Final Report

Investigation into the New Dutch Gas Balancing Regime and Market Model Wholesale Gas

Submitted to:

Energie Kamer – Nederlandse Mededingingsautoriteit (NMa) – Directie Toezicht Energie (DTe)

Submitted by:

KEMA Nederland B.V. and TPA Solutions Limited

Solihull and Groningen, March 2010

This study has been conducted by TPA Solutions working in conjunction with Kema Nederland: For further information please contact:

TPA Solutions Limited
38 Knowle Wood Road
Dorridge, Solihull
B93 8JN
UK

Contact: Mike Piggin
mike@tpasolutions.co.uk
telephone +441564774492

Kema Nederland B.V.
Energieweg 17
9743 AN Groningen
P.O. Box 2029
9704 CA Groningen
The Netherlands

Contact: Dr. Stefanie Kesting
stefanie.kesting@kema.com
telephone +31507009794

Table of Contents

List of Figures

1. INTRODUCTION

1.1 Background and Objectives

In February 2008 the Minister requested Gas Transport Services (GTS) to develop a new balancing regime in parallel with various changes to the Gas Act (the "Bill") designed to strengthen the gas market. Since this time GTS has been in intensive discussion with the various stakeholder organisations, the Ministry of Economic Affairs and the Office for Energy Regulation. There has been a high level of industry participation in the development of the proposal which takes account of both the Bill and the New Market Model Wholesale Gas (NMWG). The intention is that the new balancing model should be implemented by April 2011.

In September 2009, the collective grid operators (Gezamenlijke NetBeheerders, GNB) sent a proposal to the NMa in which they propose changes to the gas codes to incorporate the NMWG and the balancing proposal.

The NMa has the obligation to approve or disapprove the GNB proposal. According to the terms of reference to this assignment, the NMa will take into account the following criteria while assessing the proposals :

- The liquidity of the Title Transfer Facility (TTF) should increase
- Access to the Dutch gas market should become easier for new entrants
- The Dutch gas market should be better integrated in the Northwest European market
- The supply of gas should be affordable, reliable and renewable

The gas balancing regime and the NMWG form key elements of the future gas network access regime in the Netherlands. NMa has therefore asked TPA Solutions and KEMA to carry out this study, in order to support the NMa in formulating its opinion about these proposals and to help inform the basis on which the NMa reaches its conclusions.

1.2 Scope and Structure of this Study

This study explains and evaluates the GTS balancing proposals by reference to GTS' Balancing Regime Final Report published on 3 June 2009. This report includes a description of the NMWG, which introduces changes in accordance with a framework proposed by the Ministry of Economic Affairs which GTS is asked to implement concurrently with the new balancing regime.

The NMWG is intended to enable “a gas purchaser to determine what he does with his gas: use it himself or sell it on”.

The structure of this study is summarised below:

- Chapter 2: Provides the reader with relevant background information on: i) the Dutch gas market, ii) the flexibility tools available to balance supply with demand, ii) the design characteristics of the Entry-Exit open access model relevant to gas balancing, iii) the gas balancing function and the interplay between shipper balancing and system balancing, and finally, iv) key features of the Dutch balancing regime today.

- Chapter 3: Introduces the main features of GTS Report under four subject headings: i) the NMWG wholesale gas, ii) shipper balancing, iii) damping service and iv) system balancing

- Chapter 4: Provides a high level review of the NMWG proposals and comments on the purpose of programme information, buyers rights to resell gas and the implications for small field producers.

- Chapter 5: Evaluates the shipper balancing aspects of the GTS proposal. The analysis is split into three subject areas: i) Balancing Period, ii) linepack flexibility services and iii) pricing model. The generic features and concepts of each subject are discussed followed by an evaluation of the proposal. As part of this evaluation there is a brief description of how daily balancing might be introduced taking account of the Dutch gas market context. Finally, the future specification of a flexibility service, known as combiflex, is reviewed. Combiflex is an important service to help shippers to balance. GTS is obliged to offer combiflex until such time as Gasterra (GT) no longer has a dominant position in the Dutch flexibility market.

- Chapter 6: Evaluates the system balancing aspects of the GTS proposal. First the features of the alternative models for procurement of system balancing gas are described, followed by evaluation of the proposal.

- Chapter 7: Provides the study conclusions including our preliminary recommendations for the design of the shipper balancing and system balancing regimes.

2. BACKGROUND

2.1 The Dutch gas market

The Dutch natural gas industry was founded by development of the giant Groningen gas field which produces low calorific gas (G gas). Groningen production initially exceeded Dutch domestic consumption needs and surplus gas was sold under long term contracts to Germany, France and Belgium. Although production has been declining since 1980, Groningen still accounts for almost 50% of domestic production, with the remainder coming from Dutch small field production as high calorific gas (H gas)[1]. The Dutch high pressure transmission grid is also used to transit gas and there are interconnections with Belgium, Germany and Denmark which carry high calorific gas. In 2006 a pipeline connection was made under the North Sea to supply gas to the UK.

The diagram below shows the major sources of supply and demand in 2006. The G+ gas quality, made by mixing Groningen gas with a small amount of high calorific gas, is the gas quality used by all the Dutch regional grid companies, whereas large loads directly connected to the high pressure grid mainly use H+ gas. Each gas quality has its own high pressure transmission grid.

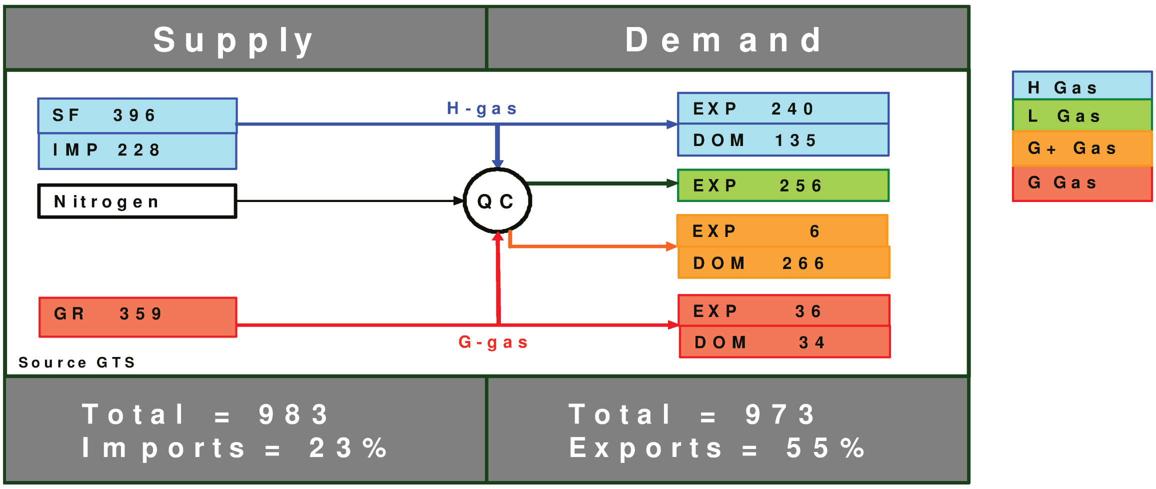

Figure 1: Sources of Supply and Demand in 2006[2] (TWh)[3]

[1] High calorific gas (H gas), is the standard gas quality specification in use within Europe

[2] Schematic developed by TPA Solutions with data from NMa Gas Monitor 2006, page 13, figure2

[3] 1 billion cubic meters is roughly equivalent to 10 TWh, SF=small fields, IMP = imports, GR = Groningen, DOM = domestic

The Dutch gas industry was developed by Gasunie, which was 25% owned by Shell, 25% by Exxon and 50% by the Dutch state until 2005. Gasunie was then split up to support gas market liberalisation. Gasunie is now 100% state owned and its activity is restricted to ownership and operation of the Dutch high pressure transmission pipeline network (via Gastransport services, GTS), a regulated business. Gasunie's gas supply business was transferred to GT which is 25% owned by Shell, 25% by Exxon-Mobil and 50% by the Dutch state.

GT continues to supply the lion's share of gas required by suppliers of households and small businesses, such as Essent, Eneco and Nuon. The market penetration of natural gas is extremely high in the Netherlands, with 98% of households connected to the network.

The 2007 Energy Market Monitor[4] comments that the Dutch gas market is still highly concentrated, especially for low calorific gas supplied to the RGO networks. Hourly balancing with high imbalance charges is seen as a serious impediment for new entrants with small portfolios. Furthermore, shippers have insufficient steering information to manage imbalance risks and imbalance charges are not related to the actual system imbalance. It is seen as important that a market based balancing regime is introduced. In addition, the TTF virtual trading point cannot be seen as a liquid market place so far, with more than 90% of gas traded elsewhere. TTF trade is mainly in long term products such as year ahead. The day ahead trading volumes are low and there is hardly any within day trade.

In 2008 agreement was reached for GTS to manage quality conversion on behalf of shippers. This means that henceforth shippers will be able to supply G+ gas consumers using H gas, an approach previously restricted by access to quality conversion capacity which was commercially congested. This development removes a significant barrier to new entrants supplying consumers within the RGO networks.

2.2 The Dutch flexibility market

Figure 2 below lists the sources of flexibility available to the Dutch gas market. At present Groningen is the main provider of diurnal flexibility due to its ability to respond rapidly to demand changes, however in recent years a number of salt cavity storages have been implemented which can also respond quickly. The remaining types of flexibility can typically respond with a lead time of 2 hours.

The market for flexibility is highly concentrated; excluding GTS linepack, GT controls 80% of short lead time flexibility and more than 70% of total flexibility[5]. Investment in new salt cavity storage facilities is the main development in the market, with additional capacity of 4 mcm/hour

[4] Page 8, paragraph 8.

[5] Calculated from data in Figure 2, below

expected to be implemented by 2011. Capacity rights are held by several of the incumbent suppliers from within the RGO networks.

Lead Time	Type of flexibility	Capacity mcm/hour	Description
Zero	GTS Linepack	2.1	System balancing & shipper balancing tolerances
Zero	Groningen	7.9	100% controlled by GT
30min	Salt cavity	1.9	Mainly controlled by existing RGO suppliers
2+hrs	UGS	6.0	95% controlled by GT, 5% TPA capacity
2+hrs	Small Fields	1.0	85% controlled by GT
2+hrs	Imports	3.9	25% controlled by GT
2-4+hrs	Interruption	0.7	Unknown
Total		23.4	

Figure 2: Sources of flexibility in the Netherlands (2009)

According to earlier calculations the overall capacity of the flexibility market is expected to increase and even exceed peak requirements in a cold winter scenario by around 50% by 2011.[6 7]

2.3 Principles of the Entry-Exit model

The entry-exit model was introduced by GTS in 2004. It involves the complete separation of the input and offtake of gas from the transmission network. The service is to bring gas into the system (entry capacity) or to remove gas from the system (exit capacity). This means there is no defined contract path between entry and exit points. The key feature of the entry-exit model is that it facilitates the operation of traded markets in both gas and capacity services.

The model enables any "entry paid" gas to be traded at a virtual hub(s)[8]. If the physical characteristics of the transmission network and the size of the geographic area allow, it is desirable if there is just a single national balancing zone. In this case, trading can take place at a single "virtual hub". This promotes liquidity and supply competition compared to multiple balancing

[6] Figures are mainly based on: Frontier 2008 report on flexibility services. Capacities in the table are from Frontier's assessment of hourly flexible capacity for 2009 from table 17, annex 2, overcapacity in a cold winter based on figure 7, page 55

[7] However, discussions with GTS revealed that there are also doubts if there is overcapacity under design conditions.

[8] In the Netherlands this is the TTF

zones which fragment trade and market liquidity. It is accepted that a single balancing zone will be an inexact model of the physical network. Nonetheless, as long as safety can be assured, the inefficiencies associated with an inexact model can be less important than the benefits for competition.

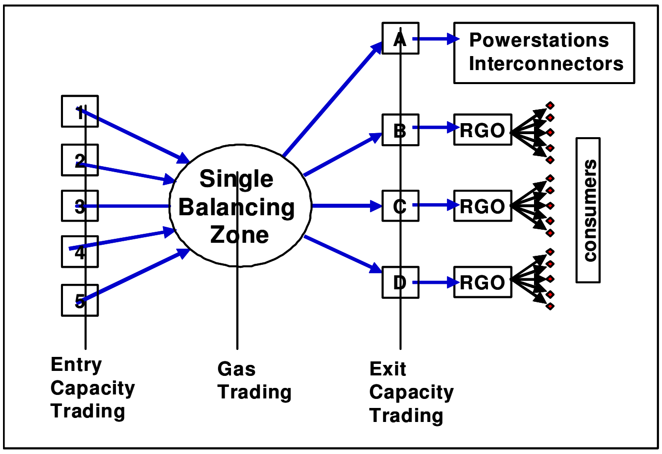

Figure 3: Schematic of Entry-exit Model

A further benefit of the entry-exit capacity model implemented in conjunction with a single balancing zone is that balancing is aggregated (or "netted off") across the whole of a shipper's supply portfolio.

The entry-exit model was first introduced in the UK in 1996 and has come to be regarded as the preferred model within Europe by both regulators and shippers. However, many of the entry – exit models currently operated in Europe are hybrids – for example, multiple balancing zones (e.g. France and Germany), postalised tariffs (e.g. Denmark, the Republic of Ireland) or physical hubs (e.g. Belgium). The main alternative to the entry-exit model is known as the "point to point" model; this is the model which was adopted by GTS up until 2003.

2.4 Introduction to gas balancing

The physical integrity of a gas pipeline network must be assured at all times by maintaining gas stock levels and pressures within specified limits. Network access rules provide financial incentives for shippers to ensure their energy inputs are equal to their energy offtaken so as to keep the transport system in balance and maintain pressure levels.

There are many reasons why the energy demand profile of individual shippers deviates from forecasts. These include forecast errors, unforeseen changes in temperature and complete outages affecting industrial consumers. On the supply side similar issues arise, resulting in differences between gas nominations and actual gas supplied.

The aggregate of all shipper surpluses and deficit imbalances makes up the overall system balance. If the system imbalance cannot be accommodated by linepack variation, the TSO buys (or sells) the additional requirement using flexibility tools. These include the traded market, storage bookings or bi-lateral contracts with flexibility suppliers. This activity is sometimes referred to as the TSO's residual balancing function. Generally the TSO will be dealing with an aggregate imbalance issue, but occasionally there may be a need for location specific intervention, for example where the single balancing zone model is a less exact representation of the physical network.

In order to evaluate the consequences of a balancing regime it is essential to have a good insight into the sources and costs of flexibility that are available to the market to ensure that shippers can balance their portfolios at all times.

2.5 The Dutch gas balancing regime today

The Dutch transmission and distribution system has been designed around the provision of flexibility from the Groningen gas field, which initially could provide flexibility to keep the system in balance in all circumstances. In fact the whole transmission and distribution system is physically balanced in real time by Groningen. This is achieved using pressure regulation whereby the flow rate is automatically adjusted so the pressure downstream of the Groningen valve is maintained at a pre-set level.

This gives GTS a different role compared to other European TSOs, as its focus is on monitoring rather than active residual balancing. The service definition and terms covering this balancing gas arrangement are bilaterally agreed between GT and GTS. This is backed up by a regulatory obligation to supply, whereby GT has a duty[9] to provide GTS with balancing services at a "reasonable price". The GT duty is independent of market concentration considerations and does not have a time limit.

GT therefore has a dual role, firstly as a major shipper and secondly as the system balancing agent. At an operational level this means the total amount of gas supplied by GT has to be separated between these two roles. At present this is done by deeming the amount of gas supplied by GT in its shipper role to be exactly equal to the amount of gas allocated to GT at transmission exit points. The remaining surplus (or deficit) is then accounted as the gas supplied (or offtaken) in GT's role as balancing agent. This means, GT's energy account is always in balance and, as a consequence, GT is practically not exposed to imbalance charges. Furthermore GT is in a position to provide balancing services to third parties.

[9] Dutch Gas act article 10a member 3

The current GTS balancing incentive arrangements apply charges for hourly, cumulative hourly and daily imbalances which are greater than the allowed tolerances. In addition, shipper's end of day imbalances are cashed out, any shipper surplus is sold to GTS and any shipper deficit is purchased from GTS.

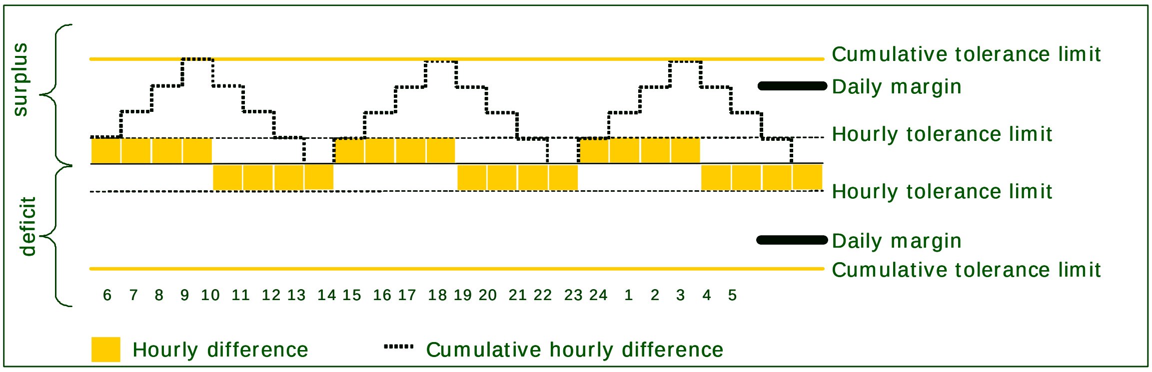

Figure 4: Hourly, cumulative hourly and daily margin tolerances[10]

The hourly tolerances are determined by complex formulae, which in summary award more tolerance to shippers with smaller portfolios. The charges for exceeding tolerance levels are 10% or 15% of the day ahead gas price for hourly excess, and 100% of the day ahead gas price for cumulative hourly excess. Exceeding the daily margin tolerance causes a charge of 100% of the day ahead gas price.

End of day settlement then involves surpluses being sold to GTS at the lowest of a basket of three market index prices[11], and deficits being bought from GTS at the highest of the same three index prices. Although these arrangements are principally market related, the charges themselves are "administrative" i.e. not related to the system balancing costs which GTS actually incurs.

Shippers have different options to minimize their imbalances. They can, for example, renominate up to 2 hours before actual flow. There is also the option to trade the gas at the TTF.

At the moment, shippers do not have access to timely information to balance their portfolios. This is especially problematic for the supply of gas to consumers with highly volatile demand.

For so long as the current high market concentration in the provision of flexibility services persists, GT has a legal obligation[12] to provide capacity for GTS to offer flexibility services to the market. Known as the combiflex service, this is meant to ensure that all market parties have

[10] Source GTS Services Included 2008, page 15

[11] The index prices are: i) APX TTF Day Ahead, Zeebrugge and NBP.

[12] Dutch Gas act article 10a member 1d

access to flexibility at reasonable price levels. Shippers can reserve combiflex each year and GTS tenders for the provision of shippers' aggregated requirements.

Combiflex is not a nominated ex ante service. Assuming a shipper has reserved sufficient combiflex, gas is automatically allocated ex post to the shipper's energy account to ensure the shipper is always in balance (each hour). However, if insufficient combiflex is reserved, the shipper may be exposed to charges and cash out.

3. SUMMARY OF THE GTS BALANCING PROPOSAL

This chapter examines the main features of the GTS Balancing Regime Final Report, as published in June 2009. For ease of comparison the same structure is adopted as subsequent chapters about the proposal evaluation:

- New Market Model
- Shipper Balancing
- Damping Service (a sub set of Linepack Flexibility)
- System Balancing

We understand that since the GTS report was published, development of the proposals has continued and discussion is ongoing. However, except where it is stated otherwise, this summary is based entirely on the GTS report. It is not a comprehensive statement of the GTS report; instead it aims to provide the reader with a general understanding of the proposal and to explain features which will be necessary to understand the proposal evaluation.

3.1 New Market Model

GTS is required to implement the NMWG concurrently with the new balancing proposals. GTS provides a detailed explanation of the NMWG in a document titled “Markt Process Model Nieuw Marktmodel Wholesale Gas” dated April 2009. Therefore the GTS Balancing Regime Final Report only covers the basic structure of the NMWG. Furthermore, GTS does not explicitly address the original purpose of the NMWG, to give a “***powerful impulse to the operation of the domestic gas market***” as it is mentioned in the explanatory notes of the Bill.[13] We discuss the purpose and impact of the NMWG in Chapter 4 below.

The Bill, as it relates to the NMWG proposal, introduces a number of new concepts which the GTS Report defines as follows:

- A **Programme** is a forecast of the energy inputs and outputs for the next gas day, expressed as energy values for each Programme Period. GTS proposes the Programme Period should initially be one hour (see section 3.2)
- **Programme responsibility (PV)** is allocated to parties who either introduce or offtake gas from the transmission network. A Programme Responsible Party (PRP) is responsible for the actual performance of its Programme(s).

[13] Explanatory note for Gas act proposal 31904

- There is a distinction between **Entry Programmes** and **Exit Programmes**, each having its own programme responsibility:
  - o The Entry Programme is the forecast amounts to be supplied at transmission entry points, identifying the portfolios which the gas is to be transferred to at the VPPV, together the amount of gas to be sold at the TTF.
  - o The Exit Programme is the forecast amounts to be offtaken at transmission exit points, sourced with amounts taken from counterparties at the VPPV and/or purchased at the TTF.

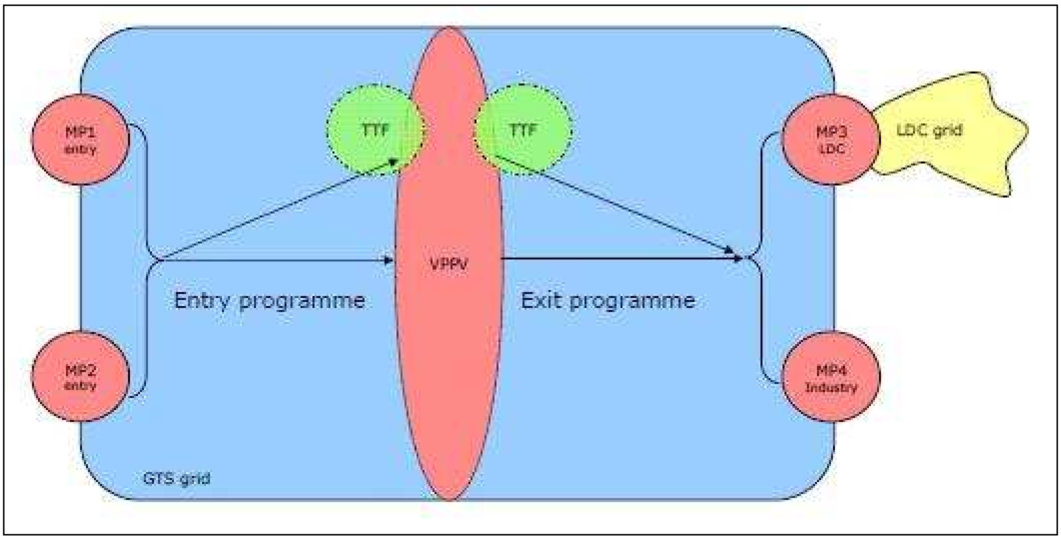

Figure 5: **Schematic Showing Entry and Exit Programmes**[14]

- The **VPPV** is a new virtual transfer point "Virtuele Punt voor Programma Verantwoordelijkheid" from the Entry Programme to the Exit Programme.
- PRP's must submit entry and exit programmes by 1400 in respect of the following gas day (1400 D-1). The obligation to nominate at some entry and exit points (where more than one shipper is active, but excluding RGO exit points), by the same deadline remains.
- GTS checks each programme for internal consistency (inputs = outputs plus the matching of VPPV amounts between Entry Programmes and Exit Programmes) and has the right to give instructions with respect to programmes. All the programmes are finalised by 2200 D-1.

[14] Source GTS web site – new balancing regime kick off presentation 19 November 2009

In the first instance, the PV party is the producer at entry and the gas consumer at exit. The exception is small consumers where the nominated supplier assumes this role. In addition, gas traders can submit a Programme specifying sales and purchases forecast to take place at the TTF. PV parties can transfer their responsibility, for submitting a programme and for their imbalance to another party.

A PRP is accountable for the imbalances associated with the programme, which occur during the course of the following gas day. Programmes are submitted for every entry and exit point of the grid. Entry points can have more than one Programme, but large consumers can only have a single Exit Programme with a single PRP[15]. Where large consumers have more than one supplier, title to gas supplied by the secondary suppliers must be transferred to the PRP at the TTF. This has the effect of increasing the use of the TTF as a trading point.

The GTS Report[16] explains that a shipper's programme is the basis for determining the shipper's imbalance. In the case of an exit programme, the shipper imbalance is the difference at the end of the Balancing Period between:

1) The expected exit as stated in the programme and the actual exit;
2) The expected entry as stated in the programme and the actual entry.
3) Therefore, imbalance = result of 1) minus the result of 2).

3.2 Shipper Balancing

This section describes the commercial framework of rules for determining shipper balancing performance and the incentives which apply. It covers the Balancing Period, the provision of information at the both the system and program level, the settlement of imbalances and the determination of imbalance prices.

The Balancing Period (which GTS refers to as the "Programme Period[17]") is the accounting period over which a shipper's inputs and outputs from the transmission network are measured. GTS proposes the Balancing Period should initially be one hour and should be defined in the Gas Conditions, stating the conditions under which GTS can revise the period. A one hour Balancing period means shippers will be commercially responsible for matching their inputs and outputs for every hour in every gas day.

[15] Loads directly connected to the transmission network can have more than one Exit Programme where the individual supplier's allocations must be proportional to their shares in the Exit Programme

[16] See GTS Final Balancing Report, page 19, paragraph 3.5

[17] For definition of the Programme Period see GTS Final Balancing Report, page 14, paragraph 3.3

GTS is required by the Bill to provide system level and program steering information to programme responsible parties. GTS proposes to provide this information in near real time so shippers will always know their own balance position and the system's balance position:

The Programme Imbalance Signal (POS) is the cumulative imbalance position across all of the shipper's programme(s), its Entry Programme(s), Exit Programmes and Trading Programmes.

The System Balancing Signal (SBS) is the aggregate of individual shipper imbalances.

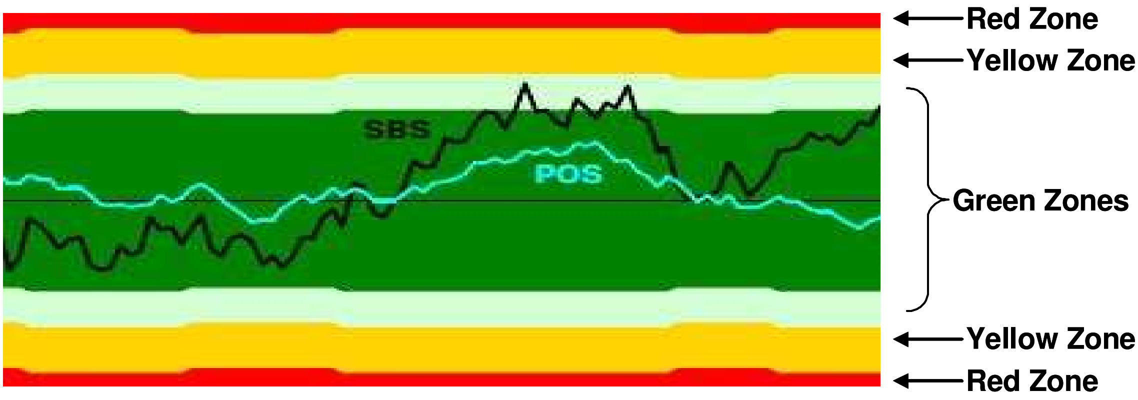

Figure 6: Linepack zones showing POS and SBS[18]

The green, yellow and red zones show the status of the transmission pipeline's linepack (or inventory) position. The SBS is allowed to move up and down freely within the dark green zone, but if the SBS moves outside the dark green zone, this triggers GTS to take a system balancing action. In this case the volume of gas purchased (sold) by GTS is determined as the amount which will return the SBS back to just inside the Green Zone.

If the SBS moves outside the dark green zone in an upward direction this indicates the pipeline is too full and triggers GTS to sell gas, which has the effect of reducing the quantity of gas entering the transmission network. On the other hand, if the SBS moves outside the dark green zone in a downward direction, this triggers GTS to buy gas. The colour of each zone indicates the severity of the balancing action which is required; the unlikely event of the SBS entering the red zone would trigger emergency measures.

The provision of near real time information is designed to enable shippers to judge their exposure to a possible system balancing action and take appropriate actions. As long as there is no system balancing action, a shipper's POS can vary without restriction free of charge. On the other hand, if a system balancing action occurs within the Balancing Period, and the shipper's POS is in the direction contributing to the need for a system balancing action, then the shipper

[18] Source GTS web site – new balancing regime kick off presentation 19 November 2009

will be cashed out at the end of the Balancing Period. This process is referred to as either "*cash-out*" or "*settlement*".[19]

The price of system balancing actions which GTS takes within the Balancing Period determines the price used for imbalance settlement using a marginal price methodology. GTS is proposing a single marginal price for the Balancing Period, equal to the highest (or lowest) priced system balancing action which is taken.

Shippers can support GTS in its system balancing role in two ways:

- **Shipper offers and/or bids for gas on the Bid Price Ladder** - in which case any bids selected will receive the marginal price (this is a high price if GTS needs to buy gas, and a low price if GTS needs to sell gas)

- **Shipper manages its own imbalance position (POS) to support the system**. For example, if the shipper sees that the system is too full of gas, the shipper "helps" by operating with a negative imbalance and vice versa. GTS refers to this as the provision of "Assistance Gas". If settlement occurs shippers providing Assistance Gas receive the marginal price (which is, in this case, an attractive price).

In the settlement process GTS recovers its costs of buying system balancing gas and Assistance Gas (or pays out its revenues from selling system balancing gas and selling Assistance Gas) from shippers with imbalances (POS) which gave rise to the need for GTS to take system balancing action(s). The payments made by GTS are exactly matched by GTS charges in the Balancing Period. The GTS settlement process is unusual in that shipper who caused an imbalance do not generally have their POS returned to zero. Causing shippers bear there proportional shares of the volumes of GTS balancing gas taken by GTS plus their share of assistance gas.

- The System is short so GTS buys enough gas to return SBS to edge of Green Zone
- The highest price paid by GTS buys in the Balancing Period is the marginal price (buy).
- Shippers with negative imbalances (POS) buy part of their imbalance deficit at the marginal price (buy), the volumes allocated being their shares of bid price ladder gas and of assistance gas.
- All shippers with positive balances (POS) sell their imbalance surplus, as Assistance Gas, at the marginal price (buy) returning their POS to zero
- GTS is financially neutral as its costs are equal to its revenues.

Figure 7: Imbalance Settlement - worked example

[19] There is no imbalance settlement at the end of the gas day, settlement only takes place in relation to a Balancing Period where one or more system balancing actions have occurred.

Under the GTS proposals, shippers know their balancing settlement costs immediately. Subsequent adjustment, leading to final allocations, does not impact settlement and is valued at a neutral gas price, being the volume weighted average of buys and sells on the Bid Price Ladder.

3.3 Damping Service

If, as expected, shippers provide their own sources of flexibility throughout the gas day, GTS will have spare linepack flexibility in addition to the linepack required by the Green Zone. GTS proposes to offer this spare flexibility as a service to shippers, to "*smooth their diurnal variation*" referred to as "*damping*" in the GTS proposal.

The diagram on the next page illustrates how the diurnal exit profile at transmission exit points to the RGO networks may be damped by transmission linepack flexibility so that the hourly variations required from Entry Programmes and/or the TTF are reduced.

The amount of damping available varies considerably from day to day and GTS has provided a formula, in the form of a spreadsheet, which is available from the GTS web site, which shippers are expected to use to calculate their required entry based on their predicted exit. This formula is based on the network characteristics and is dependent on the total amount of gas transported. The amount of flexibility available will be determined by GTS daily and published on the GTS web site by 0900 daily, for shippers to use in their calculation of the following day's supply requirement.

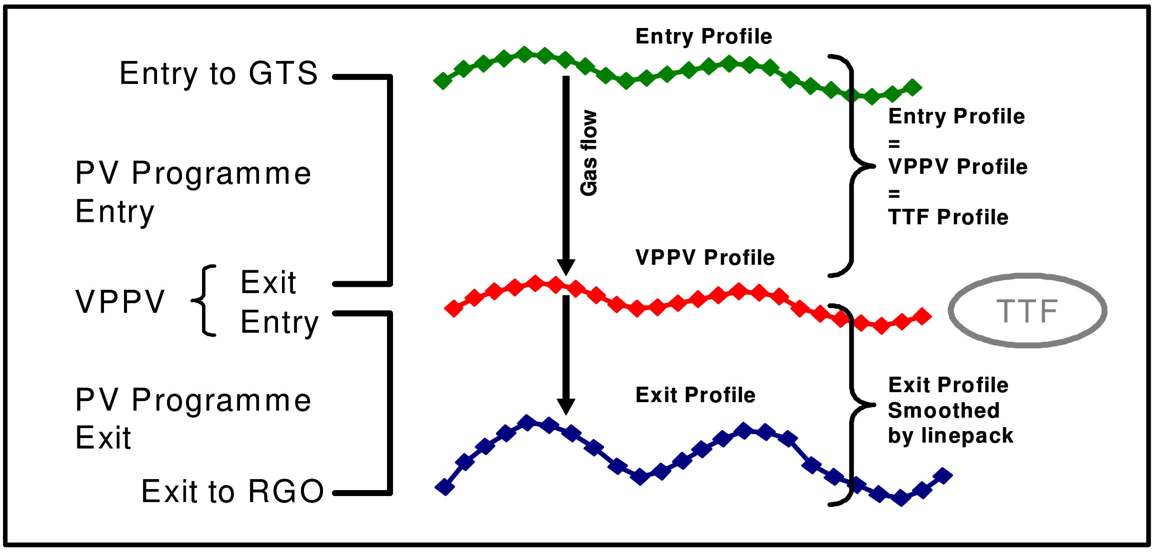

Figure 8: Schematic showing the effect of damping on the diurnal profile[20]

[20] Source TPA Solutions Limited

The available flexibility is a function of two parameters, alpha and beta, which the shipper inputs to the spreadsheet. These parameters have opposing effects:

- The Alpha parameter varies between 0.3 in summer up to 0.6 in winter. As alpha increases, the level of smoothing decreases, reflecting the lower level of linepack available when gas demand is higher. The effect of alpha is to protect the amount linepack required by the Green Zone.
- The Beta parameter varies between 0 in winter up to 1.0 in summer. As beta increases the level of smoothing increases as well, reflecting that additional linepack is available in low demand periods. However, even in the summer the level of Beta is still highly variable.

In order to give shippers an example of how the formula might be applied, GTS has published the values of alpha and beta which would have applied in 2008. These are plotted in the diagram below, demonstrating that beta is a highly volatile parameter. Nevertheless, beta is quite frequently equal to one during the summer, in which case the spreadsheet formula shows that the entry profile is completely flattened on those days.

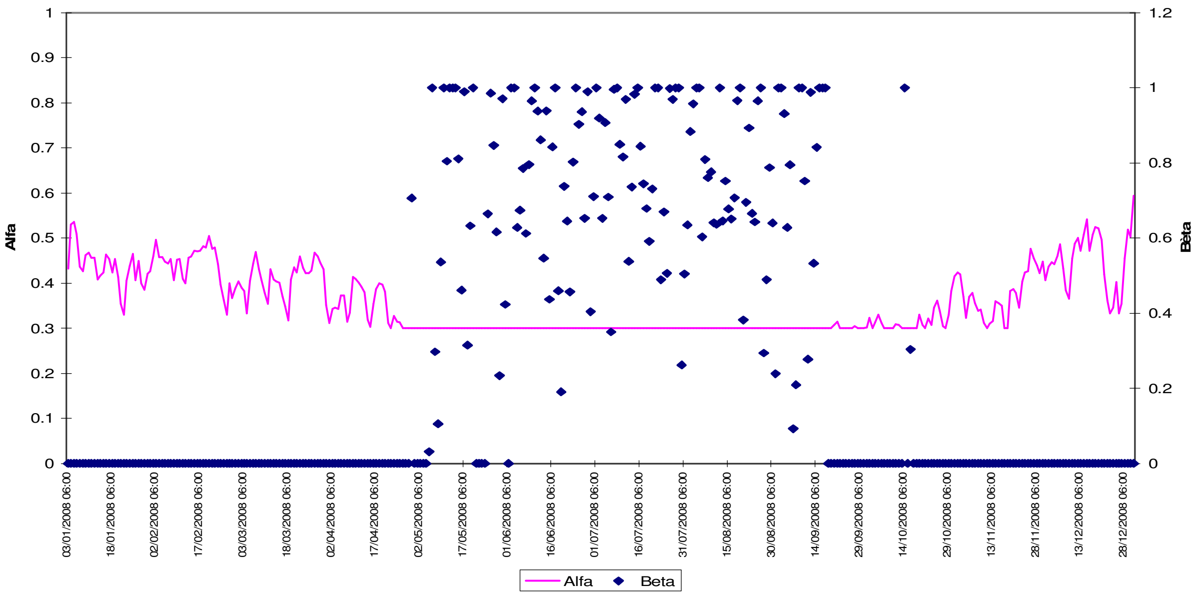

Figure 9: Values of alpha and beta as they would have been for 2008[21]

[21] Source GTS web site, damping proposals

3.4 System Balancing

To the extent that shippers do not collectively balance the gas transmission system, GTS must intervene to buy or sell gas (system balancing gas) to maintain the pipeline pressure within safe limits.

GTS proposes to introduce a Bid Price Ladder, commonly referred to as a merit order outside the Netherlands, where shippers offer to buy and sell gas to GTS for system balancing purposes. The mechanism is designed to replace the current balancing services arrangement with GT, and give other parties the opportunity to participate.

Only physical gas, directly related to an increase or decrease in gas flowing at entry or exit points, will qualify for inclusion in the Bid Price Ladder. This requirement provides more certainty that balancing actions will have a physical impact on the system, compared to "virtual" commercial transactions at the TTF for example.

GTS proposes to tender to reserve the availability of flexibility to increase confidence that sufficient capacity will always be available on the Bid Price Ladder. The upfront reservation costs would be recovered in transport tariffs on the basis that the security provided by reservations benefits everybody. On the question of how much capacity to reserve, GTS suggests it may develop a methodology in conjunction with the Office of Energy Regulation.

GTS intends to phase capacity reservations out if and when Bid Price Ladder liquidity develops sufficiently and once sufficient confidence in system operation has been gained. GTS considers this may take 2 years from introduction of the new arrangements.

In summary, key features of the Bid Price Ladder include:

- Physical gas with entry or exit point specified; firm service
- A minimum bid quantity of 150 MWh per hour
- Deployment lead times of 30 minutes, 90 minutes or 150 minutes
- Non reserved volumes and prices notified by 2200 D-1,
- Non-reserved volumes can be withdrawn up to a deadline of H-8 hours
- Bid Price Ladder prices (both reserved and non reserved capacity) can be changed up to a deadline of H-4 hours

To address the risk that, in some circumstances, Bid Price Ladder prices might not provide sufficient balancing incentive, GTS proposes a "Stimulus Component" whereby GTS would have the right to increase (or decrease) Bid Price Ladder prices. Application of the Stimulus Component makes imbalance settlement prices less attractive (more expensive) for shippers.

GTS explains there is considerable uncertainty about the frequency with which the Bid Price Ladder will be used. Narrower limits on linepack variability (the size of the Green Zone) will increase the frequency of balancing actions, but would allow more linepack to be allocated to damping to smooth the diurnal variation and vice versa. GTS suggests that the frequency of Bid Price Ladder utilisation should be sufficient to ensure that offering gas on the Bid Price Ladder is an attractive proposition.

The GTS proposal also outlines considerations relating to emergency measures where network security is at risk. In circumstances where Bid Price Ladder resources prove inadequate, GTS would have the right to issue flow instructions to shippers at entry and, if required, to disconnect loads.

In the subsequent sections, we evaluate the features of the proposals in detail, starting with the NMWG in the following chapter 4.

4. NEW MARKET MODEL WHOLESALE GAS

This chapter provides a high level review of the characteristics of the NMWG proposals. The detailed arrangements for the NMWG are not covered by the GTS Final Balancing report and are outside the scope of this study.

The NMWG processes provide a forecast of the gas which will enter and leave the system during the next gas day. The forecast is split into an Entry Programme and an Exit Programme and identifies the energy expected to be bought or sold from counterparties at the VPPV.

The VPPV is only used for the Programmes purposes; it is not used for the transfer of title to gas. The rules governing the transfer of title to gas remain as they are at present. The main points for title transfer are the entry points and exit points, including exit points to the RGO networks (the City Gates), and the TTF.

Programme information is not reconciled with and does not replace nominations. GTS still requires shippers to submit trade nominations at any entry point and exit point where there is more than one shipper flowing gas. This nomination information is used by one of the default mechanisms employed in the determination of allocations.

A shipper can have Entry Programmes, Exit Programmes and Trading Programmes all within the same POS. The link between a shipper's Programmes and its POS is that both relate to the same aggregated portfolio of supplies and consumers. It is possible for a shipper to have a separate Programme and POS for a specific portfolio (supply portfolio and/or consumer portfolio), but it is expected that shippers will normally aggregate all their shipping activity into a single POS to maximise the benefit of netting off surplus and deficit imbalances.

In the next sections we will consider the following subjects:

- The purpose of programme information
- The buyer's right to resell gas,
- Small field producers

4.1 The purpose of programme information

GTS has explained to us that the purpose of programme information is:

- To provide day ahead information on the amounts of gas entering and leaving the system,
- To allocate damping to individual exit portfolios and,
- As a consistency check for TTF trades.

The NMWG uses programme information as the starting point to determine the shipper imbalance (POS)[22]. In the imbalance formula, the programme information (for both entry and exit programmes) cancels out leaving the imbalance as the difference between the shipper's actual near real time allocations at entry and its actual near real time allocations at exit.

Furthermore, in exit programmes the imbalance formula adjusts the POS for the effect of damping. As a result fluctuating exits are allowed to have a steeper profile than the profile which is entered in the VPPV or TTF. All the physical benefits of damping pass through to the relevant entry programme.

In our view the NMWG seems to be a rather complex methodology to achieve the purposes which are identified by GTS.

4.2 Buyer's rights to resell gas

The Dutch gas market used to be structured around a single integrated transmission and supply business (Gasunie) selling gas to each of the Regional Grid companies (RGOs). It was natural for title to gas to exchange at the interface between the respective grids. This interface is now referred to as a transmission exit point (alternatively as a "City Gate" or "OV Exit").

When the entry-exit model was introduced, the facility to transfer title at the City Gate was retained alongside the introduction of a virtual transfer point, known as the TTF. In consequence title transfers are fragmented across a number of different transfer points. From a perspective of opening the gas market and developing the TTF, it would have been preferable to discontinue title transfer at City Gates.

GTS does not offer backhaul capacity at the City Gates, therefore, when title to gas transfers at the City Gate, it is impossible for the buyer to sell that gas back to the TTF. It is understood that this is what the Explanatory notes of the Bill refer to in saying that a buyer of gas should be able to determine for himself what he does with his gas: use or sell it on.

Nevertheless, we understand that under the NMWG title transfers at the City Gate will continue to be allowed and it will still not be possible for the buyer to trade the gas on. Instead of discon-

[22] See section 3.1, page 15 where the imbalance formula is described

tinuing City Gate transfers or making backhaul capacity available, reliance is placed on the new Gas Act provisions which, GTS claims, *"make it virtually impossible for a trader to force an end consumer to accept gas at the City Gate instead of at the TTF"*

In our view it would be better if City Gate transfers were simply discontinued. A decision to stop the transfer of title at City Gates would offer a clear, transparent and definitive solution to the concern that buyers should be able to sell their gas on. It would reduce reliance on monitoring compliance with the new gas law and it would be consistent with a pure entry-exit model which is designed to focus trading liquidity at a single virtual trading point.

4.3 Small field producers

At present small field producers tend to sell their gas before it enters the GTS system. In some cases the production rate of the field and/or the allocation between the producing interests may be uncertain. This can make it difficult for producers to forecast gas flows. In turn this uncertainty can expose producers to imbalances and cash out during the gas day.

Currently GT buys the lion's share of small field production[23]. Variations in the amounts of gas GT receives are compensated for automatically by changes in the flow rate of the Groningen field, and GT is not exposed to imbalance charges[24].

Under the NMWG proposals producers will by default have programme responsibility and be exposed to imbalance cash out charges. Producers should be able to mitigate imbalance cash out risks in several ways:

- Transfer Programme responsibility to an agent, which could be GT or indeed any other shipper. In future GT will, like other shippers, have to nominate and will be exposed to balancing charges. Nonetheless, it is expected that GT will have a competitive advantage over other shippers. This is due to GT's large and diverse portfolio of supply and demand and its control of the Groningen field, capable of rapid adjustment. In addition, with its large share of transport volumes (including exports) GT will be able to strongly influence the overall system balance (SBS) to avoid exposure to balancing costs.

- Amend physical facilities and allocation methodologies to be able to closely predict and control the amounts of gas entering GTS. These changes may take time to implement

[23] Based on the Small Fields Policy, GasTerra is required to offer to purchase all the gas that producers of small fields offer

[24] See explanation provided in section 2.4

and there may be costs, for example: i) lower overall production rates, ii) investment in new plant and iii) renegotiation of commercial allocation agreements with partners.

- Take direct responsibility for and manage their hourly imbalance (POS) by buying and selling gas or by procuring flexibility services. This could involve TTF trading, physical storage capacity bookings and/or use of combiflex.

5. SHIPPER BALANCING

This chapter evaluates the rules which GTS proposes will apply to incentivise shippers to balance their energy inputs and energy outputs from the transmission network. The subject is presented in three sections, each considering the generic principles and competition considerations before moving on the draw out issues which are specific to the GTS proposal. The three sections are:

- Balancing Period
- Linepack Flexibility Services
- Pricing & Settlement

5.1 Balancing Period

5.1.1 Introduction

The Balancing Period[25] (which GTS refers to as the Programme Period) is the accounting period over which the shipper is incentivised to match its inputs and outputs from the transmission network. If a shipper is out of balance at the end of the Balancing Period, the TSO "cashes-out" or "settles" the imbalance. This process returns the imbalance to zero with any surplus gas purchased by the TSO (or any deficit purchased by the shipper from the TSO). In some regimes there are rules whereby the shipper is allowed to carry over surpluses or deficits, usually subject to a maximum tolerance, into the next Balancing Period.

The Balancing Period should be determined on objective criteria reflecting the physical characteristics of the network and the flexibility tools available to the TSO and shippers for balancing, whilst also being mindful of the wider economic objectives of promoting market liquidity and supply competition. Although ultimate responsibility for system balancing always lies with the TSO, for both economic and practical reasons it is desirable for shippers to contribute as much as possible to the system balance. If the preconditions for competition are in place, shipper

[25] Under its proposal, GTS considers the balancing period to be the period between two consecutive settlements. The length of the balancing period therefore depends on the frequency with which GTS takes balancing actions.

balancing can extend the scope of supply competition by helping to create a liquid within day gas market.

5.1.2 Guidelines of Good Practice for Gas Balancing (GGPGB)

ERGEG, the European Regulators' Group for Electricity and Gas, publish guidelines to assist TSOs and national regulatory agencies in various aspects of the design of open access regimes, including gas balancing.

Chapter 1.7 of the GGP-GB[26], published in December 2006, indicates that a daily balancing period is preferred by European regulators, however chapter 1.8 suggests an alternative of no balancing period is also possible. In this case, as long as the cumulative imbalance of the shipper is kept within specified tolerance levels there is no need for a settlement procedure and therefore a balancing period.

In December 2008, ERGEG published a monitoring report on the implementation of the GGP-GB in consultation with TSOs, National Regulatory agencies and users[27]. They report that users clearly consider that balancing should be carried out on a daily basis, in order to allow smaller shippers and new market entrants to balance their positions more easily, with less risk. ERGEG notes that TSOs, when designing their balancing systems, need to put greater emphasis on compatibility with adjacent transmission systems. ERGEG suggests, to reduce barriers to cross border trade and facilitate new market entry, that the GGP-GB should specify a standardised balancing period for all systems. In line with the recommendations made in GGP-GB, section 1.7 (above), ERGEG reiterates that the preferred balancing period is daily.

More recently, in December 2009, KEMA published a study on Methodologies for Gas Transmission Network Tariffs and Gas Balancing Fees in Europe[28] on behalf of the European Commission. As part of this study a shipper survey reaffirmed a preference for daily balancing, which is also in line with various presentations, reports and surveys by different organisations. In addition, the study showed that most Member States at least formally apply a daily balancing period, although several countries apply a longer or no pre-defined balancing period. Conversely, an hourly balancing period is used in Austria as well as for transit flows in several other countries.

---

[26] ERGEG Guidelines of Good Practice for Gas Balancing, Ref: E06-GFG-17-04, 6 December 2006, chapters 1.7 and 1.8, page 5

[27] ERGEG 2008 Monitoring Report: Implementation of the GGP-GB Ref: E08-GMM-03-03, chapter 1.4.2, page 18

[28] Study on Methodologies for Gas Transmission Network Tariffs and Gas Balancing Fees in Europe, tender no: TREN/C2/240-241-2008, chapter 3.2.4, page 71

The KEMA report emphasizes that it is important to differentiate between the formal and effective balancing period. Several countries have combined a notional daily balancing period with additional hourly and/or cumulative constraints. Depending on the treatment of any imbalances which arise within these shorter timeframes, this may create a regime which more closely resembles an hourly or at least sub daily rather than daily balancing period. KEMA also explains the application of different balancing periods in neighbouring countries can result in potential barriers to cross border trade and give rise to the possibility of cross border arbitrage of imbalances[29]

5.1.3 Link between the Balancing Period & size of the Balancing Zone

A shorter Balancing Period gives shippers an incentive to manage their imbalances more tightly. Accurate shipper balancing reduces the need for the TSO to take balancing actions but this does not necessarily apply if the geographic size of the balancing zone is too large (or the balancing period is too short). With a larger balancing zone a change in an exit flow rate may not be physically corrected within the same Balancing Period by a corresponding flow rate change at a distant entry point. This is because gas moves quite slowly through transmission pipes (at a speed of between 36 to 40 km/h in the Netherlands), creating a time lag between exit and entry. In theory, with a shorter balancing period this effect is exacerbated, since cause and effect tend to be separated into different balancing periods[30], unless the size of balancing zone is correspondingly reduced. However, this effect may be reduced by the activation of compressors to pack the system as soon as a demand change occurs. Nonetheless, in some systems, a shorter Balancing Period may suggest the introduction of a number of smaller balancing zones otherwise the TSO's system balancing requirements may increase even though shippers may be commercially balanced over a larger single zone.

5.1.4 The provision of diurnal flexibility

In gas markets consumption can vary considerably over each 24 hour period. This is especially so where gas is used for space heating and cooking (domestic and commercial premises) but, to a lesser extent, can be a feature of some industrial loads The management of this diurnal variation is a key network design feature. Design solutions can involve using distribution network linepack supplemented by:

- Storage located inside the distribution network, close to the centre of demand

[29] NERA/TPA Solutions, Gas Balancing Rules in Europe, A Report for GREG, Appendix B. London/Solihull, 23 December 2005

[30] If the time lag between cause and effect is predictably constant then it can be allowed for in the balancing rules, but the larger the balancing zone the greater the scope for variability.

- Transmission linepack
- Storage caverns connected to the transmission network.

In daily balancing regimes diurnal storage is usually part of the regulated asset base and is bundled and paid for as part of the distribution tariff.

By contrast, the design of the Dutch gas supply network is unique because a significant portion of the diurnal flexibility requirement is sourced upstream, by varying the rate of flow of gas supplied by the Groningen field. The need to accommodate large upstream flow variations means Dutch transmission pipelines will tend to be bigger with more linepack than is normal.[31]. Nonetheless, Dutch regional distribution companies still make a significant contribution to diurnal flexibility[32]. On many low gas demand days in summer, diurnal flexibility requirements can be accommodated without using Groningen flexibility at all. If shippers are to provide the diurnal flexibility which is required by their portfolio, then the Balancing Period needs to be relatively short, but not necessarily as short as one hour[33].

5.1.5 The time lag between entry and exit

The balancing regime operated by GTS today involves daily imbalance settlement (or cash out) together with hourly balancing incentives across a single national balancing zone[34] . The hourly incentives work across a single national balancing zone because of the high linepack capability of the Dutch transmission network, the active use of compressors in response to demand variations and due to GTS allocation rules which impose a time lag of two hours between the amount allocated at exit and the amount allocated at entry, as illustrated below:

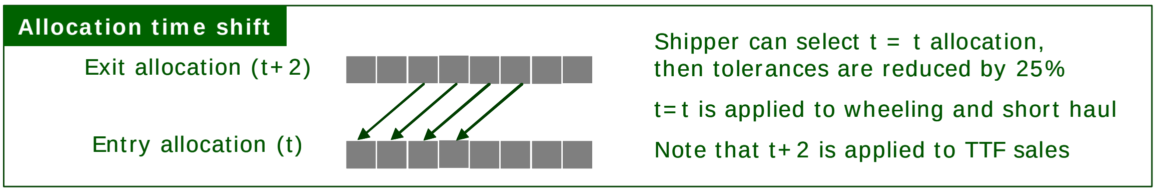

Figure 10: Existing GTS rule about the time shift between exit and entry allocations[35]

---

[31] GTS pipeline capacity requirements are reduced through the location of LNG peak shaving and storage at the extremities of the network and close to key areas of gas consumption

[32] The profile at the OV Exit Point (the City Gate) will be smoother than the aggregate profile at the distribution system exits

[33] See Figure 8, page 18, showing the typical diurnal (within day) profile of a portfolio of domestic or commercial consumers

[34] Since July 2009 gas quality conversion has been managed by GTS behind the scenes. From a shipping and trading perspective this creates a single gas quality across the Dutch gas market.

[35] Source GTS website, services included 2008

5.1.6 Fragmenting the market

The potential benefits of a shorter Balancing Period in transferring more of the system balancing requirement onto shippers needs to be considered against the adverse impact on trading liquidity due to fragmenting the market. A short Balancing Period implies a higher transaction frequency with individual trades having a lower value. This can impose significant costs at the individual shipper level, particularly for smaller shippers with few scale economies. A short Balancing Period places a premium value on sources of flexibility which can be ramped up or down rapidly, increasing commercial risk especially for new entrants with limited access to flexibility.

5.1.7 Evaluation of the GTS balancing period proposal

5.1.7.1 Factors GTS has considered

Feedback from market parties on the GTS proposals revealed that shippers have opposing commercial interests about whether GTS should offer a daily balancing regime or a shorter balancing period, down to one hour. Under daily balancing the "diurnal" variation cannot be fully provided from linepack except on some low gas demand days in summer; so GTS would have to contract for flexibility to cover these shortfalls. GTS found that shippers which had invested in flexibility resources tended to favour a short balancing period, whereas shippers without adequate flexibility resources of their own favour daily balancing as a means to facilitate market access. At present only GT has significant capacity which is able to ramp up or down very quickly (within a 30 minute lead time), but several of the major suppliers at the RGO level have salt cavity storage investments underway with a rapid deployment lead time.

In resolving these opposing interests between daily and hourly balancing, GTS suggests a decisive factor is the goal that shippers should assist in the balancing of the network[36]. GTS explains that this view is consistent with the explanatory text from the Bill which states:

"In order to give a powerful impulse to the operation of the domestic gas market the Gas Act must be tightened up on a number of points, so that: …….2) each market party can contribute individually towards keeping the gas transport network in balance….."

As a conclusion from this text, GTS assumes that shippers should provide the major portion of diurnal flexibility, noting that shippers without their own flexibility resources, have a legal right to the combiflex service available through GTS. An alternative reading would suggest that the Act

[36] GTS notes that she only considered technical and economic factors in the design of the balancing regime, and not the strategic behaviour of market participants

could be satisfied by GTS allowing all shippers the right to contribute to system balancing actions (as indeed GTS is proposing) rather than relying on GT, as in the past.

GTS did consider contracting (annually) for the flexibility it would require to offer daily balancing, but considers this approach would remove diurnal flexibility from the market and would reduce the incentive for shippers to invest in their own diurnal storage. Conversely, GTS acknowledge[37] that new investment will create overcapacity, a view which is supported by the conclusions from a 2008 study that there is a significant capacity overhang in the Dutch flexibility market[38].

5.1.7.2 Flexibility assets - physical and commercial constraints

The ability of supply sources to deliver flexibility within a period of one hour will vary considerably. Nomination lead times are subject to limits set by connected transporters and because of the technical design limits of physical assets. For example, compressors may need to be started, LNG regasification plant brought to hot standby status, or the valves on underground storage wellheads adjusted. Some facilities will have been designed to provide base load gas and it may be impractical for them to provide flexible response. Alternatively, flexibility may be possible but only at the cost of inefficient operation.

It is well known that the Groningen field and more recent investments in salt cavity storage facilities are good at providing flexibility for a single hour with just 30 minutes notice. However the capabilities of other potential sources of flexibility are not generally well understood.

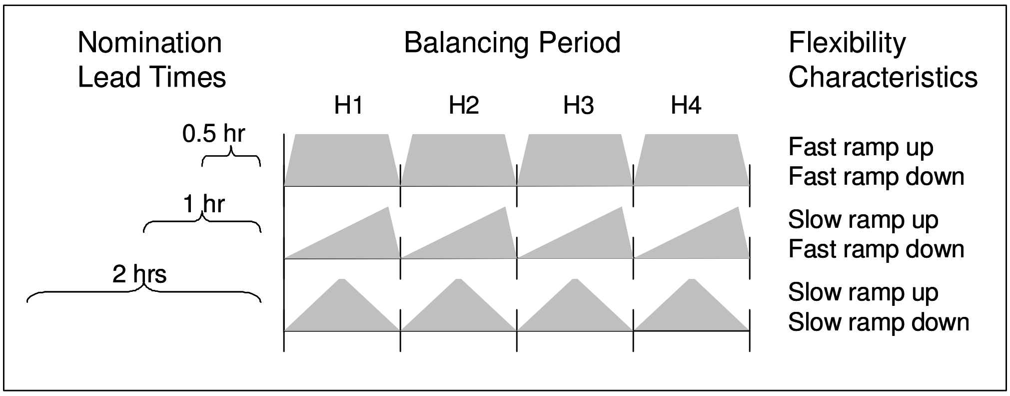

Figure 11 Schematic of limitations for hourly flexibility offers[39]

[37] See GTS Final Balancing Report, page 8, half way down

[38] See Section 2.2, page 8 (including footnote with GTS view that there is no capacity overhang)

[39] A similar schematic could be drawn for hourly flexibility bids

Figure 13 illustrates the impact that nomination lead times and ramp rates might theoretically have on the provision of hourly flexibility. Although assets with slow ramp rates may be poor at providing hourly flexibility, they could be very much better at providing flexibility over a period of several hours.

It is evident that the elapsed time between a identifying a POS imbalance, perhaps part way through the balancing period, and implementing an imbalance correction is generally longer than one hour, even for flexibility resources which can be deployed very quickly. For shippers will access to slower response flexibility resources it is likely to take around 4 hours for an imbalance to be corrected.

This means it is not practical for shippers to balance accurately hour by hour so there is an unavoidable exposure to imbalance settlement. This raises the question of whether an hourly balancing period is a sensible concept. This problem might be (partially) addressed by introducing a balancing tolerance[40] for smaller shippers who, for various reasons, experience the most difficulty in balancing accurately.

5.1.7.3 Development of the within day market

A liquid within day (or “spot”) market is the foundation for the TTF to become Northwest Europe’s favourite gas hub. Market parties trading in gas futures contracts have to be confident of exchanging their contract for physical gas on the day it matures and this relies on a liquid spot market. Market liquidity is underpinned by access to diverse sources of physical supply - gas imports, LNG terminals and local storage – all of which the Netherlands has in abundance, but it is also essential to design a commercial framework which can facilitate trading.

At present TTF trading is principally in futures contracts, day ahead trade is low and there is hardly any within day trade with 90% of gas traded elsewhere. The lack of success in developing a within day market at the TTF may be, inter alia, linked with hourly balancing, for the reasons mentioned in section 5.1.6 above.

Hourly balancing requires traders to directly link traded volumes to the hourly flows of gas which are planned to enter and exit the network. Trading activity within the hour is restricted to the netting off of opposing imbalance positions. This imposes costs and risks on traders making the TTF an unattractive trading environment.

Furthermore, if it is not possible to develop a competitive market in hourly gas this considerably undermines the case for hourly balancing, as costs could exceed benefits if competition in hourly flexibility is weak.

---

[40] See section 5.2 on linepack flexibility services

It might be argued this problem could be addressed by extending the balancing period, for example, to 4 hours, or by varying the balancing period, for example, to match expected changes in diurnal and/or seasonal flows. Whilst there could indeed be advantages from shipper and system balancing perspectives, this is possibly too small a change to stimulate the revolution in TTF liquidity really needed.

5.1.7.4 Frequency of Balancing Actions

At this early stage there is uncertainty about the frequency of balancing actions and the consequences for the cash-out of shipper imbalances. A one hour Balancing Period could mean 24 settlements every day, however if the SBS stays within the Green Zone system balancing actions (and settlement) could be rare occurrences. Nonetheless, the shipper still has to be ready for the possibility of settlement each and every hour.

GTS can use linepack flexibility to avoid taking system balancing actions, but is concerned that infrequent use of the Bid Price Ladder may result in high prices for system balancing gas. GTS has a choice between offering a wide Green Zone with infrequent system balancing actions (and less linepack available for damping) or a narrower Green Zone with more frequent system balancing actions (and more linepack available for damping).

GTS concludes[41] the market will need to develop a consensus about an appropriate allocation of linepack flexibility between damping and the Green Zone.

A one hour Balancing Period is typically most onerous for shippers serving smaller consumers where a diurnal profile must be offered and unpredictable demand variations met. The consumption patterns of large gas loads are generally (but not always) more even and predictable, imposing fewer requirements on the shipper.

5.1.7.5 Flexibility volumes and economics

At present there is a lack of understanding about the types and volumes of flexibility services required for competition to develop in the Netherlands. With the exception of combiflex, it is not clear if the market can be expected to provide these services now or by some point in the future. Furthermore, there is uncertainty about the cost of flexibility and whether it is realistic for new entrants to be able to compete with incumbent suppliers.

Although information on the Dutch flexibility market is available, the analysis[42] is not sufficient to draw quantitative conclusions about the prospects for competition. This is especially the case

[41] GTS Final Report, bottom of page 26

[42] Frontier Research into gas flexibility services, May 2008

for supply to small consumers where the requirements for flexibility are most demanding, for the purposes of:

- following seasonal variations,
- creating a day ahead profile,
- responding to unpredictable demand changes during the day.

These requirements are mentioned, as the discussion in sections 5.1.7.2 and 5.1.7.3 relates only to the provision of within day flexibility (responding to unpredictable demand changes during the day).

5.1.8 Daily Balancing

The focus of this study is to identify the advantages and disadvantages of the new balancing regime which is proposed by GTS, rather than to suggest completely alternative solutions. However we are aware of recently raised new discussions about the balancing period in the Netherlands, so that we think it is worth discussing how daily balancing could be implemented in the Dutch context.

Daily balancing could be introduced by unbundling gas balancing to create two market mechanisms, one to address diurnal variation and the second to address daily variation in gas demand. This separation is facilitated by the availability of near real time allocation information from GTS at the system and shipper levels.

By reference to the diagram below:

Figure A - illustrates the basic diurnal flexibility service. This is purely a storage service - there is no net gas delivered or offtaken over a 24 hour period (blue volume = yellow volume). Initially, the bulk of this service would be provided by Groningen.

Figure B – shows how competition can be introduced to the diurnal service provision (dark blue volumes). If the Groningen service is subject to a price cap the market should be encouraged to bid at more advantageous prices. The market mechanism could be designed carefully to facilitate competition. The capacity accepted from the market reduces the utilisation of Groningen capacity.

Figure C – shows a scenario where gas demand increases during the day. The demand increase (green volume) is sourced by shippers. There is a daily market mechanism for this purpose which shippers can use in addition to their own resources. If shippers do not source the required amount, then GTS either absorbs the difference within linepack (the Green Zone) or buys (sells) balance of day ("BOD") gas so as to steer the diurnal service back to a net zero position by the end of the gas day.

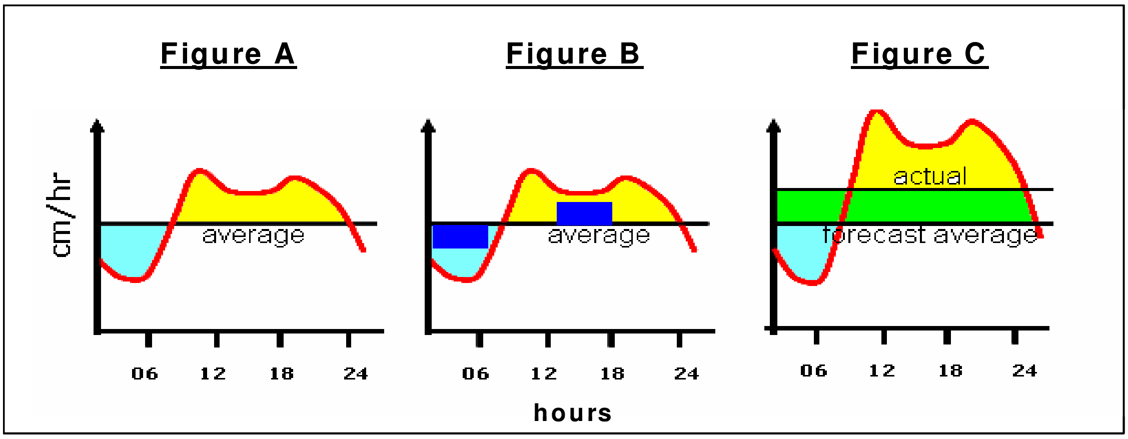

Figure 12 Schematic showing the sourcing of diurnal and daily flexibility

Initially it may be more economic for GTS to administer the diurnal market mechanism on behalf of shippers in view of the limited scope for competition. In due course, if competition develops sufficiently, a decision could be taken for GTS transfer responsibility for shippers to source their own diurnal flexibility requirements from the market mechanism.

The price cap on Groningen diurnal capacity could be set with a view to longer term policy objectives. Although the marginal cost of Groningen capacity is low, it may be appropriate to set a price cap which is sufficient to encourage investment in the new sources of diurnal flexibility which will be required as Groningen becomes exhausted.

Under this approach all shippers, including incumbent suppliers, would only have responsibility for meeting net increases or net decreases in demand occurring in each 24 hour period. Although in theory shippers have until the end of the gas day to source these daily demand variations, experience shows shippers are reluctant to take on the exposure of an imbalance position for longer than is absolutely necessary. Of course, shippers may take a long or short position based on market intelligence, but where these actions are well informed they will generally support the system balance.

Near real time allocation information would mean that GTS costs in sourcing diurnal flexibility could be accurately targeted to the shippers who imposed these requirements on the system.

By contrast diurnal flexibility in some regimes, such as the UK, is spread across all consumers through the distribution tariff and competitive provision is not possible.

5.2 Linepack Flexibility

5.2.1 Generic linepack flexibility services

The internal storage capability, or linepack, of a gas transmission pipeline is a valuable source of flexibility. It can be used to provide flexibility services to shippers in a variety of ways. Moreover, there is a choice in the regulatory treatment of flexibility between bundled services as part of the transportation tariff or else unbundled services so that shippers can choose, perhaps between several alternatives, reflecting their own circumstances and economic benefits. The potential applications of linepack flexibility include:

- To manage deviations within the balancing period where shippers may have less incentive to maintain the transmission system in balance. This application is most relevant to longer balancing periods, particularly daily balancing
- To manage errors in forecast gas demand and/or supply, including plant failure (both demand or supply), leading to system imbalances
- To provide a shipper “balancing tolerance”. There are many alternative methodologies for the allocation of balancing tolerances. Tolerances usually discriminate to some extent between shippers or between different consumer categories. For example, if a larger tolerance is allocated to domestic consumers where forecast variations are more prevalent and difficult to manage, it can be argued that this amounts to a cross subsidy paid by larger consumers. Alternatively balancing tolerances can be allocated to shippers with smaller portfolios to address their competitive disadvantage by comparison with larger shippers. Generally speaking “free” tolerances should be seen as temporary measures designed to be removed when the local flexibility market is sufficiently liquid.
- To provide a tolerance (or zone) at the end of the Balancing Period to allow shippers to carry over imbalances into the following period, and so avoid exposure to imbalance settlement. This tolerance may be allocated at the level of the individual shipper, or else at the system level, for the benefit of all shippers. A disadvantage of allocating tolerances to shippers is that individual shippers do not benefit from the unused tolerances or opposing imbalances of other shippers. On the other hand, utilisation of a tolerance at the system level can be expected to be dominated by larger shippers, with smaller players more at risk of imbalance settlement due to the actions of these larger players.

In cases where flexibility services are offered at a system level it may be impractical to offer an unbundled service. Elsewhere it should be possible to address discrimination issues by unbundling linepack services and enabling shippers to make economic choices.

5.2.2 Evaluation of linepack flexibility proposals

GTS linepack capability can make an important contribution to shipper's requirements for flexibility in a concentrated market. The choice of a one hour balancing period incentivises shippers to maintain their energy accounts in balance throughout the gas day. This aims to minimise linepack utilisation, although linepack will be needed for the Green Zone, a tolerance at the system level which is bundled and charged as part of the transportation tariff.

5.2.2.1 Damping

GTS spare linepack capacity is made available to shippers as damping, again as a bundled service at the system level. Damping has many of the same characteristics as a system level balancing tolerance, except that the service is used to smooth the diurnal load profile.

The shippers which GTS expects will benefit from the damping service are the suppliers to the domestic and retail markets which are the diurnal space heating loads. GTS proposes to allow programmes which do not supply small consumers to opt out of the damping service. GTS suggest this may be the logical choice for larger loads, especially transit flows, as the absence of damping will simplify settlement with cross border counterparties.

It is possible that suppliers to large loads and transit shippers may argue that they should not have to pay for damping within their transportation charges. However, large load shippers pay less for their transportation capacity per unit of energy than small load shippers with fluctuating loads. Therefore it may be argued that damping is already an implicit part of their transportation costs.

There are alternative ways of allocating damping between entry and exit programmes[43]. Under the GTS proposal, the profile required at the VPPV is the same as the profile required at physical entry points to the transmission system[44] If instead the entry profile benefited from more damping compared to the VPPV profile, this would bestow a benefit on physical entry points compared with gas supplied at the TTF. Given that TTF gas is entry paid gas, the current proposal seems equitable and preferable from a competition perspective, with the added benefit that it is simpler and more transparent methodology for GTS to administer.

---

[43] GTS Final report, top of page 16

[44] See Figure 8, page 16

5.2.2.2 Alternative flexibility services

GTS current transport arrangements include a shipper specific balancing tolerance according to a formula which favours shippers with smaller portfolios. This type of service could continue to be valuable in view of market concentration and because smaller shippers will tend to be at a relative cost disadvantage. A case might be made for such a service to be provided as part of the transportation tariff, at least pending the development of a liquid within day market.

More generally there may be a requirement for linepack services for shippers with alternative flexibility requirements, for example, balancing tolerances, or park and loan services for larger consumers and transit loads. A flexibility service could also be designed to address variations in producer allocations under the PV Programme methodology.

5.3 Pricing & settlement

5.3.1 Overview of Pricing Methodologies

Independent of the methodology which is chosen, an economically optimal price would reflect the actual costs of balancing gas. The pricing of balancing gas has basically two options a 1- or a 2-price system. In the first case the price for buying balancing gas is equal to the price of selling balancing gas. In a 2-price system, separate prices are used. An alternative to this model is the 1½-price model where 1-price is used where gas is either bought or sold in a balancing period with 2-prices used when gas is both bought <u>and</u> sold in a balancing period.

Independent of the price model a price forming mechanism is required. This can be:

Price Mechanism	Characteristics
Average Price	The weighted average price of all balancing gas bought and sold
Marginal Price[45]	The highest price when the system is short of gas or the lowest price when there is a surplus of gas in the network.
Index Price	The price is indexed, for example, the wholesale price.

Figure 13: Alternative Pricing Mechanisms

Any combination of pricing model and price forming mechanism is possible.

[45] also referred to as the Boundary Price

A disadvantage of 1-price model is that it only assigns the balancing cost to the causer of the imbalance as long as the system balancing actions are in one direction during the Balancing Period. Especially in the case of longer balancing periods, one cannot rely on this model to assign the costs of imbalances to the causer.

Price forming based on marginal prices will in general lead to higher imbalance costs due to the larger spread between the imbalance price and the average market price. However this complies with economic theory that efficient prices should reflect the marginal prices to give the incentive necessary to stimulate the market. In addition, where balancing gas is priced at the marginal price any failure by a shipper in its obligations to inject or withdraw balancing gas will tend to give rise to an imbalance which is then settled at the marginal price. This provides shippers with an incentive to perform balancing action obligations, which is valuable where physical measurement is not practical.

However in practice several limitations of marginal prices should be considered:,

- A power plant outage or a pipeline compressor failure can lead to extreme prices which may not reflect sensible economic signals to deliver balancing energy to the system,.
- The requirement for local balancing actions by the TSO can also result in extreme prices which are more reflective of system needs than of market prices.

For these reasons some gas and electricity markets may exclude prices which do not reflect the overall market.

5.3.2 Evaluation of GTS pricing & settlement proposals

5.3.2.1 Sufficiency of the balancing incentive

It is important that settlement costs should provide a sufficient incentive for shippers to remain in balance. However, excessive costs are unnecessary and a barrier to entry. Considerations include:

- In an hourly balancing regime the frequency of settlement is potentially higher than for daily balancing, but settlement volumes may be lower (assuming that shippers generally match their diurnal profiles),
- Whilst the GTS proposal to cash-out shippers who provide assistance gas at the marginal price provides an incentive for shippers to support the system, it also imposes higher costs on the shippers who caused the imbalance,
- On the other hand, GTS only intends to buy sufficient balancing gas to return the system balance (SBS) back to the edge of the Green Zone. This means that the settlement pro-

cess will not generally result in a causing shipper's imbalance being returned all the way back to zero, which reduces their costs,

- Marginal prices formed by GTS buying and selling physical gas will generally be wider than TTF price spreads, as GTS will be the only counterparty for physical gas.

Perhaps the most important factor influencing settlement costs is the within day market. If there is a liquid, competitive market, marginal price spreads should be much narrower than for an illiquid market.

5.3.2.2 Accounting for imbalance settlement volumes

There is a technical question regarding the time difference between imbalance settlement, which refers to shipper's POS at the beginning of the Balancing Period[46], compared to the performance of actions to buy or sell system balancing gas which can take up to 3½ hours after a balancing action is triggered. How is gas attributed to shipper balances before it has been delivered to the system?

5.3.2.3 Stimulus Component

There is a concern that Bid Price Ladder prices and therefore marginal prices may not reflect the within day market price of gas. If this occurs, shippers may not have an incentive to balance and shippers offering gas on the Bid Price Ladder may not have an incentive to perform their obligations. The Stimulus Component allows GTS to address this potential problem by intervening to increase (or reduce) Bid Price Ladder prices. The Stimulus Component does seem to be rather a "blunt tool" and it would be preferable if solutions could be identified to allow Bid Price Ladder prices to better reflect the market.

It is to be expected that within day prices will be impacted by the status of the system balance (SBS); in fact this provides a necessary incentive for shippers to address their imbalances.

5.3.2.4 Single Imbalance Price

GTS is proposing to introduce a single imbalance price in conjunction with marginal pricing, by comparison with the current 2 price mechanism[47]. This methodology does not address the scenario where GTS wishes to take both buy and sell balancing actions within the same Balancing Period. With longer Balancing Periods the likelihood of requiring opposing balancing actions

---

[46] See section 5.1.6.2 the implications of cashing out shippers by reference to the start of the Balancing Period on market behaviour

[47] See section 2.5 page 9

increases, although even with Daily Balancing it should still be a relatively rare event in a well designed balancing regime. GTS may feel that, with a Balancing Period of one hour, they do not need to consider this eventuality. There are however extreme circumstances, for example, due to the failure of a major supply source or compressor facility, where it is important that the commercial regime does not limit GTS scope to act very quickly indeed.

5.3.2.5 Potential abuse of the program

The GTS report describes how shippers may exaggerate the fluctuation in their prgrams to receive more damping instead of matching their supply to the profile of their consumer portfolio. GTS says they will monitor the differences between programs and realizations of the program. Shippers who regularly misuse their programs for this purpose will be reported to the Office for Energy Regulation and GTS will withdraw their shipper's licence.

5.3.2.6 Potential abuse of the Green Zone

There could be a concern that a larger shipper (shipper A) might be able to manipulate the system balance to its own financial advantage. For example, if the system is short of gas this could be rectified by shipper A supporting the system quite heavily and then suddenly reducing the level of support so as to deliberately trigger a balancing action and benefit from assistance gas cash out, whilst exposing its competitors to imbalance cash-out. On the other hand, this type of gaming is not possible without other shippers causing the system to be out of balance in the first place.

GTS intends that balancing actions will only be taken when the SBS moves outside the Green Zone. In the absence of a balancing action, GTS proposes to roll shipper imbalances (POS) into the next Balancing Period. This gives rise to the possibility that shippers may seek to offset balancing settlement costs in neighbouring countries by utilising GTS linepack within the Green Zone.

5.4 Development of Combiflex Services

The background and description of the current combiflex service is explained in section 2.5. Furthermore, section 5.1.6.1 explains that in proposing an hourly balancing regime GTS took account of the fact that shippers without flexible resources have a legal right to combiflex; whilst GTS notes that some shippers are uncertain if the combiflex service will continue post 2012.

The GTS proposal did not discuss the future specification of the combiflex service. However we understand that the definition of a new service specification is included in the proposal for the gas codes. The new service will provide injection capacity, withdrawal capacity and space capacity in the ratios 1:1:168 m3/hour, which can be equally described as 1:1:7 m3/day (with a contract minimum of 24m3 injection/withdrawal capacity)

The service is to be a nominated service instead of an ex post service, and the nomination lead time is based on GTS passing on the lead time offered by the service providers plus an allowance of 30 minutes for GTS to administer the service. As yet it is not clear if fast deployment flexibility resources will be offered, but if they are offered then the overall lead time should be 1 hour, which will deliver capacity within 2 hours.

The lack of an ex post service means that shippers will have to actively manage their balance positions throughout every day (24x7x365) rather than book an ex post service to automatically manage imbalances on their behalf.

A lead time of one hour means that shippers using combiflex will be at a disadvantage compared to shippers with access to fast deployment resources with a lead time of 30 minutes

There is no information available about how the service will be priced, but according to the Dutch Gas act GT is obliged to deliver gas for flexibility services at reasonable prices.

.

6. SYSTEM BALANCING

This chapter first of all introduces the subject of system balancing and then describes 3 different models which TSOs use for the procurement of balancing gas. With these background principles in place, the GTS proposals for system balancing are discussed in subsequent sections.

6.1 Introduction to system balancing

The procurement of balancing gas is one of the fundamental tasks of a TSO to ensure the integrity of the transport system in a liberalized energy market.

The TSO maintains the network's physical balance using linepack and, if insufficient linepack is available, by buying or selling gas. The decision of a TSO to take a system balancing action depends on several factors:

- The physical balance of the overall network
- Localised imbalances or constraints within the network
- The availability of linepack in the system as means to cancel out imbalances
- The development of the physical network as forecast by shipper nominations

6.2 Models for balancing gas procurement

The procurement process can be organized in different ways with each way having its own characteristics. In this section we will describe various options that are available in general and then discuss the GTS proposal in this context.

Independent of the chosen model, a number of elements are essential:

Characteristic	Description
Service Specifications	The TSO's primary requirement is to be able to ramp up or ramp down flow rates at entry and exit points within a specified lead time. This service is sometimes referred to as "physical gas" or "physical service". It is only the TSO who needs a physical service. By contrast, the service traded by shippers amongst themselves is referred to as "commercial gas" which may be backed by a change in physical flow but could equally relate to the netting off of opposing imbalance positions, something which has no impact on the system
Capacity Availability	Is sufficient capacity available within the required lead time, what factors influence capacity availability, i.e market conditions?
Security of supply	Is the service "firm" - can delivery of balancing gas be guaranteed once requested?
Lead time	How do facility characteristics affect the delivery of balancing gas? Especially discrete changes in the production process of a facility, like starting and stopping of a specific installation such as underground storage or the lead-time to physically interrupt interruptible consumers or exports.
Measurement	How will performance be assured, either by physical measurement or commercial incentive?

Figure 14: Considerations for the specification of balancing gas services

The main alternatives approaches to the procurement of balancing gas are described in the following paragraphs.

6.2.1 Balancing Contracts

In this model the TSO contracts flexibility bilaterally with one or more market parties. The service specification and terms are defined in advance and the contract duration may be annual or longer term. The TSO will require a firm service to ramp up or ramp down physical flow rates subject to clearly defined lead times. In some cases the TSO may need locational choices to address problems affecting parts of its network.

Where there is a single balancing contract it is usually the dominant incumbent supplier who is in the best position to provide the service due to the scale of its activities by comparison to new entrants. Where there are several contracts this can extend the scope of competition but may still limit the sources of flexibility which the TSO is able to access.

If the TSO is dependent on one or several incumbent suppliers, national legislation may oblige the incumbents to make capacity available on appropriate terms[48].

The gas price can be linked to one or more published prices, perhaps relating to long term supply contracts or sometimes to the incumbent's weighted average cost of gas (WACOG). In this case price tends to be calculated monthly, so it will not reflect the daily or within day market price. It is much better if prices can be closely linked to the spot gas price in the national market, but the market may not be sufficiently liquid. Where there is a liquid market in a neighbouring country this may be used either directly, or perhaps as a means to limit contract price fluctuations pending further development of the national market.

This is the method of procuring balancing gas which is currently employed by GTS. The terms are defined in a bilateral contract between GTS and GT which is confidential.

6.2.2 Market mechanism for balancing gas

This is a day ahead and/or within day market which only serves the needs of the TSO to buy or sell balancing gas. The volume traded is the TSO's requirements to keep the transport system in physical balance. Shippers offer to sell gas, or bid to buy gas, on the mechanism, which can be an electronic platform. The advantage of a market mechanism is that the TSO potentially has access to a wide range of flexibility resources with prices competitively determined. The main considerations in successfully establishing a mechanism are:

- **How to ensure sufficient capacity is made available to the mechanism in all eventualities?** In cases where the incumbent supplier(s) can influence the market it may be necessary to oblige them to participate through legislation. Whilst it is possible for the TSO to offer to reserve capacity in return for a fee this distorts the prices of gas on the mechanism. Where the market is concentrated the TSO may have a weak negotiating position to agree reasonable fees.

- **How to ensure prices are closely correlated with the market?** Physical gas and commercial gas are separate products. Because only the TSO buys physical gas, the buy-sell spreads for physical gas will be wider than for commercial gas, even in a competitive gas market. If the market is concentrated and having regard to the TSO being

[48] In the Netherlands GT has obligations in accordance with the Dutch Gas act article 10a member 1d

the only counterparty, it may be appropriate to regulate price but, at the same time, it is very important that balancing gas prices reflect the market.

The mechanism Ofgem adopted in regulating Centrica's provision of balancing gas in the early days of the UK market, was to allow freedom of prices subject to a maximum buy-sell spread[49]. This meant Centrica could decide the price level to place bids and offers, around where they expected the market to be. The success of the mechanism depended on the fact that Centrica did not know if the system was short or long (whether Transco was likely to be a buyer or a seller of balancing gas). The mechanism was, in effect, a cap and collar on the market, and was seen as a transitional measure pending development of the traded market.

Market mechanisms for balancing gas exist today in the gas markets of France and Austria. In the electricity sector it is the common methodology for the procurement of balancing energy.

6.2.3 Integrating balancing and wholesale gas markets

In this case the TSO becomes just one of the many parties trading anonymously on the within day market. The British On-the-day Commodity Market (OCM) operated by APX is an example of this approach. The OCM comprises of 3 products:

[49] The Flexibility Mechanism was the UK mechanism for Transco to procure balancing gas between1996 - 2000 and the precursor to the current On-the-day-Commodity-Market.

<table>
<tr><th>Product</th><th>Characteristics</th></tr>
<tr><td>National Title Product (commercial gas)</td><td>This is where the vast majority of trading takes place, where liquidity is concentrated and where buy-sell spreads are usually very narrow. National Grid sources most of its system balancing requirements as commercial gas</td></tr>
<tr><td>National Physical Product</td><td rowspan="2">Although shippers are free to accept physical gas bids/offers, the main purpose of these products is for National Grid to source system balancing gas where it does not obtain, or expect to obtain, the required physical response by buying or selling commercial gas:
When making bids/offers for the national product, shippers are only required to specify the entry or exit location after a bid/offer has been accepted.
However, when making bids/offer for the locational product, the entry or exit point must be specified when the bid/offer is made
Due to the much lower transaction volumes, the buy-sell spreads are expected to significantly greater than for commercial gas, with spreads for locational bids/offers being generally higher than national bids/offers</td></tr>
<tr><td>Locational Physical product</td></tr>
</table>

Figure 15: Characteristics of On-the-day-Commodity-Market (OCM) Products

A key advantage of this model relies on the TSO being able to use commercial gas for the purpose of physical balancing and, in doing so, reduce system balancing costs due to the lower buy-sell spreads which can be expected to apply.

Depending on the design of the balancing regime, there are 2 ways in which the TSO purchase and sale of commercial gas can influence the system balance:

- Commercial gas is any gas which is “entry paid”. Even where commercial gas transactions with the TSO do not make the counterparty “out of balance”, the result is still that shippers will be longer or shorter in aggregate. Where the Balancing Period is long enough and cash-out provides a balancing incentive, then commercial gas trades will translate into an adjustment to the physical flow of gas impacting the system balance.

- If the TSO buys or sells gas creating a marginal price, and where gas can be traded at levels below the marginal price, this gives shippers an incentive to get into balance before the end of the Balancing Period. For this reason the TSO may only need to buy or sell a relatively small proportion of the system imbalance, which again reduces costs. In other words, the TSO creates a price signal which may generate a geared response from shippers (provided the regime actually allows them to adjust their positions within the Balancing Period).

Commercial gas does not replace the TSO's need for physical gas which is still required where the TSO does not obtain, or expect, a satisfactory physical response using commercial gas.

6.3 Evaluation of System Balancing proposals

This section discusses the following topics:

- Groningen balancing vs commercial balancing
- Bid Price Ladder liquidity
- Assistance Gas
- Measuring balancing action performance
- Forecast information
- Capacity reservation
- Bid Price Ladder prices
- APX's proposal for an integrated market
- Emergency arrangements

6.3.1 Groningen balancing vs commercial balancing

Section 2.5 explains how the Dutch transmission and distribution networks are currently automatically balanced using pressure to regulate the flow rate of gas from the Groningen field. Concurrently with the introduction of the Bid Price Ladder it is proposed to switch the control of Groningen flow rate to volumetric control. This proposal means the network balance would henceforth be controlled by the forecasting and balancing performance of all shippers, including GT, together with GTS' interventions to buy or sell gas in the market.

It could be argued that physical balancing using Groningen is superior to relying on commercial balancing for the following reasons:

- The commercial balancing approach will mean that linepack variations will increase due to the longer lead time between a change in demand and a supply response,
- Groningen balancing facilitates the provision of ex post balancing services. These include: i) the Combiflex service, ii) GT's purchases from small field producers and iii) GT's supply to small consumers within the RGO networks. Ex post services are especially valuable in the context of hourly balancing.

Nonetheless, most gas markets do not have an asset such as Groningen and they have proved that the commercial balancing approach can be developed successfully. Furthermore, within the next 20 to 30 years the Groningen field will be exhausted and alternative sources of supply and flexibility will be needed as production rates decline.

6.3.2 Bid Price Ladder liquidity

As discussed in section 5.3.4.1, there is uncertainty about how frequently GTS will use the Bid Price Ladder, but GTS wants to ensure that use of the ladder is sufficient to encourage the development of liquidity.

The Dutch flexibility market is concentrated, particularly so for flexibility which can be deployed rapidly, and which is the most useful for system balancing. Several RGO suppliers are investing in salt cavity facilities with fast deployment times. These investments will reduce reliance on GT assets, but at this stage it is unclear how much impact the extra capacity will have on competition and prices.

Recognising that low liquidity and high prices may adversely affect the Bid Price Ladder, GTS is proposing to split the Green Zone into a narrower Dark Green Zone and a wider Light Green Zone. Flexibility with slower deployment lead times of up to 2½ hours will be called upon when the SBS moves outside the Dark Green Zone, whilst resources with deployment lead times of ½ hour will be called if the SBS moves outside the wider Light Green Zone. This means that, with a flow period of 1 hour, the full impact of a balancing action on the system will be realised within between 1½ and 3½ hours. There is at present a number of slower deployment investments planned by new market participants. Therefore the deployment of slower resources should expand Bid Price Ladder liquidity and encourage competition.

Nevertheless, due to market concentration considerations GTS is understandably concerned about liquidity (and prices) on the Bid Price Ladder, factors which are discussed further in section 6.7.

6.3.3 Assistance Gas

Section 3.2 describes how shippers can support the system balance by running a surplus shipper imbalance when the system is short, and vice versa. If GTS takes a balancing action, shippers supporting the system will be cashed out at the marginal price. Whilst this may reduce the frequency and volumes of system balancing actions, if shippers obtain the marginal price by supporting the system, they may have reduced incentives to offer gas onto the Bid Price Ladder.

These comments are in addition to concerns about assistance gas raised in section 5.3.4.1 (the impact on cash out costs), in 5.3.4.3 (the consequences of a single imbalance price) and in 5.3.4.4 (abuse of the Green Zone). Moreover, APX has raised the issue that assistance gas may reduce the incentive for shippers to trade within day, and shippers have expressed the concern that providing assistance gas may give an exposure to imbalance charges in subsequent balancing periods[50].

Furthermore, there may be a concern that the actions of multiple players in influencing the system balance could create volatility in the system balance. It may be preferable to simply give shippers an incentive to keep in balance.

Indeed, assistance gas could be seen as contravening Directive 2009/73/EC Article 41(6)b which states that balancing services should provide "*appropriate incentives for network users to balance their input and offtakes*". Whilst it is right to avoid punishing shippers who are not stressing the system, it does not seem appropriate to reward shippers for being out of balance.

Whilst GTS actions to buy or sell balancing gas are necessary to return the system balance to within the edge of the Green Zone, assistance gas does not impact the system balance, it merely transfers title to gas which is already in the system.

Assistance gas is not necessary to maintain pipeline integrity but it can impose high settlement costs on out of balance shippers. In the context of hourly balancing it may be more appropriate for GTS to take more frequent balancing actions, each time seeking to return the SBS to just within the Green Zone. The volumes of these balancing actions and the associated settlement costs should be quite limited (assuming a liquid market). In this case they can be seen a small but potentially frequent (hourly) incentive for the shipper to correct its own imbalance position.

On the other hand, the effect of potentially large volumes of assistance gas can be to return a causer's imbalance back close to zero, removing the opportunity for the causer to act on its own behalf or potentially overshooting due to actions it may have already taken to correct its own

[50] GTS Final Balancing Report page 21

imbalance[51]. High settlement costs are more likely to expose GTS to challenges, for example, that an error in the SBS has brought about a balancing action.

There is a concern that, in the absence of assistance gas, some potential sources of flexibility might not be offered. This concern could be investigated to see if the barriers to offering gas onto the Bid Price Ladder (or integrated market) can be lowered.

6.3.4 Capacity reservation

As discussed in section 6.3.2, it would not be sensible for GTS to rely on the market providing sufficient balancing gas in all market conditions. Instead GTS proposes to tender in order to reserve capacity for the Bid Price Ladder. Although GTS intends to phase out capacity reservation once the Bid Price Ladder is sufficiently liquid, it is uncertain if and when liquidity will develop.

GTS expects that reserving capacity may involve significant upfront payments, which GTS proposes to recover as part of the transportation tariff. This cost is the main concern with capacity reservation because ultimately it will be funded by consumers.

At present GT is the balancing agent for the network and has a regulatory obligation in the Gas Act to make the capacity which is required available at a reasonable cost. This obligation is independent of market concentration.

It seems certain that GT has sufficient flexible capacity to continue its current role by guaranteeing to offer its capacity onto the Bid Price Ladder at all times. This represents an alternative way of realizing the capacity reservation and does not prevent other parties from offering capacity onto the Bid Ladder at more competitive prices.

6.3.5 Bid Price Ladder prices

GTS has consulted about the advantages and disadvantages of imposing restrictions on the price of reserved capacity, for example, in line with an index, but GTS is concerned that price restrictions could distort the market and compromise network security. Although GTS considered that pricing restrictions could not be avoided in relation to reserved capacity, the unanimous opinion of potential Bid Price Ladder suppliers is that the uncertainties of an index are too large if reservation costs are to be contained. As a result GTS has concluded that it could not resolve this question and has forwarded it to the Office of Energy Regulation.

There appear to be two important criteria for bid ladder prices:

[51] GTS Final Report, bottom of page 24, item 1

- They should be free to reflect market levels as closely as possible. This is essential to ensure that the marginal prices established by balancing actions provide an incentive for shippers to balance,
- Prices should be as reasonable as possible and the current high level of market concentration[52] suggests that some form of price control is appropriate.

At first glance it seems difficult to satisfy both these criteria with the same solution, but the market does not seem to have considered the merits of an agreed maximum buy-sell spread, as described in section 6.2.2, and how this might be applied in the Dutch context..

In the mid to late 1990s Centrica did not know if Transco was a buyer or seller of balancing gas and therefore had a strong incentive to align its bid and offer prices with the market. Under the GTS proposals shippers will have near real time information about the status of the system so, if GTS is their only counterparty, they could vary their prices according to whether GTS is expected to be a buyer or a seller.

However this shortcoming could be addressed if an integrated market (see section 6.3.8 below) was introduced where shippers could participate alongside GTS as counterparties. Although shippers are not expected to trade physical products due to the higher spreads expected to apply, shipper's presence as potential counterparties could instill a valuable pricing discipline upon the providers of physical gas.

In a scenario where GT, with a regulated duty to supply, or shippers providing reserved capacity, are subject to an agreed maximum spread, this would act as a cap and collar on the market, within which other flexibility suppliers could compete on price. As the level of market concentration reduces, the maximum spread could be widened and eventually discontinued.

6.3.6 APX's proposal for an integrated market

APX has made a proposal for the development of an APX exchange for within day trade, as an alternative to the Bid Price Ladder. This exchange would cater for both shipper-shipper trading and shipper-GTS trading on a single anonymous electronic platform. These proposals are at an early stage of development, but APX suggest that, above a specific system threshold, all gas on the exchange could be reserved uniquely for system balancing purposes. As described in section 6.2.3, a key benefit of an integrated market for TSO balancing and shipper-shipper trading is where the TSO intends to use commercial gas for system balancing purposes. Against the background of a one hour Balancing Period with settlement by reference to shipper imbalances at the beginning of the Balancing Period, the use of commercial gas for system balancing is not feasible.

---

[52] See Fronitier Economic s 2008 report on the Dutch flexibility market, page 51

When physical gas is offered as commercial gas at the TTF it competes on level terms with entry paid gas (gas which is already in the network). If shippers are asked to specify the source of their gas this may be seen as a restriction justifying a premium price. If a premium price is not asked, then shippers may be reluctant to confirm the physical source with their offer.

However, it is possible for an electronic platform to enable gas to be offered in more than one market at the same time. For example, the same gas might be offered on commercial, physical and locational markets at different prices. When an offer was accepted, the gas could be removed from the remaining markets.

This type of solution could possibly promote Bid Ladder liquidity whilst addressing a concern that capacity offered on a Bid Ladder is then withheld from the wholesale market. It is understood that discussions are ongoing between GTS and APX about the merits of an integrated market.

6.3.7 Emergency Arrangements

The discussion of emergency arrangements in the GTS Report relates principally to the price which should apply when GTS issues flow instructions in an emergency. GTS has consulted with shippers with the conclusion that the volume weighted average prices of the Bid Price Ladder should be used. This provides a less attractive price to give shippers an incentive to make sure sufficient gas is available to avoid an emergency occurrence.

It could be argued that replacing the management of the system balance using Groningen pressure control with a market mechanism reduces network security. On the other hand many other TSOs manage their networks safely with market based physical balancing mechanisms. Moreover, GT has a gas act duty to supply, although GTS does not explain how GT may comply with this obligation in the context of the Bid Price Ladder.

Some TSOs supplement market mechanisms with storage capacity bookings for use in near emergency situations. These services can allow the TSO to exercise control where a storage facility is not supporting the network's requirements. It may be possible for the TSO to use an interruptible service for this purpose, which can be both an effective and an economic solution.

Finally, TSOs normally publish detailed rules for the conduct of an emergency situation, setting out clear responsibilities for the various parties. Transparency about GTS emergency procedures is essential for shippers to prepare their own emergency procedures and be in a position to respond effectively to flow instructions, including the disconnection of large consumers.

7. CONCLUSION

All balancing regimes involve a degree of trade-off between different objectives that are frequently in conflict. The TSO is typically concerned to ensure system security by matching the commercial regime as closely as possible to physical reality. New shippers wish to see a simple commercial regime with manageable risks and low transaction costs that promotes liquid wholesale markets. Incumbent shippers want to protect the value of their resources and avoid subsidising new entrants. The regulator has to decide how to weigh these considerations, often on the basis of qualitative analysis and projections rather than hard empirical evidence.

The essence of the GTS proposal is to devise an hourly shipper balancing regime that treats GT the same as all other shippers, and to end the special pressure controlled balancing role of Groningen, replacing it with a market based system balancing regime. This approach reflects a spirit of promoting a non-discriminatory system that reflects the physical features of the Dutch transmission system. However, the likely commercial and regulatory success of such a system is heavily dependent on the degree of concentration of balancing resources. An hourly balancing regime places a premium on diurnal flexibility provision, which only serves to increase market concentration compared to a daily scheme. This will almost inevitably necessitate some form of regulated price control or restrictions to prevent flexibility costs soaring. Furthermore, an hourly scheme increases transaction costs and tends to hinder the development of a liquid traded gas market. For these reasons, if purely measured against the stated NMa criteria the GTS proposal may be expected to pose some considerable difficulties.

Shipper Balancing:

- The provision by GTS of near real time balancing information at the shipper and system levels facilitates shippers to take responsibility for their own imbalance and enables system balancing costs to be accurately targeted according to an individual shipper's usage of flexibility.
- In the context of an hourly balancing regime, GTS balancing actions to return the SBS back to the edge of the Green Zone are necessary and appropriate. Moreover, it is correct that out of balance shippers should be exposed to potentially frequent settlements if this is needed to maintain the SBS at the edge of the Green Zone.
- There are various problems associated with the Assistance Gas concept. In particular assistance gas can make settlement costs unnecessarily severe. By returning an out of balance shipper's POS close to zero, assistance gas can remove the opportunity for the shipper to correct its own imbalance and, any corrective actions already in hand may result in an overshoot.

- The Green Zone can potentially be used to offset balancing costs in neighbouring regimes, most notably at the end of the gas day, impacting the GTS system balance. If this turns out to be a serious problem then an end of day settlement process to return all shipper imbalances to zero may be required. A side advantage of end of day settlement is its effect to focus within day trading liquidity but, in the context of hourly balancing incentives it is more likely to be a punitive feature.
- A decision to discontinue title transfer at City Gates would offer a clear, transparent and definitive solution to the concern that buyers should be able to sell their gas on. It would reduce reliance on monitoring compliance with the new gas law and it would be consistent with a pure entry-exit model which is designed to focus trading liquidity at a single virtual trading point. In the case of the Netherlands, this is the TTF.
- Combiflex provides a necessary solution in a concentrated market, but economic access is crucial to make this service valuable for all shippers. Otherwise, the system gives shippers with their own storage an advantage.
- The absence of a liquid traded market is a serious impediment facing new market entrants. At present the sourcing of inter day and intra day flexibility needs are not differentiated. As a step towards structuring a more liquid market, it may be possible to design a separate day ahead market mechanism for intra day (diurnal) flexibility[53]. Pending the development of liquidity, it could be most efficient for GTS to operate this mechanism for the system as a whole, on behalf of shippers.
- If GTS is confident in being able to source the network's needs for diurnal flexibility (see above), then the challenges to introduce daily balancing would be considerably reduced. A framework of daily balancing would greatly facilitate a liquid within day market, which in turn would support futures contract trading and Dutch ambitions for the TTF to become Northwest Europe's favourite gas hub.

System Balancing (TSO):

- We support ongoing discussions between GTS and APX about the potential development of a platform for balancing gas as part of a single integrated within day market[54]. This has two significant advantages compared to a separate Bid Price Ladder. Firstly, the same gas can be bid as different products (commercial, physical, locational) so that flexible capacity is not removed from the market, remaining available for all potential applications. Secondly, an integrated market enables the application of a maximum buy-

[53] This is a flexibility service where the gas lent during one part of a gas day is repaid before the end of that gas day See paragraph 5.1.8

[54] This market mechanism could operate alongside a day ahead market for intra day (diurnal) flexibility – see earlier bullet

sell spread to be used in conjunction with a capacity reservation fee or regulatory supply obligation.

- A regulated obligation to supply is preferable to a reservation fee, on grounds it does not distort the market and is a lower cost solution pending the development of a sufficiently liquid market.
- System balancing costs and therefore, settlement costs, would be considerably reduced if GTS could use commercial gas for system balancing purposes. This is because the buy-sell spreads will be considerably narrower than physical gas buy sell spreads, where GTS will be the only counterparty. However performance of accepted bids or offers has to be assured and, this will not possible in the case of the GTS proposals. Generally speaking, a daily balancing regime with end of day settlement would be required for this.

In summary, the key benefits of the GTS proposal is equal treatment for all shippers, the provision of near real time balancing information and the removal of arbitrary imbalance penalty charges. The major concerns still to be addressed relate to the impact of the concentrated flexibility market on both shipper and system balancing costs and the retention of hourly balancing incentives, which can restrict the further development of a liquid within day market.