

# Research into gas flexibility services

## CONSULTATION QUESTIONS

DTe is interested in getting feedback on the report by Frontier Economics *Research into gas flexibility services*, dated January 2008 (hereafter “Frontier’s 2008 Report”). We invite interested parties to respond to this consultation paper.

Please submit your reaction before the 22<sup>nd</sup> of February 2008 to the email address [DTe-CODATA\\_NG@nmanet.nl](mailto:DTe-CODATA_NG@nmanet.nl) or if you prefer in writing to NMa/DTe, Bedrijfsvoering en Informatiemanagement (B&I), Postbus 16326, 2500 BH, Den Haag. Please state the reference number 102651.

In Frontier’s 2008 Report, GasTerra is found to have a significant capacity share in nearly all flexibility segments assessed throughout the period 2009 to 2011. In addition, Frontier’s 2008 Report finds GasTerra pivotal in the L-gas market as well as for the combined H-gas and L-gas market throughout the period 2009 to 2011.<sup>1</sup> Only in the H-gas market is it found that capacity to provide flexibility services under the control of players other than GasTerra is sufficient to meet physical flexibility demand.<sup>2</sup>

The robustness of the analysis is partly dependent on the quality of available data and, in particular, the analysis of markets for gas flexibility services in future years relies on assumptions about market developments. This consultation paper sets out assumptions applied by Frontier’s 2008 Report and specifically invites comments on the assumptions applied to the analysis of the market structure for gas flexibility services. It also invites interested parties to comment more generally on Frontier’s 2008 Report and its conclusions.

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<sup>1</sup> We consider the possibility that the relevant markets comprise the separate L-gas and H-gas systems and the possibility that the relevant market comprises the combined L-gas and H-gas system.

<sup>2</sup> See Sections 4.2 and 4.3 in the Frontier’s 2008 Report.

# ANALYSIS OF GAS FLEXIBILITY SERVICES IN 2006

## L-gas

Table 1 summarises Frontier's estimates of the flexibility capacities that were available to supply the L-gas market in 2006.<sup>3</sup>

mcm/h	2006			Report 2005		
	Total	Non-GasTerra	Gas-Terra	Total	Non-GasTerra	Gas-Terra
Groningen	11.9	0.0	11.9	22.1	0.0	22.1
Imports	1.4	0.6	0.8	1.4	0.6	0.8
Interruptible Contracts	0.4	- confidential -		0.0	0.0	0.0
Linepack	2.9	2.9	0.0	1.6	1.6	0.0
LNG	0.0	0.0	0.0	1.3	1.3	0.0
Quality Conversion	6.4	- confidential -		5.6	5.6	0.0
Small Fields						
Storage	4.0	0.4	3.6	3.8	0.1	3.7
<b>Total</b>	<b>27.0</b>	<b>6.3</b>	<b>20.7</b>	<b>35.8</b>	<b>9.2</b>	<b>26.6</b>

Table 1: L-gas flexibility capacity 2006

Source: Frontier

### Groningen

For Groningen, the maximum available capacity was estimated as the hourly peak production observed during 2006 (11.9 mcm/h)<sup>4</sup>. This is a very conservative assumption since during the peak hour there is likely to be some spare production capacity. Groningen capacity is under the control of GasTerra.

### Imports

No direct import capacity for L-gas exists between the Netherlands and neighbouring gas systems. However, the possibility exists that backhaul flows could be used to transfer to the Netherlands flexibility from sources connected to gas systems outside the Netherlands. Frontier assumes this option is available for storages located in Germany that are near to the Dutch border, but not for storages in Belgium due to all of the Belgium storage capacity being fully dedicated to Belgium customers. In addition, export pipelines that only transport L-gas are not considered, due to L-gas not being used in the Dutch market and converters (which are necessary to create G+-gas quality), being fully booked.

Frontier identifies EWE's and BEB's systems as potential sources of flexibility supply to the GTS system. In 2006, flexibility sourced from BEB's system are ascribed to GasTerra due to cross-ownership (both BEB and GasTerra were affiliated to Shell and ExxonMobil in 2006).

<sup>3</sup> More details of the approach applied by Frontier to the analysis and assumptions underlying the data presented in this consultation paper can be found in Frontier's 2008 Report.

<sup>4</sup> GTS data from gasmonitor. Note: all L-gas production is grouped within the category Groningen.

## Question 1

- Are you aware of additional possibilities for backhaul flows to be used to deliver flexibility to the Netherlands?
- Is it practical for backhaul flows to be used to deliver flexibility services to the Netherlands, for example, if export contracts delivered gas at a point located in a system adjacent to GTS' system, backhaul flows into the Netherlands would require the payment of additional cross-border fees?

### Interruptible customers

Two kinds of contracts are considered that might be candidates for interruption as a source of flexibility supply: gas supply contracts with power plants and export contracts. We understand that options to interrupt contracts have almost never been used in the past. Nevertheless, interruptible contracts provide a theoretical source of flexibility for the supplier, which is considered in Frontier's 2008 Report.

Frontier's 2008 Report assumes that approximately 25% of gas volumes procured by power plants could be interrupted for a few hours<sup>5</sup> and 40% of the Dutch power stations are connected to the L-gas system. Frontier conservatively assumes that these contracts are not under the control of GasTerra.

With respect to GasTerra's export contracts, Frontier's 2008 Report states that only a minor share of the total exports is likely to be interruptible in a way that it can be used as source of flexibility by GasTerra.

## Question 2

- Please comment on the frequency and duration of interruptions assumed in Frontier's 2008 Report.
- Can you provide additional detailed information about the ability to interrupt long-term contracts currently in place with power plants and large industrials?

### Linepack

Linepack was estimated in Frontier's 2008 Report using information publicly available from GTS. Linepack control was assigned to non-GasTerra firms. This is a conservative assumption since GasTerra is by far the largest shipper and by virtue of this position has a large share of the hourly tolerance provided by GTS. However, if another shipper were to capture market share from

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<sup>5</sup> Based on information from Global Insight. See the reference list in Frontier's 2008 Report for more details.

GasTerra, some tolerance would be reallocated from GasTerra to that shipper. It is for this reason that Frontier's 2008 Report assumes linepack not to be under the control of GasTerra.

### Question 3

Please comment on the treatment of linepack:

- Is the assumed total linepack volume available for flexibility services and the allocation of that volume to the L-gas and H-gas systems (see also Table 2) realistic?
- Does the allocation of all linepack to non-GasTerra firms reflect the control of linepack?

### LNG

Gasunie operates an LNG storage facility at Maasvlakte which provides short term flexibility for GTS. Due to the facility being reserved to operate during periods of very low temperature it is not able to contribute to the market for "normal" flexibility services. Consequently, it is not treated in Frontier's 2008 Report as a source of flexibility services.

We intend to ask GTS for further information about the contracting of flexibility services to be used during periods of very low temperatures.

### Quality conversion

Quality converters are able to shift flexibility between the H-gas and L-gas markets and contribute significantly to the potential supply of flexibility in the L-gas market. Converters are the second largest potential source of flexibility in the L-gas market, behind Groningen.

In 2006, GTS offered to the industry a total of 37 million KCE (quality conversion units) of which a significant proportion was booked by GasTerra. As GasTerra mainly converts H-gas to L-gas – while others convert H-gas to G+-gas – different Wobbe-factors are applied to GasTerra and to others in order to estimate the capacity of quality conversion held in terms of mcm/h.

### Storage

In the Netherlands, two depleted gas fields are used as L-gas storage. Norg is operated by NAM and Alkmaar has been sold by BP to Taqa, an energy investment company based in the United Arab Emirates. Norg is fully contracted to GasTerra and Alkmaar is largely contracted to GasTerra, offering a small quantity of capacity for third party access. In addition, Frontier's 2008 Report includes one storage site in Germany that is directly connected to the GTS system: Essent's salt caverns at Epe which is assumed not to be controlled by GasTerra.

## H-gas

Table 2 summarises the estimated flexibility capacities that were available in the H-gas market in 2006.

mcm/h	2006			Report 2005		
	Total	Non-GasTerra	Gas-Terra	Total	Non-GasTerra	Gas-Terra
Groningen						
Imports	4.0	- confidential -		3.5	3.1	0.4
Interruptible Contracts	0.7	- confidential -		0.6	0.6	0.0
Linepack	1.0	1.0	0.0	0.9	0.9	0.0
LNG	0.0	0.0	0.0	0.0	0.0	0.0
Quality Conversion	6.4	- confidential -		3.6	3.6	0.0
Small Fields	5.9	0.9	5.0	5.1	0.5	4.6
Storage	3.2	0.8	2.4	2.6	0.4	2.2
Total	21.2	7.7	13.5	16.3	9.1	7.2

Table 2: H-gas flexibility capacity 2006

Source: Frontier

### Imports

The peak hourly import of H-gas in 2006 was 4.0 mcm/h. GasTerra's bookings of import capacity indicate that less than half of this was under the control of GasTerra.

### Interruptible customers, linepack and quality conversion

Frontier's 2008 Report applies the same approach as for the L-gas market. For quality conversion Frontier conservatively assumes that the maximum flexibility from this source occurs by ramping down all converters without applying restrictions from the L-gas demand.

### Storages

There is only one storage facility in the Netherlands that is connected to the H-gas system: Grijpskerk, owned by NAM. The majority of Grijpskerk's capacity is dedicated to GasTerra due to long term capacity bookings. Frontier's 2008 Report includes Kalle – an aquifer in Germany – which is directly connected to the GTS system. Kalle is operated by RWE and is therefore not ascribed to GasTerra.

### Small fields

Frontier's 2008 Report conservatively assumes the maximum production capacity was equal to the maximum hourly production rate in 2006. GasTerra was assumed to control about 85% of the small fields' capacity.

## Question 4

- Can you comment on the assumption that GasTerra controls 85% of the capacity from the small fields?

## GTS system (L-gas and H-gas combined)

When assessing whether GasTerra is pivotal in the combined L-gas and H-gas market (i.e. the GTS system), Frontier's 2008 Report applied the assumptions of the separate L-gas and H-gas market analyses, with one exception: the treatment of converter stations. Quality conversion is excluded from the analysis of the combined H-gas and L-gas market since it may be used to transfer flexibility from one system to the other without being a source of flexibility *per se*.

mcm/h	2006			Report 2005		
	Total	Non-GasTerra	Gas-Terra	Total	Non-GasTerra	Gas-Terra
Groningen	11.9	0.0	11.9	22.1	0.0	22.1
Imports	5.4	- confidential -		4.9	3.7	1.2
Interruptible Contracts	1.1	- confidential -		0.6	0.6	0.0
Linepack	3.8	3.8	0.0	2.5	2.5	0.0
LNG	0.0	0.0	0.0	1.3	1.3	0.0
Quality Conversion						
Small Fields	5.9	0.9	5.0	5.1	0.5	4.6
Storage	7.2	1.2	6.0	6.4	0.5	5.9
<b>Total</b>	<b>35.3</b>	<b>9.7</b>	<b>25.6</b>	<b>42.9</b>	<b>9.1</b>	<b>33.8</b>

Table 3: L-gas and H-gas flexibility capacity 2006

Source: Frontier

## ANALYSIS OF GAS FLEXIBILITY SERVICES IN THE PERIOD 2009-2011

### Assumptions

#### Demand

In the L-gas segment households and small industry comprise the bulk of demand. This sector is already well penetrated by gas, so Frontier's 2008 Report assumes a small increase in demand over time. Frontier assumes an annual growth rate of 0.5% p.a. for L-gas demand. The increase in L-gas demand is largely offset by the phase-out of some export contracts.

In contrast, H-gas is mainly used by large industry and power stations. For industrial consumers Frontier assumes, sourced from a GTS scenario, a demand increase of about 2% p.a., and a stepwise expansion of demand by power plants, which adds additional demand of 1.5 mcm/h in 2011.

Frontier assumes for simplicity that changes in demand do not affect the profile of demand within a year – rather demand is scaled up or down uniformly.

mcm/h	2006	2009	2010	2011
L-gas	17.0	17.2	17.2	17.0
H-gas	5.7	7.2	8.0	8.3

Table 4: Overview of peak demand forecast

Source: Frontier

## Question 5

- Please comment on the assumptions about forecast demand.

### Production

Dutch gas reserves are mature and, in particular, production from H-gas fields is expected to decline dramatically. Even by including production from yet to be developed H-gas fields the maximum production rate is likely to halve, based on publicly available information from TNO. For Groningen, Frontier assumes a stable production capacity available for flexibility over the period. Existing production wells are likely to decrease in general. NAM has announced an intention to invest in Groningen facilities and Frontier therefore expects production to remain at approximately the current level.

Frontier assumes that some Groningen capacity is dedicated to provide flexibility to GTS for reasons of system stability and therefore the capacity shown in Table 5 excludes this reserved capacity.

mcm/h	2006	2009	2010	2011
Groningen	11.9	12.0	12.0	12.0
Small fields	5.9	3.7	3.4	3.1

Table 5: Production capacity assumptions

Source: Frontier

Concerning the contractual control of production, Frontier sees no indication that the current shares of GasTerra (100% Groningen and 85% of the small fields' production) will change over the period of the study.

### Infrastructure

Several infrastructure projects are likely to be commissioned in the period from 2009 to 2011. They consist of both L-gas and H-gas storage sites, LNG import terminals and also some pipeline capacity expansions. All projects that are included in Frontier's analysis are summarised in the table below. Some projects that are currently proposed are not considered since their implementation is doubtful by 2011 (e.g. a new pipeline from Norway or an expansion of Norg).

The assumptions are nevertheless conservative as they consider a broad set of potential future projects associated with GasTerra's competitors.

Source	System	Name	2009	2010	2011
Storage	L	Epe Essent cavern #4	0.2	0.2	0.2
Storage	L	Epe Nuon	0.4	0.4	0.4
Storage	L	Epe Eneco	0.0	0.0	0.4
Storage	L	Zuidwending	0.0	1.6	1.6
Storage	L	Waalwijk	0.0	0.0	0.5
Storage	H	Bergermeer	0.0	0.0	0.7 <sup>6</sup>
LNG	H	Gate	0.0	0.0	1.6
LNG	H	LionGas	0.0	0.0	1.2
LNG	H	Taqa	0.0	0.6	0.6
Imports	H	Open season expansion	0.0	0.0	1.5
Imports	H	BBL backhaul (incl. expansion)	2.2	2.6	2.6

Table 6: Infrastructure development assumptions (in mcm/h)

Source: Frontier

## Question 6

- Which of the listed projects do you believe would become operational by 2011 (and if so, when)?
- Do you expect other relevant projects in addition to those listed above to become operational by 2011, e.g. German storages directly connected to the GTS system?
- Can you provide information about expansion plans of existing storage facilities (in particular the Norg facility)?

<sup>6</sup> According to DTe sources availability of Bergermeer more likely to be 2013.

## Question 7

- What capacities (in terms of maximum injection rate onto the GTS system in mcm/hour) do you expect for those projects in Table 6?
- Which firms will control those capacities (either physically or through long term contracts) or, in the case of multiple firms, in what proportion will they control the capacities?

### Quality converters

In combination with pipeline expansions, an increase of converter capacity is also the focus of the current GTS open season process. Frontier assumes an expansion of conversion capacity by the end of 2009 (which becomes effective for the analysis in 2010) of 30%. In addition to GasTerra's booking of the existing capacity, Frontier conservatively assume that GasTerra will not participate in the booking of the new capacity.

### Interruptible contracts

Frontier has no information about the evolution of GasTerra's interruptible export contracts and therefore Frontier assumes they remain constant throughout the period of analysis.

As described above, demand from gas-fired power stations will increase significantly by 2011.

Frontier conservatively assumes that all new projects will have interruptible contracts similar to the existing stations and GasTerra has no control over these supplies. .

## Question 8

- Please comment on the assumed capacities and allocation of flexibility associated with interruptible contracts.
- On average, how often are contract interruptions used and how long could an interruption last?

### Overview of L-gas

In the L-gas market, flexibility capacity is assumed to increase by 18% between 2006 and 2011. The largest increment in capacity is from 2009 to 2010 when new quality converters and storages are assumed to become available. The majority of this capacity is ascribed to non-GasTerra players, reducing the number of hours for which GasTerra is pivotal to about 1200 hours in 2011 (see Frontier's report Section 4.3 for details and figures).

mcm/h	2009		2010		2011	
	Total	Gas-Terra	Total	Gas-Terra	Total	Gas-Terra
Groningen	12.0	12.0	12.0	12.0	12.0	12.0
Imports	1.4	0.8	1.4	0.6	1.4	0.6
Interruptible Contracts	0.4	- conf. -	0.4	- conf. -	0.4	- conf. -
Linepack	3.0	0.0	3.1	0.0	3.1	0.0
LNG	0.0	0.0	0.0	0.0	0.0	0.0
Quality Conversion	6.1	- conf. -	7.8	- conf. -	7.8	- conf. -
Small Fields						
Storage	4.6	3.6	6.2	3.6	7.1	3.6
Total	27.5	19.6	30.9	19.9	31.8	19.9

Table 7: L-gas flexibility capacity 2009 to 2011

Source: Frontier

## Overview H-gas

The increase in flexibility capacity is larger in the H-gas system than in the L-gas system. As illustrated in Table 8, the capacity controlled by non-GasTerra players is similar to GasTerra's. GasTerra is consequently not pivotal over the period 2009 to 2011 (also see Frontier's report).

mcm/h	2009		2010		2011	
	Total	Gas-Terra	Total	Gas-Terra	Total	Gas-Terra
Groningen						
Imports	5.8	- conf. -	6.1	- conf. -	7.6	- conf. -
Interruptible Contracts	0.8	- conf. -	1.0	- conf. -	1.1	- conf. -
Linepack	1.0	0.0	1.0	0.0	1.0	0.0
LNG	0.0	0.0	0.6	0.0	3.4	0.0
Quality Conversion	6.1	- conf. -	7.8	- conf. -	7.8	- conf. -
Small Fields	3.7	3.1	3.4	2.9	3.1	2.6
Storage	3.2	2.4	3.2	2.4	3.9	2.4
Total	20.5	11.2	23.0	10.3	27.7	10.8

Table 8: H-gas flexibility capacity 2009 to 2011

Source: Frontier

## ADDITIONAL ASSUMPTIONS FOR THE CAPACITY SHARE ANALYSIS

Frontier's 2008 Report makes additional assumptions for the capacity share analysis as set out below. The focus of this consultation paper is on the most relevant issues, a detailed overview over all assumptions is provided in the Annexe of Frontier's 2008 Report.

## **Linepack**

- In 2006, hourly data for the availability of linepack is available;
- For 2009-2011 Frontier assumes that the ratio of maximum to average flows remains constant over time, based on the 2006 ratio; and
- Linepack capacity is only considered for hourly flexibility.

## **LNG**

- LNG storage at Maasvlakte is assumed by Frontier to have no capacity available to provide flexibility services to shippers throughout the period of analysis;
- Maximum flows of LNG terminals are set equal to their maximum technical capacity;
- For the LNG terminals Gate and LionGas (2011) Frontier assumes average utilisation of 50% each; and
- For the LNG terminal Taqa Frontier assumes (2010-2011) average utilisation amounts to 33% of its technical capacity since it is an offshore facility which would in general have a higher swing than an onshore facility.

## **Converter stations**

- In 2006, average utilisation of converter stations amounted to 40%;
- Frontier assumes the same average usage for the years 2009-2011, and across parties;
- No constraint on conversion were assumed as the available time span of 8000 hours exceeds the seasonal duration;
- The flexibility from converters is the same for the L-gas and the H-gas market as converters merely shift flexibility between markets; and
- In the analysis of the combined H-gas and L-gas market, there is no capacity to supply flexibility from converters.

## **Underground storage**

- Underground storages are assumed to have a capacity equal to their maximum withdrawal rate, i.e. average flows are zero;
- The ability to provide flexibility into longer duration market segments is constrained by the working gas volume in the case of aquifers and depleted fields; and

- For cavern storages Frontier assumes that they can provide up to twice their working gas volume (i.e. two storage cycles in a 90 day period). This assumption is conservative as all cavern storage projects which are assumed to be commissioned by 2011 are contracted (or assumed to be contracted in the future) by non-GasTerra players.

### **Imports**

- Hourly capacities are scaled up according the duration of the segment;
- Average L-gas imports (backhauls) are zero; and
- For H-gas imports, average imports as a percentage of maximum flows are assumed by Frontier to be identical for GasTerra and non-GasTerra players.

### **Interruptible customers**

- Frontier assumes a restriction of two days per year for all interruptible contracts; and
- Average flows from interruptible customers are assumed to be equal to zero.

### **Production swing**

- Groningen swing for the hourly segment is calculated as the difference between the maximum hourly output and the average hourly output from Groningen in 2006;
- For longer durations Frontier scales up hourly flexibility accordingly; and
- Groningen's production is constrained by a production cap (425 bcm over a period of 10 years). This restriction is not binding, however, even in the seasonal markets.
- Relative average flows are assumed to be the same for GasTerra and non-GasTerra players (small fields only).

#### **Question 9**

- Please comment on any of the assumptions made by Frontier for the capacity share analysis.

#### **Question 10**

- Please comment on any other aspect of Frontier's 2008 Report.