Final Proposed LDZ Shrinkage Factors
North East and Northern LDZ
Gas Year 2005/06

NGN
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LDZ Shrinkage Factors Final Proposals - Gas Year 2005/06

Contents

LDZ Shrinkage Factors Final Proposal for Gas Year 2005/06

1. Purpose of Proposal

The purpose of this paper is to present NGN's proposals in respect of LDZ Shrinkage Factors for the North East and Northern LDZ for the Gas Year 2005/06 as required under Section N of the Network Code.

In Section N of Network Code, Northern Gas Networks has an obligation to set a LDZ Shrinkage Factor to provide for the gas that is used by Northern Gas Networks LDZs or lost from its LDZ systems.

2. Summary of Proposal

NGN has considered carefully the representations from shippers, their input at the shrinkage forum consultation on 15th August and their subsequent comments (see section 9). As a result, NGN has reduced its initial proposals by just over 0.02% and the final proposals represent a conservative estimate of the overall shrinkage factor. In particular, NGN has sought to ensure consistency between transporters' methodology for calculating shrinkage which was the primary request from shippers.

The LDZ Shrinkage Factors, set out within the table below, reflect the losses associated with leakage, theft of gas and gas used in the operation of the system. Details of how these factors have been determined are provided later in this paper. The structure of the paper follows the format of a Network Code Modification report.

Fugitive emissions of gas have been calculated on an LDZ basis. Theft of gas and gas used in the operation of the system has been calculated on a national basis which NGN supports for this year's proposals. NGN has used a figure for OUG below that of last year but significantly above that indicated by independent reports. NGN has also considered Theft of Gas and proposes a reduction in the level attributable to the LDZ's, but still above that indicated by the only available statistics. The calculations that were used to derive the Shrinkage Factors and a summary of the underlying information are set out in this proposal.

The Shrinkage Factors set out in these proposals do not include pressure or temperature correction, in line with the methodology agreed last year. The factors are based on 35 year weather corrected demand data from 2004, consistent with last year's methodology and as agreed by shippers and transporters. These factors are those proposed for the gas year commencing October 2005.

LDZ	Proposed Shrinkage Factor 2005/06
North East	0.664
Northern	0.603

Note: the factors shown in the table are as a percentage of LDZ throughput – i.e. 0.664 (as shown in the table) is 0.664% of the appropriate LDZ's throughput.

3. Component Analysis

This section of the document presents an analysis of the components of LDZ shrinkage that make up the estimates for the Gas Year 2005/06 proposal.

3.1 Leakage

Leakage represents the largest component of the LDZ Shrinkage Factor.

For the purpose of analysis leakage may be conveniently split into the following three categories:

- distribution Mains (including service pipes);
- above Ground Installations (AGIs); and
- other losses.

Distribution mains and services leakage is a feature of normal system operation.

AGI leakage includes the routine venting of control equipment. (Routine equipment venting at AGI installations could be said to be Own Use Gas, however for the purpose of this proposal it is included in the AGI leakage category.)

Other losses include gas lost as a result of interference damage and broken mains. These losses are not continuous; they are caused by specific events.

3.1.1 Distribution Mains (and Services) Leakage

The leakage of gas from the Distribution Mains system (which includes service pipe leakage) is calculated by combining the results of the 2002/03 National Leakage Testing programme with the following network[1] specific information:

- current (year end 2004) records of the pipe asset;
- the annual average system pressure in each network; and
- the measured concentration of Monoethylene Glycol (MEG) joint treatment chemical in the gas.

Leakage is calculated by multiplying the annual average mains pressure in each network by the Main and Service Pipe Leakage Factors determined by the 2002/03 National Leakage Test programme and the relative lengths of mains / numbers of services in each network. Where applicable (i.e. cast iron mains only) the Pipe Leakage factors are adjusted to take into account the measured concentration of MEG.

Information relating to the National Leakage Test programme, the application of the results to calculate leakage and the external validation of the results has already been shared with Users and Ofgem; consequently it is not proposed to include additional details in this paper.

[1] Network in this context relates to physical interconnected pipe systems.

The table below shows the Low Pressure leakage on an LDZ basis.

LDZ	Low Pressure Leakage	
	Tonnes[2]	GWh
North East	16086	247
Northern	12370	190
Total	**28456**	**437**

The table below shows the Medium Pressure leakage on an LDZ basis.

LDZ	Medium Pressure Leakage	
	Tonnes	GWh
North East	1220	19
Northern	769	12
Total	**1989**	**31**

3.1.2 AGI Leakage

The figures for leakage from Above Ground Installations have been taken from the findings of the Transco 2003 Above Ground Installation Leakage Test programme.

Information relating to the programme has already been shared with Users and Ofgem; consequently, it is not proposed to include significant detail in this paper.

The table below shows AGI leakage on an LDZ basis.

LDZ	AGI Emissions[3]	
	Tonnes	GWh
North East	2679	41
Northern	1986	30
Total	**4665**	**71**

3.1.3 Other Losses

Gas may be lost from LDZ equipment as a result of specific events, namely broken mains and interference damage to plant, in addition to ongoing leakage. These losses are known collectively as other losses.

Statistics in respect of the number of broken mains and damages are used in conjunction with calculations of the amount of gas lost through each type of incident to derive the total amount of gas lost as a result of these events. (For the purpose of

[2] The tonnes figure is provided for information (it has no purpose in respect of calculating the Shrinkage Factors). The conversion to tonnes is based on a gas density of 0.73kg/m^3.
[3] Includes leakage and routine equipment venting

this paper the number of events in 2004 has been used for the analysis together with emergency personnel response times from the first quarter of 2005.)

The table below shows the amount of gas lost as a result of other losses on a national basis.

Interference	Tonnes	GWh
North East	67	1.0
Northern	56	1.0
Total	**123**	**2.0**

3.1.4 Total Leakage

The table below shows the total amount of predicted leakage for Gas Year 2005/06 on an LDZ basis with the leakage expressed in tonnes, GWh and as a percentage of LDZ throughput.

LDZ	Leakage		
	Tonnes	GWh	Leakage % Throughput
North East	20051	308	0.609
Northern	15182	233	0.548

3.2 Own Use Gas

Natural gas is a compressible fluid; as a direct result of this property, it experiences a drop in temperature when it undergoes an isenthalpic expansion. This means that when gas has its pressure reduced (at an NTS offtake or Local Transmission System regulator site) the gas on the downstream side of the pressure reduction apparatus is colder than the gas on the upstream side.

To avoid the gas leaving a site at below the freezing point of water pre-heating may be applied. (Pre-heating is only needed to maintain gas above 0 deg C and if the gas enters the site at a sufficiently high temperature – e.g. during the summer, or the pressure reduction is small then pre-heating may not be required.)

Pre-heating requires a small proportion of the gas passing through the site to fuel the pre-heating equipment[4].

The model used to assess the Own Use Gas component applies thermodynamic principles with a range of conservative assumptions. These include the supposition that all gas into an LDZ passes through one offtake, and is subject to a two stage pressure reduction process with a plant efficiency assumed to be 50%. Metered data where available is not used.

[4] A minority of the smaller pre-heaters use electricity instead of gas as the fuel.

Transco believes that the assumptions used in the calculations, particularly concerning the plant efficiency of the equipment, are pessimistic. That is to say that the calculations overstate the amount of own use gas that is consumed. Transco highlighted this situation last year and estimated that the actual OUG figure was between 0.02% and 0.03%.

NGN has considered the Transco OUG methodology and has come to a similar conclusion.

Section N 3.1.1 of the Uniform Network Code requires the Transporter to estimate, for the purpose of establishing the Shrinkage Factor, the amount of OUG in the following gas year. The amount determined by the Transco methodology is generally accepted by the industry, to be an over estimate.

NGN recognises that any method to estimate OUG will have limitations but it is a clear Code obligation on all Transporters to use the best information available to estimate OUG in the LDZ.

Advantica is well respected within the gas industry with many years' experience in scientific and engineering development. A report published by Advantica in May 2002 concluded that OUG in 2000 was 0.0113% of throughput with an upper bound 95% confidence limit of 0.0137%. The report also identified that a number of features in the model were not fully utilised and these would have allowed pre-heat modelling to be carried out in much more detail. The features concerned lead NGN to the opinion that the figure for OUG could be even lower. NGN considers this Advantica report to be the best information available to estimate OUG in the LDZ. Although this report is three years old, the equipment and heating methodology has not changed and its conclusions are still valid.

For the Gas Year 2005/06, NGN proposes figures for Own Use Gas of 0.035%, which is significantly above that in the Advantica report and which allows for the heater efficiency to be significantly below the 50% assumed within the report. The 0.035% was a compromise arrived at after discussions with shippers indicated that they would support it. NGN is using a national figure for own use gas to ensure a common methodology between transporters, however NGN will consider moving to regional (LDZ) estimates next year once further analysis has been undertaken. For future years, NGN plans to identify a more accurate methodology for calculating OUG – firstly to calculate a better estimate and secondly to ensure that NGN is incentivised appropriately to reduce OUG.

3.3 Theft of Gas

Network Code Section N 1.4.2 states that LDZ Shrinkage shall include, and Northern Gas Networks is therefore responsible for, gas illegally taken upstream of the customer control valve and downstream where there is no shipper contract with the end-user. The statistics for confirmed Theft of Gas for 2004 are detailed in the table below.

Cases Of Confirmed Theft Made Known To Transco	Total	Transporter Responsible
2004	1316	53 (4.0%)
2003	419	5 (1.2%)

The statistics indicate that of the cases of confirmed theft made known to Transco, 4% were identified as being transporters' responsibility in 2004 and just 1.2% in 2003.

Historically, unidentified theft has been assumed to be 0.3% of LDZ throughput, of which 10% is deemed to be Transporter responsibility, resulting in a theft of gas factor of 0.03%. The basis for these assumptions is uncertain. NGN does not accept that the proportion of Transporter theft is as high as 10%. The most recent statistics support this view.

The statistics imply that transporters are responsible for between 1% and 4% of theft. While recognising the limitations of the current methodology and the concerns of shippers, NGN considers that the proportion of theft attributed to the Transporter should be 4%, in line with last year's transporter responsible thefts and significantly above 2003's. This would give an overall theft of gas of 0.012%. However, NGN recognises the concern of shippers that further work should be done to confirm this data, and notes that the ENA and ERA are currently preparing a report on theft of gas that may further inform the figure that should be used. NGN therefore proposes, conservatively, that the national Theft of Gas factor be set at 0.02% for the Gas Year 2005/06 in line with the compromise discussed at the 15th August shrinkage forum.

3.4 LDZ Shrinkage Factor Summary

The proposed LDZ Shrinkage Factors for the Gas Year 2005/06 are presented in table below.

LDZ	Leakage	Own Use Gas	Theft of Gas	Proposed Shrinkage Factor 2005/06
North East	0.609	0.035	0.02	0.664
Northern	0.548	0.035	0.02	0.603

Note: All factors are expressed as percentages of LDZ throughput.

4. Detailed Analysis

4.1 Leakage

In May 2003, Advantica on behalf of Transco completed an extensive programme of Leakage Tests. These tests were undertaken at the request of Users.

Before commencing the testing programme, Users were invited to help Transco scope the project. Subsequently Users were updated in respect of progress and had the opportunity to witness one of the tests.

Altogether 849 sets of test results were obtained. The full test results were presented to Users on the 10th of June 2003. Users have subsequently received a report, written by Advantica, detailing the programme and its findings.

To ensure that the testing programme was effective Stone and Websters (a firm of consulting engineers) was asked to investigate the planned methodology. They found that both the proposed testing process and the equipment were fit for purpose. A copy of their report has been circulated.

In addition, Dr Shirley Coleman from the Industrial Statistics Research Unit of Newcastle University was invited to comment upon and discuss with Users the proposed sample plan. It was concluded that the proposed sample was likely to produce the results that were required.

To ensure that the tests were conducted properly, Haswells (a firm of consulting engineers) were invited to observe the training given to test teams and to carry out random audits of the tests as they occurred. Altogether, Haswells audited 77 tests finding that high professional standards were maintained throughout the programme. Haswells produced interim and final reports that have been passed to Users. In addition, Users were given the opportunity to question Haswells during a meeting.

All the data produced by the tests was sent to Dr Coleman for independent analysis. She presented her findings to the Users on the 10th of June 2003 when she also provided them with copies of her report.

Further detail relating to the testing programme and the results that it produced may be found in the Advantica report that has been circulated to Ofgem and Users.

In addition to testing distribution mains, we have also tested our above ground LDZ assets.

The AGI testing programme was introduced during the March 2003 Shrinkage Forum. Subsequently Users had the opportunity to question Dr Peter Russell - who led the work - and to visit a test in progress. To ensure the integrity of the testing programme, Nottingham University (Environment Science Department) examined the testing procedure and Dr Coleman commented upon the results prior to their being used in the Final Proposals in respect of the 2003/04 Gas Year.

We believe that the recent test programmes provide a firm basis for assessing the leakage from both the distribution mains and AGIs; consequently, Northern Gas Networks has utilised the information as the basis for these proposals.

The results of the leakage testing programmes have been used in conjunction with our mains and other plant records, measurements of MEG concentration and system pressures to derive total leakage by LDZ.

In the twelve months since we published our proposals for the 2004/05 Gas Year we have:

- replaced around 412km of metallic low pressure gas mains and associated metal gas services,
- replaced around 35km of metallic medium pressure gas mains and services,

The net effect of these significant initiatives has been to reduce the amount of leakage that has been occurring.

Set against these positive steps (from a leakage reduction perspective) we have installed additional Pressure Reduction Installations to enable the connection of new customers and seen a reduction in measured MEG concentration[5]. Average system pressure has also increased slightly in both LDZ's which has led to a marginal increase in leakage.

4.2 Own Use Gas

In the past, Transco has presented details of the method whereby Own Use Gas is calculated. NGN support the opinion, expressed at last year's proposal meeting, that the OUG methodology overestimates the figure for OUG due to pessimistic assumptions in the current model, particularly with regard to plant efficiency and the supposition that all gas enters the LDZ via one offtake. The report carried out by Advantica for Transco and published in 2002 concluded that the OUG for calendar year 2000 was 0.0113%. NGN has used a conservative figure of 0.035% to allay shippers' concerns about the applicability of the report and to ensure consistency between transporters.

4.3 Theft of Gas

Transco first raised the issue of Theft of Gas at the Shipper Forum meeting on 24 February 2003 and subsequently on several other occasions – most recently on 8 March 2004. As a result of those discussions, it was concluded that 0.3% of LDZ throughput would have to continue to be used as the overall level of theft until better information becomes available.

The most recent Transco figures suggest that the proportion of theft for which Transco was responsible for managing was significantly less than 10%, (see table in Section 3.3).

[5] It should be expected that MEG concentration will reduce year on year as gas treatment becomes less economic as the length of cast iron main to treat reduces – as it is replaced by PE mains.

In the light of the 2003 and 2004 figures of 1.2% and 4% provided in section 3.3, and the discussion at the most recent Gas Shrinkage Forum, NGN consider that theft which is the transporter's responsibility is no more than 1.2%, ie 4% of 10%. However, recognising the concerns raised by shippers, NGN proposes, conservatively, that a national Theft of Gas factor should be set at 0.02% for the Gas Year 2005/06 (ie 6.5% of 0.3% of LDZ throughput).

5. Extent to which the Proposal would better facilitate the relevant objectives

This proposal provides an accurate estimate of LDZ leakage and a conservative estimate of LDZ theft of gas and own use gas for the Gas Year 2005/06. As a result, the gas usage and loss in transportation within the LDZs will be reflective of actual conditions. This facilitates the achievement of efficient and economic operation of the system as NGN will be incentivised to identify opportunities to reduce shrinkage in future years.

It will also lead to better targeting of costs to Users through the RbD process and this is consistent with securing effective competition.

6. The implications for Northern Gas Networks of implementing the proposal including:

a) Implications for the operation of the System:
We are not aware of any such implications that would result from implementing this proposal.

b) Development and capital cost and operating cost implications:
The proposed LDZ Shrinkage Factors (which do not include Pressure and Temperature correction) lead to a fair allocation of operating costs between LDZ systems.

c) Extent to which it is appropriate for Northern Gas Networks to recover the costs, and proposal for the most appropriate way for Northern Gas Networks to recover the costs:

It is appropriate for each LDZ to incur a share of the overall Shrinkage Energy dependent upon the actual shrinkage in that LDZ.

d) Analysis of the consequences (if any) this proposal would have on price regulation

The continued removal of Temperature and Pressure correction greatly facilitates the establishment and operation of Distribution Network specific transportation charging formula (which is an Ofgem objective). For this reason in 2004 Transco proposed to move to a regime that did not include Temperature and Pressure Correction. Northern Gas Networks concur with this proposal.

In the longer term, the implementation of this proposal offers the prospect of real savings for consumers through the operation of the principle of comparative regulation.

7. The implications of implementing the Proposal for Users

This proposal improves the equability and accuracy of cost targeting across all Users.

8. Analysis of any advantages or disadvantages of implementation of the Proposal

- **Advantages:** Improved allocation of the actual system usage and losses with improved cost targeting and appropriate incentivisation for future shrinkage reduction.
- **Disadvantages:** Northern Gas Networks is not aware of any disadvantages.

9. Summary of the representations (to the extent that the import of those representations are not reflected elsewhere in the Proposal)

The network code allows shippers to make representations to transporters on their initial proposals by 1st August. By this date we had received just one representation, from Total. However, in producing our final proposals, we have also taken into account a representation by e.on addressed only to NGT and a representation from British Gas, sent on the 5th August. We have recognised the shippers' primary request for a common methodology and consequently the transporters have agreed to use the same methodology. Additionally we have used more conservative estimates for theft of gas and own use gas, in line with shippers' requests.

At the Shrinkage Gas Forum on 15th August, it was agreed that 35 year weather corrected demand data should be use, in line with NGN's initial proposals.

There was some discussion about own use gas and the 2002 Advantica report. Four shippers subsequently provided representations that they would be happy with a national figure of .04%. It was subsequently agreed with these shippers that a figure of .035% would be used by all transporters.

At the Shrinkage Gas Forum on 15th August a compromise figure of 0.02% for theft was discussed and no shippers dissented at the meeting. Subsequently, three shippers indicated that they would be unhappy with 0.02%. However, Centrica commented "we . . . will consider whether this retains sufficient accommodation of the other issues of ToG within the final proposals". Subsequently, our understanding is that Centrica has agreed not to submit an application for disallowance of shrinkage proposals on the basis of a theft figure of 0.02%. On this basis, we have used this compromise figure in our final proposals.

Accordingly, NGN has modified its initial proposals and amended its shrinkage factor in line with the above. This has resulted in an increase in the shrinkage factor from initial proposals for both North East and Northern LDZ.

10. Programme of works required as a consequence of implementing the Proposal

The only required modification is to the LDZ Shrinkage Factor values entered into the UK LINK.

11. Proposed implementation timetable (inc timetable for any necessary information system changes)

When we publish our final proposals, Users have until the 16th of September 2005 to request that Ofgem issue a Condition 7(4) disapproval of this proposal. (This provision is in the Network Code Section N 3.1.8.)

If no disapproval notice is issued, it is our intention to implement revised LDZ Shrinkage Factors from 06:00 hrs on the 1st of October 2005.

12. Recommendation concerning the implementation of the Proposal

We recommend the proposed LDZ Shrinkage Factors be implemented with effect from 06:00 hrs on the 1st October 2005.

13. Northern Gas Networks Proposal

This report contains our proposal for the LDZ Shrinkage Factors for the Gas Year 2005/06.

Appendix 1 – Pipe and Service Leakage Analysis 2003 to 2004 by LDZ

This section of the document provides a comparison of the assessed levels of LP pipe and service leakage by LDZ.

Details of leakage quantities in tonnes and energy quantities, annual average system pressures (ASP) and Monoethylene Glycol (MEG) levels are presented for 2004 with 2003 for comparison purposes. The levels quoted are only those attributable to low pressure mains and service leakage.

For the first time we have supplied specific information relating to the average pressure that is experienced by networks that contain metallic pipes and which excludes the all PE networks that often operate at higher pressures but which have very low leakage as a result of their superior performance. This should enable Users to better compare the effective operating pressures of the different LDZs.

North East LDZ

	2003	**2004**
Leakage (GWh)	230	247
Annual Average System Pressure	31	31.95
ASP (All-PE systems excluded)	30.5	31.46
MEG Saturation Level	24%	15.54

There was an increase of 0.96mbar in overall ASP for North East LDZ between 2003 and 2004. There was also a decrease of 8.46% in MEG Saturation levels.

Northern LDZ

	2003	**2004**
Leakage (GWh)	185	190
Annual Average System Pressure	33.0	33.1
ASP (All-PE systems excluded)	32.1	32.29
MEG Saturation Level	26%	19.74

There was an increase of 0.19mbar in overall Average System Pressure for Northern LDZ between 2003 and 2004 and a decrease of 6.26% in MEG Saturation levels.

Appendix 2 – Flow-Weighted Average Calorific Values (CVs) for each LDZ for 2003 and 2004

The daily flow weighted average Calorific Values for each LDZ, determined in accordance with the Gas (Calculation of Thermal Energy) Regulations, have been used to determine flow-weighted averages for 2004. These values have then been applied to convert leakage estimates in volume terms to energy quantities for each LDZ. The values are presented in the table below with 2003 for comparison purposes.

LDZ	**Average Calorific Values (MJ/m^3)**	
	2003	**2004**
North East	40.6	40.43
Northern	40.4	40.30