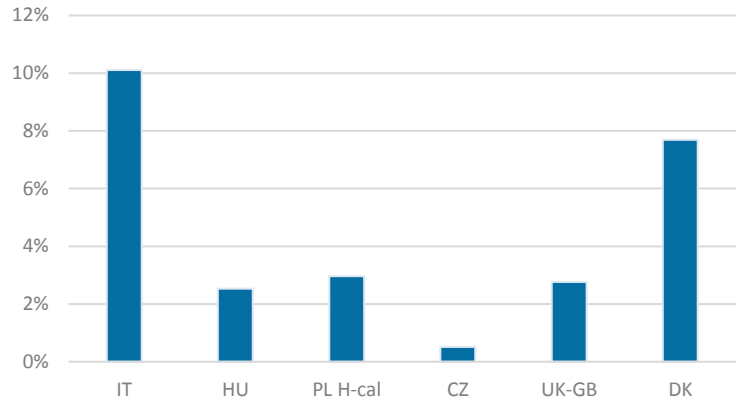
1) Gross energy transacted (GWh);
2) Net energy position (GWh);
3) Absolute sum of cash flows for the four principal basic neutrality cash flows (thousand EUR);
4) Net financial neutrality (thousand EUR);
5) Net financial neutrality per unit of market volume (EUR/MWh);
6) Net adjusted financial neutrality 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).

Applying the neutrality metrics for the cross-regional analysis[68]

(297) Figure 5-10 shows considerable variation in Gross energy transacted. Three countries might indicate a norm in the range of 2-3%. The Czech value is much lower than this because of the regime design: a substantial proportion of network users' imbalances are not cashed out due to the use of the linepack flexibility service and the TSO rarely intervenes for system balancing purposes. The Italian situation seems to show the natural consequence of intense TSOs and network users' balancing activity. The Danish value is heavily influenced by network users' imbalance performance, which in turn may be heavily influenced by the relatively benign balancing incentives associated with the small adjustment.

[68] Data tables available in Annex 3.

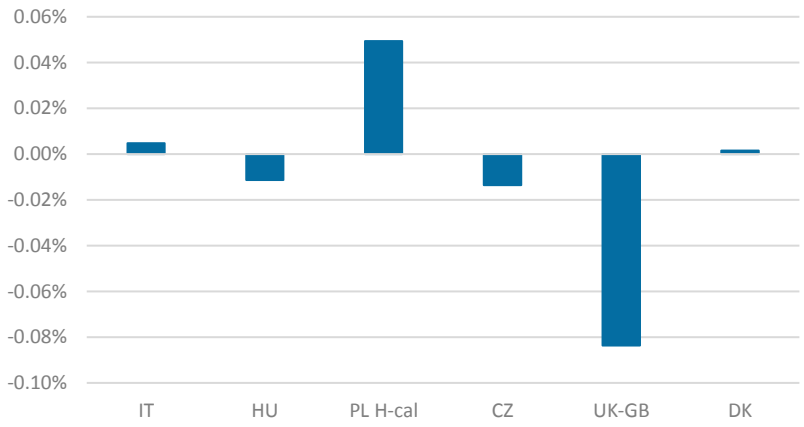
Figure 5-10: Gross energy transacted (% of market entry volume, GY 2016/17)



Source: ACER

(298) Figure 5-11 shows the net position associated with the four energy transactions[69]. The net position should be very close to zero over the analysed period, unless there is a significant change in linepack level or there are considerable gas accounting issues. Desirable values of the net quantity position needs to be considered in the context of the local circumstances. NRAs and TSOs should consider how close to zero they might expect the neutrality account to remain.

Figure 5-11: Net energy position (% of market entry volume, GY 2016/17)

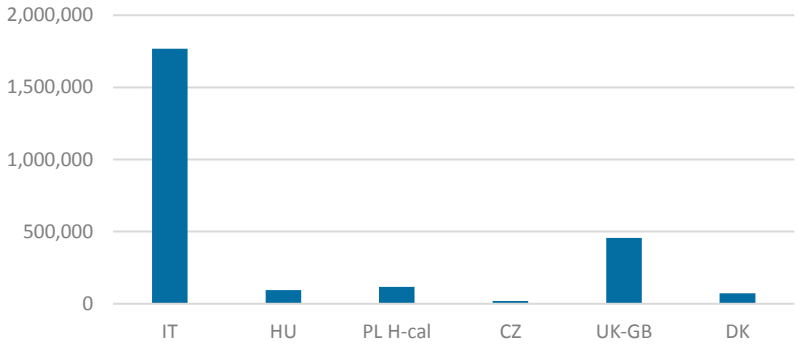


Source: ACER

(299) Figure 5-12 highlights a wide range of gross cash flows, worth further consideration, given that net figures can mask many features of regime performance. Italy has remarkably high cash flows of EUR 1,769 million; a staggering amount for financial transactions associated with what should be small residual amounts of gas. However, the analysis does not reflect many other significant costs and cash flows in the regime, particularly those associated with SOP and SNT. It is therefore difficult to draw meaningful conclusions about the net effects of all the financial transactions in the Italian regime that are beyond the framework of this basic analysis.

[69] The sign convention used in this Report for the net commercial imbalance position is: Total System Buy Quantities plus Network Users' Imbalance Long Position Quantities less TSO System Sell Quantities plus Network Users' Imbalance Short Position Quantities.

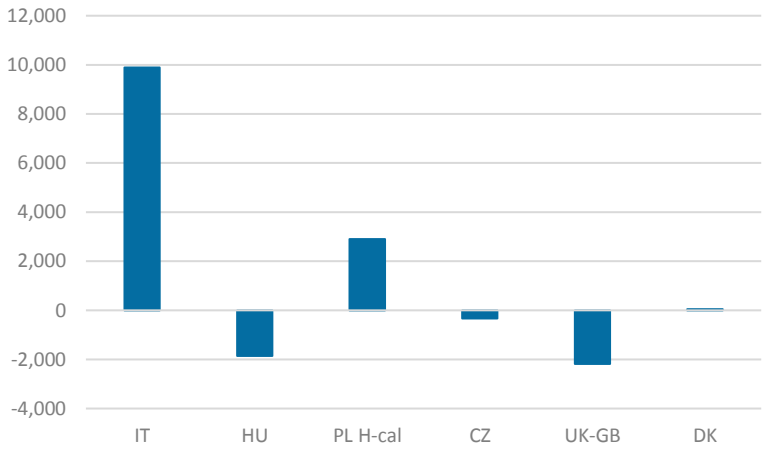
Figure 5-12: Absolute sum of cash flows (thousand EUR, GY 2016/17)



Source: ACER

(300) Figure 5-13 shows the net financial neutrality position. With the exception of Italy[70], all other countries have a relatively modest net financial neutrality, as cash flows predominantly net off over the year. However, the Italian position reflects the specificities of the current balancing implementation, where the TSO uses storage services. Additionally, there may be merit in exploring the within year developments of the net financial neutrality indicator as some countries display some very large within-year variations.

Figure 5-13: Net financial neutrality position (thousand EUR, GY 2016/17)



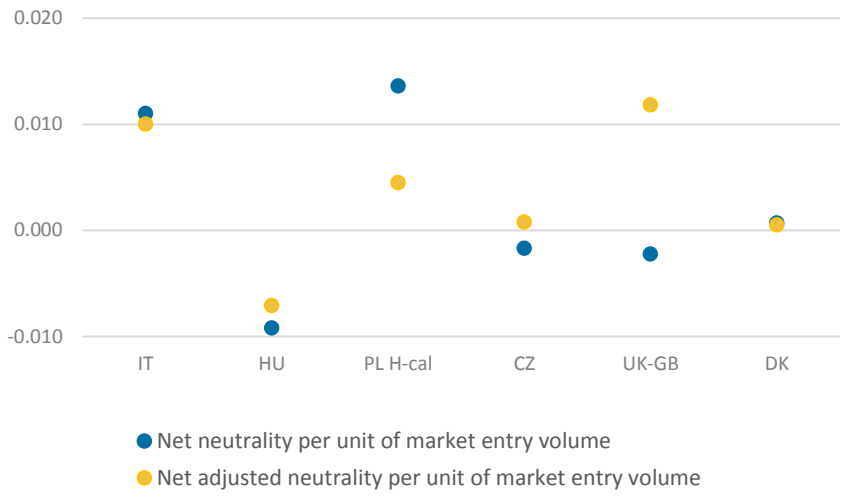
Source: ACER

(301) Figure 5-13 displays the diversity of the overall average credit or charge derived from neutrality, assuming it is levied at a uniform rate over entry quantities. Italy generates the greatest revenue. Overall, the Hungarian, Czech, and British systems generated a net cost.

(302) The adjusted neutrality unit measure, which is designed to adjust for the net purchase or sale made by neutrality over the year, seeks to deliver a volume neutral indicator. This indicator facilitates the understanding of the underlying cost/revenue generated by the functioning of the balancing regime. Adjusted values are shown by the dark blue dots in Figure 5-14. For example, Poland has a net sell position via neutrality of 105 GWh, which accounts for approximately two-thirds of the net revenue. When adjusted for volume effects, both the Czech and Great Britain regimes display financial credits arising from underlying neutrality transactions.

[70] The Italian data represents only the four basic neutrality transactions used in the standard analysis. There will also be significant costs and cash flows associated with the other tools that Italy uses for system management purposes beyond the STSPs.

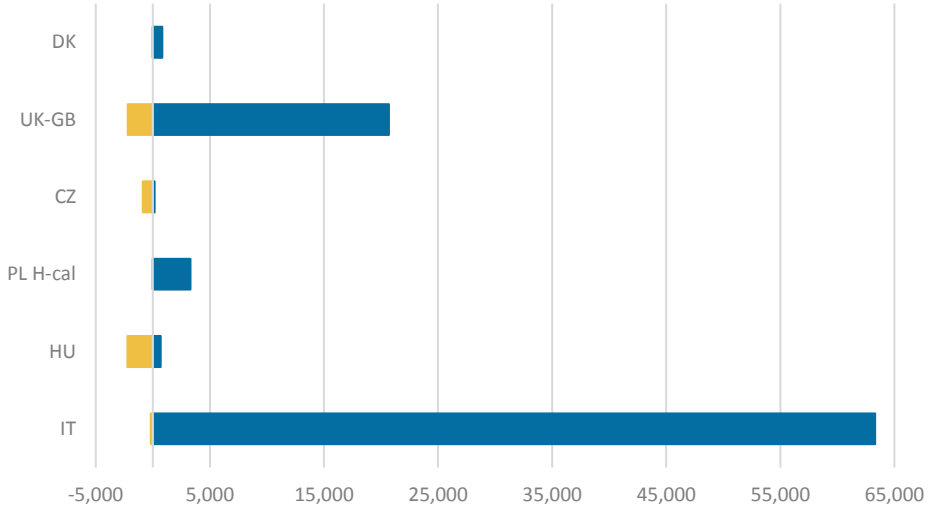
Figure 5-14: Net financial and net financial adjusted neutrality per unit of market volume (EUR/MWh, GY 2016/17)



Source: ACER

(303) Figure 5-15 provides evidence of the maximum and minimum cumulative financial neutrality positions over the analysis period. These indicate that all sample zones do exhibit periods in the year where neutrality generates substantial revenues or costs. The swings are substantial in many zones, for example in Italy the cumulative financial neutrality swings from a cost of around EUR 200,000 to a revenue of more than EUR 63 million, while in Great Britain the swing is from a cost of around EUR 2 million to revenue of EUR 20 million.

Figure 5-15: Maximum and minimum cumulative neutrality (thousand EUR, GY 2016/17)



Source: ACER

(304) 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 NRAs and stakeholders periodically to review these summary indicators together with some of the data and graphics used in the individual country analysis included in the previous Chapter and discuss it with their TSOs.

5.2.4 Physical linepack levels and commercial imbalances

(305) The preparation of both the first and second 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).

(306) 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. As it was explored in last year's Report, this appears to keep costs in the balancing regime low, but may in fact bury considerable costs in network users' operational flow and risk management activities. Balancing zones allowing substantial access to available linepack do not explicitly factor in its cost, nor can they accurately allocate it to the users as a balancing cost. Tight within day restrictions generally do not apply in the analysed countries, apart from Austria[71].

(307) The *Framework* therefore seeks to obtain information about physical linepack positions, and look at what effect the operation of the commercial framework might have on physical linepack in the system. These relationships were explored in last year's Report[72].

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

(309) 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).

(310) Exploring differences between regimes assists 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.

Applying the linepack metrics for the cross-regional analysis[73, 74]

(311) Figure 5-16 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. Hungary displays by far the greatest level of variation. This may imply a wider tolerance of operational variation in linepack, which may explain why the TSOs balancing action activity is one of the lowest observed. At the same time, its actions can

[71] The Czech approach is an interesting case in this respect. It has nomination restrictions on transit flows across the system and this discipline means that there is typically ample flexibility available for domestic users so that strict within day or daily balancing is not necessary. The regime effectively provides a substantial facility for network users to carry over imbalances from one day to a later day, provided that the cumulative imbalance position is within their entitlement to flexibility service, or opportunity to secure it on the secondary market of unused flexibility.

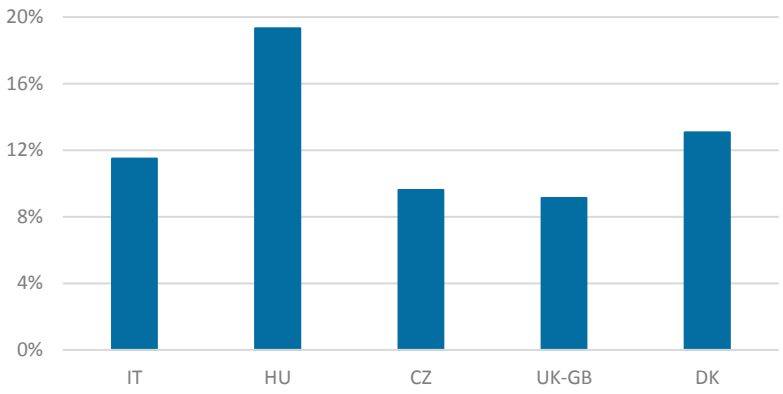
[72] https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER%20Report%20on%20the%20implementation%20of%20the%20Balancing%20Network%20Code%20(Second%20edition)%20Volume%20I.pdf, Annex 4.

[73] Annex 4 of last year's Report provide background information to the analytical framework and specifically to the issue associated with the comparison of linepack and commercial positions.

[74] Data tables available in Annex 3.

occasionally be large (relative to demand levels) and be priced at greater differentials than elsewhere in our sample.

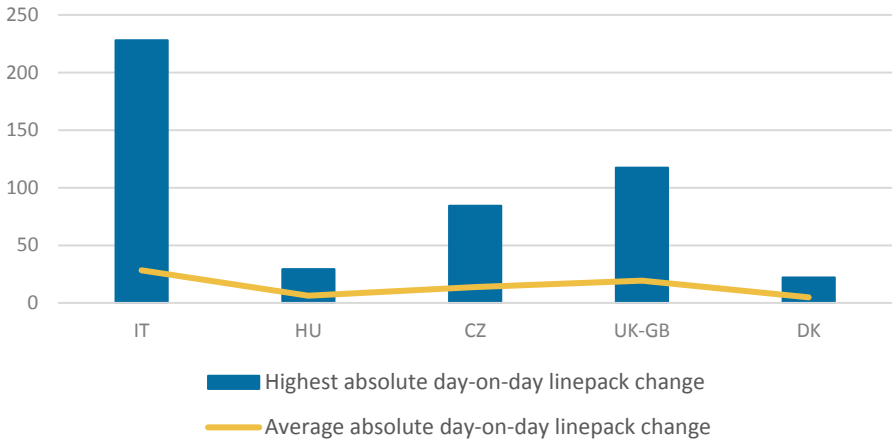
Figure 5-16: Opening linepack range (% of average linepack level, GY 2016/17)



Source: ACER

(312) Figure 5-17 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 the average day-on-day linepack changes and in the largest day-on-day changes. This variability may, under some circumstances, provide an indication of the extent to which zones can absorb substantial imbalances. The Italian system demonstrates some very large day-on-day swings. For such a small system, the Czech position perhaps indicates why it has no need to introduce strong incentives to balance on an individual day.

Figure 5-17: Highest and average absolute day-on-day linepack changes (GWh, GY 2016/17)

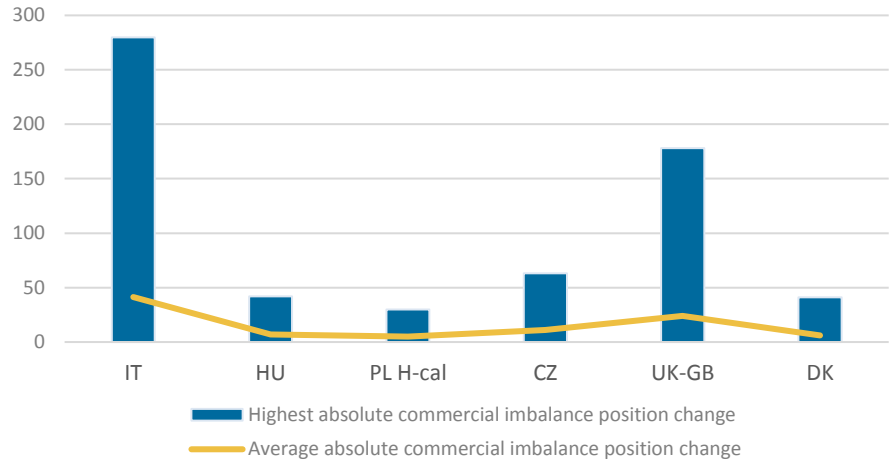


Source: ACER

(313) Figure 5-18 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. Italy shows the highest peak and average values[75]. The Polish, Czech and Hungary values are broadly similar, indicating that the Czech regime delivers proportionally larger average and extreme commercial imbalances.

[75] Italy's data does not reflect the impacts of SOP and SNT and therefore cannot provide an accurate impression of the full impact of network user activity and TSO activity (involving both STSPs and deployment of other tools).

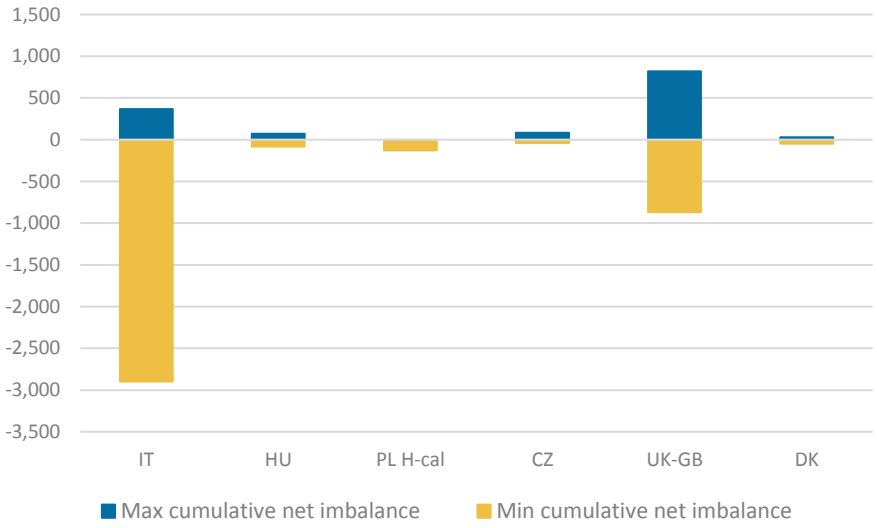
Figure 5-18: Highest and average absolute commercial imbalance position change (GWh, GY 2016/17)



Source: ACER

(314) Figure 5-19 indicates the maximum and minimum cumulative values of the daily commercial imbalance positions observed during the period. The result for Great Britain is unlikely to be consistent with the inherent level of linepack flexibility available even in such a large system. It is likely there are either logical or data issues at play that warrant investigation. SOP and SNT will influence flows on and off the Italian system and, in order to enable a comparison with physical linepack positions, the effects of those should be reflected in the daily commercial position.

Figure 5-19: Maximum and minimum cumulative net imbalance (GWh, GY2016/17)



Source: ACER

5.3 Way forward: how the analysis could be used

(315) The Agency believes that wider application of the *Framework* will help further to 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 *Framework*. A key objective should be to assess to what extent balancing regimes are functioning effectively, given the local circumstances. When using indicators and drawing conclusions from them, it is important that the characteristics of each balancing regime are well understood.

(316) The aspiration is that the analyses presented in the last two Chapters will be extended to cover a wider range of countries in future Reports, wherever NRAs and/or TSOs are willing to supply information and to

engage in interpreting the derived measures. The Agency warns that the interpretation of the output requires careful consideration given the complex interactions of measures applied within each balancing regime.

ANNEXES

Annex 1: List of abbreviations and country codes

Acronym	Definition
ACER	Agency for the Cooperation of Energy Regulators
Code	Balancing Network Code
DM / NDM	Daily metered / Non daily metered
ENTSOG	European Network of Transmission System Operators for Gas
MADAM	Market Area and Distribution Area Manager
MAM	Market Area Manager
MGS	Market for Gas in Storage
NCG	Net Connect Germany market area and balancing zone
NRA	National Regulatory Authority
OBA	Operational Balancing Agreements
OTE	Czech Gas Market Operator
SNT	TSO-nominated storage
SOP	Operational Storage
SSO	Storage System Operator
STSP(s)	Short-Term Standardised Product(s)
TGE	Polish Power Exchanges
TGPS	Transit Gas Pipeline System Yamal-Western Europe
TSO	Transmission System Operator
WDO(s)	Within Day Obligation(s)

Acronym	Country
AT	Austria
CZ	Czech Republic
DK	Denmark
HU	Hungary
IT	Italy
PL	Poland
UK-GB	Great Britain

Annex 2: Data collection and processing

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

(317) The analysis relied on data for the Gas Year 2016/17 (1 October 2016 to 30 September 2017) for all sample countries[76].

(318) The Gas Year 2016/17 was chosen because it is the time span associated with data collected by ENTSOG, and for which the Agency received individual balancing zone spreadsheets.

(319) The Agency worked with ENTSOG prior to this year's implementation monitoring activity to specify information requirements to support the application of the *Framework*. The provision of information was greatly enhanced compared to last year. Nevertheless, the ENTSOG dataset did not contain data on a number of variables that the Agency wanted to assess. Therefore, the Agency complemented the initial ENTSOG dataset in the following areas:

- 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, instead of linepack data.
    - Filling this gap may help assess the alignment of the physical operation of the system and its commercial functioning.
    - The Agency has, however, either been assisted by NRAs and/or TSOs is some countries, or been able to obtain this data from public sources to enable the analysis.

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

- 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.
    - For this Report, the Agency has addressed these issues following discussion and agreement with NRAs and/or TSOs/MAM or has been able to obtain this data from public sources to enable the analysis.

(321) Individual discussions took place with most 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[77].

(322) 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 data. 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 directly from the TSO/NRA wherever necessary.

[76] Five countries volunteered to participate in this year's analysis (AT, CZ, IT, HU, PL) and two countries from last year's analysis (GB and DK) were also included to provide additional comparators).

[77] 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 this report.

Annex 3: Data tables

A.3.1 TSO Balancing Actions

		IT	HU	PL H-cal	CZ	UK-GB	DK
Total Balancing Action Quantities	GWh	15,711	727	1,987	460	3,144	344
Total Balancing Action Quantities	(% of Zone Entry)	1.74%	0.36%	0.93%	0.23%	0.32%	0.6%
Percentage of Total Balancing Action Buy Quantities	(% over all balancing Quantities)	69.7%	39.1%	41.5%	50.1%	64.2%	61.4%
Balancing actions taken	No of days	270	78	364	48	109	90
Average Price of Balancing action Buys	(EUR/MWh)	20.60	21.34	19.00	18.92	17.25	17.02
Average Price of Balancing action Sells	(EUR/MWh)	17.68	15.91	17.47	17.55	16.20	16.71

A.3.2 Network Users' Imbalance

		IT	HU	PL H-cal	CZ	UK-GB	DK
Total Imbalance Cash out Quantities	GWh	75,549	4,405	4,322	570	23,957	4,034
Total Imbalance Cash out Quantities	% of zone entry quantities	8.37%	2.17%	2.03%	0.29%	2.45%	7.09%
Percentage of Total Network Users' Buy Quantities (in Total Imbalance Cash out Quantities)	% of all cash out quantities	54.1%	47.9%	47.3%	47.7%	50.1%	51.0%
Average Network Users' Long Position Cash out Price	EUR/MWh	18.87	18.48	18.01	17.39	16.25	16.29
Average Network Users' Short Position Cash out Price	EUR/MWh	19.69	18.73	19.22	19.06	17.35	16.35
TSO balancing action percentage	% of TSO's balancing action quantities + network users' imbalances	17%	14%	31%	45%	12%	8%

A.3.3 Neutrality

		IT	HU	PL H-cal	CZ	UK-GB	DK
Gross energy transacted	GWh	91,260	5,132	6,309	1,029	27,101	4,378
Net energy position	GWh	43	-23	105	-27	-820	1
Absolute sum of cash flows	Thousand EUR	1,769,080	95,034	116,287	18,740	455,569	71,656
Net financial position	Thousand EUR	9,886	-1,861	2,903	-332	-2,187	42
Net neutrality per unit of market volume	EUR/MWh	0.0110	-0.0092	0.0136	-0.0017	-0.0022	0.0007
Net adjusted neutrality per unit of market volume	EUR/MWh	0.0100	-0.0071	0.0045	0.0008	0.0118	0.0005
Maximum yearly cumulative neutrality	Thousand EUR	63,309	689	3,308	157	20,693	826
Minimum yearly cumulative neutrality	Thousand EUR	-179	-2,217	0	-893	-2,187	-405

A.3.4 Linepack and commercial position

		IT	HU	PL H-cal	CZ	UK-GB	DK
Max opening linepack level	GWh	6,015	758		1,731	3,964	295
Average opening linepack level	GWh	5,642	701		1,651	3,777	277
Lowest opening linepack level	GWh	5,367	623		1,572	3,619	259
Highest absolute day-on-day linepack change	GWh	228	29		84	118	22
Average absolute day-on-day linepack change	GWh	28	6		14	19	5
Highest absolute commercial imbalance position change	GWh	280	42	30	63	178	41
Average absolute commercial imbalance position change	GWh	41	7	5	11	24	6
Max cumulative net imbalance	GWh	366	70	0	82	820	29
Min cumulative net imbalance	GWh	-2,897	-80	-128	-40	-868	-49

Annex 4: Provision of linepack information

(323) This Annex has been written to explore when release of linepack information might be appropriate.

(324) It considers both the issue of provision of information close to gas flow and the issue of data access for retrospective assessment of regime function (as for example envisaged under the *Framework*.)

Linepack information in the context of the operational balancing regime

(325) The TSO may need to take balancing action to keep the system within acceptable physical limits.

(326) The aim of the Code is that network users should have primary responsibility for balancing their own portfolio, thereby having a key role in balancing the whole system as a result: *'The network users shall be responsible to balance their balancing portfolios in order to minimise the need for transmission system operators to undertake balancing actions…'*[78] The concept that individual network users' daily balancing is incentivised with full financial imbalance settlement at market-prices for long or short positions, builds on this. Adopting a simplified view, if all network users are close to balanced[79], then aggregated inputs and off takes should be close and, provided the distributions of inputs and off takes (both daily and within day) are within acceptable ranges[80], then the TSO should not need to intervene with any balancing actions.

(327) Information provision is therefore essential so that network users can understand their individual positions. This should enable them to manage their balancing exposures (either via deployment of physical gas resources or via gas trading activities). Cash out prices are influenced by TSO balancing actions and so TSO balancing activities generate financial risks for network users. Hence, it is appropriate that network users have appropriate information that may allow them to mitigate the risks associated with the daily balancing regime. Information about current, or projected, linepack levels may therefore indicate, when and whether a TSO might be looking to act to take a balancing action[81]. This linepack information may offer a benefit to network users, which might help network users to take actions that would avoid TSO interventions.

(328) Provision of linepack information may however have a second benefit. It can stimulate competition in the supply of flexibility to the TSO, which may be important in some systems. For example, whilst individual network users are incentivised to balance on a daily basis, over time the combined effect of all network users may yield a linepack build or depletion, unacceptable from a system management perspective. Additionally, for operational reasons, the TSO may wish to take balancing action to change the level of linepack in the system. Linepack information may therefore indicate the likelihood of an action. This of course depends upon the market players being able to interpret the linepack information to anticipate the TSO's actions. Particularly in the early days of market evolution, there may be a requirement for the market to know the acceptable linepack ranges outside of which the TSO would act. That said, linepack information is only a part of the broader information suite that may be needed to encourage the market to function efficiently. Careful consideration needs to be given to the merits of linepack information, or any other information that might provide insights as to whether a TSO might be about to take a balancing action.

(329) It is often argued that those regimes that provide information about individual and aggregated network user positions deliver all information that is needed by network users to satisfy their individual balancing requirements. In earlier Reports, the Agency has explored these issues. Whilst it is acknowledged that the

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[78] Article 4(1) of the Code.

[79] Where the network users' allocations are not simply the network users' nominations, as in the Variant 2 information model.

[80] Network users' inputs and offtake vary during the day (e.g. flat offtake but input just during a few hours). Depending on the systems' operational constraints, TSOs may need to take actions during the day even if all users are balanced by the end of the gas day.

[81] Since linepack swings, OBAs, and storage services, where present, constitute a complement to balancing actions when no mandated TSO's policy is in place for taking balancing actions. Any accurate information about linepack value and forecast may be used by network users, at its own risk, to try and predict the physical situation of the network and the TSO's behaviour.

data may be adequate for individual network user balancing, the Reports have identified that TSO's balancing actions may have a significant impact on the functioning of the system. As indicated, information about linepack levels, together with clarity about under what circumstances a TSO might take balancing actions, can act to stimulate competitive supply of flexibility to the TSO.

(330) Agency has therefore recommended that NRAs, TSOs, and wider stakeholders carefully consider whether enhanced provision of linepack information might improve the functioning of the balancing system. The physical operation of the system should not be considered entirely independent of the commercial functioning of the balancing regime.

(331) The underlying aspiration of the Code was that market based balancing would deliver a more efficient outcome than TSOs managing all flows on the system. An efficient access by network users to inherent flexibility available at reasonable cost is an important part of this aspiration. The information about actual linepack usage would provide useful information particularly, where the linepack differs from the expected level, based on the influence of network users' activity.

(332) For example, the sizing and positioning of the network users' aggregated imbalance zone (typically referred to as the "green zone") may have a significant impact on the costs and risks faced by individual network users in managing their imbalance exposures. It is generally acknowledged that some linepack flexibility can be accessed with minimal costs, whereas higher levels of linepack flexibility might incur progressively greater costs. In some systems that do not have the ability to allocate within day flows to individual network users, it may create risks of commercial exploitation of linepack flexibility. Careful consideration of the size of "green zones" is necessary. Widening the green zones may reduce the costs associated with individual network user balancing although widening might not be a panacea: increasing the size of the green zone may involve some risks of increasing visible costs in the balancing regime and in TSO's operational costs.

(333) Agency therefore believes that the provision of information to enable both individual network users' balancing and to generally enhance the functioning of the balancing regime should be carefully explored between NRAs, TSOs, and wider stakeholders. Where costs of providing additional information are low such information should be provided to the market save where it is proven that its release is exploitable and therefore to the detriment of customers.

Linepack information as an input to regime performance assessment

(334) Regardless of whether linepack information is provided in operational timescales, there may be merit in using linepack information in an assessment of regime functioning. The second Report describes these merits in the description of the application of the *Framework*.

(335) The *Framework* requires information about actual linepack levels observed in the balancing zone. The outputs specifically look at comparators between the observed physical position (linepack) and the commercial position (related to the expected linepack changes that might be explained by the combined effect of all network users and the TSO's balancing actions). Where this data indicates divergence between the physical and commercial positions, this may warrant further consideration of NRAs, TSOs, and wider stakeholders. Where divergence occurs, it is important to understand why this has occurred and whether it is within acceptable bounds. The Agency recommends that all NRAs should apply the *Framework* and in particular give careful consideration to any divergence between physical and commercial positions in the outputs.

Conclusion

(336) The Agency therefore concludes that linepack information is an essential data input to retrospective balancing system performance analysis. Local discussions between NRAs, TSOs, and wider stakeholders should take place to assess the merits of linepack information release in operational timescales to enhance the efficiency of regime functioning.

Annex 5: Explaining the indicators used in Chapter 5

TSO Balancing Actions metrics

(337) *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 understanding. Expressing the total balancing action quantities as a percentage of the zone entry quantities improves comparability. Generally, a "low" level (below 1% of total throughput) might be considered as residual, 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 inappropriately burdensome balancing disciplines[82] on network users, or that there may be ample flexibility in the system that the TSO need not act quickly to achieve a close balance. On the other hand, higher levels might indicate that the TSO may be taking too many balancing actions rather than ensuring that network users have sufficient information to promote their trading of imbalances. Interpreting the results involves considering what range might be reasonable in the context of local circumstances.

(338) *Percentage of Total Balancing Action Buy Quantities over Total Balancing Action Quantities*[83]. 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. For example, if the TSO's Buy actions are within a range of 25-75% of total TSO actions, this might be considered an acceptable asymmetry. Such an approach, which highlights any asymmetry beyond the aforementioned expected range thereby encouraging a consideration of the reason for the outcome, should generate a deeper understanding about the interactions within the operation of the balancing regime.

(339) *Numbers of days when balancing actions are taken*. Very low numbers might be very good news or, as suggested in last year's analysis, indicate that the regime is too restrictive and that network users are being heavily constrained and facing too onerous balancing requirements. Similarly, infrequent TSO balancing might suggest that TSOs are deferring balancing actions or that the physical system can absorb larger imbalances than the network user community are imposing on the system. Moreover, 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.

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

Network Users' Imbalance Cash out metrics

(341) 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.

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

(343) *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.

[82] For example, within day obligations may be necessary to ensure system integrity but should not impose unwarranted restrictions on network users.

[83] 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.

(344) *Percentage of Total Network User Buys in the Imbalance Cash out Quantity* (i.e. percentage of the end-of-day Imbalance Short Positions)[84], expressed as a percentage of total Network Users' Imbalance cashed out quantities, indicates whether there is any bias in network user imbalance positions.

(345) *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.

(346) *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 way to consider the extent of the TSOs residual role in the context of the operation of the balancing regime.

Neutrality metrics

(347) *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.

(348) *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).

(349) *Absolute sum of cash flows* represents the absolute sum of cash flows corresponding to the sum of the absolute values of cash flow associated with the four separate basic neutrality blocks (TSO/System Sells, TSO/System Buys, Network Users' Imbalance Cash out of Long Positions, and Network Users' Imbalance Cash out of Short Positions).

(350) *Net financial neutrality position* represents the net sum of cash flows 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.

(351) *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.

(352) *Net adjusted financial neutrality position per unit of market volume* provides a refinement of the previous metric. It is designed to indicate the underlying financial position had the basic neutrality cash flows been volume neutral. It adjusts by attributing financial value to the unmatched purchased (or sold) volumes.

(353) *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.

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

Linepack metrics[85]

(354) Information about opening linepack levels is available for all of our sample zones featuring in this Report except for Poland. A few summary statistics have been derived and these have been used as the basis for comments.

(355) *Highest, average and lowest opening linepack level (mcm or GWh)* are based on the opening linepack positions and provide an insight into the range of linepack variation experienced. The Opening linepack range might then be expressed as the % derived from (Highest opening linepack minus lowest open linepack) divided by average opening linepack over the Gas Year.

(356) *Highest and average absolute linepack day-on-day change (mcm or GWh)* are derived from the opening linepack positions. The absolute linepack change on any Gas Day is determined as the magnitude of the difference between the opening and closing linepack levels on the Gas Day. The highest indicates the greatest linepack change observed over a Gas Day. The average is the sum of the absolute differences over the analysis period divided by the number of days in the analysis period.

(357) *Highest and average absolute net daily commercial imbalance position (GWh)* are derived to assess the combined impact of network users and TSO balancing actions over a Gas Day. The net daily commercial imbalance position for each Gas Day is derived from the quantities associated with the four elements comprising TSO balancing actions (Buys and Sells) and the network users' imbalance cash outs (Long and Short positions). The formula is (network users' Long + TSO balancing Buys) less (TSO balancing sells + network users' Short). The highest and averages of the absolute values are then derived.

(358) *Highest and lowest expected commercial regime impact on absolute linepack (GWh)* are derived from a time series that indicates the cumulative effect of the net daily commercial imbalance position over the analysis period. The highest and lowest values indicate the maximum and minimum linepack positions relative to the opening linepack position at the start of the analysis period that would result from the impact of the 4 transactions in the balancing regime (TSO Buy and Sells and network user Short and Long cash outs).

(359) 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. However, 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.

(360) 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, 3, and 4 of last year's Report.

(361) As a starting point, the cumulative net daily commercial imbalance position starting from a zero reference point at the start of the data set (for this third Report, Gas Day on 1 October 2016) is calculated. The highest and lowest cumulative position values are derived over the period covered by the analysis. As explained in Annex 4 of last year's Report, this data provides a measure of the expected range of linepack positions during the gas year attributable to the operation of the balancing regime.

(362) 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. In this year's analysis, all data was provided in energy units except for GB,

[85] For a full explanation of the ideas explored in the metrics in this Section and their interpretation please see Annex 4 of the second Report: https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER%20Report%20on%20the%20implementation%20of%20the%20Balancing%20Network%20Code%20(Second%20edition)%20Volume%20I.pdf

where the Agency extracted data from publicly available data in volume terms and then applied a conversion factor to yield an energy equivalent.

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